

Appendix D
Detailed Safety Assessment

Study Area Safety Review

This appendix presents the safety review of the 15 study area intersections and the corridor. Crash patterns for the intersections and along the corridor were examined, and a field visit was performed to identify contributing factors and possible mitigation measures identified. Following the field visit, each intersection was reviewed and additional factors identified. Crash Modification Factors (CMFs) were used to quantify an expected reduction in crashes if various measures were implemented. The primary source for CMF was the AASHTO Highway Safety Manual (HSM), 1st Edition (2010), while the VDOT HSIP's CRF were used as a supplementary reference where the HSM did not have listed factors. **Figure D-1** presents the location of the 15 study area intersections. Previous prepared studies, as summarized in **Section 3.1**, were also considered as part of the process to develop recommendations for the study intersections and the corridor. This was included in the process to ensure consistency with past studies.

Intersection Safety Review

This section reviews and provides summary of crash type by intersections, observations of field review with patterns and potential causes contributing to crashes, and recommendations for mitigation measures.

The crashes were grouped in the day and night classification based on the crash data description below.

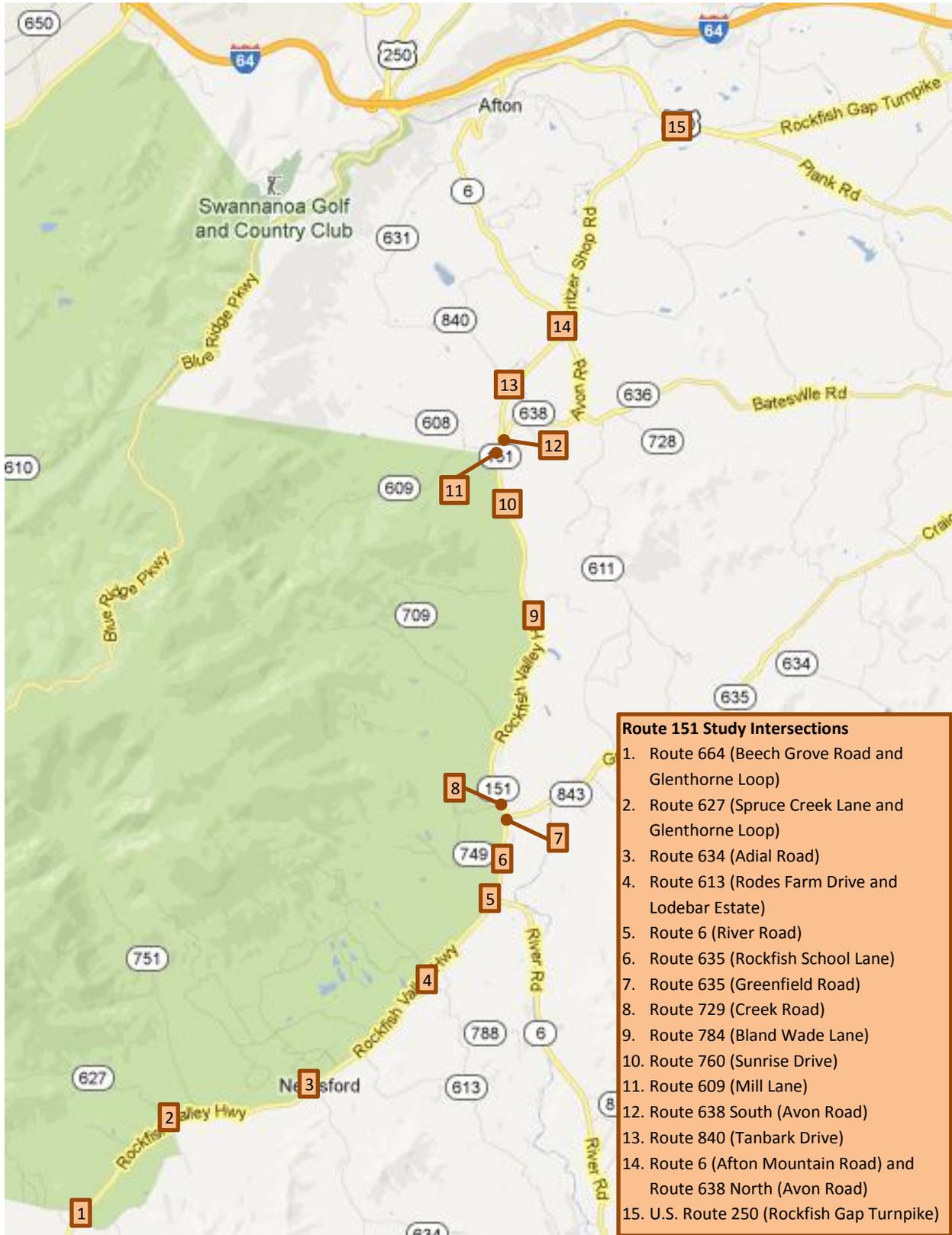
Classification	Crash Report Description
Day	Daylight
Night	Darkness, Dusk, Dawn

Following the review of the key study area intersections, a review of general issues is provided for the corridor, along with recommendations.

The recommendations are listed as:

- **Short-term Improvements:** Improvements that can be implemented in the immediate 6-year timeframe. Such projects would be maintenance items including replacing guardrails, improving signage, or projects that are funded with Highway Safety Improvement Program (HSIP) grants. The six-year improvement program can also fund projects, but likely be in the outlying years.
- **Mid-term Improvements:** that can be implemented in the 6 to 10-year timeframe.
- **Long-term Improvements:** require additional studies and/or design efforts and would be implemented beyond the 10-year timeframe.
- **On-going Maintenance:** regarded as action items or maintenance items that would be implemented continuously, including enforcement of regulations prohibiting over-sized trucks on Route 151, or removing overgrown vegetation.

Figure D1: Study Area and Study Intersections



1. Route 664 (Beech Grove Road)/(Glenthorne Loop) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Angle	1	Property Damage	Day
Fixed Object - Off-Road	1	Property Damage	Night

Observations:

- Route 151 southbound right turning traffic onto Beech Grove Road.
 - Slow turning movements. The slow turning vehicles may obstruct the view for the vehicles turning from eastbound Beech Grove Road.
 - Some vegetation in northwest quadrant impedes sight distance.
 - Impatient Route 151 southbound through vehicles may clip right-turning vehicles.
 - Some southbound Route 151 traffic may be intending to turn into “Ski Barn” parking lot but may have turn signal on when passing Beech Grove Road.
 - This may confuse Beech Grove Road eastbound left turning traffic, causing this traffic to turn in front of Route 151 southbound through traffic.
- Signage on northbound Route 151 may be confusing; current location of Route 664-ahead sign could direct traffic into Devils Backbone business.
- Conditions are worse during ski season.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Trim vegetation in northwest quadrant	On-going	<ul style="list-style-type: none"> • Increases sight distance for turning vehicles • Eliminates obstacle within the sight distance triangle
Adjust signage along northbound Route 151	Short-Term	<ul style="list-style-type: none"> • Helps drivers prepare early for turning
Add southbound offset right turn bay, or	Mid-Term	<ul style="list-style-type: none"> • Prevents stopped vehicles from blocking the through movements • Expect 14 percent reduction in crashes based on Highway Safety Manual (HSM)¹

¹ AASHOTO, Highway Safety Manual, 1st Edition, 2010.

2. Route 627 (Spruce Creek Lane and Glenthorne Loop) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Angle	1	Injury	Day
Fixed Object - Off-Road	1	Injury	Night
Wildlife	1	Property Damage	Night

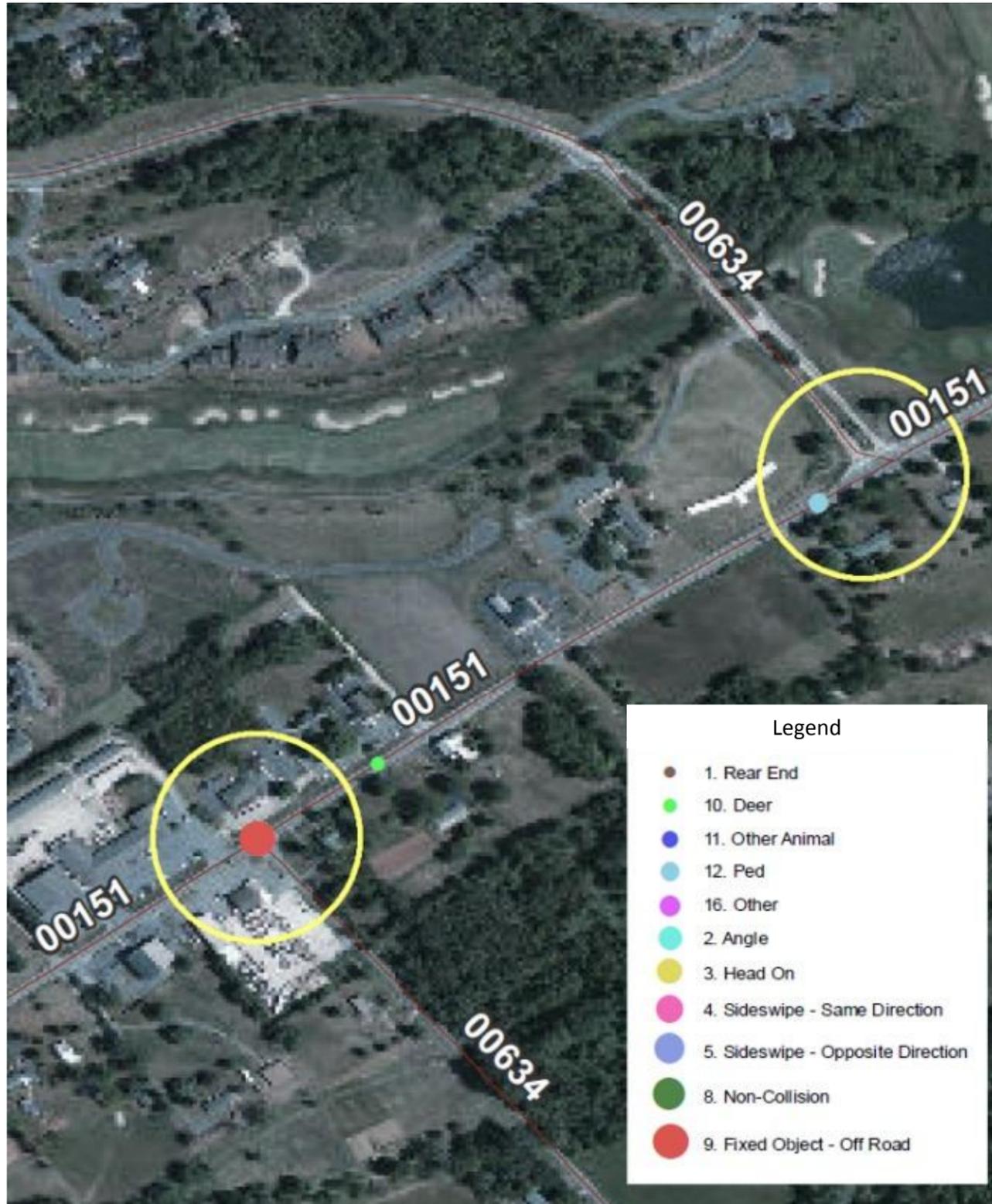
Observations:

- Skewed alignment due to foundation of a former mill in the southeast quadrant.
- Approximately 100-150 people reside along Spruce Creek Lane; ongoing development is currently adding 25 homes (some may already be occupied).
- Per comments from the Sherriff's Deputy, when eastbound vehicles turn left to travel northbound, often they will turn into the southbound lane (in the wrong lane), get up to roadway travel speed, then move over into the northbound lane.
- Location has a perceived high left turning truck traffic volume. Note, a cidery is located to the east.
- Spruce Creek Lane eastbound left turning onto Route 151 northbound has very poor line of sight:
 - Embankment in southwest quad limits sight distance.
 - Often left turning traffic will turn and drive in the southbound lane (i.e. wrong way traffic) until they can move over into the northbound lane.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Add intersection-ahead signage with flashers on the northbound approach, include actuation when vehicles approach intersection on minor approaches	Short-Term	<ul style="list-style-type: none"> • Enhances the visibility of intersection and increases motorists' awareness of traffic on the minor approaches
Realign Route 627 to reduce skew (by 25 degrees) and improve sight distance	Mid-Term	<ul style="list-style-type: none"> • Improves sight distance • Reduces the chance of left turn vehicles to turn onto wrong way on Route 151 • Expect 9 percent reduction in crashes based on HSM
Regrade embankment in the southwest quadrant	Mid-Term	<ul style="list-style-type: none"> • Increases sight distance for side street vehicles • Eliminates obstacle within the sight distance triangle
Monitor traffic volumes and crashes to determine if signal is warranted	On-going	<ul style="list-style-type: none"> • Signalization will provide safe opportunities for minor road traffic to turn onto Route 151
Monitor need for a southbound left turn bay to accommodate turning traffic	On-going	<ul style="list-style-type: none"> • Will provide a separate lane for left turning traffic as they wait for a safe gap in the opposing through lane to turn

3. Route 634 (Adial Road)/Nellysford area at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Pedestrian	1	Fatal	N.A.
Fixed Object – Off Road	1	Property Damage	Day
Wildlife	1	N.A.	N.A.

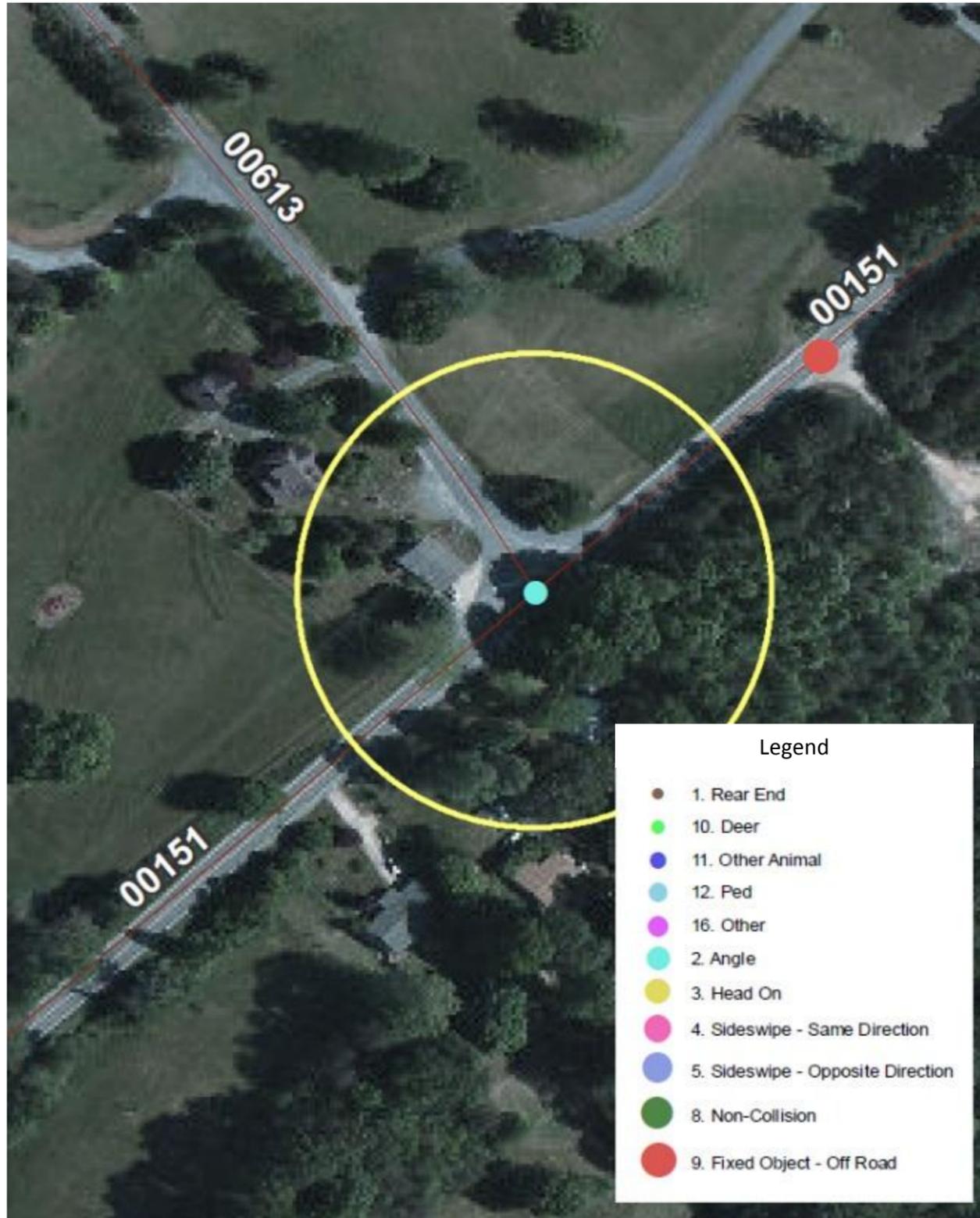
Observations:

- Lack of stop bar and end-of-road treatment.
- Vegetation along the side of the roadway can block view of the stop sign.
- Lack of pedestrian facilities.
- Poor Access Management/poor inter-parcel connectivity.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Add sidewalks and crosswalks for pedestrians	Short-Term	<ul style="list-style-type: none"> • Separates pedestrian and vehicular traffic flow • Provides protection to pedestrian and enhances their safety
Along Adial Road, trim vegetation and relocate stop sign	Short-Term	<ul style="list-style-type: none"> • Increases sight distance for turning vehicles • Eliminates obstacles within the sight distance triangle
As new development or re-development occurs, improve access management and inter-parcel connectivity	Long-Term	<ul style="list-style-type: none"> • Limits disturbances from driveways and reduces inter-parcel traffic's usage of mainline • Expect 25 percent reduction in crashes based on HSM
Explore potential to reduce speed limit to 35 mph within the Nellysford commercial area	Long-Term	<ul style="list-style-type: none"> • Reduces both crash potential and collision severity

4. Route 613 (Rodes Farm Drive and Lodebar Estate) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Angle	1	Injury	Night
Fixed Object – Off Road	1	Injury	N.A.

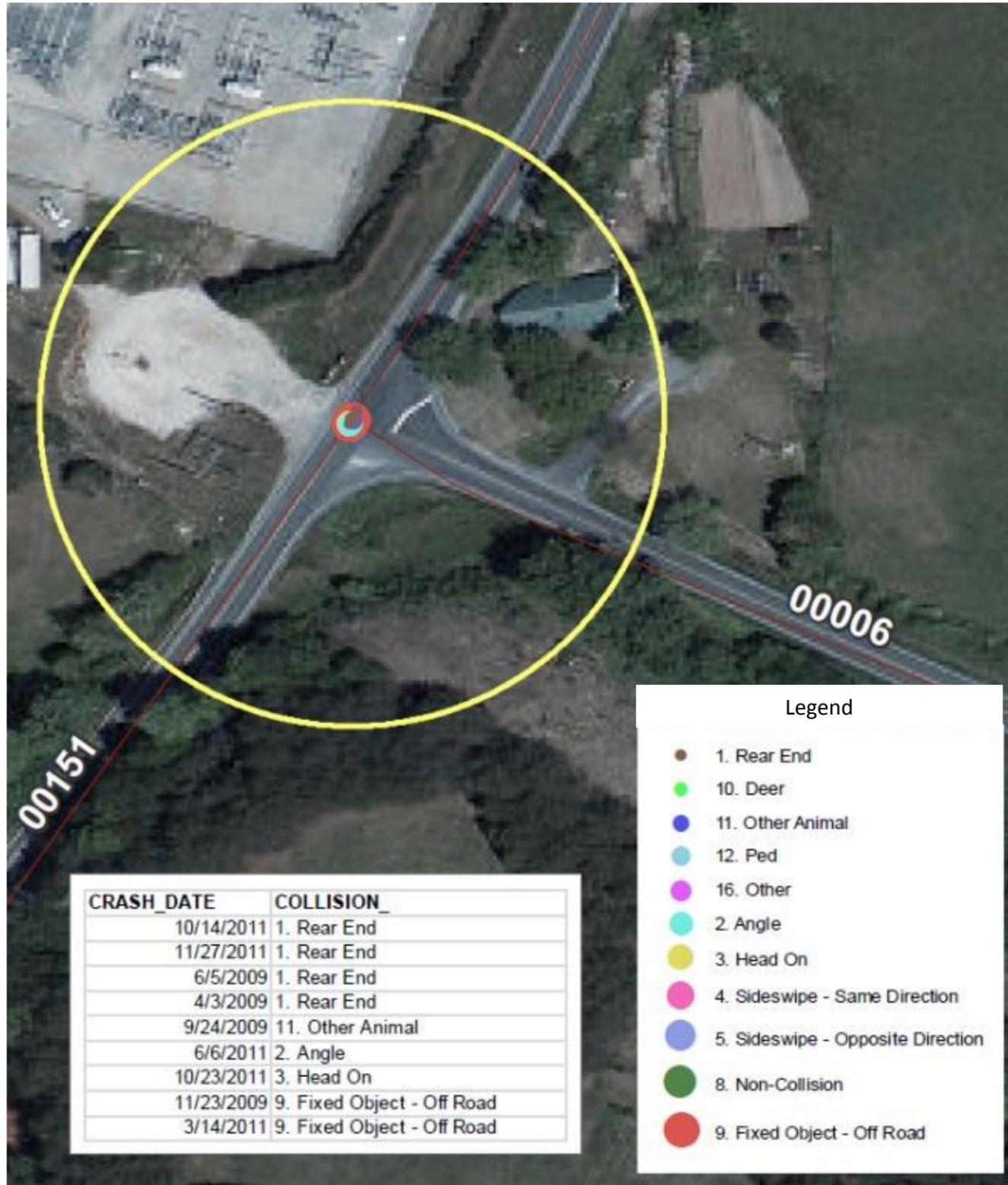
Observations:

- Crest in hill and embankments between the two (2) intersections limits sight distance for turning vehicles from minor roadways and driveways.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Regrade roadway in area to improve sight distance <ul style="list-style-type: none"> ○ Reduce crest of hill ○ Regrade embankment 	Long-Term	<ul style="list-style-type: none"> • Increases sight distance for side street vehicles • Eliminates obstacle within the sight distance triangle
Review signage to ensure compliance with State Code	Short-Term	<ul style="list-style-type: none"> • Increases sight distance for side street vehicles and reduces driver distraction

5. Route 6 (River Road) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Read-end	1	Injury	Day
	2	Property Damage	Day
	1	Property Damage	Night
Angle	1	Injury	Day
Fixed Object – Off Road	1	Injury	Night
	1	Property Damage	Night
Other Types	1	Property Damage	Night

Observations:

- Stop bar on River Road fairly close to edge of travel way of Route 151 northbound.
 - Route 151 southbound left turning traffic crosses over double-yellow of both Route 151 and River Road, which may cause them to conflict with River Road traffic queued at the stop bar.
 - Buses and tractor trailers have little room to make left turn if a vehicle is stopped, as there is little receiving room for the departing leg.
 - Cannot move stop bar back due to embankment in southeast quad.
- Lack of southbound left turn lane.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Widen east leg of intersection for wider receiving area to accommodate turning vehicles	Short-Term	<ul style="list-style-type: none"> • Provides better radius for easy turning movements of heavy vehicles and buses
Consider roundabout (Option A)	Mid-Term	<ul style="list-style-type: none"> • Relatively low traffic circulation speed • Reduces conflict points and angles • Reduces collision potentials and severity • Expect 44 percent reduction in crashes based on HSM
When upgrading bridge to the north, widen structure to accommodate a southbound left turn bay (close proximity of bridge may preclude a left turn bay under current configuration)	Mid-Term	<ul style="list-style-type: none"> • Reduces the collision potentials between through vehicles and turning vehicles stopped at the intersection • Expect 44 percent reduction in crashes based on HSM

6. Route 635 (Rockfish School Lane) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Read-end	4	Injury	Day
	3	Property Damage	Day
Angle	1	Injury	Day

Observations:

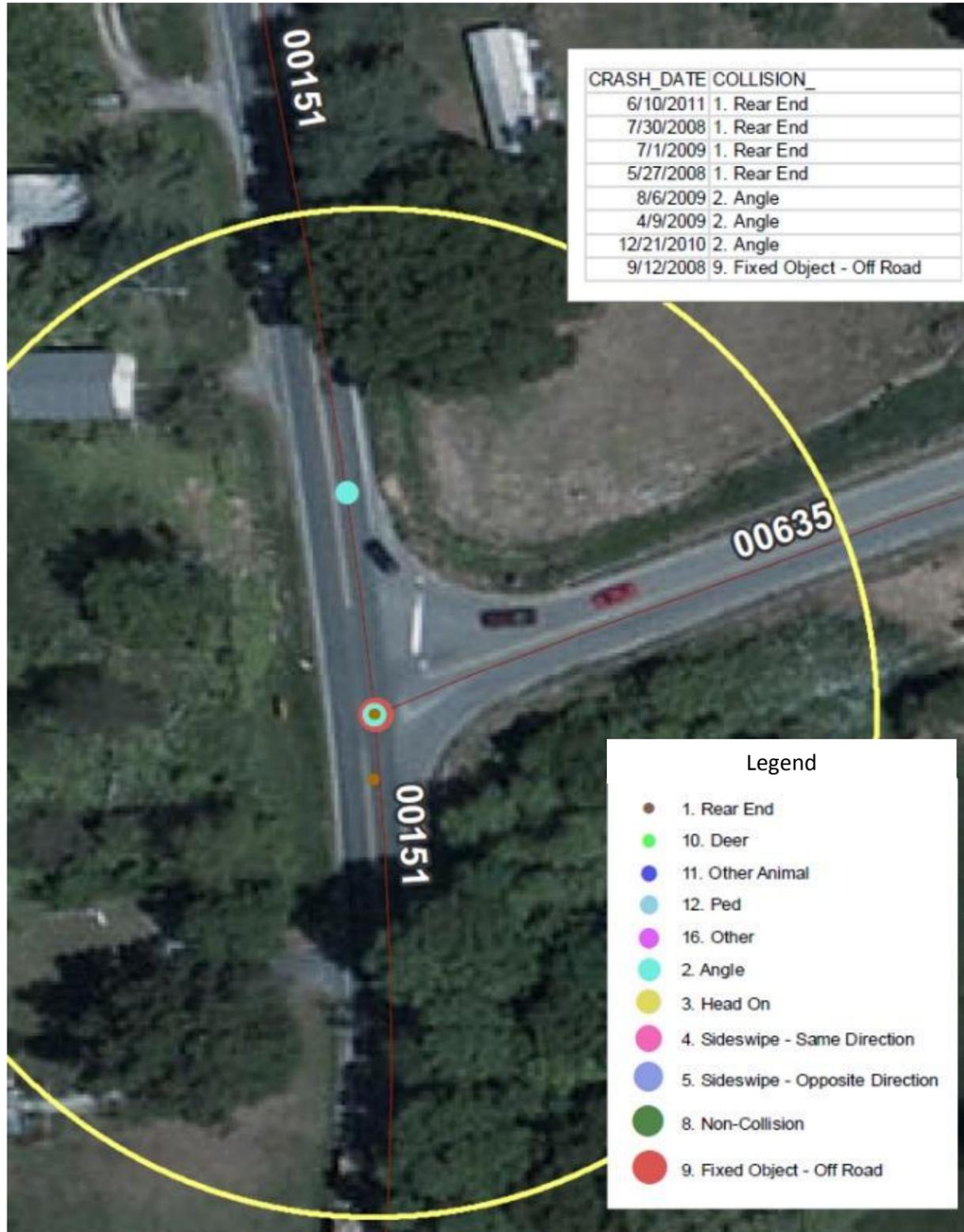
- Most crashes have occurred in 2010 and 2011:
 - Due to addition of Recycling Drop-off at Community Center.
 - Park activities generate high traffic: soccer fields, horse and dog shows.
- Lack of turn lanes.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Add a northbound left turn lane*	Short-Term	<ul style="list-style-type: none"> • Reduces the collision potential between through vehicles and turning vehicles stopped at the intersection • Expect 44 percent reduction in crashes based on HSM

* VDOT has approved an HSIP grant to construct a northbound left turn lane. Preliminary start date for construction is October 2015.

7. Route 635 (Greenfield Road) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Read-end	4	Property Damage	Day
Angle	1	Injury	Day
	2	Property Damage	Day
Fixed Object -Off-road	1	Injury	Night

Observations:

- Most crashes occurred in 2008 and 2009.
 - Note that this location was reconstructed in 2010-2011 timeframe.
- The northbound right turn bay is short.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Extend northbound right turn bay by utilizing (restriping) the existing shoulder prior to the start of the turn bay	Short-Term	<ul style="list-style-type: none"> • Reduces the collision potential between through vehicles and turning vehicles stopped at the intersection • Expect 14 percent reduction in crashes based on HSM

8. Route 729 (Creek Road) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Read-end	2	Injury	Day
	1	Property Damage	Day
Angle	2	Injury	Day

Observations:

- Line of sight issues for Creek Road.
- Lack of left turn bay into the southern entrance of the store, primary access point for vehicles from the south.
 - Many drivers already using hatched median as a turning area.
- Lack of southbound right turn bay.
- Presence of underground utilities may hinder improvements.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Restripe roadway to provide northbound left turn into the store's southern access	Short-Term	<ul style="list-style-type: none"> • Reduces the collision potential between through vehicles and turning vehicles stopped at the intersection • Expect 44 percent reduction in crashes based on HSM
Add a southbound right turn bay onto Creek Road, move minor road stop bar further towards the southbound through lane	Mid-to Long-Term	<ul style="list-style-type: none"> • Reduces the collision potential between through vehicles and turning vehicles stopped at the intersection • Expect 14 percent reduction in crashes based on HSM

9. Route 784 (Bland Wade Lane) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Read-end	1	Injury	Day
Angle	1	Injury	Day
Fixed Object -Off-road	1	Injury	Day
	1	Injury	N.A.

Observations:

- Limited sight distance to the north, less than 200 feet, affects southbound left turns and Bland Wade traffic.
- Route 151 dips to the south, limiting sight distance.
 - Traffic from 784 cuts through the gym lot to turn left when destined to the south – gets better line of sight.
- Lack of advance signage for Route 784 in the northbound direction, and signage for Route 784 is on the far side of the intersection.
- There is already a constant flashing 35 mph advisory speed sign.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Consider changing flashers to be demand responsive, so that they flash only when a vehicle present (35 mph advisory speed sign with flashers already present)	Short-Term	<ul style="list-style-type: none"> • Increases motorists’ awareness of the speed limit in this section • Alerts speeding drivers and reduces collision potentials and severity
Add a northbound right turn bay	Mid-Term	<ul style="list-style-type: none"> • Reduces the collision potential between through vehicles and turning vehicles stopped at the intersection • Expect 14 percent reduction in crashes based on HSM
Regrade roadway to improve sight distance and eliminate dip in road, or relocate Bland Wade Lane south of the Fitness Center	Long-Term	<ul style="list-style-type: none"> • Increases sight distance in mountain terrain

10. Route 760 (Sunrise Drive) at Route 151



Crash Summary:

- No reported crashes for analysis years
- Crash debris present south of intersection during site visit
- Guardrail condition indicates two (2) off-road accidents
- Frequent deer collisions in the vicinity of the intersection

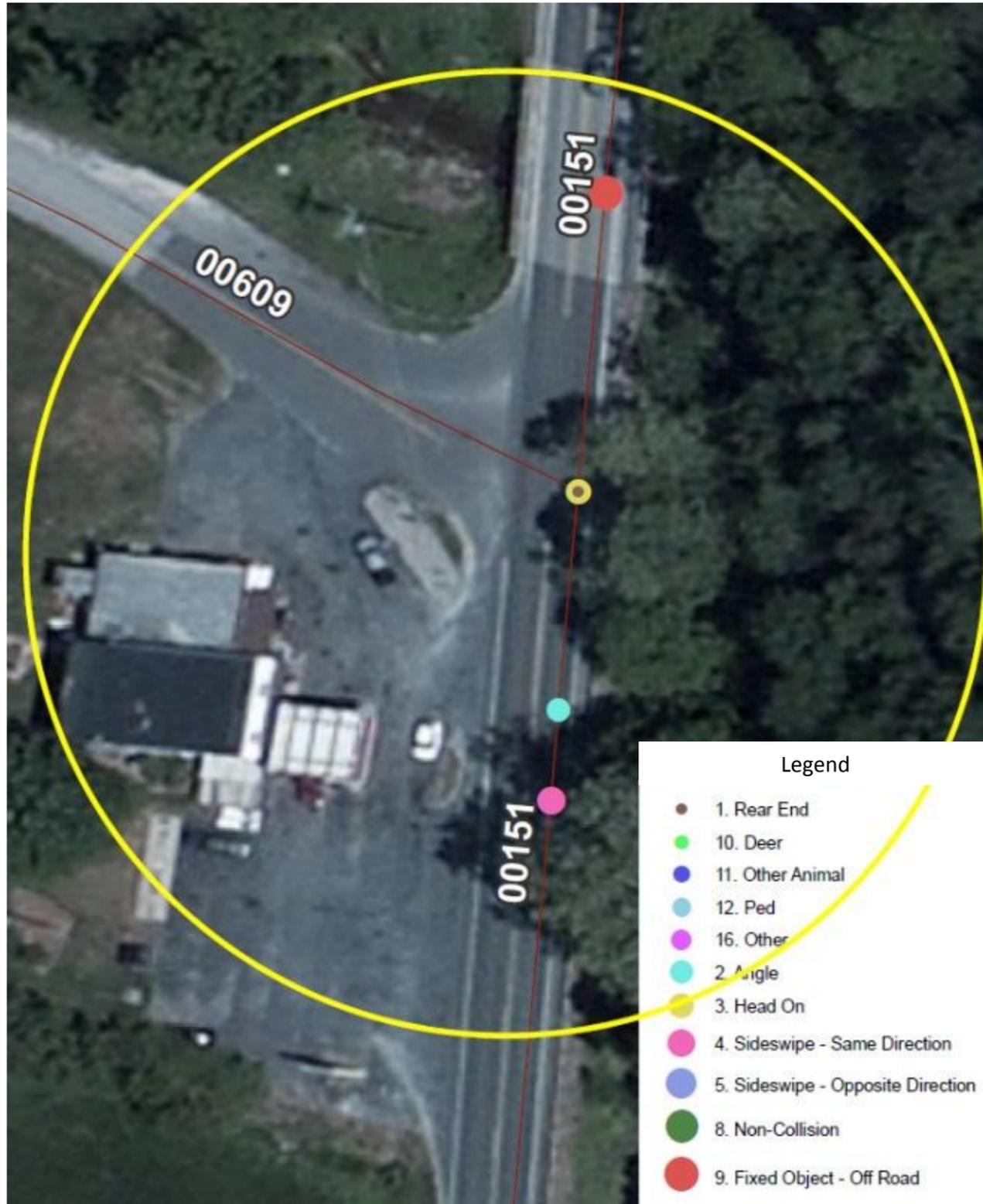
Observations:

- Due to crest of hill to the south, left turning traffic is limited in sight distance of northbound vehicles.
 - Regrade hill.
- Guardrail needs rehabilitation, due to recent crashes; note that there is a steep drop-off.
- Crash debris at crest of hill.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Rehabilitate guardrail and improve drainage	Short-Term	<ul style="list-style-type: none"> • Protects off-road vehicles and reduce collision severity
Add Deer Crossing signs	Short-Term	<ul style="list-style-type: none"> • Raises driver awareness of frequent deer crossing the roadway in the vicinity of the intersection
Modify embankment in southwest quadrant	Mid- to Long-Term	<ul style="list-style-type: none"> • Increases sight distance for side street vehicles • Eliminates obstacle within the sight distance triangle
Regrade roadway to reduce crest	Long-Term	<ul style="list-style-type: none"> • Increases sight distance in mountain terrain

11. Route 609 (Mill Lane) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Read-end	1	Property Damage	Night
Angle	1	Property Damage	Day
Fixed Object -Off-road	1	Property Damage	Night
Side-swipe	1	Property Damage	Day
Head-on	1	Injury	Day

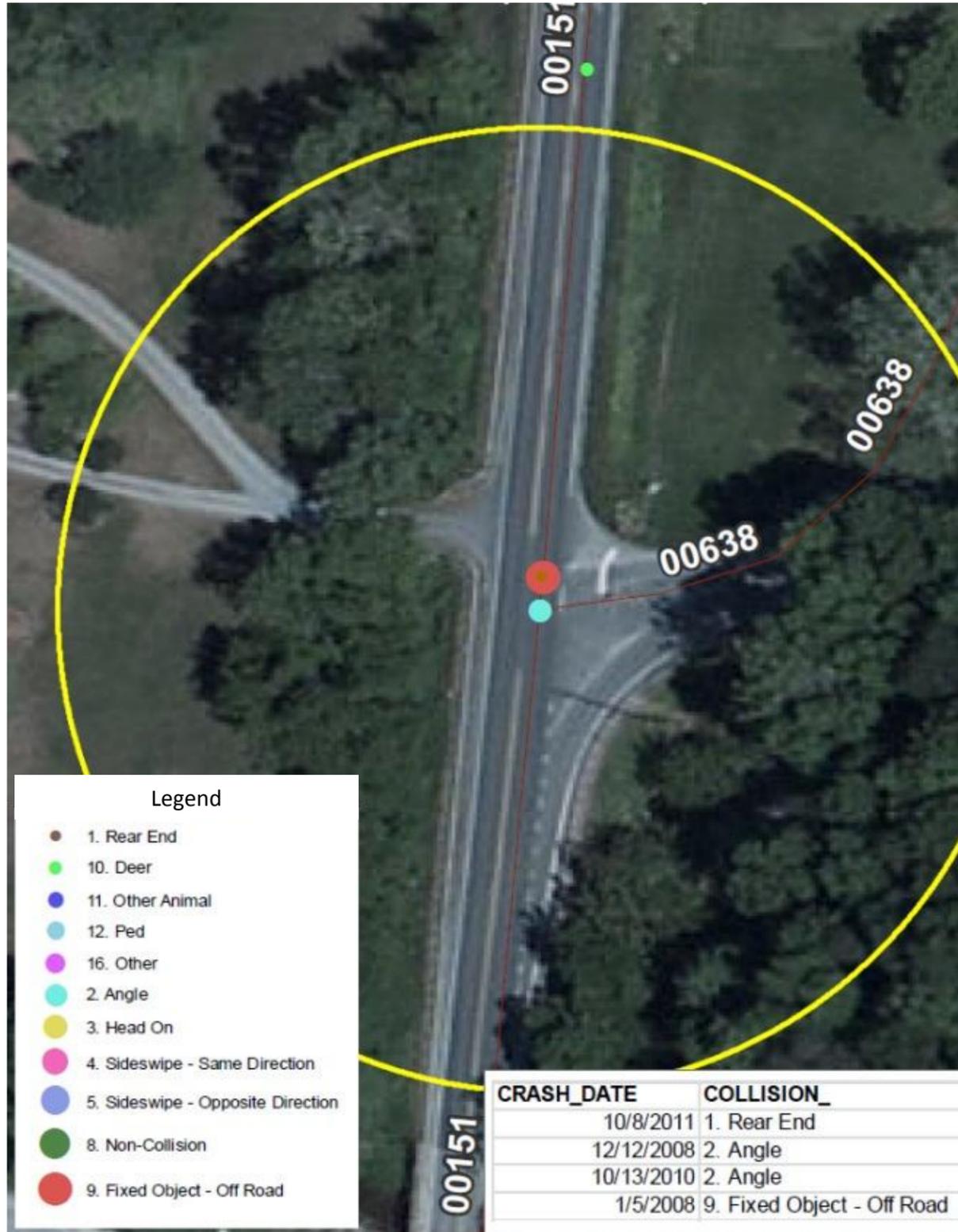
Observations:

- Poor sight distance:
 - The parapet wall of the Goodwins Creek Bridge can restrict sight distance for Mill Road traffic looking north.
 - Overgrown vegetation
- Poor access management: driveways of gas station are in close proximity of the intersection.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Trim vegetation along the west side of Route 151	On-going	<ul style="list-style-type: none"> • Increases sight distance • Eliminates obstacle within the sight distance triangle
Improve signage on Route 151 for Route 609	Short-Term	<ul style="list-style-type: none"> • Increases intersection visibility and motorists' awareness
Improve access management	Mid-Term	<ul style="list-style-type: none"> • Limits disturbances from driveways and reduce inter-parcel traffic's usage of mainline
Widen bridge structure	Long-Term	<ul style="list-style-type: none"> • Increases sight distance for traffic on Mill Road

12. Route 638 S (Avon Road) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Read-end	1	Injury	Day
Angle	1	Injury	Day
	1	Property Damage	Day
Fixed Object -Off-road	1	Property Damage	Day

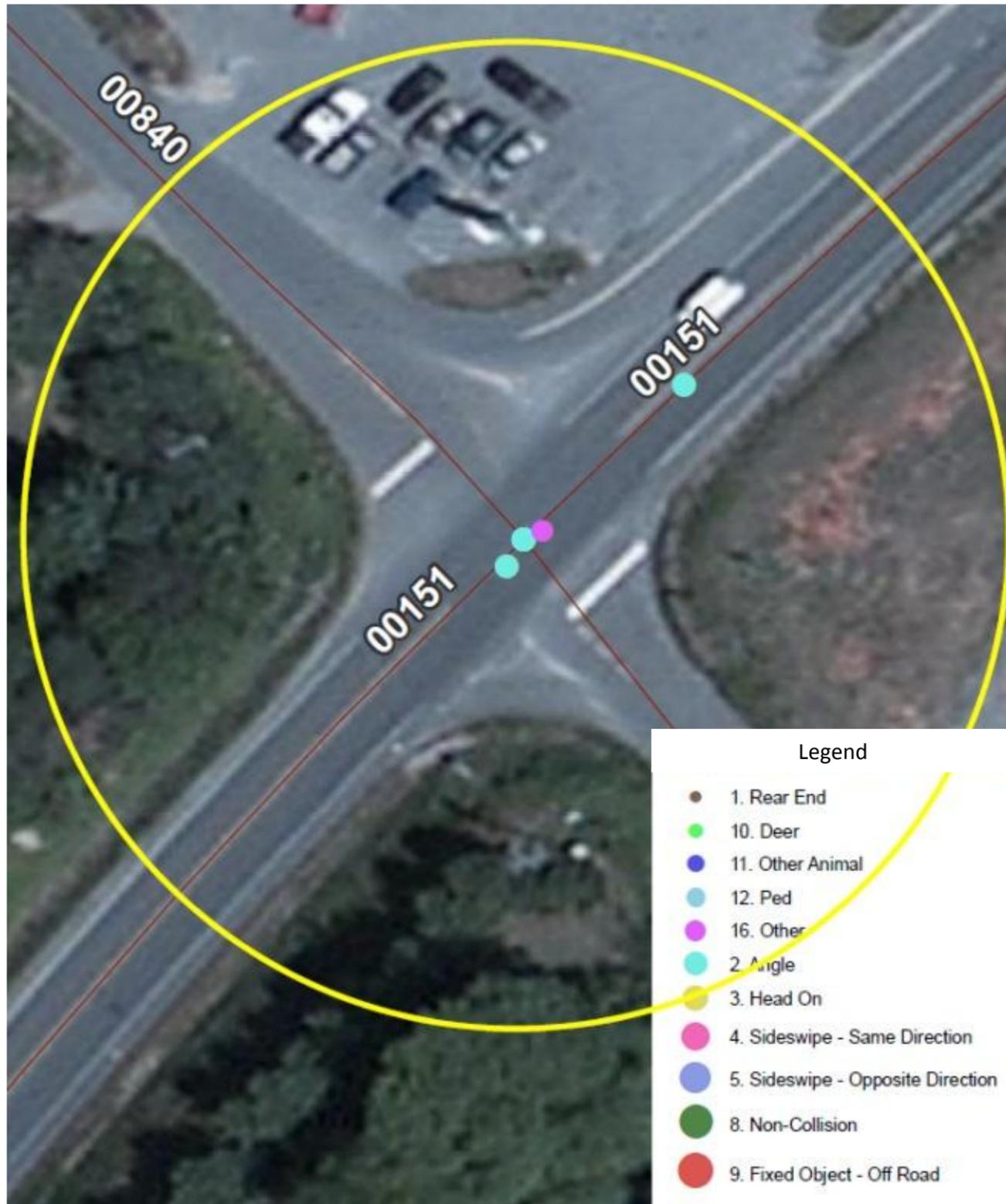
Observations:

- Overgrown vegetation on the eastside of the roadway can restrict sight distance for Avon Road traffic looking south.
- Stop bar is to far back from roadway.
- Frequent deer collisions north if intersection

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Move stop bar closer to roadway to improve sight distance	Short-Term	<ul style="list-style-type: none"> • Increases sight distance for turning vehicles
Add Deer Crossing signs	Short-Term	<ul style="list-style-type: none"> • Raises driver awareness of frequent deer crossing the roadway in the vicinity of the intersection
Trim vegetation along the east side of Route 151	On-going	<ul style="list-style-type: none"> • Increases sight distance • Eliminates obstacle within the sight distance triangle

13. Route 840 (Tanbark Drive) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Read-end	1	Property Damage	Day
Angle	1	Injury	Day
	2	Injury	Night
	1	Property Damage	Day
	1	Property Damage	Night
Other	1	Property Damage	N.A.

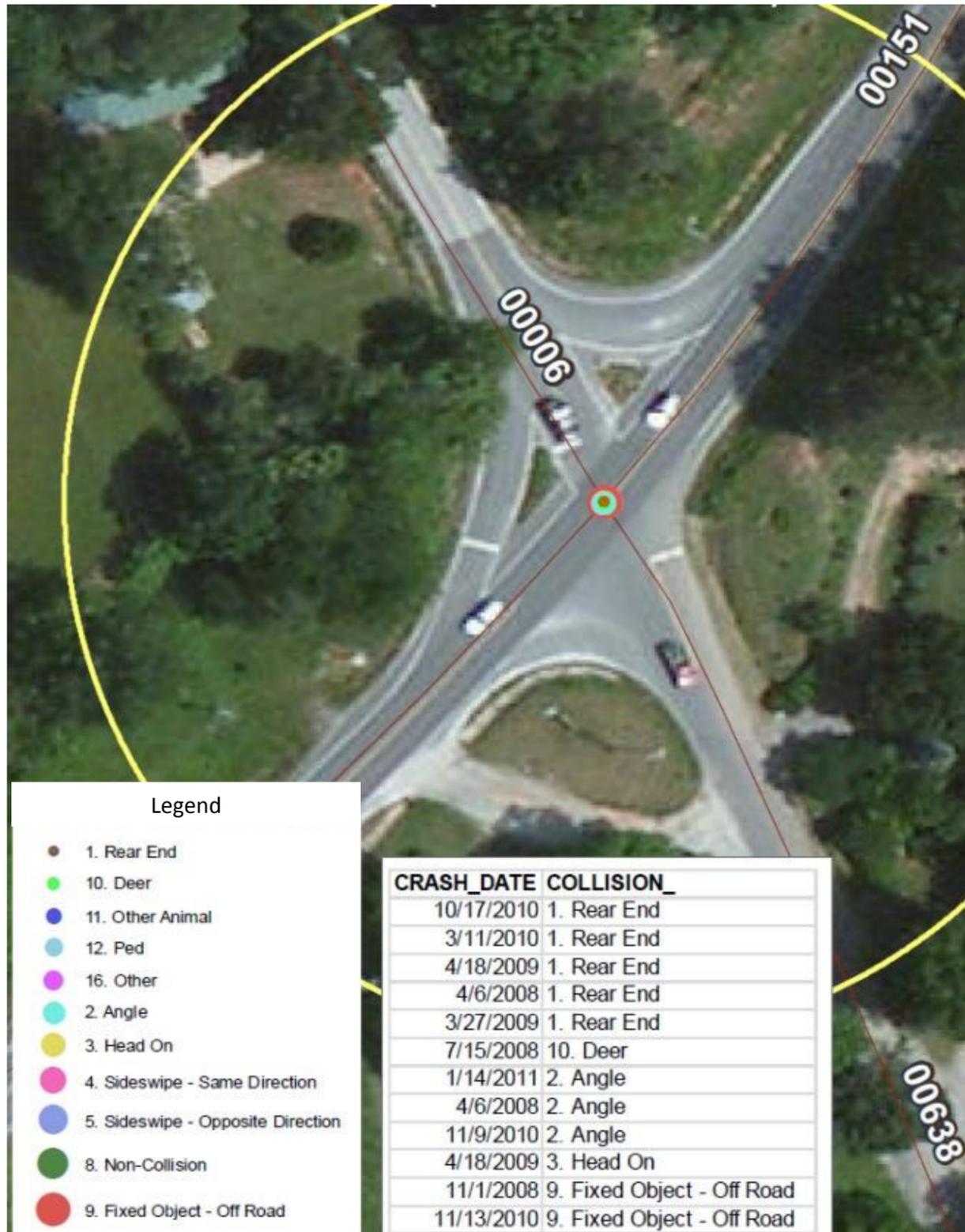
Observations:

- Yellow and stop bar pavement markings are faded on both minor approaches.
- The eastbound approach (Tanbark Drive) dips as the roadway approaches Route 151, which hides the view of Route 151 until the vehicle is immediately near the intersection.
- Embankment in southwest quadrant limits sight distance to the south for eastbound Tanbark Drive.
- Embankment in southeast quadrant limits sight distance to the south for westbound Tanbark Drive. Utilities/trees are present at the edge of the embankment's top which may limit opportunities to regrade embankment, appears to have been regraded in the past 5 years.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Refresh yellow lines and stop bars and relocate stop sign	Short-Term	<ul style="list-style-type: none"> • Increases intersection visibility and motorists' awareness
Add intersection ahead signs on Route 840	Short-Term	<ul style="list-style-type: none"> • Increases intersection visibility and motorists' awareness
Add 45mph advisory sign to the existing Intersection Warning Sign	Short-Term	<ul style="list-style-type: none"> • Encourages drivers to reduce speed • Reduces collision potentials and severity
Consider rumble strips for Route 840 approaches to Route 151	Short-Term	<ul style="list-style-type: none"> • Increases motorists' awareness of upcoming intersection
Regrade Tanbark Road to improve visibility to Route 151	Long-Term	<ul style="list-style-type: none"> • Increases sight distance • Eliminates obstacle within the sight distance triangle
Regrade embankment in the southwest and southeast quadrants	Long-Term	<ul style="list-style-type: none"> • Increases sight distance • Eliminates obstacle within the sight distance triangle

14. Route 6 (Afton Mountain Road) and Route 638 North (Avon Road) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Rear-end	2	Injury	Day
	2	Injury	Night
	1	Property Damage	Day
Angle	1	Injury	Night
	2	Property Damage	Day
Other Types	1	Injury	Day
	3	Property Damage	Night

Observations:

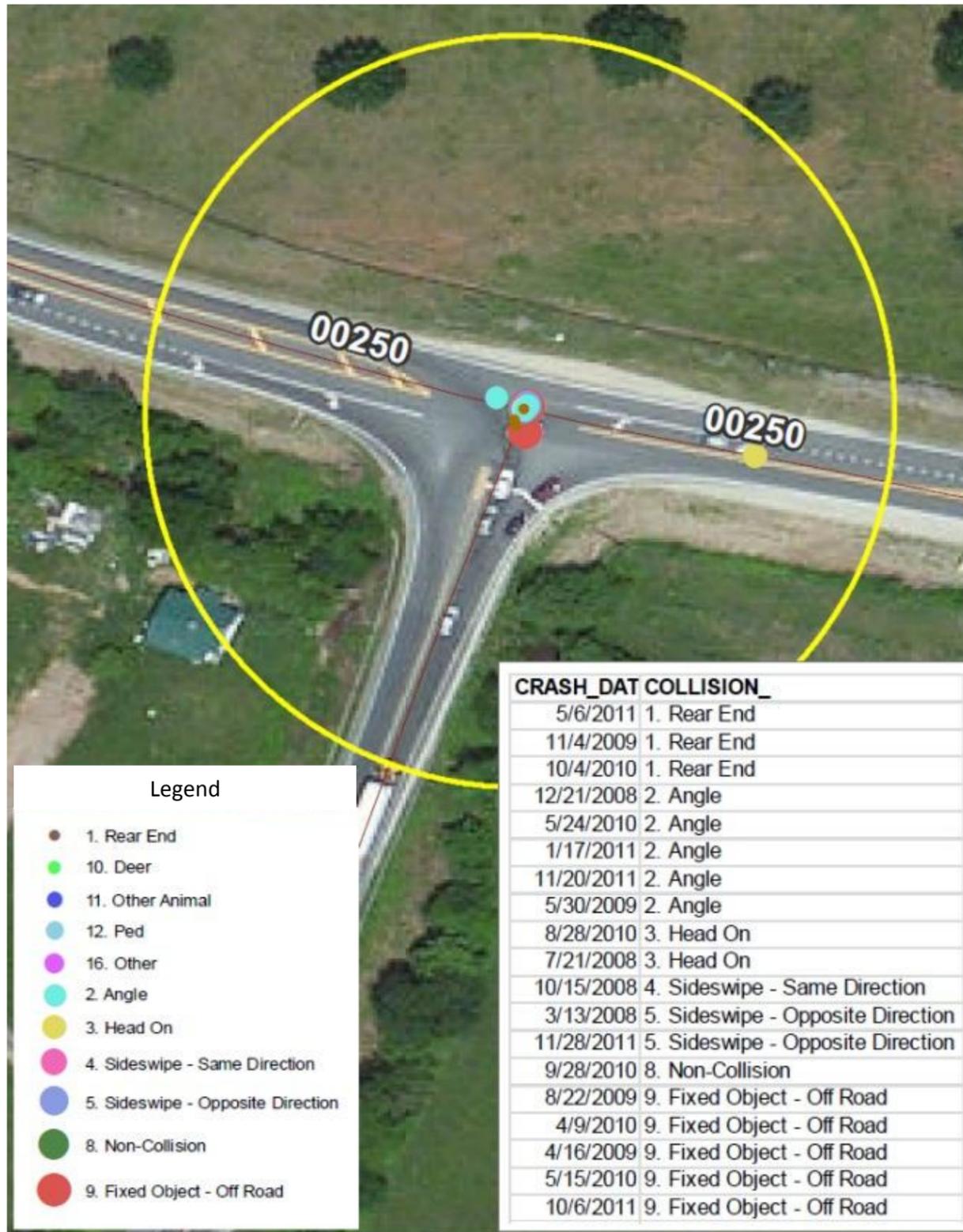
- Route marker sign and vegetation block view of the stop sign on Route 6 eastbound approach.
- Stop signs are not consistent in size on the eastbound approach.
- Eastbound right turning angle is poor, forcing drivers to really look over their shoulder, curvature of roadway increases issue.
- Sight distance for vehicles looking to the south is also an issue as Route 151 dips.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Add left turn lanes for the northbound and southbound approaches *	Short-Term	<ul style="list-style-type: none"> • Reduces the collision potentials between through vehicles and turning vehicles stopped at the intersection • Expect 48 percent reduction in crashes based on HSM
Reconfigure eastbound right turn lane to reduce skew by 20 percent	Short-Term	<ul style="list-style-type: none"> • Improve sights distance • Reduces the chance of left turn vehicles to turn onto wrong way on Route 151 • Expect 8 percent reduction in crashes based on HSM
After the above improvements implemented, monitor need to add rumble strips on Route 6 and Route 638 approaches to Route 151	Mid-Term	<ul style="list-style-type: none"> • Increases motorists' awareness of upcoming intersection
After the above improvements implemented, monitor need to add acceleration lane to assist eastbound right turning vehicles to merge into southbound traffic	Mid-Term	<ul style="list-style-type: none"> • Improves merging conditions and reduces merging conflicts
Regrade Routes 6 and 638 approaches to the intersection	Long-Term	<ul style="list-style-type: none"> • Increases sight distance
VDOT recently reviewed Route 151 to the north, improved signage	Completed	<ul style="list-style-type: none"> • Increases intersection visibility and motorists' awareness

* VDOT has approved an HSIP grant to construct a northbound left turn lane. Preliminary start date for construction is March 2016.

15. US Route 250 (Rockfish Gap Turnpike) at Route 151



Crash Summary:

Type	# of Crashes	Severity	Day/ Night
Rear-end	3	Injury	Day
Angle	3	Injury	Day
	2	Property Damage	Day
Head-on	1	Injury	Day
	1	Property Damage	Day
Fixed Object – Off Road	1	Injury	Day
	4	Property Damage	Night
Other Types	1	Injury	Day
	2	Property Damage	Day
	1	Property Damage	Night

Observations:

- U.S. Route 250 eastbound right turning traffic blocks line of sight of eastbound through traffic for Route 151 turning traffic. The curve on U.S. Route 250 makes it difficult to differentiate eastbound rights from eastbound through movement vehicles.
- The westbound left turn queue often spills into the westbound through lane, as the turn bay is insufficient in length. U.S. Route 250 westbound through traffic is driving around the queued vehicles, by driving on the shoulder and the grass.

Recommendations:

Improvements	Short/Long Term	Potential Safety Benefits
Extend the westbound left turn lane	Short- to Mid-Term	<ul style="list-style-type: none"> • Reduces the chance of queuing vehicles spilling back to the through lanes • Reduces the collision potential between through vehicles and turning vehicles stopped at the intersection
Offset the eastbound right turn bay by 12 feet to improve visibility of eastbound through vehicles	Mid-Term	<ul style="list-style-type: none"> • Improves visibility of eastbound through vehicles
Add a northbound right turn lane. If a signal or roundabout will not be installed, add an acceleration lane on US Route 250	Mid-Term	<ul style="list-style-type: none"> • Reduces the collision potential between through vehicles and turning vehicles stopped at the intersection • Expect 14 percent reduction in crashes based on HSM
Consider street lighting	Mid-term	<ul style="list-style-type: none"> • Increases visibility of the intersection at night time, would reduce off-road crashes
Consider a roundabout (Option A)	Mid-Term	<ul style="list-style-type: none"> • Relatively low traffic circulation speed • Reduces conflicting points and angles • Reduces collision potential and severity • Expect 44 percent reduction in crashes based on HSM
Consider a traffic signal (Option B)	Mid-Term	<ul style="list-style-type: none"> • Eliminates conflicting points • Reduces collision potentials and severity • Expect 44 percent reduction in crashes based on HSM

Corridor Safety Review

This section reviews and documents the corridor wide safety issues, including perceived issues, and general recommendations for addressing the safety concerns. The recommendations are listed as short-term, mid-term, long-term or on-going. As previously described, past studies, as identified in **Section 3.1**, were considered as the recommendations were developed and assessed. Those past studies identified a need for capacity improvements at select locations, corridor-wide or spot improvements to address safety or geometric deficiencies, or improvements for better pedestrian and bicycle accommodations. The recommendations, as described below, are consistent with the past plans and studies, except that no roadway widening from two to four lanes, as identified in the previous Route 151 Corridor Study, is recommended as a result of this study.

1. Perceived Excessive Speeds

Perceived Issues:

- Perceived excessive speeds for the existing land-uses along segments. Excessive speeds can contribute to accidents such as rear-end collisions or off-road accidents (resulting from vehicles swerving to avoid other vehicles, or the inability to navigate a turn).

Short-Term Recommendations:

- Perform a comprehensive speed study for the corridor to set the speed limits appropriate for the traffic patterns, land uses and geometric deficiencies along the corridor. The study should be completed end to end for the corridor, several key segments are noted below:
 - Segment from U.S. Route 250 to Route 6 (Afton Mountain Road)/Route 368 north (Avon Road) underwent a VDOT speed study in 2012; there was no pedestrian activity during the study of this segment. A brewery and a church are located in this area. Public comments suggest that the brewery's peak time for vehicle traffic, which results in parking on the shoulders and pedestrian traffic, occurs on Friday evening and on Saturday. The church has services Sunday morning. A follow-up to the previous study should be conducted to review operations in this area during the peak times of the activity generators, from Friday evening to Sunday afternoon. It should be noted that this segment has a higher injury rate than the statewide average for similar facilities; speeds can be a contributing factor to higher injury rates.
 - Segment from Route 6 (Afton Mountain Road) / Route 638 north (Avon Road) to Route 784 (Bland Wade Lane). A number of intersections that were examined during the field visits have poor sight distance.
 - Segment through Nellysford. The current speed limit is 45 mph, but with increased commercial activity and residential development in recent years, the perception is that the speed limit (and typical or perceived travelling speeds) is too high. The most recent four-year crash history (2008-11) indicates that only three crashes have occurred in this area. A comprehensive speed study should be conducted to determine whether a speed reduction is necessary within the commercial area of Nellysford.

2. Poor Access Management

Perceived Issue:

- Access Management is less than desirable for the corridor. Issues include a lack of inter-parcel connectivity of adjacent businesses and driveways located too close to other driveways or intersections.

On-going Recommendations:

- Apply VDOT's Access Management Design Standards for Entrances and Intersections (Appendix F in the VDOT Road Design Manual):
 - Examine the potential of consolidating driveways of closely spaced businesses or create inter-parcel connections, especially in the Nellysford area. Reducing access-point density from 10-24 per mile to less than 10 per mile can reduce crashes by up to 14 percent, per the HSM.
 - Consider inter-parcel connections as new businesses are constructed to minimize the number of access points onto Route 151.
 - Ensure that new business access points meet the required spacing distances as specified in the Access Management Regulations, to the extent possible.

3. Lack of a community plan for the Nellysford Area

Issues:

- Nellysford does not have a development plan. Parcels and subdivisions are constructed without long-term planning for the area, this results in little inter-parcel connectivity. The lack of inter-parcel connectivity and parallel roadway(s) causes Route 151 to be the only north-south roadway. Without a second north-south roadway, Route 151 is the only way to travel from one subdivision or parcel to the others. Access management application is limited as there are multiple businesses with closely spaced driveways. Pedestrian and bicyclist accommodations are nonexistent.

Short-Term Recommendations:

- Develop a community plan for the Village of Nellysford. For the transportation component of the plan, consider:
 - Creating a parallel road for internal trips.
 - Constructing roundabouts rather than installing traffic signals (traffic lights).
 - Creating gateways at entrances to Nellysford area, such as median islands with welcome signs or roundabouts.
 - Creating a multimodal system with pedestrian and bicycle facilities.
 - As new developments are constructed, look for potential to provide inter-parcel connections.
 - Apply access management techniques to existing business with potential to provide inter-parcel connections and consolidate driveways.
 - Improving transit services to connect to other areas, including Wintergreen, Charlottesville, Nelson/Amherst and Waynesboro.

4. Geometric Deficiencies

Perceived Issues:

- Geometric limitations along the corridor exist, including limited sight distance and lack of shoulders. The limited sight distance creates safety issues for drivers egressing from residences and side roadways and for turning traffic from Route 151. The lack of shoulders affects pedestrian/cyclist mobility and safety.

Long-Term Recommendations:

- Reconstruct Route 151 to include paved shoulders (five-foot minimum) for pedestrians and cyclists, and to correct limited sight distance. Retain two-lane cross-section plus turn lanes at key intersections. Such reconstruction should modify embankments that contribute to sight distance issues. The corridor exist as five basic segments, each segment begins with a changed land use condition or change in traffic patterns. Roadway improvements for the corridor can be phased by segment. The segments and its recommendations are as follows:
 - Route 664 to Nellysford: Reconstruct the roadway to improve vertical and horizontal alignments, include two (2) 11-foot lanes with paved five-foot shoulders.
 - Nellysford area: Reconstruct the roadway to include an on-street bike lane in both directions and a multi-use trail along the north side of the roadway. Crosswalks should be considered at key locations to improve pedestrian mobility between the east and west sides of Route 151. This component should be integrated into any efforts to develop a community plan for the Village of Nellysford. VDOT's HSIP crash reduction factors indicate that:
 - Adding pedestrian crosswalks can reduce pedestrian related crashes by up to 25 percent.
 - Adding pedestrian sidewalks can reduce pedestrian related crashes by up to 50 percent.
 - Nellysford to Route 6 (River Road): Reconstruct the roadway to improve vertical and horizontal alignments, include two (2) 11-foot lanes with paved five-foot shoulders.
 - Route 6 (River Road) to Route 6 (Afton Mountain Road): Reconstruct the roadway to improve vertical and horizontal alignments, include two (2) 11-foot lanes with paved five-foot shoulders.
 - Route 6 (Afton Mountain Road) to U.S. Route 250: Reconstruct the roadway to improve vertical and horizontal alignments, include two (2) 11-foot lanes with paved five-foot shoulders.
- If it is desired to add rumble strips (travel lane edge) to the corridor as part of the roadway reconstruction, additional pavement width should be provided, so that the rumble strips remain a separate portion of the paved shoulders.
- In areas where there are high frequency of deer collisions, add deer crossing warning signs.

The HSM indicates that:

- Adding a four-foot shoulder can reduce shoulder-related crashes by up to 23 percent and adding a six-foot shoulder can reduce these by up to 33 percent. Shoulder related crashes include run-off-the-road, head-on and side-swipe crashes.
- Crashes on horizontal curves, with curve radius of 1000 feet or less and half a mile in length can be reduced by about 33 percent by increasing the curve radius by 500 feet.

VDOT's HSIP crash reduction factors indicate that:

- Improving the vertical alignment can reduce crashes by up to 25 percent.
- Improving sight distance by improving the roadway alignment can reduce crashes by up to 30 percent.

5. Roadway Sign Clutter

Perceived Issue:

- Public perception is that roadside signs, flags and other clutter, intended to raise awareness of activities of businesses, are excessive and create distractions for drivers.

Short-term Recommendations:

- Nelson County should coordinate with VDOT to review and understand the code, and adjust county regulations as necessary.

On-going Recommendations:

- VDOT will improve way-finding and other roadway signage as projects are implemented along the corridor.
- Nelson County will improve its county zoning ordinance relative to commercial signage within and adjacent to the VDOT right-of-way, and ensure compliance with State Regulations.
 - The Code of Virginia §§33.1-351 to 33.1-381 provides regulations for outdoor advertising whether in the VDOT right-of-way or on private property adjacent to VDOT right-of-way.
 - All signs within the right-of-way require a permit. Sign permits in Nelson County are issued by the Appomattox Residency and in Albemarle County signs are issued by the Charlottesville Residency.
 - The Adopt-a-Highway program can be a tool used to remove signage that does not comply with the Code. There are already segments along Route 151 that are part of this program. Efforts should be made to ensure that the groups responsible for these segments understand the policy of signage that can be removed as part of the Adopt-a-Highway program.

6. Lack of Guardrail

Perceived Issue:

- There are segments along Route 151 that do not have a guardrail but are in need of one.

On-going Recommendations:

- VDOT Lynchburg District maintains a guardrail database which identifies segments needing new guardrails or existing segments needing an upgrade or replacement. VDOT prioritizes the locations and installs guardrails as funding is made available.
- In locations where serious or fatal crashes have occurred, VDOT reviews the location from a variety of safety factors, including the need for guardrails. VDOT's HSIP crash reduction factors indicate that adding or upgrading guardrails can reduce fatal and injury crashes by up to 35 percent.

7. Truck Traffic

Perceived Issue:

- Trucks routinely exceed the speed limit, are oversized and are a safety issue along the corridor. Route 151 is not a corridor suited for heavy truck traffic; as such trucks should be rerouted to U.S. Route 29 and I-64.

Short-Term Recommendations:

- VDOT is concurrently performing a separate study to identify necessary improvements to the I-64 / U.S. Route 29 interchange to improve safety and provide better operations for trucks through the interchange. Such improvements may divert truck traffic away from Route 151. At this time, no information exists on the potential improvements or timeline to construct such improvements.

On-going Recommendations:

- Nelson County police should continue its active program on enforcing the speed limit and truck size regulations for the corridor.
- VDOT and Nelson County will continue to work with VDOT on geometric safety issues.

The crash database indicates that of the reported crashes, heavy trucks (large straight trucks or tractor-trailers) were involved in only two (2) of the 111 reported crashes for the period 2008 to 2011.