

# Route 5/Virginia Capital Trail

## Pedestrian Safety and Operational Assessment

### Henrico County, Virginia

Prepared For:

**Virginia Department of Transportation  
Central Region Operations  
(UPC 81373, CRO Task Order #256)**



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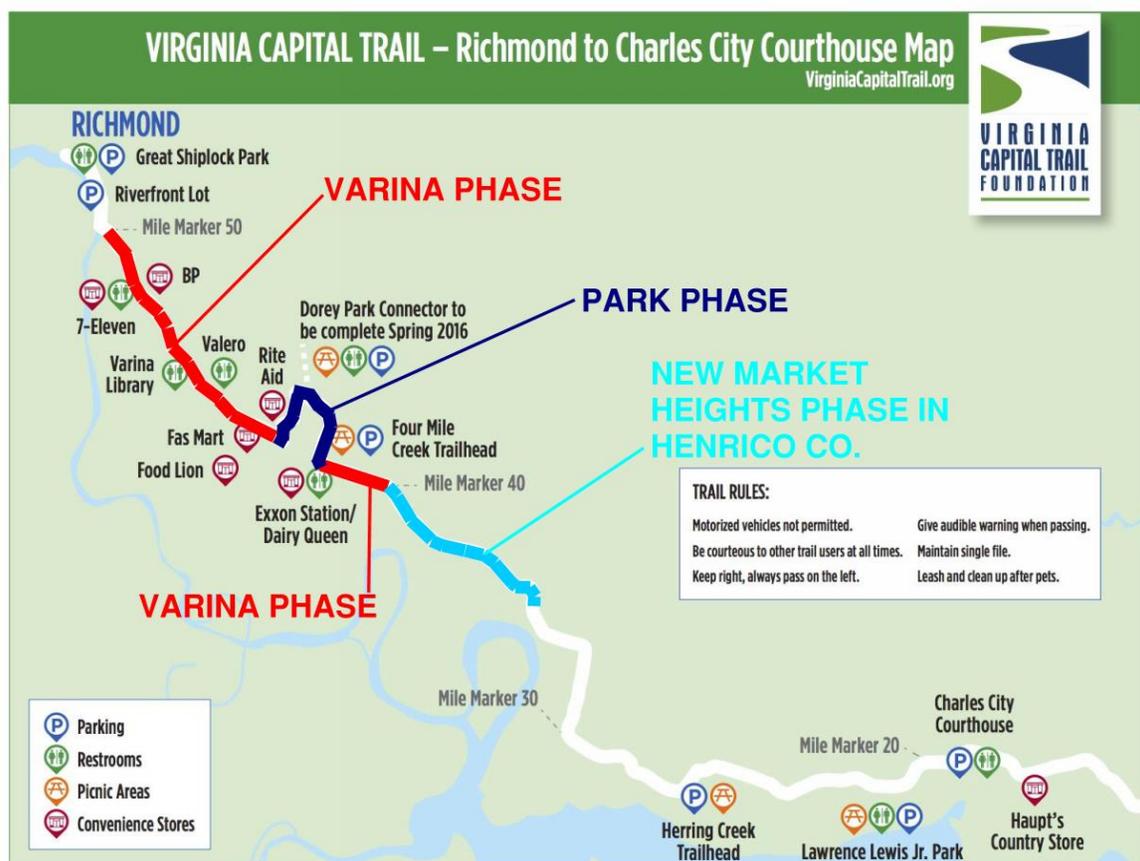
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## Executive Summary

Pursuant to the request of the Virginia Department of Transportation (VDOT), Timmons Group assessed the operations and safety of the portion of the Virginia Capital Trail that runs parallel to Route 5 (New Market Road) within Henrico County. This portion of the trail runs from the City of Richmond/County of Henrico line to the County of Henrico/Charles City County line and consists of the "Varina Phase" and the western portion of the "New Market Heights Phase". The review excludes the portion of the Virginia Capital Trail in Henrico County within the "Varina Phase" known as the "Park Phase" as it veers out of the Route 5 corridor and runs predominantly through fields, woods, and park land to traverse through the Interstate 295 corridor. Refer to the Map Below for reference.

**MAP 1**



The goal of this assessment is to address safety and operational concerns where the Virginia Capital Trail (VCT) users interact with vehicular traffic. Timmons Group gathered data, performed research, reviewed studies, conducted interviews, and performed field reviews of the corridor. Based on the results of the assessment, there are several improvements that can be made throughout the corridor to improve the operations and safety of the pedestrian and bicycling users of the trail.

For purposes of the report, Route 5 (and the parallel VCT) will be understood as running north-south with the west side of the trail being described as the James River side of the trail.

## FOCUS

- There are suggested improvements to the trail focused on making the vehicular motorists more aware of the trail users.
- There are suggested improvements to the trail focused on making users of the trail more aware of the vehicular motorists in the area.
- There are suggested improvements to the trail focused on making users of the trails more aware of certain nuances of the trail itself.

## SUGGESTED IMPROVEMENTS

- After reviewing available data, conducting interviews, and conducting field reviews, we have developed a list of suggested improvements that will improve the safety and operation of the Virginia Capital Trail located along Route 5 in Henrico County.
- The improvements are mainly concentrated around the various intersections along the corridor although there are some improvements that are within the length of the trail itself away from an intersection or crossing.
- The improvements were localized into twenty-two (22) different locations and broken into thirty-five (35) separate pay item groupings totally approximately \$500,000 of proposed improvements ranging from simple installation of pavement markings to the installation of overhead Rectangular Rapid Flashing Beacons or other signal improvements.
- For a plan view depiction of the improvements explained in this assessment, refer to APPENDIX A.
- For a detailed cost estimate of the improvements explained in this assessment, refer to APPENDIX B. In this chart, we have categorized the list of priorities (Low, Medium and High) based on the trail users' perspective. It should be noted that some of the high priorities also carry some of the more expensive suggested improvements.
- For pictures of various areas within the corridor, refer to APPENDIX C.

## LIMITATIONS

- The Virginia Capital Trail in Henrico County opened in October 2015. At this time, there are no known crash studies or annual crash reports available to be able to compare "pre-trail" to "post-trail" trends.

## **Virginia Capital Trail Design-Build Plans**

VDOT provided the record drawings for the "Varina Phase" and the "New Market Heights Phase". We reviewed the plans and have used the signing and striping plans as the base mapping for the project. The design-construction for these two phases were delivered for VDOT using the same contractor-engineer vendor. For the most part, the treatment is fairly consistent at side street connection crossings (side crossings have a flush median island at the quadrants with detectable warning strips and either stop signs or signalized crossings) although at the Wood Mill Road crossing the use of bollards was employed. We were not able to ascertain why the use of bollards was employed at this one intersection.

## LOCATION OF TRAIL RELATIVE TO ROUTE 5

The trail begins at the northern end of the study area located on the western (James River) side of Route 5 where it runs for approximately 2 miles; it then crosses over from the west side to the east side of Route 5 and continues on the east side of Route 5 for approximately 8 miles (not including the meandering through the Park Phase); crosses back over from the east side to the west side of Route 5 and finishes on the west side of Route 5 at the southern termini of the study area after another 2 miles.

## SIDE STREETS/CROSSINGS

- There are twenty-six (26) public and private street crossings of the trail (not counting Route 5 itself) in this stretch of the trail. All but two (Pocahontas Parkway and Interstate 295 which are grade separated crossings) are at grade crossings of roads maintained by Henrico County or private entities. The crossings are:
  - Indian Trail (private)
  - Cattle Drive (private)
  - Tree Hill Lane (private)
  - Osborne Turnpike
  - Chatsworth Road
  - Freeless Street
  - Messer Road
  - South Laburnum Avenue (signalized)
  - Pocahontas Parkway (bridge carrying trail over limited access highway)
  - Towhee Lane
  - Willson Road (signalized)
  - Gregg Road
  - Strath Road (signalized)
  - Wood Mill Drive
  - Kinvan Road (through the Park Phase)
  - Doran Road (through the Park Phase)
  - Interstate 295 (through the Park Phase where the trail passes under a bridge carrying I-295 over Four Mile Creek)
  - Farmer's Circle Drive (through the Park Phase)
  - Rocky Hill Farm Drive (private)
  - New Market Heights Lane
  - Turner Road
  - Camp Hill Road (private)
  - Sweeney Landing Road
  - Curles Neck Road (2 private crossings)
  - Turkey Island Road
- There are two (2) crossings of the trail across Route 5 in this stretch of the trail. These crossings are:
  - West side to East side in-between Midview Road and Herman Street with an overhead push button actuated Rectangular Rapid Flashing Beacon (RRFB) device.
  - East side to West side approximately mid-way between Kingsland Road and Longbridge Road with static signs.

## **VDOT Route 5 Safety Study from Oakland Road to Four Mile Run Parkway**

In January 2014 (prior to the VCT being constructed and opened), the Department completed a study by Jeff Kuttesch that presented findings of a safety and operations review along Route 5 (Osborne Turnpike/New Market Road) in Henrico County from Oakland Road to Four Mile Run Parkway, a distance of 5.5 miles. This study included analyses of operating speeds, crash history, heavy vehicle (truck) usage, sight distance issues, and existing signing and marking reviews, including appropriateness of passing zones.

It was determined that many of the items recommended in this report have already been implemented in the field prior to this safety review being conducted. Items implemented include:

- A reduced posted speed from 55 MPH to 50 MPH from 8.09 mile east of Oakland Road to 0.04 mile east of Freeless Street, a distance of 1.37 miles.
- A removal of roadside impediments at four locations (WB direction/looking east at Lanier Avenue; EB direction/looking west at Lovey Lane; EB direction/looking west at Herman Street; and WB direction/looking east at Park Avenue).
- A study to evaluate the feasibility, including consideration of the potential impacts of the Virginia Capital Trail project, of new auxiliary lanes at the Route 5/Midview Road, Route 5/Messer Road, Route 5/Mill Road, Route 5/Bufin Road/Wood Mill Drive, and Route 5/Doran Road intersections. Refer to section named Route 5 Corridor from Oakland to Four Mile Run Parkway (included).
- Implement new clearance interval timings at signalized intersections in the corridor.
- Remove and replace signal-related signage at Strath Road/Route 5 signal.
- Continue to monitor vehicle speeds by conducting speed zone evaluations every two years.

With increased traffic and the opening of the Virginia Capital Trail that has occurred since this report was conducted, we recommend that an updated speed study be conducted along this corridor to determine if vehicular speeds have increased, decreased or remained the same.

## **Route 5 Corridor from Oakland Road to Four Mile Run Parkway**

In March 2015, Kittelson and Associates completed a study for VDOT Central Region Operations. The study assessed the feasibility of constructing auxiliary turn lanes (left, right, or both) at five intersections on the Route 5 (Osborne Turnpike/New Market Road) corridor from Oakland Road to Four Mile Run Parkway in Henrico County, Virginia. The analysis reviewed the existing intersection operations and safety performance and used criteria identified in Appendix F of the VDOT Road Design Manual to assess left and right turn lane warrants at the intersections. Based on the results of the warrant analysis, and in consideration of the design environment including the proposed (at the time) Virginia Capital Trail (VCT), auxiliary turn lanes provide potential benefits at all five intersections studied. The study found that auxiliary turn lanes were warranted at all intersections in all directions with the exception of the southbound right-turn lane at the Route 5/Mill Road intersection where a right-turn taper only was recommended.

A summary of the findings of this report as well as potential ramifications if implemented are:

- Midview Road intersection – Proposed SB left-turn lane recommended with existing NB right-turn lane to remain. Benefit/Cost (B/C) Ratio of 1.20 cited. Would likely impact the trail if this were implemented due to the fact that the trail crosses Route 5 just south of this intersection.
- Messer Road intersection – Proposed NB right-turn lane recommended with existing SB left-turn lane to remain. B/C Ratio of 0.08 cited. Would likely cause re-construction of a portion of the trail if implemented on the east side of Route 5 (logical side of the road to add right-turn lane).
- Mill Road intersection – Proposed SB right-turn taper and proposed NB left-turn lane recommended. B/C Ratio of 0.29 cited). Should not directly impact the trail if implemented to the west side of Route 5.
- Wood Mill Road/Buffin Road intersection – Proposed SB left-turn lane and right-turn lanes recommended along with a proposed NB left-turn lane recommended while the existing NB right-turn lane remains. B/C Ratio of 0.43 cited. Should not directly impact the trail if implemented to the west side of Route 5.
- Doran Road intersection (outside the effects on the VCT) – Proposed SB left-turn lane and NB right-turn lane recommended. B/C Ratio of 9.40 cited. Should not directly impact trail if implemented.

As stated, this report was completed prior to the completion of the VCT.

### **Review and Summary of Citizen Comments Received by VDOT Regarding Usage of the VCT**

Here is a list of citizen comments received by VDOT and our suggested replies:

- **Comment:** While riding the trail this weekend, I was almost hit by a car that was turning right at the Laburnum intersection while the walk sign was on for me to cross. Is there a way you could put up some signs or paint the road so that cars know the trail crosses there?

**Reply:** We suggest adding signage along Route 5 on NB approach to indicate that vehicles turning right need to anticipate trail crossing bikes and pedestrians. In addition, we suggest adding signage to the signal pole/mast arm to indicate vehicles must yield to pedestrians/bikes. Further, we suggesting adding signs along the trail warning users to be prepared for the upcoming signal. Lastly, we suggest consideration be given to adding a seldom utilized right turn flashing yellow light for the NB Route 5 drivers turning right onto South Laburnum. Please refer to APPENDIX A for all improvements suggested at this intersection.

- **Comment:** I was running east bound on the trail going out from Richmond. Across from Varina Elementary School on New Market Road, the trail runs alongside the road without grass separation that is present in other sections of the trail. As I neared Gregg Road, a car traveling south on Gregg Road and turning right onto New Market Road turned directly on to the trail as if it was a merge lane rather than a biking and running

trail. I was very lucky to be able to dodge the car by running off the trail towards the road as the car swerved away from me at the last minute. I strongly suggest that you look into poles to prevent motor vehicles from turning on to the trail (I saw those at almost all other intersection) as well as something like cones to provide some sort of barrier between the trail and the road. Given the presence of an elementary school across the street, this area deserves the same attention to safety as the rest of the trail.

**Reply:** We suggest consideration be given to the placement of a raised concrete median in the striped out portion of the widened pavement area constructed as a part of the Dollar General Store's POD. Additionally, we suggest increased signage and the placement of green paint on that portion of that trail to increase visibility/awareness of the crossing. Please refer to APPENDIX A for all improvements suggested at or near this intersection.

- **Comment:** Please consider the speed limits on the Route 5 corridor.

**Reply:** Two years have gone by since the last VDOT speed study was conducted. During that period, traffic has increased by double digit percentages in 2015, several PODs (Dollar General, new Varina Library, etc.) have been completed, not to mention the completion of the VCT. We recommend that VDOT conduct an updated speed study in the corridor.

- **Comment:** There is a great deal of concern with the new Varina Library and the pedestrian crossings that will inevitably occur between the library and the Capital Trail. Additionally, this new facility will create new conflict points that should be considered for both vehicles and pedestrians.

**Reply:** Please refer to the section below and the APPENDIX A for all improvements suggested at this new access point along Route 5.

- **Comment:** Jeff Kuettesch performed the attached study which would lend some credence to a corridor-wide speed limit reduction (the 85<sup>th</sup> percentile on the eastern and western ends of the corridor).

**Reply:** Our read of the Jeff Kuettesch study ([VDOT Route 5 Safety Study from Oakland Road to Four Mile Run Parkway](#)---above) indicates that the suggested speed limit reductions called for in that study were implemented. We do suggest that another speed study be conducted and that in keeping with the recommendations in the report that the corridor continue to be monitored for speed.

### **Review of New Varina Library Site Plan**

We contacted the Henrico County Planning Department (David Wilhite) who furnished us with an approved site plan for a new library located on the west side of Route 5 just east of the Pocahontas Parkway overpass. We visited the corridor and noted that the site is well under construction at the time of this assessment. The building is nearly completed and the site entrance road has curb & gutter in place on a stone subgrade. While some of the auxiliary left and right turn lanes have some grading in place, the majority of the work within the Route 5 corridor is not completed. Without pavement in place and other improvements, our general

observation is that the site distance coming out of the site looking north (or left) is somewhat limited. Sight distance calculations as shown on the plans indicate that there will be 610' of sight distance after construction is completed. The 610' dimension would be consistent with guidelines for a two lane roadway. With the left turn lane and right turn lane being added with the site plan or Plan of Development (POD), it could be that 650' of sight distance could be achieved for safe egress. We recommend that actual sight distance be verified after construction is complete.

The POD calls for another bike/pedestrian crossing of Route 5; however no signing appeared in the plans. Sight distance for pedestrian crossings is recommended to be ten times the speed limit which at 55 miles per hour would require a minimum of 550' of sight distance which is achieved. We understand that this proposed crosswalk may attract many bike riders and pedestrians once the library is opened to public whether for the intended library usage or use of bathroom/water facilities. We have made recommendations for additional signage, markings and RRFB at this crossing (refer to Varina Library plan located in APPENDIX A in the report).

### **Coordination with other interested stakeholders**

During the development of this assessment, Timmons Group personnel met with and/or spoke with various individuals that have some interest in the trail to gain unique and/or varied perspectives that may otherwise remain undiscovered. A list of individuals along with their organization and/or responsibility follows:

- David Christoph – VDOT Maintenance – David is responsible for directing the maintenance crews that work along Route 5 and concentrate on the Virginia Capital Trail.
- Harold Dyson – VDOT Construction – Harold oversaw the Virginia Capital Trail Design-Build contracts that were completed in October 2015. Harold continues to remain involved in many of the various aspects of the trail related items well after construction.
- Randy Ditberner – VDOT Northern Virginia Regional Traffic Engineer
- John Bolececk – VDOT Statewide Bicycle and Pedestrian Coordinator
- Multiple Anonymous Submissions – BikeWalk RVA Staff Members
- Beth Weisbrod – Virginia Capital Trail Foundation
- Kevin Willhite – Henrico County Planning Department

The items we heard are summarized in the Table 1 as shown below:

### **Table 1. Stakeholder Discussions**

Timmons Group reviewed user surveys and interviewed several stakeholders to identify the primary operational and design issues experienced within the Henrico County portion of the Virginia Capital Trail. Interviews included VDOT's statewide bicycle and pedestrian coordinator, VDOT maintenance and engineering staff, Virginia Capital Trail Foundation, Visit Richmond, BikeWalk RVA, and East End Connects.

In addition, Henrico County provided comments received from citizens concerned about bicycle safety. The comments and concerns are summarized in the table below. Generally, trail users are most concerned about locations where right-of-way is not clearly understood by motorists.

<b>Comment, Concern</b>	<b>Primary Operations; Design Issue; Possible Solution</b>
Cyclists ignore the stop signs and roll into the pavement without coming to a stop.	ROW; signs; education (consider passing out while papers to folks that live along the corridor)
Cyclists seem impatient and get irritable with maintenance crews along the path.	Maintenance; signage perhaps should be placed closer to work areas with suggested alternatives
Cyclists on the shared use path ignore pedestrian signals and go whenever they want.	ROW; TCD; WAPM; enforcement
Cyclists might be having a difficult time judging the distance a vehicle covers vs. the clearance time required to cross a street.	Crossing time to be reviewed; speed to be reviewed; signage/awareness to be increased
Henrico County personnel have asked VDOT to consider putting up bollards near each street connection to discourage or eliminate the ability for motor vehicles from driving on the path.	Safety; According to the <u>Guide for the Development of Bicycle Facilities</u> , "the routine use of bollards and other similar barriers to restrict motor vehicle traffic is not recommended. Bollards should not be used unless there is a documented history of unauthorized intrusion by motor vehicles". *Refer to planned improvement suggested in Appendix A
There have been a lot of reported "near misses" at the Laburnum crossing as well as at Midview.	TCD; signage; pavement markings; speed; *Refer to planned improvement suggested in Appendix A
At the "Y" intersection of Route 5 and Osborne Turnpike, there are some confusing signs that might be miss-interpreted depending on your direction and view shed.	ROW; signs; *Refer to planned improvement suggested in Appendix A
Sight distance issue? At Route 5 and Osborne Turnpike.	Sight distance; We did not see where sight distance was an issue in any of the operations in this area.
Just east of Osborne Turnpike (near the 7-11) there is a grated drop inlet that is situated where the grates run longitudinally with the cyclists. This could cause a problem on a bike with narrow tires.	Maintenance. *Refer to planned improvement suggested in Appendix A

<b>Comment, Concern</b>	<b>Primary Operations; Design Issue; Possible Solution</b>
Very wooded in sections of trail. Lots of fallen limbs and debris falls onto the trail which becomes a maintenance issue.	Maintenance
Many near misses at the Valero Gas Station near Strath Road.	Visibility; ROW; *Refer to planned improvement suggested in Appendix A
Crossing at Laburnum feels dangerous. Cars heading west have right-on-red while trail users have a walk sign.	Signage; TCD; ROW. *Refer to planned improvement suggested in Appendix A
Trail isn't visible through the 7-11 parking lot near Osborne/New Market.	Visibility; ROW; Markings; *Refer to planned improvement suggested in Appendix A
Trail needs more visibility. Maybe a dashed center line.	Visibility; markings; Many of the road crossing have white mini-skips which is not the correct markings to split traffic *Refer to planned improvement suggested in Appendix A
The commercial area near Varina Elementary School has lots of close calls. Seems like drivers aren't expecting people to cross the street.	Visibility; ROW; *Refer to Gregg Road improvements
Strath Road / Valero has lots of close calls. Large turning radius at Strath results in long distance to be exposed on bike. Valero drivers are not expecting bike cross-traffic.	Visibility; *Refer to Strath Road improvements
Blinking lights near the 7-11 seem to be working great. Cars used to just blow through even when cyclists were at the crossing. More of those would be a good idea.	TCD; visibility; ROW
Too many stop signs on the trail. Trail users should be prioritized at intersections where it doesn't cross Route 5.	ROW; Some stop signs should be removed like at commercial driveways as the trail user should have the ROW; *Refer to planned improvement suggested in Appendix A
There are many roads and driveways west of Strath Road and cyclists don't seem to be very cautious.	ROW
Big sign and flashing lights near Old Osborne Tpk are very helpful. Another one at the next crossing near Kingsland would be good.	Visibility

<b>Comment, Concern</b>	<b>Primary Operations; Design Issue; Possible Solution</b>
Inconsistent and often inappropriate intersection designs.	ROW; markings; bollards; There are some inconsistencies along the corridor; *Refer to planned improvement suggested in Appendix A
Shouldn't expect trail users to tolerate excessive delay at signalized intersections.	TCD; Continue to monitor demand
Crossings that fall right where a vehicle will queue (instead of in front or behind) is poor design.	Markings; ROW; TCD; Did not see this situation. Perhaps vehicles are stopping behind crossing initially and then roll forward to enter Route 5.
Use proper and consistent signage, markings, and other traffic control devices.	TCD; Signage; Markings
Old Osborne Tpk intersection – speed is high but volumes are low and sight distance is good. I've never seen anyone use the RRFB.	This seems to contradict other comments commending the use of RRFB
The Midview RRFB just east of Osborne is in a "dicey" location. I've seen close calls out there.	We think the location is in a good spot. It is in between two three legged intersections where no left turners will ever be stacking up. *Refer to planned improvement suggested in Appendix A
Bollards at Freeless Street should be removed. There are multiple driveways on either side of the bollards and if someone insists on driving on the trail, there are several places for them to do it anyway.	Bollards; ROW; *Refer to planned improvement suggested in Appendix A
Several farms have stops or yields for path users. State code clearly states vehicles entering and existing public ROW are to yield.	ROW; visibility. *Refer to planned improvement suggested in Appendix A
Sweeney Landing Road has 4 houses – they should not have the ROW over trail users. Other roads (Turkey Island Rd) are effectively private drives because they have such low volumes.	ROW. *Refer to planned improvement suggested in Appendix A
Don't tell path users to stop for cars parking who want to be using the trail. Cars shouldn't have the right-of-way.	ROW; Code of Virginia §46.2-826 states that users of the trail have the right of way at private driveways.
Doran Road sight distance and speeds are problematic. Families use this crossing since it's close to the park.	Sight distance; speed; Although not in the purview of this report, we believe that RRFB should be reviewed for this location due to long, straight grade and the apparent or

<b>Comment, Concern</b>	<b>Primary Operations; Design Issue; Possible Solution</b>
	described speeding that occurs on that stretch of the road.
Have heard about motorists yelling, honking, being aggressive at people making a legal crossing near Doran Road. Might need targeted enforcement against motorists.	ROW; enforcement; Although not in the purview of this report, we suggest a pavement marking arrow be placed on the north side of the eastern section directing trail users to turn left rather than continue into private drive (also, install a better, more permanent sign.
Need wayfinding signage at Kinivan. Once you've ridden through the Park Phase several times you'll remember what to do, but if you're new to the trail, it's confusing.	Wayfinding; Although not in the purview of this report, we suggest that the orange arrow be replaced with an orange arrow, that a permanent sign be added to the trail on the south side of the path prior to crossing Kinvan and that an arrow be added to the pavement on the north side of the trail to help guide users of the trail
Turns onto Wood Mill Drive should yield. There's a turn pocket that allows a right-turning vehicle to yield without risk of being rear-ended by Route 5 traffic.	ROW
Signals need hot calls if not already provided, including extending the green if placed shortly after start of the parallel green traffic movement. Otherwise, people simply disregard them because they have to wait for an entire cycle. Bikes and peds have much different crossing time needs.	TCD; ROW
Check Strath minimum green time. It doesn't take long to bike across, but walking is much slower.	TCD
Put signal call buttons on the proper (right) side of the path – not on left-side pedestal poles.	TCD; *Refer to planned improvement suggested in Appendix A
Gregg Road – signage doesn't match pavement markings. Minimal car traffic should warrant giving priority to the trail, especially since it's such an odd, undefined stretch through the parking/frontage area.	TCD; markings; ROW. *Refer to planned improvement suggested in Appendix A
Varina Veterinary is an example of poorly conceived path access. Getting on/off from Mill Road which leads to the Battlefield Park and neighborhoods is difficult and dangerous	Access; markings. *Refer to planned improvement suggested in Appendix A

<b>Comment, Concern</b>	<b>Primary Operations; Design Issue; Possible Solution</b>
because there is no access directly across the intersection.	
Get the fence off the bridge at Laurel Hill Lane. Fence off access to the work zone without closing half the bridge. Current set-up makes no sense and is dangerous for path users.	Maintenance; We understand that this had to do with a temporary maintenance activity where bicycles were routed into Route 5 for a brief period while maintenance was taking place.
Along Route 5, there are some stop bars on side-streets that have been placed such that they block the crosswalk. They should have aligned the crossings to be either in front or behind the stop bar.	TCD; markings. *Refer to planned improvement suggested in Appendix A
Antioch Baptist and Chatsworth – priority should be given to the trail.	ROW; markings. *Refer to planned improvement suggested in Appendix A
Watched driver turning from Gregg right onto New Market Road use the trail as if it was a merge lane. I was on a bike and had to swerve away to avoid being hit.	ROW; markings; signs. *Refer to planned improvement suggested in Appendix A
There’s no physical separation near Varina Elementary School.	Trail separation. *Refer to planned improvement suggested in Appendix A
Liability and expensive lawsuits could arise over inconsistency with application of VDOT standards and AASHTO guidelines.	Design; markings; signs. *Refer to planned improvement suggested in Appendix A

Legend for Table 1: TCD=Traffic Control Devices; ROW=Right-of-way;

### **Code of Virginia § 46.2-826**

With respect to the motorists leaving the private driveway, the Code of Virginia clearly states that the motorist must stop and yield the right of way. The cited Section of Code follows:

*Stop before entering public highway or sidewalk from private road, etc.; yielding right-of-way.*

*The driver of a vehicle entering a public highway or sidewalk from a private road, driveway, alley, or building shall stop immediately before entering such highway or sidewalk and yield the right-of-way to vehicles approaching on such public highway and to pedestrians or vehicles approaching on such public sidewalk.*

*The provisions of this section shall not apply at an intersection of public and private roads controlled by a traffic signal. At any such intersection, all movement of traffic into and through the intersection shall be controlled by the traffic signal.*

*(Code 1950, 46-240; 1958, c. 541, 46.1-223; 1987, c. 346; 1989, c. 727.)*

***Disclaimer:*** *These codes may not be the most recent version. [Virginia](#) may have more current or accurate information. We make no warranties or guarantees about the accuracy, completeness, or adequacy of the information contained on this site or the information linked to on the state site. Please check official sources.*

### **Review of Historical Marker Relocations being considered**

We received the February 1, 2016 email from Albert Bryan (VDOT) to Michael Zink (VDOT) relating to the historical marker relocations. We suggest that the markers be considered for relocation within existing right of way and/or permanent easements such that no portion of the sign encroaches within 3' desirable or 2' minimum of the pavement related to the trail.

### **Field reviews**

We performed two independent field reviews and then compared notes in this assessment. The first field review (Field Review #1) was conducted by Andy Boenau who drove the corridor with various stakeholders. The second field review (Field Review #2) was conducted by Chris Kiefer separately. The summary of these two field reviews are outlined below:

#### FIELD REVIEW #1

##### Corridor-wide

- Operationally, bicycles parallel to Route 5 should have priority.
- Sharks teeth markings may be helpful at several locations where cars cross the trail.
- Cross-street (including driveway) traffic should *expect* to yield to bicyclists on the trail.

### Vulcan Materials Entrance

- Western end of trail where it comes out of woods to meet Route 5.
- Quick turn, then steep hill down to Vulcan entrance. Very low traffic volume at Vulcan, but there's no on-street indication to expect bikes.
- Stop bars (along with existing sign) would help give bikes priority.

### 7 Eleven Parking Lot area

- The Osborne Turnpike intersection appears good overall.
- All-way stop control should be revisited. Should bikes really be stopping? Or, like Route 5, should bikes have the right-of-way?
- Retail corner has 2 entrances close together – doesn't need both. Adds to confusion and conflicts between bikes and cars.
- Parallel white stripes through parking lot don't call enough attention to trail passing through. From driver perspective, lines appear parking-related.
- Green(\*) paint in conflict areas and sharks teeth at entrance would probably help.

### Antioch Baptist Church

- Bikes shouldn't stop on the trail.
- Yield signs would work fine if Sunday enter/exit traffic at church is a concern.

### South Laburnum Ave

- Route 5 traffic is "noticeably" faster than closer to city limits. Downhill (westbound) towards Laburnum is especially fast. *Some of this "faster" traffic as commented on could be expected due to its proximity in relation to the location itself which is a more isolated intersection in a transition area from more urban environment to the west (aka the urban environment of the City) and the more rural sections of the corridor to the east. In addition, the fact that this intersection is near the interface of the access point coming off of/leading to the nearby limited access point of Pocahontas Parkway. This coupled with the fact that the Laburnum Avenue corridor to the north is a VDOT four lane, divided primary roadway with large undeveloped tracts of land approaching the intersection provide motorists with a sense that they can drive faster than the speed limit and still be "safe". Furthermore, motorists driving west on Route 5 (downhill) towards the traffic signal can recognize the green light from quite a distance which tends to contribute to faster speeds in this direction.*
- Wide turn radius encourages motorists to maintain higher speed around corners where pedestrians and bicyclists wait to cross (or are crossing).

- Westbound motorists have right-turn sign on mast arm, but no indication to expect bicyclists or pedestrians.

### Dairy Queen / I-295

- No crossing for bikes/peds at location that will likely be busy destination for trail users.
- Park phase of trail comes back to Route 5 on north side, DQ is on south side.

### FIELD REVIEW #2

#### Corridor-wide

- There were many places along the trail that had standing water. If the standing water on the asphalt paths is not repaired, there could be long term maintenance issues that result.
- Despite the rainy weather during the large majority of assessment period, it was noted that there were a large amount of bicycle and pedestrian users of the facility.
- The higher concentrations of pedestrian and bicycle activity appeared to be in the stretch between the 7-11 and Doran Road. Activity east of I-295 appeared to drop off significantly.
- Many of the detectable warning surface strips are placed perpendicular to the path as opposed to diagonal with the radial returns which may be more effective for the visually impaired users to differentiate between the roadway and the trail.
- Many of the detectable warning surfaces are dark red and seem to blend in with the pavement as opposed to a brighter color like yellow.
- Refer to APPENDIX A for plan view depictions of the areas described in this section.

#### Vulcan Materials Entrance

- Users of the trail come out of the wooded section from the City of Richmond ascending up a steep incline and come upon the Vulcan Materials Entrance. The Vulcan Entrance is an industrial intersection with a large percentage of trucks.
- While the users of the trail have the right of way in crossing the private drive, we recommend adding detectable warning surfaces on each radial return to raise awareness of the trail users.
- We recommend that white lines be considered across the entrance to raise awareness of the vehicular users of the access road.

#### County Pump Station Entrance

- This access point is used far less frequent than Vulcan and others. We would classify this as a low priority improvement need.
- While the users of the trail have the right of way in crossing the private drive, we recommend adding detectable warning surfaces on each radial return to raise awareness of the trail users.

#### Steep grade with sharp curves just south of the County Pump Station Entrance

- It appeared that there was some undermining of the shoulder of the trail under a portion of the safety fence that was coned off indicating that the area was being considered for repair. We recommend that this area be repaired so as not to continue to erode which could result in more costly repair if left unattended.
- We recommend that a center yellow stripe be added to the meandering portion of the trail where users working to climb the steep incline could pass with higher speed users coming in the opposite direction on the steep decline.
- One private driveway has a retaining wall right up to the interface with the trail limiting sight distance for vehicles egressing to Route 5. We suggest adding shark teeth on the paved driveway to increase awareness of the vehicles as they approach the trail.

#### Osborne Turnpike/New Market Road at the "Y" near the 7-Eleven

- We suggested a yellow centerline stripe be placed in the short section between the two road crossing to indicate that the users of the trail should stay in their lane for this short stretch.
- We recommend that green(\*) paint either in the form of a ribbon inside the existing white lines or to fill in the entirety of the "NO PARKING" areas within the asphalt parking lot be considered to help differentiate the trail from the parking areas.
- In addition to the bullet above, we recommend that plastic curbing with flexible post delineators be placed in between the driveways to further delineate this area.
- The Trail Crossing 325' ahead sign on Osborne Turnpike is significantly blocked by an existing power pole limiting the effectiveness for motorists travelling northbound on Osborne Turnpike as they approach the "Y". We suggest moving the sign and perhaps changing the distance marker to increase effectiveness.
- There is an existing flush drop inlet inside the path that has the grate slots running longitudinal to the bicycles tires. We recommend that the grate be sized up and replaced with diagonal grates to lessen the probability of tires running into the grates.

#### Midview Road Crossing of Route 5

- As you approach the crossing from the north, there is an 18' wide paved shoulder portion of the path that is unstriped and un-delineated across four driveways. The area appears to be somewhat confusing and could lead to vehicles parking in the area. We suggest that at a minimum, the area be striped and marked as a "NO PARKING" area like others in the corridor. Consideration should be given to painting the area in green (\*) as a ribbon or in its entirety similar to the suggestion at the 7-Eleven parking lot earlier.
- The two large signs located on the approaches to the Midview Crossing seem to inhibit sight distance for users of the trail planning their crossing. We recommend that the signs be raised to be a minimum of 7' up from ground to the bottom of the sign.
- We recommend that centerline yellow pavement markings be installed for the abrupt turn to square up to the crossing to help users of the trail who may be approaching the crossing in lower light situations.

#### South Laburnum Avenue intersection

- As you approach the intersection on Laburnum from the east, there is no indication that you are coming to a trail crossing. We recommend that trail crossing ahead and trail crossing signs at the crossing be installed to increase awareness.
- We recommend that high visibility crosswalk striping be added to the hollow lines as currently exists to increase awareness.
- We recommend that a signal ahead sign be placed along the trail as you approach the intersection from both the north and the south to increase awareness to the users of the trail as they approach the signalized intersection.
- We recommend that a sign be placed alongside the northbound right turn lane (Route 5 to Laburnum) indicating that there is a trail crossing upon taking the right to increase awareness.
- We recommend that signs be placed on the poles in the NE and NW quadrants of the intersection to alert motorists to the trail crossing.
- We recommend that consideration be given to the placement of a three section head in the NE quadrant mast arm providing a red ball, yellow arrow, and a flashing yellow arrow to alert the motorists that they turn right cautiously to reduce the potential for vehicles taking the right faster.
- We recommend that the white skip lines approaching the flush median be replaced with solid yellow lines to keep users of the trail in their lanes. On heavier usage time periods like weekends, bicycle users stack up as observed.
- Consideration should be given to the placement of a pedestrian pedestal and push button actuation on the right side of the crossing rather than on the left side of the crossing in the NE quadrant.

#### Antioch Baptist Church Entrance

- We recommend that the trail stop signs and trail stop bars be removed from the driveway. The trail has the right of way across private driveways. Stop conditions for the trail should be reserved for road crossings.
- Likewise, the stop ahead pavement markings should be eradicated for the same reason as above.
- At Freeless Street, the bollards should be removed and replaced with the same flush median and stop bars for consistency. Bollards should be used only in cases where there is a known and recurring activity of motor vehicles using the trail.

#### New Market Veterinary Entrance

- We recommend that the trail stop signs and trail stop bars be removed from the driveway. The trail has the right of way across private driveways. Stop conditions for the trail should be reserved for road crossings.
- We recommend that consideration be given to the placement of detectable warning surfaces to call attention to the commercial entrance.

#### New Varina Library Entrance (currently under construction)

- We recommend that the new planned Route 5 crossing be considered for an overhead RRFB push button actuation similar to the Midview crossing due to the high speed and somewhat limited sight distance looking north.
- We recommend that advance trail crossing be installed to alert motorists of the upcoming crossing.

- We recommend that a trail crossing to the right sign be placed for vehicles exiting the library site turning south.
- We recommend high visibility crosswalk pavement markings be installed in Route 5 to increase awareness of motorists.
- Construction is still in process of this site at the time of the assessment.
- We note that if it is the intent that the 8' wide concrete sidewalk area located on the south side of the entrance is intended to be utilized as a shared use path that it should be separated from the travel way by a minimum of 4' rather than immediately adjacent to the back of curb as shown in the site plan.

### Wilson Road

- As you approach the intersection on Wilson from the east, there is no indication that you are coming to a trail crossing. We recommend that trail crossing ahead and trail crossing signs at the crossing be installed to increase awareness.
- We recommend that a signal ahead sign be placed along the trail as you approach the intersection from both the north and the south to increase awareness to the users of the trail as they approach the signalized intersection.
- We recommend that signs be placed on the poles in the NE and NW quadrants of the intersection to alert motorists to the trail crossing.
- We recommend that the white skip lines approaching the flush median be replaced with solid yellow lines to keep users of the trail in their lanes. On heavier usage time periods like weekends, bicycle users stack up as observed.
- Consideration should be given to the placement of a pedestrian pedestal and push button actuation on the right side of the crossing rather than on the left side of the crossing in the NE quadrant.
- We recommend that a sign be placed alongside the northbound right turn lane (Route 5 to Wilson Road) indicating that there is a trail crossing upon taking the right to increase awareness.

### Gregg Road

- It appears that a trail of sorts was constructed along the frontage of Varina ES but it has no connectivity at this time.
- We recommend that consideration be given to a new Route 5 crossing with an overhead RRFB push button actuation similar to the Midview crossing in order to accommodate pedestrians who may walk between the ES and the commercial centers across Route 5. In addition, we recommend the application of high visibility pavement markings for the crosswalk.
- We would recommend that a raised median be installed to shorten the crossing distance and provide a refuge spot as they join the trail. This median could serve another purpose as it would better define the trail area from the vehicular traffic and should result in less frequent accidental vehicular usage of the trail.
- The areas to the north and south of Gregg Road should be considered for the same application of green (\*) pavement to help differentiate the trail from motorists either in the form of a ribbon or total fill.
- As you approach the intersection on Gregg from the east (and the commercial uses), there is no indication that you are coming to a trail crossing. We recommend that trail crossing ahead and trail crossing signs at the crossing be installed to increase awareness.

### Strath Road

- We recommend that the white skip lines approaching the flush median be replaced with solid yellow lines to keep users of the trail in their lanes. On heavier usage time periods like weekends, bicycle users stack up as observed.
- We recommend that a short piece of curb & gutter be constructed just north of Strath Road where the 2' minimum shoulder area/clear zone is not achieved for the trail.
- As you approach the intersection on Strath Road from the east, there is no indication that you are coming to a trail crossing. We recommend that consideration of trail crossing ahead and trail crossing signs at the crossing be installed to increase awareness.
- In the SE quadrant of the intersection as you enter the roadway pavement from the trail, there appears to be a large pothole or loose asphalt section surrounding an existing manhole. It is right in the crossing of the trail and should be repaired to reduce the likelihood of a tire or ankle falling in.

### Wood Mill Drive

- The bollards should be removed and replaced with the same flush median and stop bars for consistency. Bollards should be used only in cases where there is a known and recurring activity of motor vehicles using the trail.
- Removal of bollards and the placement of a flush median may result in a situation whereby the power pole in the NE quadrant may need to be moved or re-positioned. We recommend that consideration be given to this area as it may require costly DVP relocation and/or the acquisition of easements to be accomplished.
- As you approach the intersection on Wood Mill Drive from the east, there is no indication that you are coming to a trail crossing. We recommend that consideration of trail crossing ahead and trail crossing signs at the crossing be installed to increase awareness.

### New Market Phase to Varina Phase Crossing

- We recommend that the white skip lines approaching the flush median be replaced with solid yellow lines to keep users of the trail in their lanes.
- We recommend that high visibility crosswalk striping be added to the hollow lines as currently exists to increase awareness.

### Turner Road

- As you approach the intersection on Turner Road from the east, there is no indication that you are coming to a trail crossing. We recommend that consideration of trail crossing ahead and trail crossing signs at the crossing be installed to increase awareness.
- We recommend that the white skip lines approaching the flush median be replaced with solid yellow lines to keep users of the trail in their lanes.

### New Market Heights Lane

- As you approach the intersection on New Market Heights Lane from the east, there is no indication that you are coming to a trail crossing. We recommend that consideration of trail crossing ahead and trail crossing signs at the crossing be installed to increase awareness.

- We recommend that the white skip lines approaching the flush median be replaced with solid yellow lines to keep users of the trail in their lanes.

#### Bridge B-611 Area

- We recommend that a solid 4" yellow centerline be striped in the north side of the bridge to keep users on their side of the trail as they approach the bridge bollard in a curvilinear alignment approach.

#### Longbridge Road Area

- We recommend that a solid 4" yellow centerline be striped in certain stretches of the trail to keep users on their side of the trail as they navigate these sharp curves in the wooded areas where visibility along the trail is impeded somewhat by the wooded environment.

#### PCN, LLC Area

- We recommend that a solid 4" yellow centerline be striped in certain stretches of the trail to keep users on their side of the trail as they navigate these sharp curves in the wooded areas where visibility along the trail is impeded somewhat by the wooded environment.

#### Turkey Island Road

- We recommend that a trail crossing sign be placed in between Route 5 and the trail crossing of this roadway as it is located in an area where there is some separation. We would classify this as a low priority improvement need.

#### Willis Church Road area

- We recommend that a solid 4" yellow centerline be striped in certain stretches of the trail to keep users on their side of the trail as they navigate these sharp curves in the wooded areas where visibility along the trail is impeded somewhat by the wooded environment.

#### Alexander area

- We recommend that a center yellow stripe be added to the meandering portion of the trail where users working to climb the steep incline could pass with higher speed users coming in the opposite direction on the steep decline.

#### Kinvan area

- Although not technically part of the VDOT study area, there was a fair amount of complaints about the eastern Kinvan Road trail crossing in the Park Phase of the project. This is an area maintained by the County of Henrico and not adjacent to the Route 5 corridor. As a courtesy, we reviewed the area and made some recommendations.

- The issue at hand that needs to be addressed is the trail users heading north bound that cross the road seem to be confused and end up driving straight instead of turning left after they cross the road. Bike users seem to end up pedaling down a private paved driveway instead of staying on the path.
- We suggest adding signage and pavement markings to increase awareness to the users of the path.

### (\*) Benefits of "Green" Paint Markings

Green paint can be applied to the outside of a bike lane, fill in the bike, denote a bike box or an intersection crossing. This application increases the safety of the cyclist and those driving vehicles. Multiple factors allow for this safety increase:

- Increases the visibility of cyclists
- Discourages illegal car parking in bike lanes thus reducing traffic in said bike lanes
  - Drivers will feel more exposed and attention drawn so they will be deterred to park there
- The cyclists are also more aware of their space and of points of conflict
- Increases comfort of cyclists
  - Increased comfortability will lead to less anxiety which decreases the number of accidents
- Motorist yield more frequently to cyclists
- Cyclist accidents in intersections are reduced
- In busy or crowded over laps of striping, the green paint can be easily distinguished from the normal white striping resulting in less confusion
- By highlighting specific areas of conflict the DOT's of that city or area will increase awareness of the user leading to less incidents
- Better indicates who has priority at intersections
  - One of the biggest issues with bike lanes is the lack of knowledge of yielding with motorists, but green bike lanes will more clearly show yielding

Colored pavement (including green) has already been implanted in major cities across the United States such as Chicago, Washington D.C., New York City, San Francisco, and many others. All of which have shown positive results. This increased safety allows and leads to more use of the bike lanes benefitting the city.

An example of the increased safety is with a driveway entrance. Many times the motorist does not think about bike traffic or even notice the white lines in front of them, but will treat as any other driveway. Green bike lanes would immediately catch their attention making known to them that there is a bike lane in front of the driveway so they need to wary of cyclists.

Green painted asphalt provides other benefits as well. The decrease of illegal parking in bikes lanes leads to more pleased users and less complaints. The green paint also "promotes the multi-modal nature of the corridor." (NACTO) The enhanced bike lanes will increase the amount of people biking in a city which decreases the cities need for public transportation while increasing the exercise rate of the city as well.

Both motorists and cyclists agree that the biggest impact has been the raised awareness. Motorists are more aware that cyclists might be present and where those cyclists would be. Cyclists are more aware of the area that they have to travel and where they should ride in a busy intersection. This increase in awareness leads to safer conditions on cities roadways.

“Green Paint” References:

<http://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/colored-bike-facilities/>

[http://www.pedbikesafe.org/BIKESAFE/countermeasures\\_detail.cfm?CM\\_NUM=18](http://www.pedbikesafe.org/BIKESAFE/countermeasures_detail.cfm?CM_NUM=18)

[http://www.pedbikeinfo.org/cms/downloads/06%2013%202014%20BIKESAFE%20Lit%20Review\\_FINAL.pdf#page=50](http://www.pedbikeinfo.org/cms/downloads/06%2013%202014%20BIKESAFE%20Lit%20Review_FINAL.pdf#page=50)

[http://www.fhwa.dot.gov/environment/bicycle\\_pedestrian/publications/separated\\_bikelane\\_pdg/page11.cfm](http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/page11.cfm)

[http://mutcd.fhwa.dot.gov/resources/interim\\_approval/ia14/index.htm](http://mutcd.fhwa.dot.gov/resources/interim_approval/ia14/index.htm)

### **Compare/contrast of western section vs eastern section**

Although the majority of this study focused on the western section (the Henrico Section) of the Virginia Capital Trail, we did drive through the eastern sections (Charles City County and James City County) to compare/contrast some of the items along the trail. As a general statement, the eastern section of the trail was completed years before the western section.

Here are some of the observations made based on a windshield survey of the eastern section:

- While the western section employed one set of bollards as discussed above, the eastern section had several. We made note of one such location in the eastern section where it appeared a bollard had been employed at some point in the past but had subsequently been removed.
- The western section was very consistent on the flush median stamped concrete islands at all street crossings (red brick pattern and flush with similar dimensions whereas the eastern section had more of a mix with some similar to the western section and others with grass either sunken or flush.
- The eastern section employed many green “Bike Route” (with bike symbol) signs along various portions of the trail while we did not notice them in the western section.
- While the western section has a few parallel at grade, close to the Route 5 travel lane sections (just west of Midview for example), the eastern section had many more. These appeared to be somewhat confusing and according to some we interviewed after the fact appeared to be confusing. One commenter noted that the eastern section seemed to have many places in the trail that the biker felt like they were being directed into traffic. Perhaps the eastern section could consider the use of green pavement markings in several locations as well.

### **Total Traffic Volumes along the corridor**

The AADT along the study segment of Route 5 ranged from 9,500 to 11,000 vehicles per day in 2015 based on published VDOT count data. Table 1 shows historic average annual daily traffic volume (AADT) trends at three locations over the latest 13-year period from 2003 to 2015. The

data in Table 2 shows that while the corridor had decreases in traffic in the recession, it appears that traffic is once again on the rise and is currently at the highest level in the last 13 years. In the absence of new major land development projects, the current Route 5 two-lane typical section should accommodate incremental traffic volume increases for the foreseeable future with the possibility of select turn lanes being added. Traffic seems to drop off south of the I-295 interchange.

**Table 2. Route 5 – Henrico County Historical Traffic Volumes**

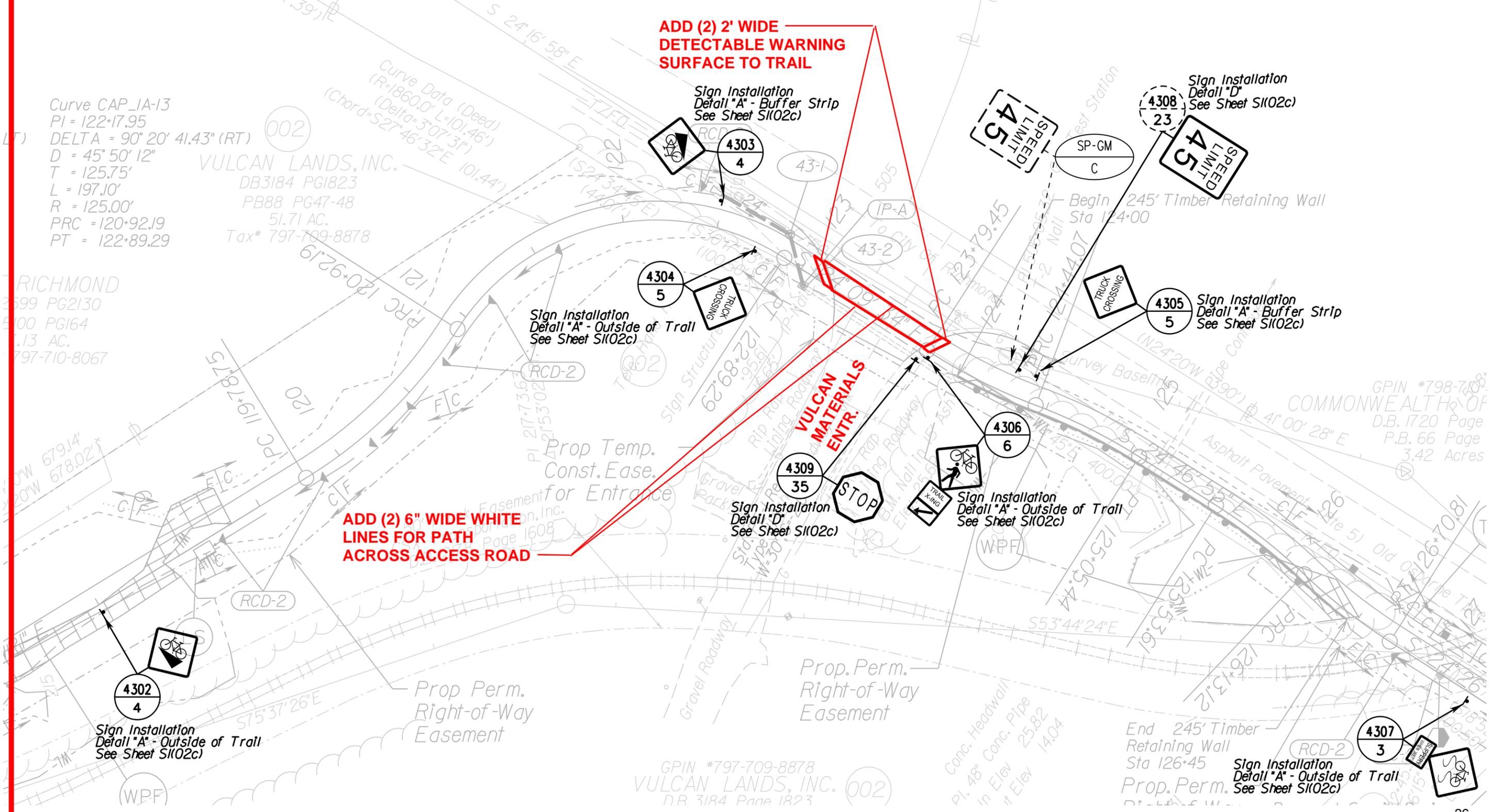
Average Annual Daily Traffic Count Data 2003-2015						
Year	Between Richmond CL and New Market Road		Between Osborne Tpke and South Laburnum Ave		Between South Laburnum Ave and I-295	
	AADT	% Change	AADT	% Change	AADT	% Change
2003	10,000	----	7300	----	7500	----
2004	8400	-16.0	6900	-5.5	7500	0
2005	8300	-1.2	6900	0	7700	+2.6
2006	8600	+3.6	7100	+3.0	7900	+2.6
2007	8400	-2.3	6900	-2.8	7600	-3.8
2008	8500	+1.2	7000	+1.4	7700	+1.3
2009	7700	-9.4	6300	-1.0	6900	-10.4
2010	9100	+18.2	7500	+19.0	8300	+20.3
2011	9000	-1.0	7400	-1.3	8200	-1.2
2012	8600	-4.4	7100	-4.1	7800	-4.9
2013	9500	+9.5	7900	+10.1	8200	+4.9
2014	9800	+3.1	8100	+2.5	8500	+3.5
2015	11,000	+10.9	9500	+14.7	10,000	+15

## **Report References**

1. Virginia Department of Transportation Central Region Operations. Route 5 Safety Study: From Oakland Road to Four Mile Run Parkway. January 2014
2. Virginia Department of Transportation Central Region Operations. Route 5 Corridor from Oakland Road to Four Mile Run Parkway – Turn Lane Warrant Analysis. March 2015
3. Virginia Department of Transportation Traffic Engineering Division. Guidelines for the Installation of Marked Crosswalks.
4. American Association of State Highway and Transportation Officials (AASHTO). Guide for the Development of Bicycle Facilities. 2012 (Fourth Edition)
5. Virginia Department of Transportation. Road Design Manual, APPENDIX A. April 2016
6. U. S. Department of Transportation Federal highway Administration. Manual on Uniform Traffic Control Devices (MUTCD). 2009 Edition
7. AASHTO: A Policy on Geometric Design of Highways and Streets. 2011 Edition

**APPENDIX A – PROPOSED IMPROVEMENTS**

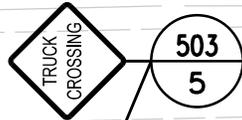
# VULCAN MATERIALS ENTRANCE SITUATION



# COUNTY PUMP STATION SITUATION

See Phase IV Sheet 43

Sign Installation  
Detail "A" - Buffer Strip  
See Sheet SI(02c)



Sign Installation  
Detail "A" - Outside of Trail  
See Sheet SI(02c)



Sign Installation  
Detail "A" - Outside of Trail  
See Sheet SI(02c)

COUNTY PUMP STATION ENTR.

ADD (2) 2' WIDE  
DETECTABLE WARNING  
SURFACE TO TRAIL

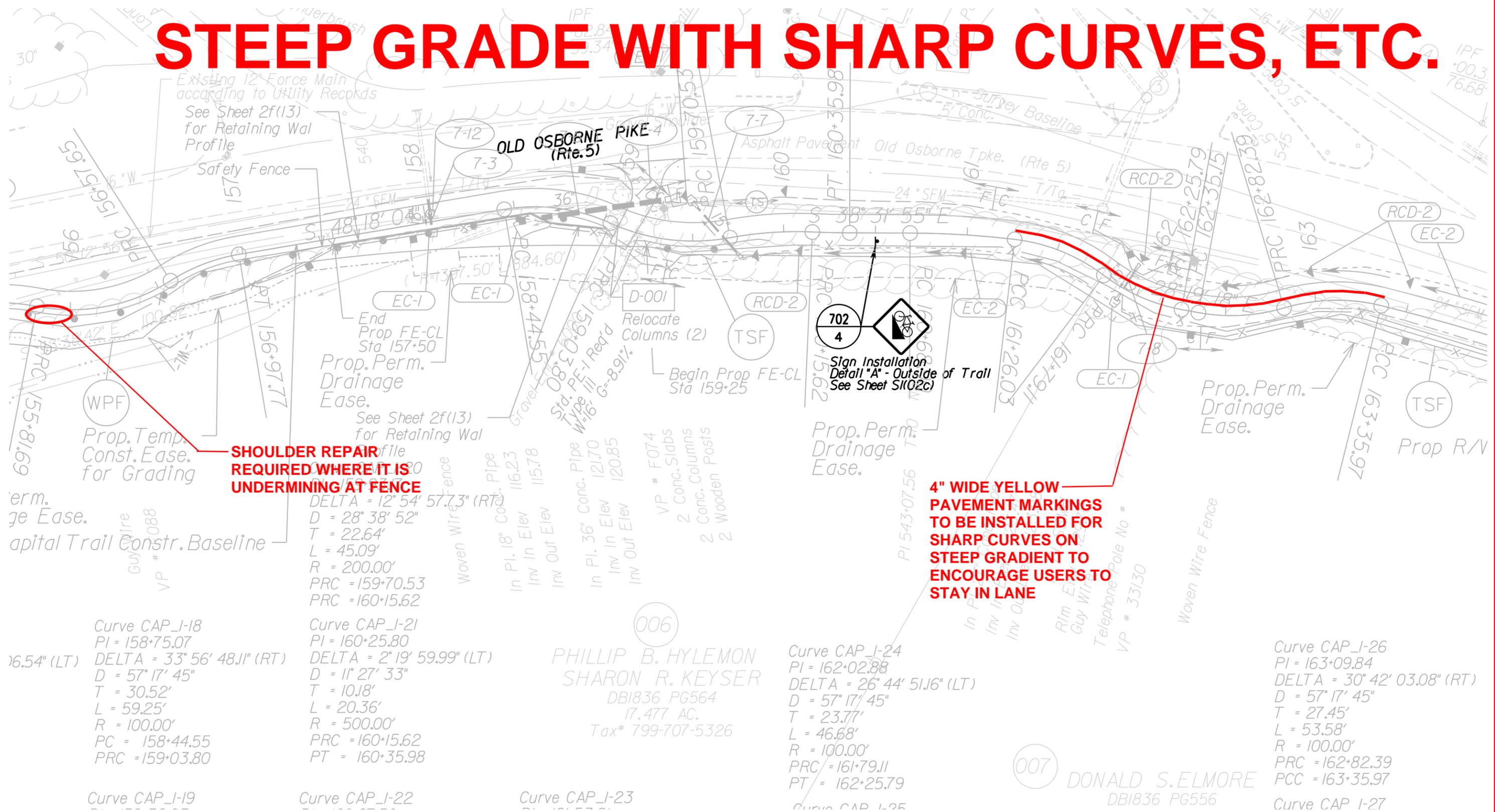
OLD OSBORNE PIKE  
(Rte. 5)

VA CAPITAL TRAIL

Prop. Temp. Const. Ease. for Grading  
Capital Trail Constr. Baseline

COUNTY OF HENRICO, VIRGINIA  
DBI846 PG471  
0.602 AC.

# STEEP GRADE WITH SHARP CURVES, ETC.



**SHOULDER REPAIR  
REQUIRED WHERE IT IS  
UNDERMINING AT FENCE**

**4" WIDE YELLOW  
PAVEMENT MARKINGS  
TO BE INSTALLED FOR  
SHARP CURVES ON  
STEEP GRADIENT TO  
ENCOURAGE USERS TO  
STAY IN LANE**

Curve CAP\_I-18  
PI = 158+75.07  
DELTA = 33° 56' 48.11" (RT)  
D = 57° 17' 45"  
T = 30.52'  
L = 59.25'  
R = 100.00'  
PC = 158+44.55  
PRC = 159+03.80

Curve CAP\_I-21  
PI = 160+25.80  
DELTA = 2° 19' 59.99" (LT)  
D = 11° 27' 33"  
T = 10.18'  
L = 20.36'  
R = 500.00'  
PRC = 160+15.62  
PT = 160+35.98

006  
PHILLIP B. HYLEMON  
SHARON R. KEYSER  
DBI836 PG564  
17.477 AC.  
Tax# 799-707-5326

Curve CAP\_I-24  
PI = 162+02.88  
DELTA = 26° 44' 51.16" (LT)  
D = 57° 17' 45"  
T = 23.77'  
L = 46.68'  
R = 100.00'  
PRC = 161+79.11  
PT = 162+25.79

007  
DONALD S. ELMORE  
DBI836 PG556

Curve CAP\_I-26  
PI = 163+09.84  
DELTA = 30° 42' 03.08" (RT)  
D = 57° 17' 45"  
T = 27.45'  
L = 53.58'  
R = 100.00'  
PRC = 162+82.39  
PCC = 163+35.97  
Curve CAP\_I-27

Curve CAP\_I-19

Curve CAP\_I-22

Curve CAP\_I-23

Curve CAP\_I-25

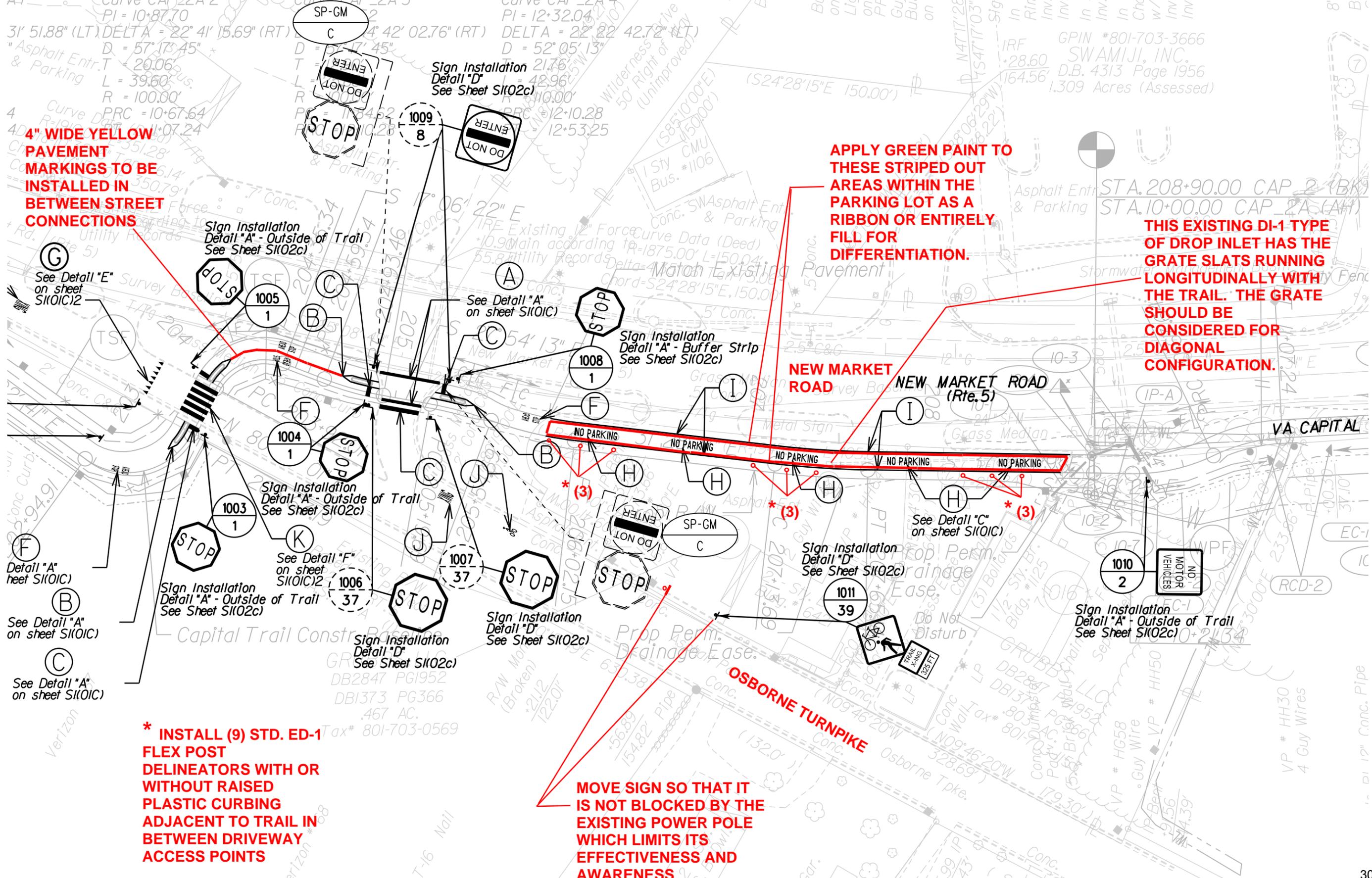
# STEEP GRADE WITH SHARP CURVES, ETC.

Curve DRWI\_02-1  
PI = 10+58.64  
DELTA = 16° 28' 57.23" (LT)  
D = 143' 14" 22"  
T = 5.79'  
L = 11.51'  
R = 40.00'  
PC = 10+52.85  
PT = 10+64.36

Station 167+00 Match Line See Sheet 8

**INSTALL "SHARK TEETH" PAVEMENT MARKINGS FOR PROPERTY OWNER APPROACH TO TRAIL WHERE SIGHT DISTANCE IS LIMITED DUE TO RETAINING WALLS AND SLOPE**

# OSBORNE TPKE / NEW MARKET RD "Y" AREA



**4" WIDE YELLOW PAVEMENT MARKINGS TO BE INSTALLED IN BETWEEN STREET CONNECTIONS**

**APPLY GREEN PAINT TO THESE STRIPED OUT AREAS WITHIN THE PARKING LOT AS A RIBBON OR ENTIRELY FILL FOR DIFFERENTIATION.**

**THIS EXISTING DI-1 TYPE OF DROP INLET HAS THE GRATE SLATS RUNNING LONGITUDINALLY WITH THE TRAIL. THE GRATE SHOULD BE CONSIDERED FOR DIAGONAL CONFIGURATION.**

**\* INSTALL (9) STD. ED-1 FLEX POST DELINEATORS WITH OR WITHOUT RAISED PLASTIC CURBING ADJACENT TO TRAIL IN BETWEEN DRIVEWAY ACCESS POINTS**

**MOVE SIGN SO THAT IT IS NOT BLOCKED BY THE EXISTING POWER POLE WHICH LIMITS ITS EFFECTIVENESS AND AWARENESS**



# LABURNUM AVENUE AREA

**INSTALL W11-15, W11-15P, & W16-9P TRAIL CROSSING AHEAD SIGNAGE IN ADVANCE OF THE INTERSECTION**

**INSTALL W11-15, W11-15P, & W16-7P TRAIL CROSSING HERE SIGNAGE AT THE INTERSECTION**

**PUSH BUTTON AND PEDESTAL ON WRONG SIDE OF PATH FOR CROSSING**

**INSTALL W3-3 & W16-9P SIGNAL AHEAD SIGN**

**ADD NEW SIGNAL HEAD, 3-SECTION, WITH A FLASHING RIGHT YELLOW ARROW\***

**\*WILL REQUIRE STRUCTURAL EVALUATION**

**ADD HIGH VISIBILITY PAVEMENT MARKINGS TO CROSS WALK**

**LABURNUM AVENUE**

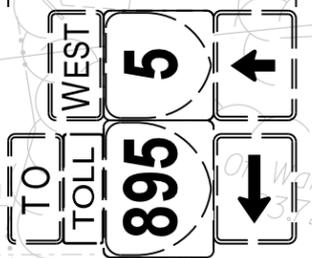
**INSTALL W11-15, W11-15P, & W16-6P (R) TRAIL CROSSING UP AND TO THE RIGHT SIGNAGE AT THE INTERSECTION**

**INSTALL W3-3 & W16-9P SIGNAL AHEAD SIGN**

Sign Installation Detail "D" See Sheet S1(02c)

Sign Installation Detail "A" - Outside of Trail See Sheet S1(02c)

Sign Installation Detail "A" - Buffer Strip See Sheet S1(02c)



Pipe culvert believed to be in this location, but was unable to locate ends of pipe because of coarse gravel at invert in and large riprap at invert out.

Curve CAP\_3-27  
PI = 331+62.44  
DELTA = 4° 02'  
D = 28° 38' 52"  
T = 7.04'  
L = 14.08'  
R = 200.00'  
PC = 331+55.4  
PCC = 331+69.4

Curve CAP\_3-27  
PI = 329+60.21  
DELTA = 45° 15' 51.54" (RT)  
D = 229° 10' 59"  
T = 10.42'  
L = 19.75'  
R = 25.00'  
PC = 329+49.79  
PCC = 329+69.54

Curve CAP\_3-28  
PI = 329+79.40  
DELTA = 43° 00' 59.29" (LP)  
D = 229° 10' 59"  
T = 9.86'  
L = 18.78'  
R = 25.00'  
PC = 329+69.54  
PCC = 329+88.32

RM-2  
+46.58  
62.08'

RM-2  
+55.93.27

RM-2  
+55.93.34

RCD-2  
EG-1A

SP-GM  
C

SP-GM  
C

JOHNS  
IOHNS  
32316  
26214  
AC.  
35-7001

1685+46.58

Top Of Water Elev 94.01

Drain Ease.

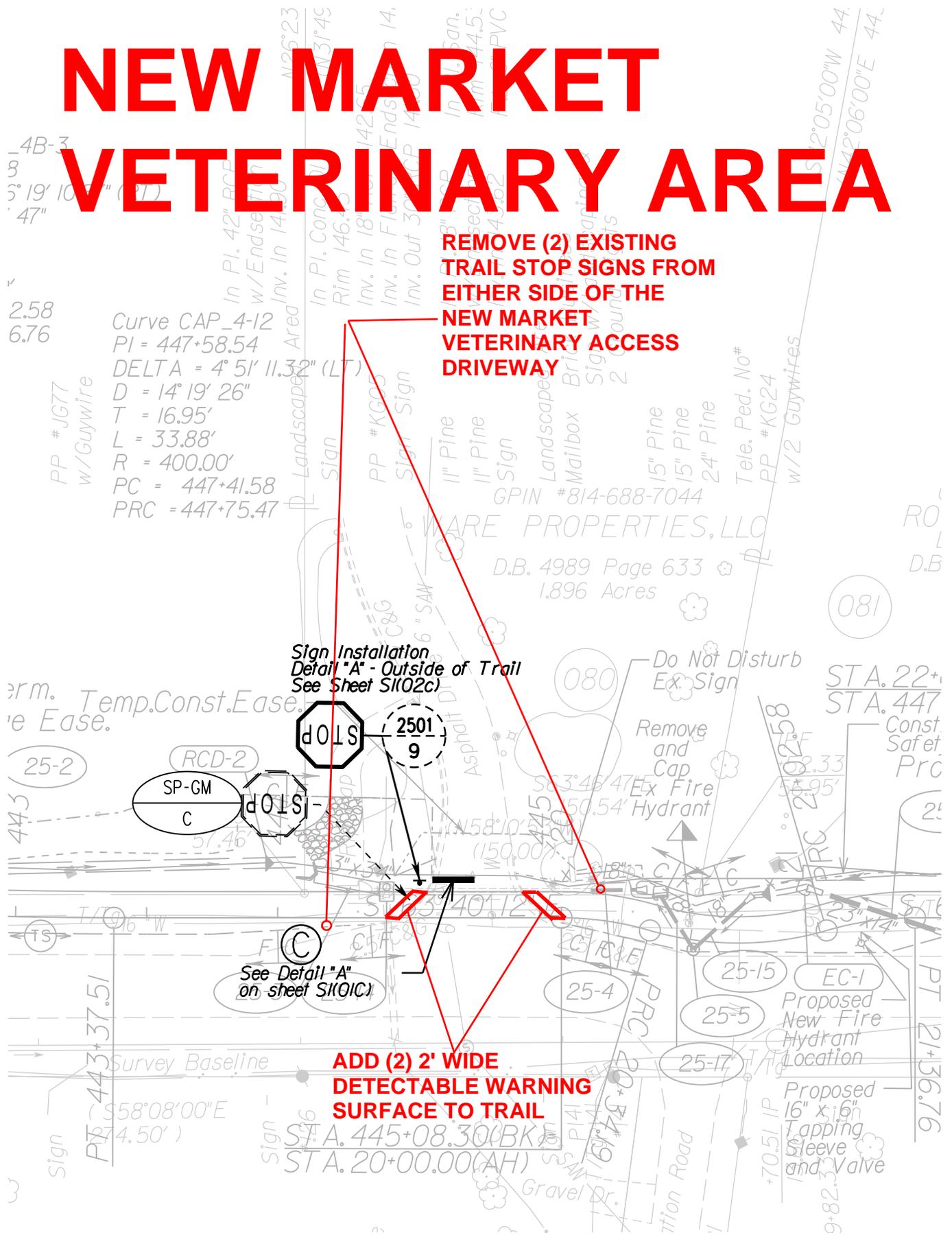


# NEW MARKET VETERINARY AREA

**REMOVE (2) EXISTING  
TRAIL STOP SIGNS FROM  
EITHER SIDE OF THE  
NEW MARKET  
VETERINARY ACCESS  
DRIVEWAY**

Sign Installation  
Detail "A" - Outside of Trail  
See Sheet S1(02c)

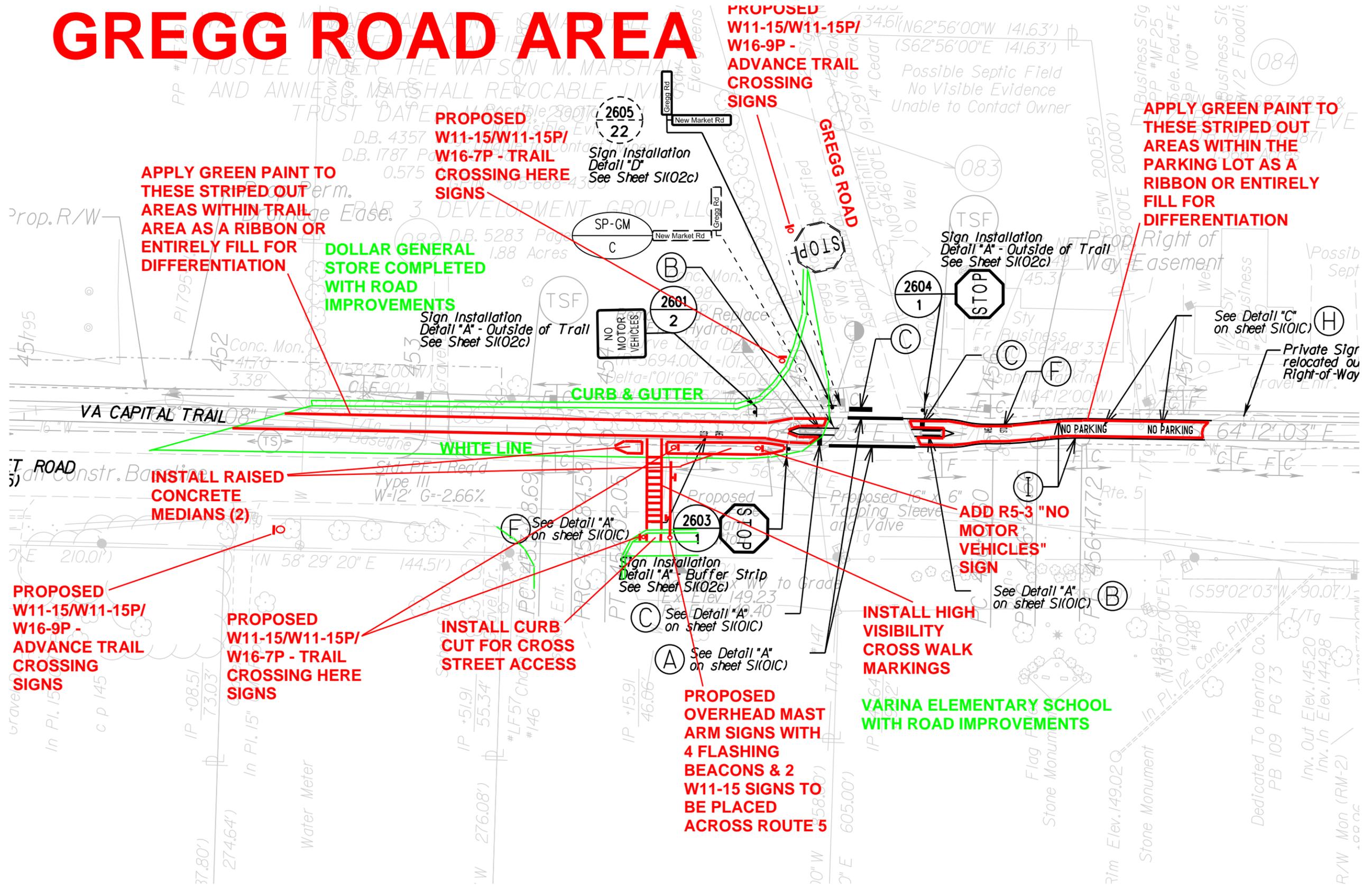
**ADD (2) 2' WIDE  
DETECTABLE WARNING  
SURFACE TO TRAIL**







# GREGG ROAD AREA



APPLY GREEN PAINT TO THESE STRIPED OUT AREAS WITHIN TRAIL AREA AS A RIBBON OR ENTIRELY FILL FOR DIFFERENTIATION

DOLLAR GENERAL STORE COMPLETED WITH ROAD IMPROVEMENTS

PROPOSED W11-15/W11-15P/ W16-7P - TRAIL CROSSING HERE SIGNS

PROPOSED W11-15/W11-15P/ W16-9P - ADVANCE TRAIL CROSSING SIGNS

APPLY GREEN PAINT TO THESE STRIPED OUT AREAS WITHIN THE PARKING LOT AS A RIBBON OR ENTIRELY FILL FOR DIFFERENTIATION

INSTALL RAISED CONCRETE MEDIANS (2)

PROPOSED W11-15/W11-15P/ W16-9P - ADVANCE TRAIL CROSSING SIGNS

PROPOSED W11-15/W11-15P/ W16-7P - TRAIL CROSSING HERE SIGNS

INSTALL CURB CUT FOR CROSS STREET ACCESS

Sign Installation Detail "D" See Sheet SI(02c)

Sign Installation Detail "A" - Outside of Trail See Sheet SI(02c)

Sign Installation Detail "A" - Outside of Trail See Sheet SI(02c)

See Detail "A" on sheet SI(01C)

Sign Installation Detail "A" - Buffer Strip See Sheet SI(02c)

See Detail "A" on sheet SI(01C)

See Detail "A" on sheet SI(01C)

PROPOSED OVERHEAD MAST ARM SIGNS WITH 4 FLASHING BEACONS & 2 W11-15 SIGNS TO BE PLACED ACROSS ROUTE 5

ADD R5-3 "NO MOTOR VEHICLES" SIGN

See Detail "A" on sheet SI(01C)

INSTALL HIGH VISIBILITY CROSS WALK MARKINGS

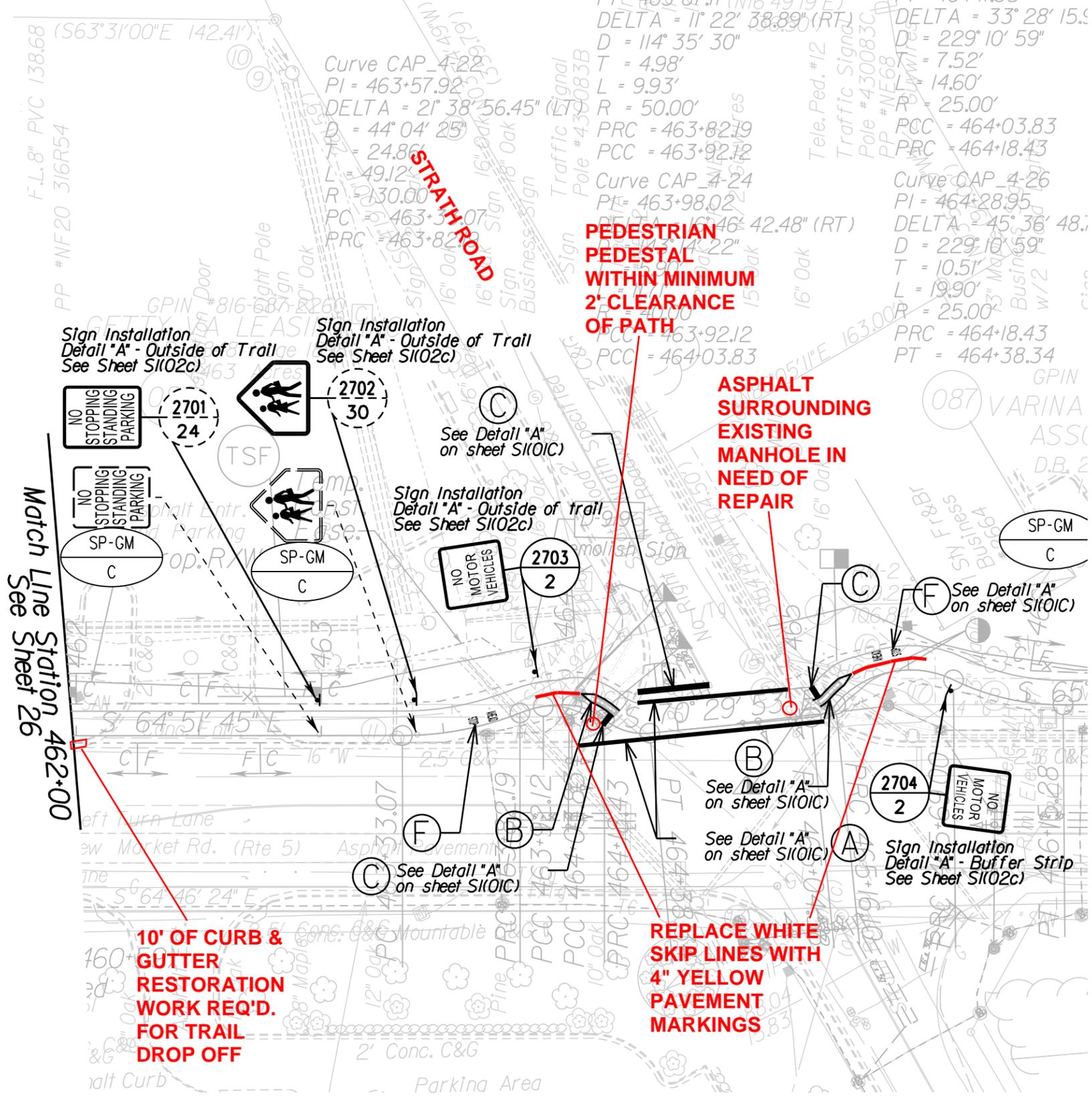
VARINA ELEMENTARY SCHOOL WITH ROAD IMPROVEMENTS

See Detail "C" on sheet SI(01C)

Private Sign relocated on Right-of-Way

B. 2248 Page 1211 IPF  
B. 90 Page 154

# STRATH ROAD AREA



# WOOD MILL AREA

**PROPOSED  
W11-15/W11-15P/  
W16-7P - TRAIL  
CROSSING HERE  
SIGNS**

**INSTALL W11-15,  
W11-15P, & W16-9P TRAIL  
CROSSING AHEAD  
SIGNAGE IN ADVANCE  
OF THE INTERSECTION**

**\*MAY REQUIRE  
EXCEPTION FOR  
SHOULDER  
OFFSET OR  
ADJUSTMENT  
OF UTILITY POLE**

**(B) See Detail "B"  
on sheet S1(01C)**

**NO MOTOR  
VEHICLES** (2801 2)

**Sign Installation  
Detail "A" - Outside of Trail  
See Sheet S1(02c)**

**NEW MARKET ROAD  
(Rte. 5)**

**Sign Installation  
Detail "A" - Buffer Strip  
See Sheet S1(02c)**

**\*MAY REQUIRE  
DVP EASEMENT**

**WOOD MILL DRIVE**

**2805  
25**

**Sign Installation  
Detail "D"  
See Sheet S1(02c)**

**STOP** (2804 1)

**Sign Installation  
Detail "A" - Outside of  
See Sheet S1(02c)**

**(C) See Detail "B"  
on sheet S1(01C)**

**(A) See Detail "B"  
on sheet S1(01C)**

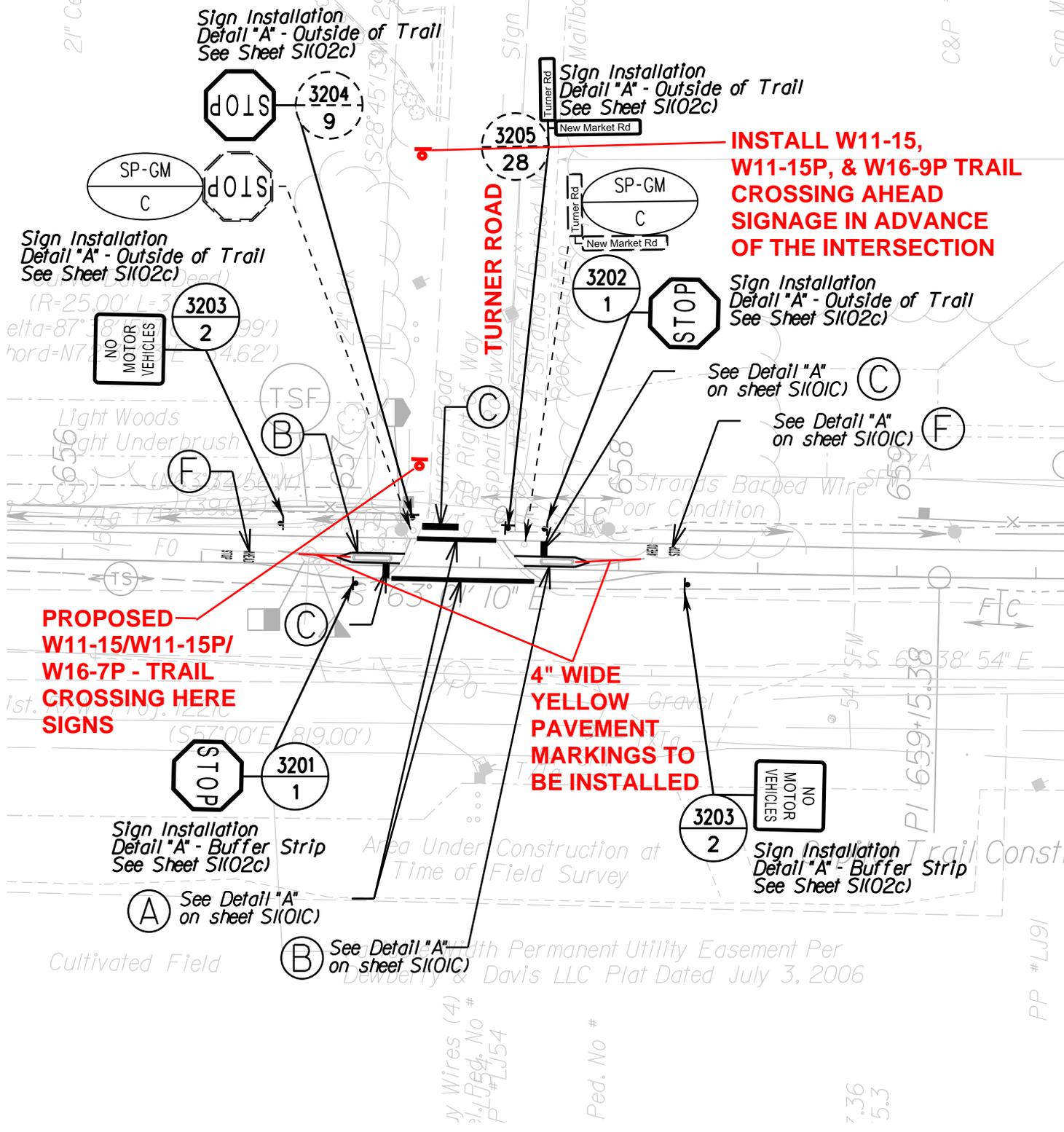
**EDGE OF TRAIL  
NOT PROPER  
DISTANCE OFF  
EDGE OF  
PAVEMENT**

**REMOVE  
BOLLARDS AND  
REPLACE WITH  
SAME  
INTERSECTION  
TREATMENT AS  
ALL OTHER  
INTERSECTIONS**

**BUFFIN ROAD**



# TURNER ROAD AREA



Sign Installation  
Detail "A" - Outside of Trail  
See Sheet S1(02c)

Sign Installation  
Detail "A" - Outside of Trail  
See Sheet S1(02c)

**INSTALL W11-15,  
W11-15P, & W16-9P TRAIL  
CROSSING AHEAD  
SIGNAGE IN ADVANCE  
OF THE INTERSECTION**

Sign Installation  
Detail "A" - Outside of Trail  
See Sheet S1(02c)

Sign Installation  
Detail "A" - Outside of Trail  
See Sheet S1(02c)

See Detail "A"  
on sheet S1(01C)

See Detail "A"  
on sheet S1(01C)

**PROPOSED  
W11-15/W11-15P/  
W16-7P - TRAIL  
CROSSING HERE  
SIGNS**

**4" WIDE  
YELLOW  
PAVEMENT  
MARKINGS TO  
BE INSTALLED**

Sign Installation  
Detail "A" - Buffer  
Strip  
See Sheet S1(02c)

Sign Installation  
Detail "A" - Buffer Strip  
See Sheet S1(02c)

See Detail "A"  
on sheet S1(01C)

See Detail "A"  
on sheet S1(01C)

Cultivated Field

Area Under Construction at  
Time of Field Survey

With Permanent Utility Easement Per  
Dewberry & Davis LLC Plat Dated July 3, 2006

PP # LJ91

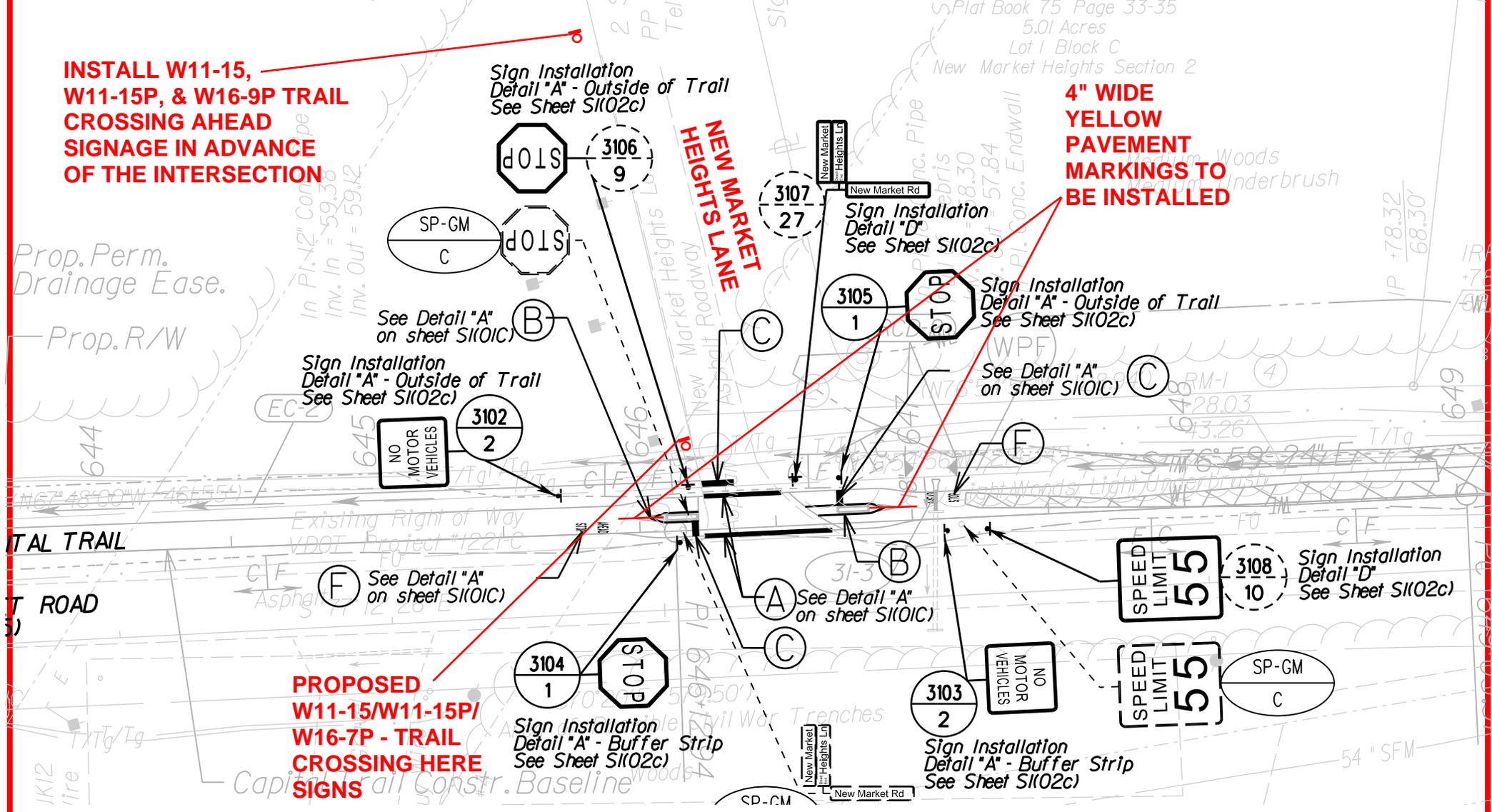
# NEW MARKET HEIGHTS LN AREA

**INSTALL W11-15, W11-15P, & W16-9P TRAIL CROSSING AHEAD SIGNAGE IN ADVANCE OF THE INTERSECTION**

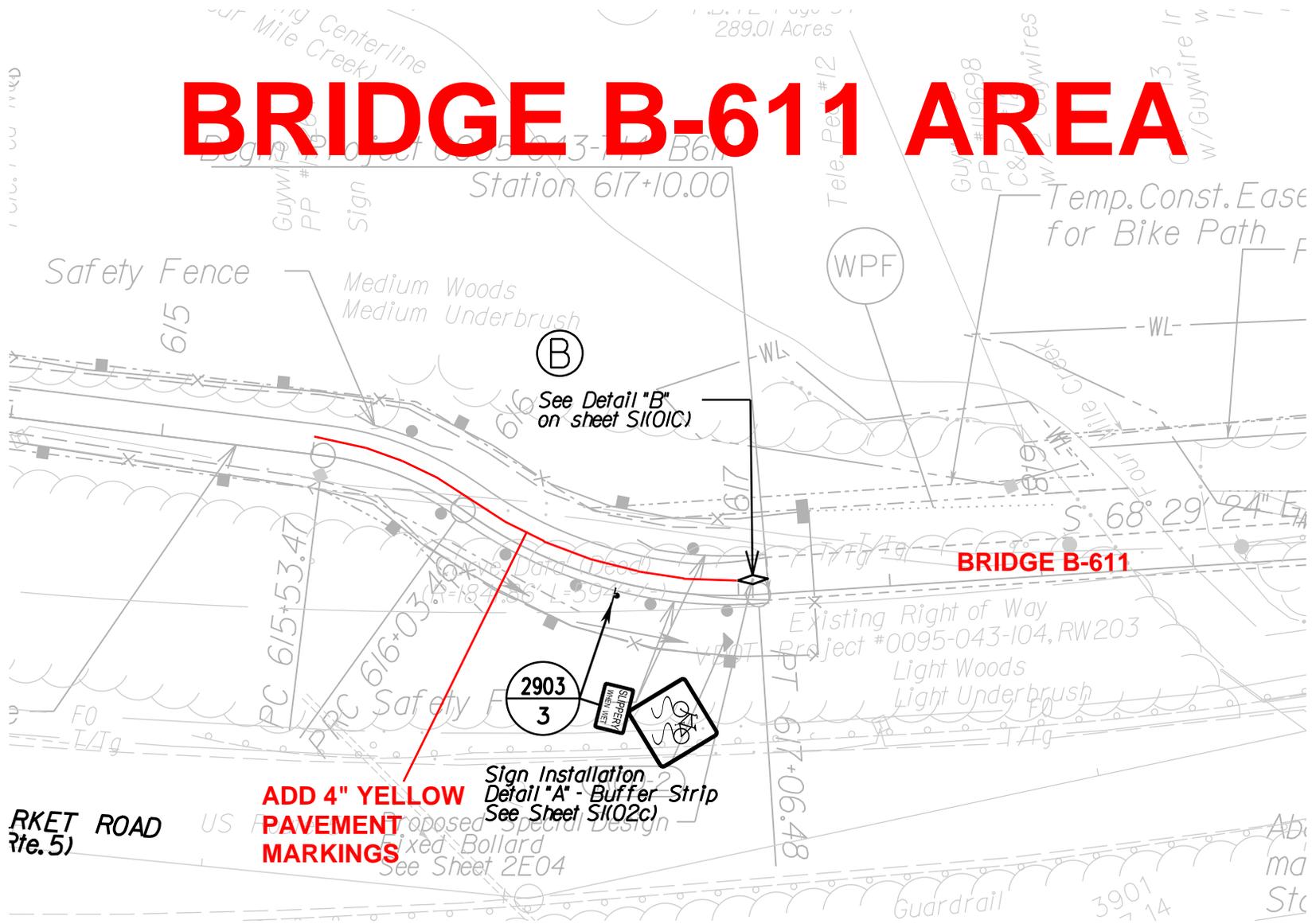
**4" WIDE YELLOW PAVEMENT MARKINGS TO BE INSTALLED**

**NEW MARKET HEIGHTS LANE**

**PROPOSED W11-15/W11-15P/ W16-7P - TRAIL CROSSING HERE SIGNS**



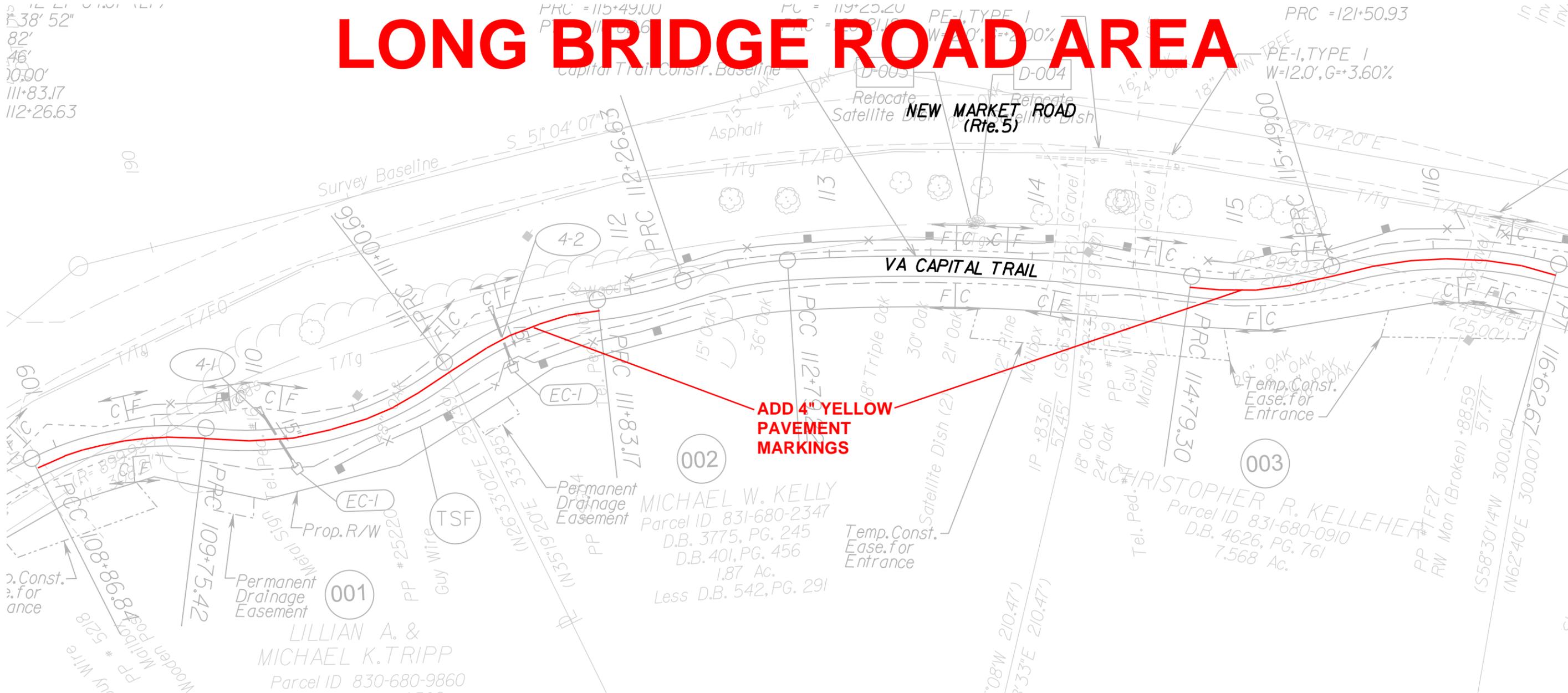
# BRIDGE B-611 AREA



**ADD 4" YELLOW PAVEMENT MARKINGS**  
Sign Installation  
Detail "A" - Buffer Strip  
See Sheet S1(02c)

RKET ROAD  
Rte. 5)

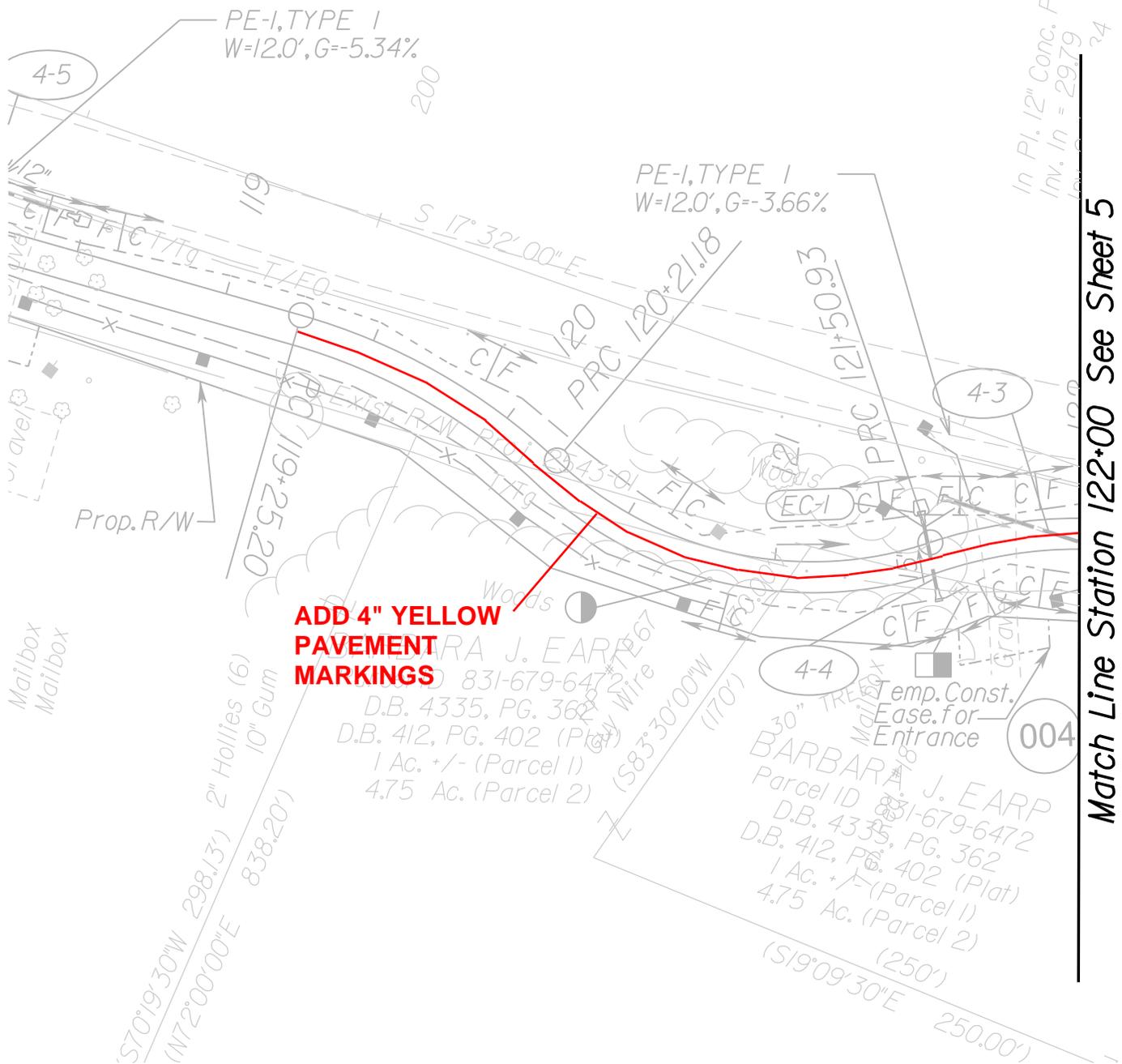
# LONG BRIDGE ROAD AREA



In Pl. 12" Conc. Pipe  
Inv. In = 37.59  
Inv. Out = 37.57

PRC = 121+50.93  
PCC = 122+31.07

# LONG BRIDGE ROAD AREA



**ADD 4" YELLOW  
PAVEMENT  
MARKINGS**

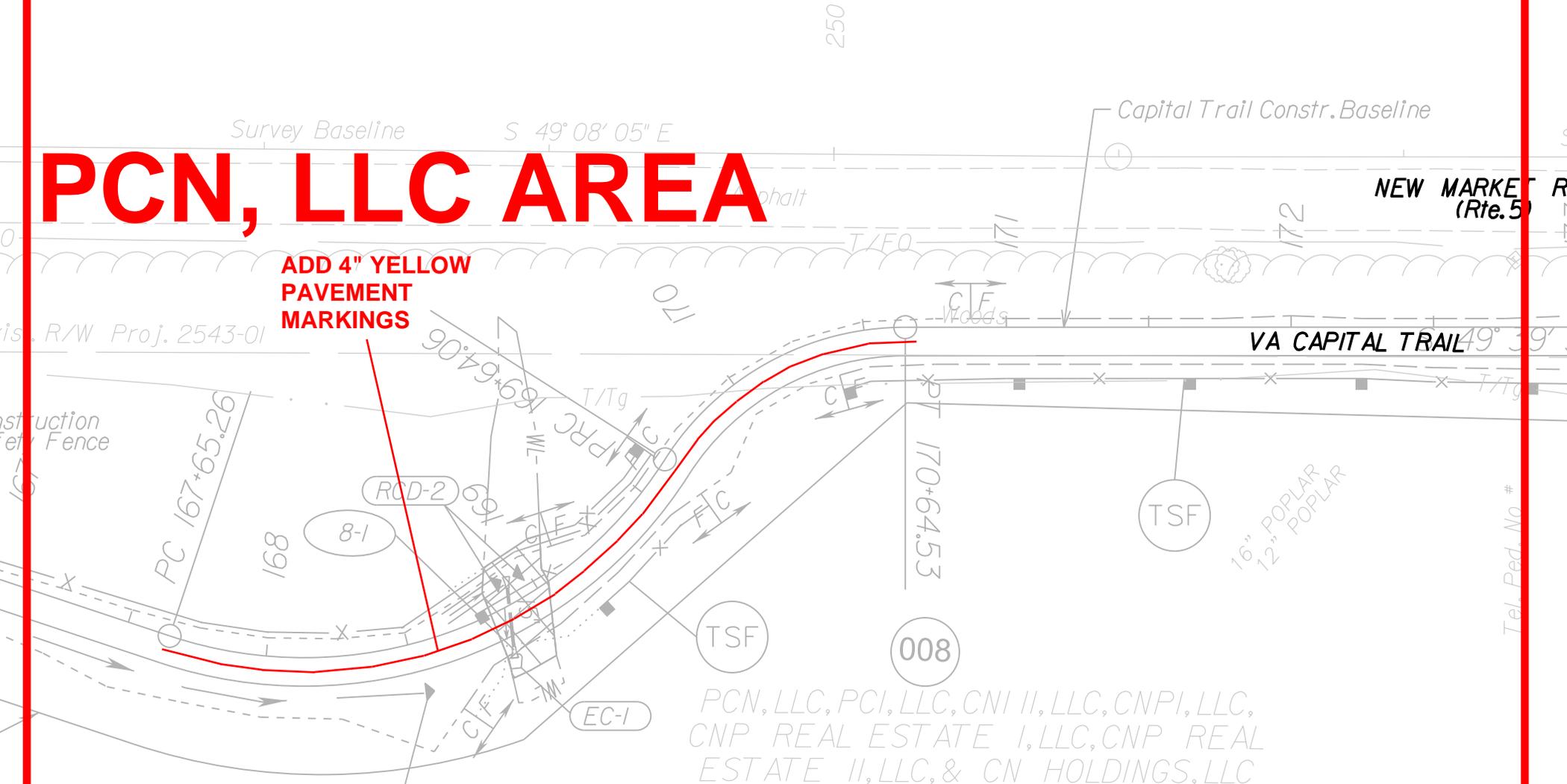
BARBARA J. EARP  
831-679-6472  
D.B. 4335, PG. 362  
D.B. 412, PG. 402 (Plat)  
1 Ac. +/- (Parcel 1)  
4.75 Ac. (Parcel 2)

BARBARA J. EARP  
Parcel ID 831-679-6472  
D.B. 4335, PG. 362  
D.B. 412, PG. 402 (Plat)  
1 Ac. +/- (Parcel 1)  
4.75 Ac. (Parcel 2)

Match Line Station 122+00 See Sheet 5

# PCN, LLC AREA

**ADD 4" YELLOW  
PAVEMENT  
MARKINGS**

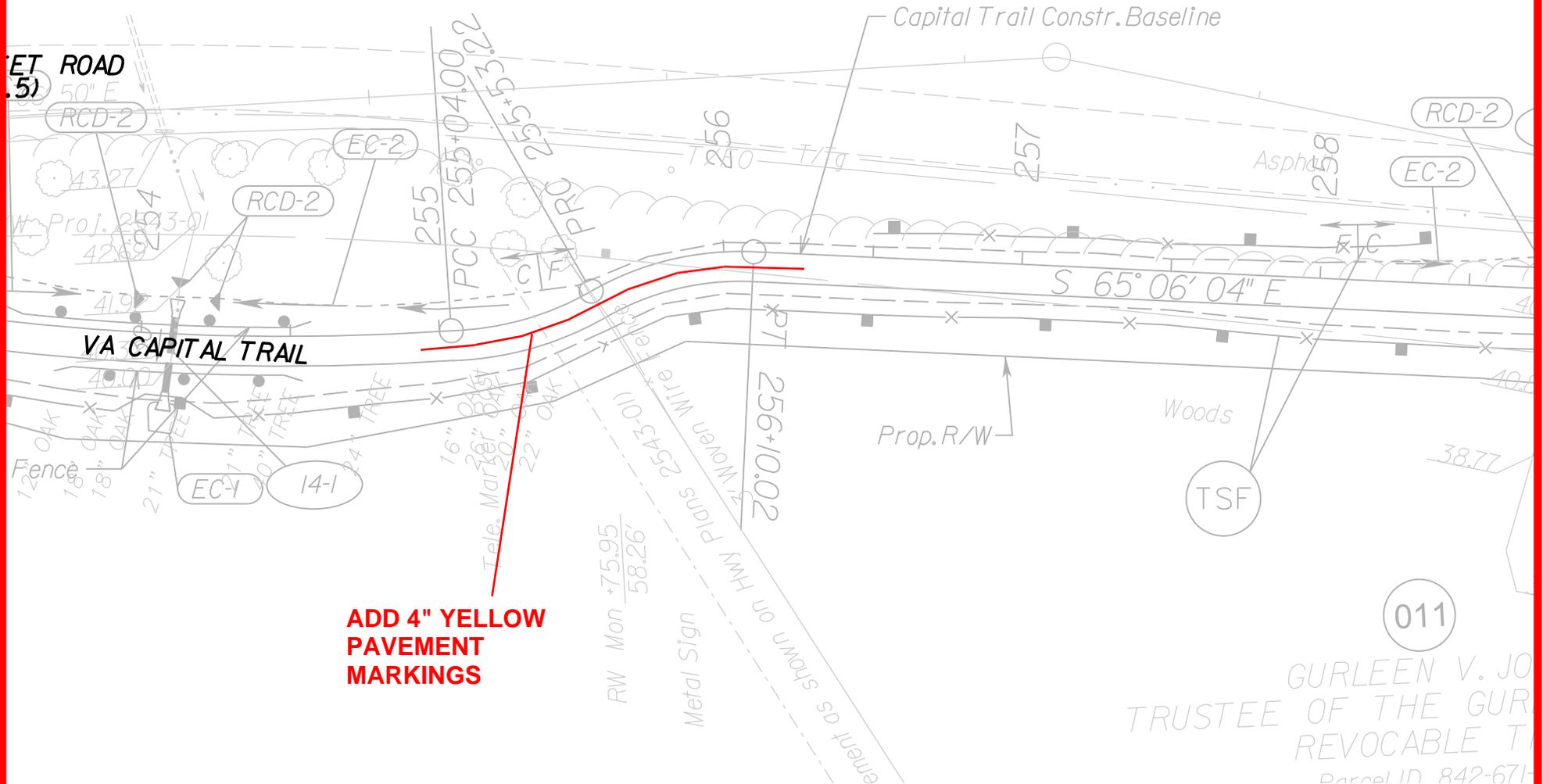


PCN, LLC, PCI, LLC, CNI II, LLC, CNPI, LLC,  
CNP REAL ESTATE I, LLC, CNP REAL  
ESTATE II, LLC, & CN HOLDINGS, LLC

Parcel ID 836-667-5251  
D.B. 4077, PG. 2090, D.B. 4787, PG. 1028  
D.B. 4898, PG. 1686, DB. 4796, PG. 1766  
D.B. 4915, PG. 0476, D.B. 4915, PG. 0489  
D.B. 4797, PG. 2077  
144.44 Ac., 181.5 ac., 11.8 Ac. &  
Several Tracts w/No Recorded Acreage



# WILLIS CHURCH ROAD AREA



**ADD 4" YELLOW  
PAVEMENT  
MARKINGS**

011  
GURLEEN V. JO  
TRUSTEE OF THE GUR  
REVOCABLE T  
Parcel ID 842-671

# ALEXANDER AREA

