PENNDOT

Delaware Valley
Regional Planning
Commission

AQUETONG ROAD/ WINDY BUSH ROAD

Road Safety Audit

October 2007

Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency that provides continuing, comprehensive and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester and Mercer counties in New Jersey. DVRPC provides technical assistance and services; conducts high priority studies that respond to the requests and demands of member state and local governments; fosters cooperation among various constituents to forge a consensus on diverse regional issues; determines and meets the needs of the private sector; and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the Commission.

Our logo is adapted from the official DVRPC seal, and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole, while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

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APPENDICES

The crash data used in this report was provided by the Pennsylvania Department of Transportation for the Delaware Valley Regional Planning Commission's traffic safety related transportation planning and programming purposes only. The raw data remains the property of the Pennsylvania Department of Transportation and its release to third parties is expressly prohibited without the written consent of the Department.

AQUETONG/WINDY BUSH ROADS - ROAD SAFETY AUDIT

1.0 BACKGROUND

This is the first Road Safety Audit (RSA) of Phase II, of this two-phased program. In fiscal year 2007 (Phase I), three RSAs were conducted in three different environments – urban, suburban and rural. The work is now being continued in fiscal year 2008 in which several RSAs will be conducted. This project represents the coordination of the Delaware Valley Regional Planning Commission's (DVRPC) Planning Work Program and Pennsylvania Department of Transportation (PennDOT) District 6 Safety Plan. DVRPC's planning work program includes a RSA Program. All state departments of transportation are required to develop a Strategic Highway Safety Plan (SHSP) in order to draw on safety funds according to SAFETEA-LU, the federal transportation legislation. In Pennsylvania each district is required to have a Safety Plan to be incorporated in the state's SHSP. In PennDOT's District 6 Safety Plan several corridors are identified under Section 148 Planned Safety Projects eligible for Highway Safety Improvement Program funding. This was an opportunity to analyze corridors which were already on the plan and eligible for dedicated funding.

Whereas, the goal of this project is to improve and promote transportation safety on the region's roadways while maintaining mobility, the main objective is to address the safe operation of the roadway and ensure a high level of safety for all road users. The road safety audit program is conducted to generate improvement recommendations and countermeasures for roadway segments demonstrating a history of, or potential for a high incidence of motor vehicle crashes. The emphasis is placed on identifying low cost, quick turnaround safety projects to address the issues where possible but will not exclude the more complex projects.

1.1 The Audit

Prior to the road safety audit activities on site, DVRPC collected, reviewed and analyzed data (video of roadway under different conditions, traffic volume data, turning movement counts, maps, aerial photographs, previous traffic reports and crash data). Using the crash data, crash clusters were identified and mapped for locations along Aquetong and Windy Bush Roads. These locations were the main focus of the road safety audit.

The Road Safety Audit was conducted on Friday, August 17, 2007. The Pre-Audit meeting involved the definition of road safety audit and how it differs from a corridor study process; the required steps of an audit; presentation of the corridor issues and an exchange of ideas and knowledge of the roadway. A video showing the corridor under night time conditions was also shown. The field view involved the audit team which was made up of federal, state, and local officials and other stakeholders walking the corridor and identifying transportation safety problems. See ***Appendix A*** for the list of audit team members. The post-audit meeting was spent discussing the findings from the field view and determining priorities.

1.2 Overview of the Study Area

The study area consists of 1.8 miles of Aquetong Road (SR 1003) from Covered Bridge Road to Solebury Mountain Road, and 0.4 mile of Windy Bush Road (SR 232) from Aquetong Road to Cornwell Drive in Solebury Township, Bucks County; see ***Appendix B*** for *Study Area Map*. At the request of PennDOT the audit team also looked at Windy Bush Road from Aquetong Road to Pidcock Creek Road. Aquetong Road is functionally classified as a rural major collector east of Windy Bush Road and an urban collector west of this point. This road runs in a north-west to south-easterly direction. Windy Bush Road is functionally classified a rural major collector south of Aquetong Road and an urban collector north of Aquetong Road. The land use in the corridor is predominantly residential with large lot single family homes. There are spots of commercial and institutional uses. The area is distinctly suburban and rural in character.

Aquetong Road has two lanes throughout its length, one travel lane in each direction with no shoulders or curb. The roadway consists of numerous curves and steep grades; with no sidewalks. Windy Bush Road has two lanes throughout its length, one travel lane in each direction with narrow shoulders. There are six unsignalized intersections along Aquetong Road within the study corridor with a 4-way stop at Windy Bush Road and a 2-way stop at the Sugan Road T-intersection.

Traffic volumes in the corridor vary. Volumes collected this summer showed that there are higher volumes on Aquetong Road east of Windy Bush Road than west. This is consistent with volumes collected in the late 1990s and early 2000s. The 2007 volumes registered AADT of 2,370 vehicles between Covered Bridge Road and Rockwood Path; and 1,954 vehicles just east of Solebury Mountain Road. An AADT of 2,398 vehicles were recorded on Windy Bush Road between Old Windy Bush Road and Cornwell Drive. This is consistent with the 1995 volumes. The speed limit along the corridor is 45 MPH with curve warning speed limit of 25 MPH.

1.3 Crash Data

According to PennDOT's crash data there were 25 reportable crashes between 2003 and 2005. Reportable crashes are crashes which may result in a fatality, injury and/or property damage rendering the vehicle disabled, requiring it be towed from the scene. A comprehensive analysis of the crash data is shown in ***Appendix C***. Of the reportable crashes, there were 16 crashes in 2003 (64%); 2 crashes in 2004 (8%); and 7 crashes in 2005 (28%). When analyzing crash frequency by month, February had the highest number of crashes with 5 (20%), April was next with 4 crashes and January, May and September had 3 crashes each. The months of March, June and October had no reportable crashes recorded.

Angle (12) and hit fixed object (7) crashes represented 76% of the 25 reportable crashes. There were no fatal crashes during the study period, 11 injury crashes of varying levels of severity, and 14 property damage only crashes. The majority of the crashes occurred during fair weather (60%) with 32% occurring during rainy, snowy or sleeting conditions. In an analysis of roadway surface conditions the occurrence of crashes are about evenly split with 44% occurring on dry road surface and 42% occurring on inclement (wet, snow covered) road surface conditions. Sixty-four percent of the crashes occurred during daylight hours.

2.0 FINDINGS AND RECOMMENDATIONS

The following represents the findings and recommendations of the Aquetong/Windy Bush Roads Road Safety Audit.

CORRIDOR-WIDE ISSUES

SAFETY ISSUES	REMEDIAL STRATEGIES	LEVEL OF EFFORT	POTENTIAL SAFETY BENEFIT
Drainage o Poor drainage or the lack of a proper drainage system in the corridor has resulted in a number of safety issues. Potentially resulting in sheeting across roadway during inclement weather. o Edge of roadway eroded due to wash out. o Swells need to be cut back, near S curve east of Sugan Road o Pipes are clogged, some are not visible (due to debris)	o Conduct a comprehensive drainage study for the corridor to identify specific issues and long term solutions. Consideration should be given to additional pipes and new parallel drainage systems	High	High
	o In the short term: clean clogged pipes and remove debris from the drains. o In addition, where possible excavate and fill in with ballast (rocks).	Low Medium	High High
Edge Lines and Edge Drop-offs o Lack of edge of pavement delineation is consistent through the corridor. In addition, edge drop-offs are consistently evident. This is a result of the poor drainage control.	o Install edge line as appropriate throughout the corridor to guide motorists and prevent run of the road crashes. ***PennDOT should consider minimum 9.5 foot lanes as a safety measure***	Low	High
Fixed objects o Numerous fixed objects were observed in the clear zone. These included trees (large and small); boulders (many used for landscaping by property owners and, stone headwalls (approx. 3 feet above the ground)	o All fixed objects in the clear zone should be removed. Initial clearing should be at least four feet from edge of travel. ***Many trees along the corridor were already marked for removal***	Medium	High

SAFETY ISSUES	REMEDIAL STRATEGIES	LEVEL OF EFFORT	POTENTIAL SAFETY BENEFIT
Narrow roadway width o Roadway width throughout the study area on Aquetong and Windy Bush Roads varied between 9 and 10 feet	o Any widening of the roadway may require additional right of way. Given the roadway geometry travel lanes should be at least 12 feet wide in the 40 MPH zone with a shoulder width of at least 2 feet.	High	High
Vegetation o Trees and shrubs obstruct the view of many signs throughout the corridor and interfere with sight lines	o Trimming trees and brush	Low	High
Centerline Delineation o The corridor is shadowed during the day due to the canopy of trees and extremely dark at night, a result of the lack of street lighting. Coupled with narrow pavement width.	o Install raised pavement markers (RPM) the length of the corridor to keep the motorist in his travel lane. Installation of centerline rumble strips to assist in the prevention of cross-over head-on collisions were examined but the narrowness of the travel lanes negates this treatment.	Medium	High
Speed Limit o Given the geometry of the corridor, the set speed limit of 45 MPH may be excessive	***A speed study was conducted by PennDOT; as a result, the speed limit will be lowered along Aquetong Road from River Road to Sawmill Road to 35 MPH***	Low	High
Passing Zones o There are too many passing zones in the corridor given the narrow lanes and edge drop offs which are not forgiving if motorist overcompensate while passing.	o Eliminate passing zones	Low	High

SAFETY ISSUES	REMEDIAL STRATEGIES	LEVEL OF EFFORT	POTENTIAL SAFETY BENEFIT
Signs			
o No "Share the Road" signs.	o Install "Share the Road" signs throughout the corridor so motorists are cognizant of other users.	Low	High
o Construction signs located along Aquetong Road with no construction being conducted	o Remove or cover construction signs at times when there is no work being conducted on the roadway.	Low	High
o No name plates for advance intersection signs	o Add street name plates to advance intersection signs	Low	High
	o Add advance signs for hidden driveways as appropriate	Low	High
Pavement Markings			
o Several intersection approaches with stop control do not have stop bars	o Install stop bars to intersection approaches as appropriate	Low	High
Sight Lines			
o Limited sight lines	o Maximize sightlines around curves by cutting back embankment and removing trees.	High	High

LOCATION SPECIFIC ISSUES

SAFETY ISSUES	REMEDIAL STRATEGIES	LEVEL OF EFFORT	POTENTIAL SAFETY BENEFIT
At Covered Bridge Road			
o Covered Bridge Road is skewed at the intersection with Aquetong Road. Additionally, there are no pavement markings at the Covered Bridge Road approach.	o Use pavement markings to soften skew allowing easier access to Aquetong Road especially for left turning traffic	Low	High
o Utility pole to the west of the intersection on Aquetong Road obstructs sight lines.	o Relocate utility pole	Medium	Medium
o Rail fence west of intersection on Aquetong Road next to parking lot is in Right of Way.	o Relocate fence outside Right of Way. ***Fence will be removed as part of new development***	Low	Low
At Rockwood Path			
o Tree to the west of the intersection blocks sight lines for Rockwood Path approach traffic	o Remove tree	Low	High
Between Rockwood Path and Wagner Road (private road)			
o "Curve ahead" (W1-2) sign is too far from the actual curve and is faded	o Upgrade sign (W1-2) and relocate closer to curve	Low	Medium
o "Slow Curve Ahead" pavement markings are too far from curve and are wearing out	o Add pavement marking legend closer to curve and repaint existing ones.	Low	Medium
o Eastbound "No Passing" (W14-3) sign knocked down	o Replace sign (W14-3)	Low	High
o Hidden driveway at the curve	o Install advance warning sign for driveway.	Low	High
o Night time driving difficult due to the darkness which could makes negotiating the curve difficult.	o Install lighting on curve	Medium	Medium
o Illegal speed limit sign is installed within the ROW eastbound before the curve	o Remove sign	Low	Low

SAFETY ISSUES	REMEDIAL STRATEGIES	LEVEL OF EFFORT	POTENTIAL SAFETY BENEFIT
Between Wagner Road (private road) and Old Windy Bush Road			
o Junction sign is blocked by tree limbs	o Trim tree limbs o Relocate street name sign to the post assembly of "Stop Ahead" (W3-1) sign	Low	High
o Cut off sign posts are protruding out of the ground	o Remove posts	Low	Medium
At Old Windy Bush Road			
o "Stop Ahead" sign is blocked by vegetation	o Trim vegetation	Low	High
At Windy Bush Road			
o Sign clutter, potentially confusing to motorists	o Remove or consolidate signs as appropriate	Low	Medium
o Westbound approach to intersection, poor sight distance which is made worse by vegetation	o Cut away vegetation to improve sight distance	Low	High
o Northeast, northwest and southwest corners of intersection has unprotected drainage holes that lead to pipe	o Install protective grates	Medium	High
Windy Bush Road between Old Windy Bush and Aquetong Road			
o "Intersection ahead" sign on northbound side of the road is blocked by vegetation	o Trim vegetation	Low	High
o No advance street name sign for the Aquetong Road intersection	o Install advance "Aquetong Road" sign (W16-8)	Low	Medium
Old Windy Bush Road at Windy Bush Road			
o Drainage hole on the southeast corner	o Install protective grate	Medium	Medium
o Utility pole lying on the ground at the southeast corner of the intersection.	o Remove pole	Low	Low

SAFETY ISSUES	REMEDIAL STRATEGIES	LEVEL OF EFFORT	POTENTIAL SAFETY BENEFIT
Between Windy Bush Road and Sugan Road			
o Aquetong Road is an S-curve in this area with post mounted warning signs only	o Add "Slow Curve Ahead" pavement markings in both direction	Low	High
o Vegetation on the westbound side of the road conceals the edge of pavement	o Cut back vegetation	Low	High
o Edge drop off in this section of roadway is pronounced as a result of poor drainage	o ***Currently a PennDOT project to excavate and fill with rocks.*** o This is a temporary fix and in the long term proper drainage should be installed including pipes	Medium	High
o Reflector poles are in poor condition. Reflector strips have been stripped from the poles and many are down in the drain.	o Replace with chevrons (W1-8)	Low	High
o Aquetong Road westbound curves while Sugan Road continues straight ahead, there is no directional signage.	o Add graphic directional signage with road names	Low	High
At Sugan Road			
o At Sugan Road the intersection is on the curve and very wide. Additionally, travel lanes are not delineated.	o Add dashed double centerline and single edgeline through intersection. This will alleviate driver confusion	Low	High
o Curve needs to be delineated	o Add large warning arrow (W1-6) on the curve for eastbound Aquetong Road traffic	Low	High
Between Sugan Road and Solebury Mountain Road			
o Oversized drainage pipes installed by property owners at driveways are unprotected hazards in the clear zone. Some pipes include headwalls.	o Install appropriate drainage pipes according to regulation.	Medium	High

SAFETY ISSUES	REMEDIAL STRATEGIES	LEVEL OF EFFORT	POTENTIAL SAFETY BENEFIT
Windy Bush Road between Aquetong Road and Pidcock Creek Road			
o Open pipe culvert on the side of the road result in unprotected curb drop off.	o Widen road to 12-foot lanes with paved shoulder to eliminate open pipe culvert that parallels the road.	Medium	High
o Property owners have installed a variety of drainage pipes and sizes at driveways. They are unprotected hazards in the clear zone and some pipes include headwalls.	o Install appropriate drainage pipes according to regulation.	Medium	High
o Pipes at property owners driveways are clogged with debris	o Clear pipes to prevent flooding on the roadway	Low	High
o Guide rail needs to be updated	o Replace guide rail with upgraded end treatments.	Medium	High

3.0 CONCLUSION

As discussed earlier, the road safety audit program is conducted to generate improvement recommendations and countermeasures for roadway segments demonstrating a history of, or potential for a high incidence of motor vehicle crashes. The safety issues identified during the audit and documented in this report along with recommended strategies should improve the overall safety of Aquetong and Windy Bush Roads. These remedial strategies can be implemented as time and budget limitations permit. The study area is identified under PennDOT's Section 148 Planned Safety Projects and therefore, implementation is eligible for Highway Safety Improvement Program funding. Additionally, many of the strategies identified can be implemented through routine maintenance.

Given that the contributing factors for some crashes are "running the stop sign" and "too fast for condition", engineering strategies alone cannot effectively address the traffic safety issues identified along the corridor. Therefore, enforcement and education are necessary components to address the human behavioral aspects to effectively reduce the number of crashes occurring.

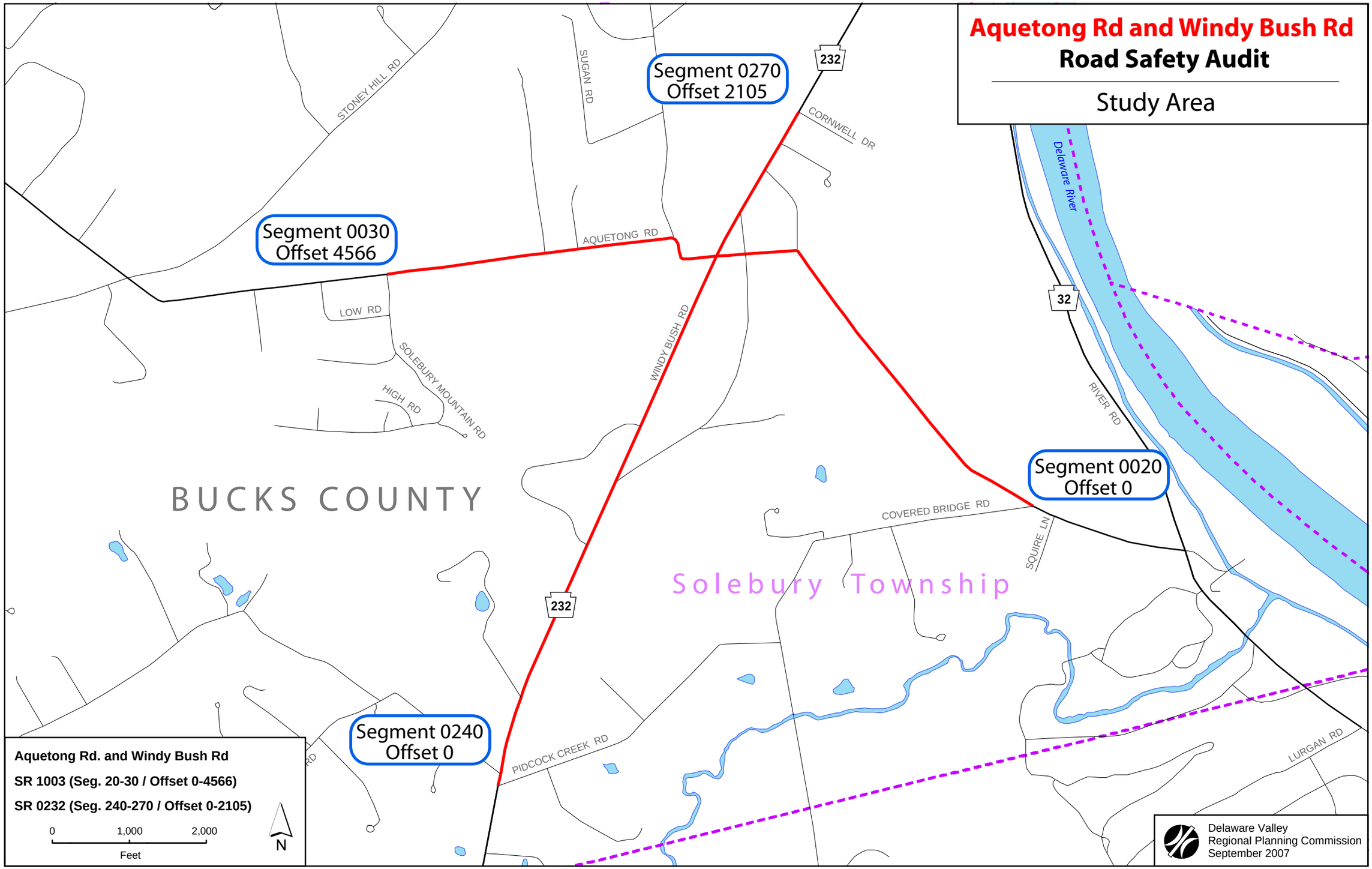
APPENDIX A
Audit Team

Aquetong/Windy Bush Roads – Road Safety Audit

Audit Team

Name	Organization
Rosemarie Anderson	Delaware Valley Regional Planning Commission
Dominick Bellizzie	Solebury Township Police Department
Larry Bucci	Pennsylvania Department of Transportation
Dennis Carney	Solebury Township
Michael Castellano	Federal Highway Administration
Joe Fiocco	McMahon Associates – Solebury Township
Carmine Fiscina	Federal Highway Administration
John Granger	Solebury Township
David Johnson	Bucks County Planning Commission
Regina Moore	Delaware Valley Regional Planning Commission
Brooke Moran	Bucks County Area Agency on Aging
Kevin Murphy	Delaware Valley Regional Planning Commission
Mark Roth	McMahon Associates
Derrick Sexton	Delaware Valley Regional Planning Commission
Karen Yunk	Federal Highway Administration

APPENDIX B
Maps


Aquetong Rd and Windy Bush Rd
Road Safety Audit
Study Area
Segment 0270
Offset 2105
Segment 0030
Offset 4566
Segment 0020
Offset 0
Segment 0240
Offset 0
STONEY HILL RD
SUGAN RD
CORNWELL DR
AQUETONG RD
LOW RD
SOLEBURY MOUNTAIN RD
HIGH RD
WINDY BUSH RD
RIVER RD
Delaware River
BUCKS COUNTY
Solebury Township
COVERED BRIDGE RD
SQUIRE LN
PIDCOCK CREEK RD
LURGAN RD
232
32
Aquetong Rd. and Windy Bush Rd
SR 1003 (Seg. 20-30 / Offset 0-4566)
SR 0232 (Seg. 240-270 / Offset 0-2105)
0
1,000
2,000
Feet
N
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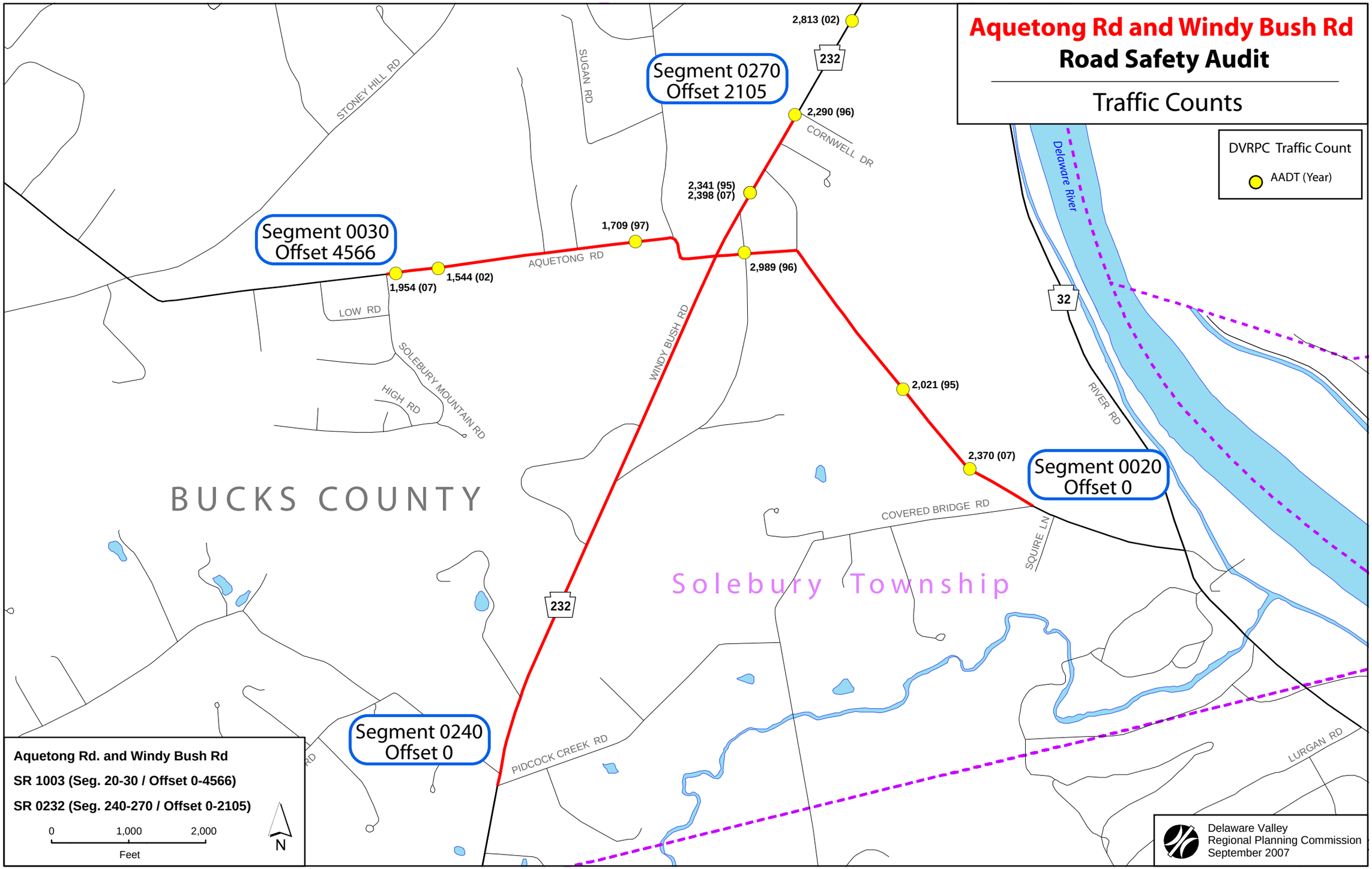
September 2007


Aquetong Rd and Windy Bush Rd
Road Safety Audit
Traffic Counts
DVRPC Traffic Count
AADT (Year)
Segment 0030
Offset 4566
Segment 0270
Offset 2105
Segment 0020
Offset 0
Segment 0240
Offset 0
1,954 (07)
1,544 (02)
1,709 (97)
2,341 (95)
2,398 (07)
2,813 (02)
2,290 (96)
2,989 (96)
2,021 (95)
2,370 (07)
AQUETONG RD
WINDY BUSH RD
STONEY HILL RD
SUGAN RD
CORNWELL DR
LOW RD
SOLEBURY MOUNTAIN RD
HIGH RD
PIDCOCK CREEK RD
COVERED BRIDGE RD
SQUIRE LN
RIVER RD
LURGAN RD
Delaware River
232
32
BUCKS COUNTY
Solebury Township
Aquetong Rd. and Windy Bush Rd
SR 1003 (Seg. 20-30 / Offset 0-4566)
SR 0232 (Seg. 240-270 / Offset 0-2105)
0
1,000
2,000
Feet
N
Delaware Valley
Regional Planning Commission
September 2007

APPENDIX C
Traffic Data

RSA AQUETONG AND WINDYBUSH ROADS, BUCKS COUNTY

Date Range: 1/1/2003 to 12/31/2006

Area of Interest: (In County 09 On State Route 0232(P) Between Segment 0270 Offset 0 and Segment 0270 Offset 2105) or (In County 09 On State Route 1003(P) Between Segment 0020 Offset 0 and Segment 0030 Offset 4566)

USER_ID/QUERY ID: lkubli/ 0620070602001

MONTH OF YEAR

	JAN	FEB	APR	MAY	JUL	AUG	SEP	NOV	DEC	
CRASHES	3	5	4	3	2	2	3	1	2	25
PCT	12%	20%	16%	12%	8%	8%	12%	4%	8%	100%

DAY OF WEEK

	SUN	MON	TUE	WED	THR	FRI	SAT	
CRASHES	6	1	2	1	3	7	5	25
PCT	24%	4%	8%	4%	12%	28%	20%	100%

HOUR OF DAY

	03	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	
CRASHES	1	1	1	1	1	2	1	1	1	3	2	1	3	1	1	2	1	1	25
PCT	4%	4%	4%	4%	4%	8%	4%	4%	4%	12%	8%	4%	12%	4%	4%	8%	4%	4%	100%

YEAR

	CRASHES	PCT
2003	16	64%
2004	2	8%
2005	7	28%
TOTAL	25	100%

COLLISION TYPE

	CRASHES	PCT
ANGLE	12	48%
HIT FIX OBJ	7	28%
OPP DIR SS	2	8%
HEAD ON	1	4%
NON COLL	1	4%
PEDESTRIAN	1	4%
REAR END	1	4%
TOTAL	25	100%

CRASH SEVERITY LEVEL

	CRASHES	PCT
MAJOR	1	4%
MODERATE	3	12%
MINOR	7	28%
PDO	14	56%
TOTAL	25	100%

SEVERITY COUNT

	PERSONS
FATALITIES	0
MAJOR	1
MODERATE	3
MINOR	11
UNK SEVERITY	0
UNK IF INJURED	0

DRIVER ACTIONS

	ACTIONS	PCT
NO CONTRIBUTING ACTION	36	40%
RUNNING STOP SIGN	10	11%
TOO FAST FOR CONDITION	10	11%
OTHER IMPROPER DRIVING	9	10%
OVER/UNDER COMP CURVE	7	7%
PROCEED W/O CLEARANCE	7	7%
WRONG SIDE OF ROADWAY	6	6%
AFFECTED PHYSICAL COND	2	2%
RUNNING RED LIGHT	2	2%
SPEEDING	1	1%
TOTAL	90	100%

VEHICLE TYPE

	VEHICLES	PCT
AUTOMOBILE	25	58%
SUV	9	20%
VAN	4	9%
SMALL TRUCK	3	6%
MOTORCYCLE	1	2%
LARGE TRUCK	1	2%
CONSTRUCTION	1	2%
TOTAL	43	100%

ROAD CONDITION

	CRASHES	PCT
DRY	11	44%
WET	9	36%
SNOW	4	16%
UNK	1	4%
TOTAL	25	100%

ILLUMINATION

	CRASHES	PCT
DAYLIGHT	16	64%
DARK	7	28%
DUSK	1	4%
UNK	1	4%
TOTAL	25	100%

WEATHER

	CRASHES	PCT
CLEAR	15	60%
RAIN	4	16%
SNOW	3	12%
UNK	2	8%
SLEET	1	4%
TOTAL	25	100%

ENVIR/ROADWAY FACTORS

	FACTORS	PCT
NONE	22	88%
DEER IN ROADWAY	1	4%
SLIPPERY ICE/SNOW	1	4%
UNKNOWN	1	4%
TOTAL	25	100%

Print Date: 6/2/2007:

CDART - CRASH SUMMARY REPORT (09-06)

NOTES:

1

The data available in this application is dynamic and should be used with care. Please take note of the following data alerts:

2 2007 crash records are incomplete
Data for the current year, 2007, is not fully represented in CDART. Crashes will be added for this year as they are made available to the Department. Include this year in queries with caution.

3 Complete data years
Complete records of reportable crashes are available in CDART for the following years: 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005,2006

REPORT PARAMETERS:

Query ID:	0620070602001
User ID:	lkubli
Area of Interest:	(In County 09 On State Route 0232(P) Between Segment 0270 Offset 0 and Segment 0270 Offset 2105) or (In County 09 On State Route 1003(P) Between Segment 0020 Offset 0 and Segment 0030 Offset 4566)
Date Range:	1/1/2003 to 12/31/2006
Criteria:	STATE ROAD

1. Intersection of Aquetong Rd. and Windy Bush Rd., Study Area Limits

Aquetong Rd. (seg 20/0 to seg 30/4566), Windy Bush Rd. (seg 270/0 to seg 270/2105)

COLLISION TYPE	
Angle	12
Hit Fixed Object	7
Opp Dir Sideswipe	2
Rear end	1
Head On	1
Pedestrian	1
Non Collision	1
Total	**25**
ILLUMINATION	
Daylight	16
Dark	7
Dusk	1
Unknown	1
Total	**25**
WEATHER	
Clear	15
Rain	4
Snow	3
Unknown	2
Sleet	1
Total	**25**
SEVERITY COUNT	
Fatalities	0
Major	1
Moderate	3
Minor	11

N

NOT TO SCALE

Delaware Valley Regional Planning Commission
August 2007

Road Safety Audit - FY 2008
2. Aquetong Rd. East of the Intersection

Year Range:	**2003**	to	**2005**	Area of: In County	**9**	On Route	**1003**
Between Segment	**20**	Offset	**980**	and Segment	**20**	Offset	**4604**

COLLISION TYPE		
Hit fixed object	3	50%
Opp Dir Sideswipe	2	33%
Hit pedestrian	1	17%
Total	**6**	

SEVERITY LEVEL		
Not injured	4	67%
Moderate injury	2	33%
Total	**6**	

SEVERITY COUNT	
Fatalities	0
Major	0
Moderate	2
Minor	1
UNK Severity	0
UNK If	0

ENVIR/ROADWAY FACTORS		
None	4	67%
Slippery road conditions	1	17%
Unknown	1	17%
Total	**4**	

ROAD CONDITION		
Dry	1	17%
Snow covered	4	67%
Unknown (expired)	1	17%
Total	**6**	

WEATHER		
No adverse conditions	1	17%
Sleet (hail)	1	17%
Snow	3	50%
Unknown	1	17%
Total	**6**	

ILLUMINATION		
Daylight	2	33%
Dark – no street lights	3	50%
Unknown	1	17%
Total	**6**	

DRIVER ACTIONS		
Driving on the wrong side of roadway	2	25%
Over or under compensation at curve	2	25%
Driving too fast for conditions	4	50%
Total	**8**	

VEHICLE TYPE		
Automobile	6	67%
Small truck	1	11%
SUV	2	22%
Total	**9**	

YEAR		
2003	3	50%
2005	3	50%
Total	**6**	

MONTH		
JAN	3	50%
FEB	2	33%
DEC	1	17%
Total	**6**	

DAY OF WEEK		
SUN	4	67%
WEC	1	17%
SAT	1	17%
Total	**6**	

HOUR OF DAY		
10	1	17%
14	1	17%
15	1	17%
18	1	17%
19	1	17%
22	1	17%
Total	**6**	

2. Aquetong Rd. East of the Intersection

Segment 20, Offset 980 to Segment 20, Offset 4604

COLLISION TYPE	
Hit Fixed Object	3
Opp Dir Sideswipe	2
Pedestrian	1
Total	**6**
ILLUMINATION	
Dark – no street lights	3
Daylight	2
Unknown	1
Total	**6**
WEATHER	
Snow	3
Sleet (hail)	1
Clear	1
Unknown	1
Total	**6**
SEVERITY COUNT	
Fatalities	0
Major	0
Moderate	2
Minor	1

N

NOT TO SCALE

Delaware Valley Regional Planning Commission
August 2007

Road Safety Audit - FY 2008
3. Intersection of Aquetong Rd. and Windy Bush Rd.

Year Range:	2003	to	2005	Area of: In County	9	On Route	1003
Between Segment	30	Offset	266	and Segment	30	Offset	341

COLLISION TYPE		
Angle	10	71%
Hit fixed object	2	14%
Rear-end	1	7%
Non collision	1	7%
Total	**14**	

SEVERITY LEVEL		
Not injured	7	50%
Major injury	1	7%
Moderate injury	1	7%
Minor injury	5	36%
Total	**14**	

SEVERITY COUNT	
Fatalities	0
Major	1
Moderate	1
Minor	8
UNK Severity	0
UNK If	0

ENVIR/ROADWAY FACTORS		
None	13	93%
Deer in roadway	1	7%
Total	**14**	

ROAD CONDITION		
Dry	9	64%
Wet	5	36%
Total	**14**	

WEATHER		
No adverse conditions	10	71%
Rain	3	21%
Unknown	1	7%
Total	**14**	

ILLUMINATION		
Daylight	11	79%
Dark – no street lights	2	14%
Dusk	1	7%
Total	**14**	

DRIVER ACTIONS		
Proceeding w/o clearance after stop	2	13%
Running stop sign	5	31%
Running red light	1	6%
Over or under compensation at curve	1	6%
Speeding	1	6%
Driving too fast for conditions	1	6%
Affected by Physical Condition	2	13%
Other improper driving actions	3	19%
Total	**16**	

VEHICLE TYPE		
Automobile	13	50%
Motorcycle	1	4%
Small truck	1	4%
Large truck	1	4%
SUV	6	23%
Van	3	12%
Construction	1	4%
Total	**26**	

YEAR		
2003	10	71%
2004	2	14%
2005	2	14%
Total	**14**	

MONTH		
FEB	3	21%
APR	2	14%
MAY	2	14%
JUL	2	14%
AUG	2	14%
SEP	2	14%
DEC	1	7%
Total	**14**	

DAY OF WEEK		
SUN	1	7%
MON	1	7%
TUE	2	14%
THR	2	14%
FRI	5	36%
SAT	3	21%
Total	**14**	

HOUR OF DAY		
3	1	7%
6	1	7%
7	1	7%
8	1	7%
9	1	7%
11	1	7%
12	1	7%
13	1	7%
14	1	7%
16	1	7%
17	2	14%
20	1	7%
21	1	7%
Total	**14**	

3. Intersection of Aquetong Rd. and Windy Bush Rd.

Segment 30, Offset 266 to Segment 30, Offset 341

COLLISION TYPE	
Angle	10
Hit fixed object	2
Non collision	1
Rear-end	1
Total	**14**
ILLUMINATION	
Daylight	11
Dark – no street lights	2
Dusk	1
Total	**14**
WEATHER	
Clear	10
Rain	3
Unknown	1
Total	**14**
SEVERITY COUNT	
Fatalities	0
Major	1
Moderate	1
Minor	8

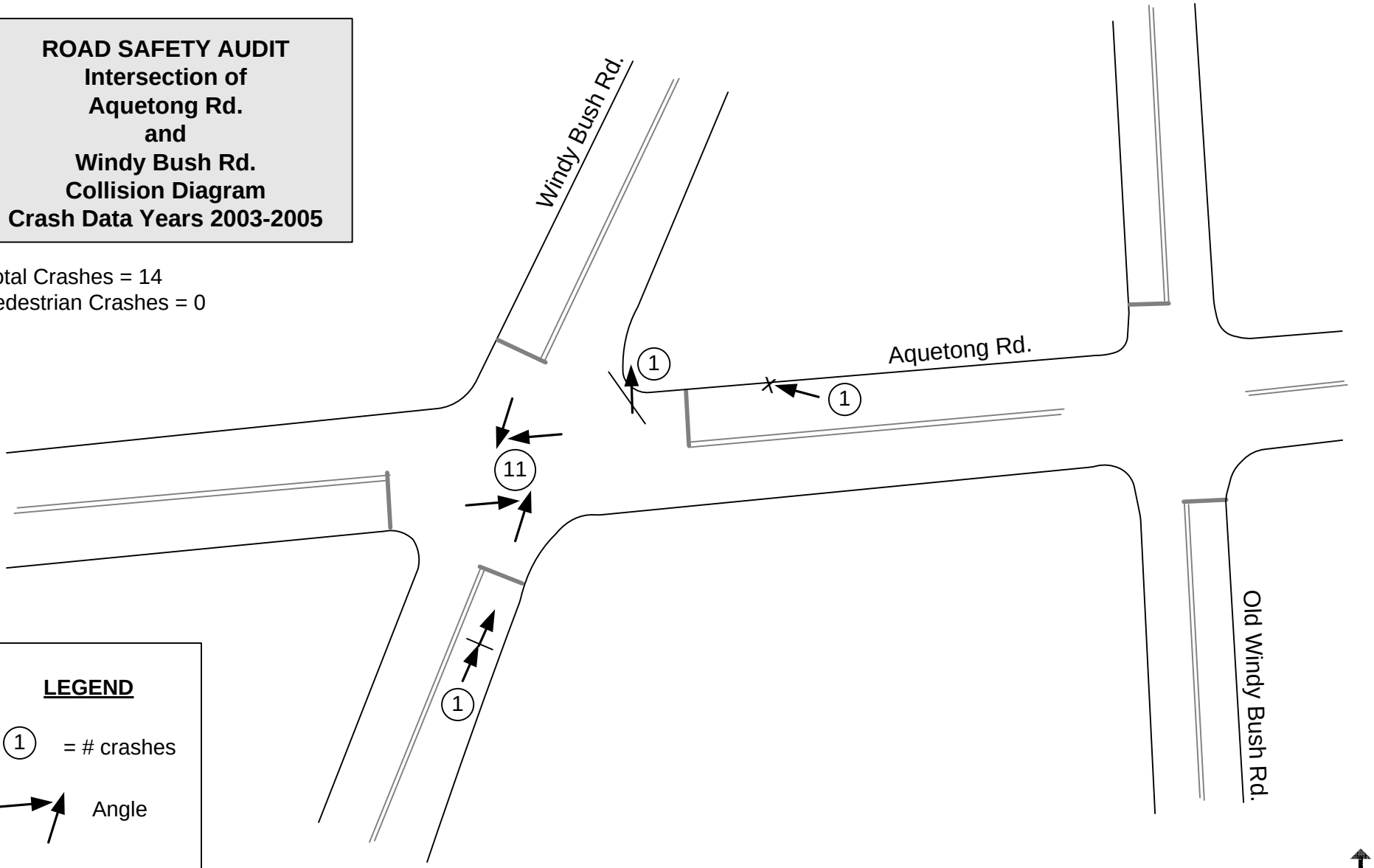
N

NOT TO SCALE

Delaware Valley Regional Planning Commission
August 2007

ROAD SAFETY AUDIT
Intersection of
Aquetong Rd.
and
Windy Bush Rd.
Collision Diagram
Crash Data Years 2003-2005

Total Crashes = 14
Pedestrian Crashes = 0



LEGEND

(1) = # crashes

Angle

Rear End

Hit Fixed Object

Non-collision

N

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Delaware Valley Regional Planning Commission
August 2007

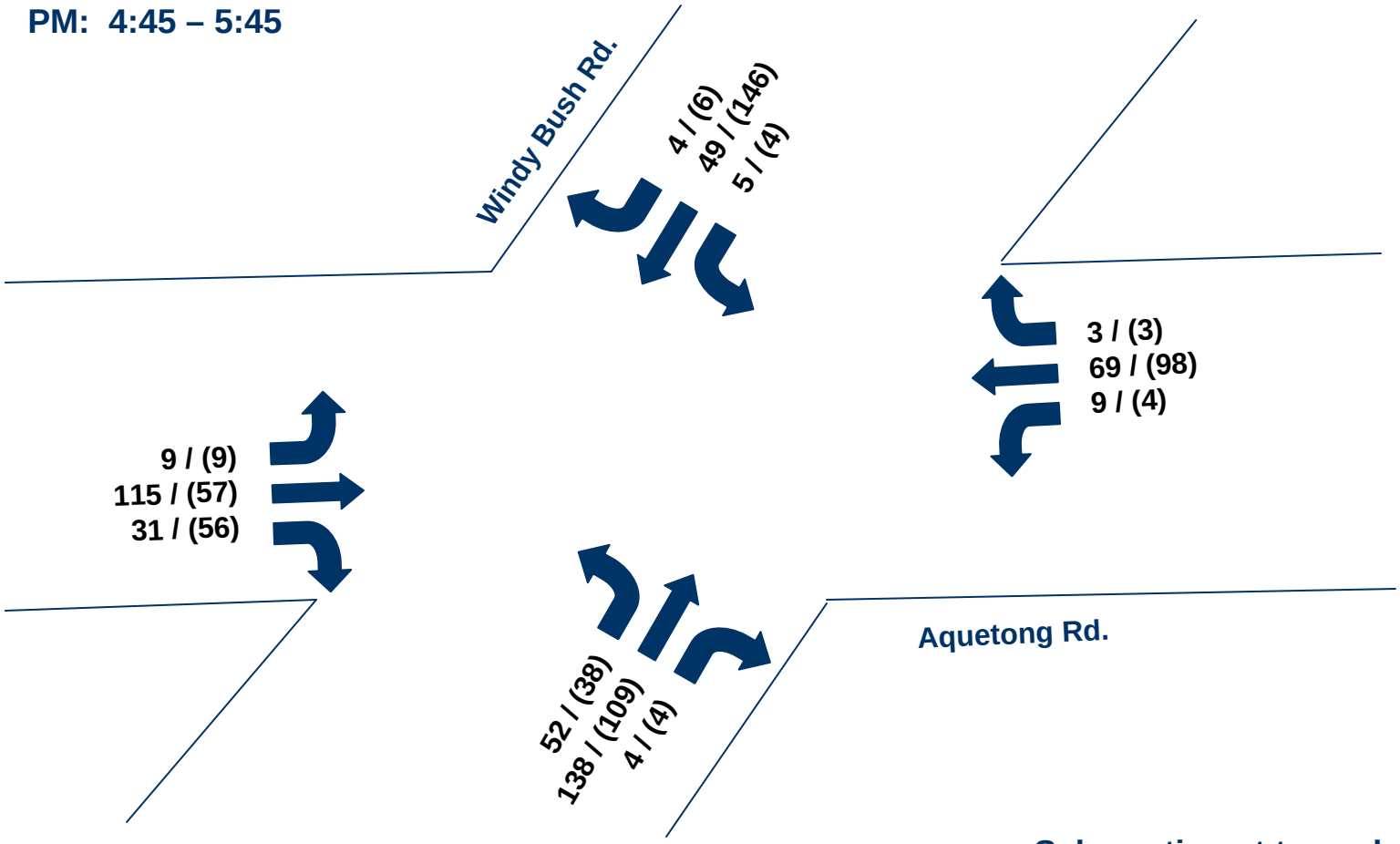
Windy Bush Road and Aquetong Road

Existing Peak Hour Turning Movement Counts AM / (PM)

Peak Hours

AM: 8:00 – 9:00

PM: 4:45 – 5:45



Schematic not to scale

Delaware Valley Regional Planning Commission

August 2007

Road Safety Audit - FY 2008
4. Aquetong Rd. Curve at Sugan Rd.

Year Range:	**2003**	to	**2005**	Area of: In County	**9**	On Route	**1003**
Between Segment	**30**	Offset	**823**	and Segment	**30**	Offset	**1154**

COLLISION TYPE		
Angle	2	50%
Hit fixed object	1	25%
Head-on	1	25%
Total	**4**	

SEVERITY LEVEL		
Not injured	3	75%
Minor injury	1	25%
Total	**4**	

SEVERITY COUNT	
Fatalities	0
Major	0
Moderate	0
Minor	1
UNK Severity	0
UNK If	0

ENVIR/ROADWAY FACTORS		
None	4	100%
Total	**4**	

ROAD CONDITION		
Dry	1	25%
Wet	3	75%
Total	**4**	

WEATHER		
No adverse conditions	3	75%
Rain	1	25%
Total	**4**	

ILLUMINATION		
Daylight	3	75%
Dark – no street lights	1	25%
Total	**4**	

DRIVER ACTIONS		
Proceeding w/o clearance after stop	1	20%
Driving on the wrong side of roadway	1	20%
Driving too fast for conditions	2	40%
Other improper driving actions	1	20%
Total	**5**	

VEHICLE TYPE		
Automobile	6	75%
SUV	1	13%
Van	1	13%
Total	**8**	

YEAR		
2003	2	50%
2005	2	50%
Total	**4**	

MONTH		
APR	1	25%
MAY	1	25%
SEP	1	25%
NOV	1	25%
Total	**4**	

DAY OF WEEK		
THR	1	25%
FRI	2	50%
SAT	1	25%
Total	**4**	

HOUR OF DAY		
10	1	25%
14	1	25%
15	1	25%
17	1	25%
Total	**4**	

4. Aquetong Rd. Curve at Sugan Rd.

Segment 30, Offset 823 to Segment 30, Offset 1154

COLLISION TYPE	
Angle	2
Hit Fixed Object	1
Head On	1
Total	**4**
ILLUMINATION	
Daylight	3
Dark – no street lights	1
Total	**4**
WEATHER	
Clear	3
Rain	1
Total	**4**
SEVERITY COUNT	
Fatalities	0
Minor	1

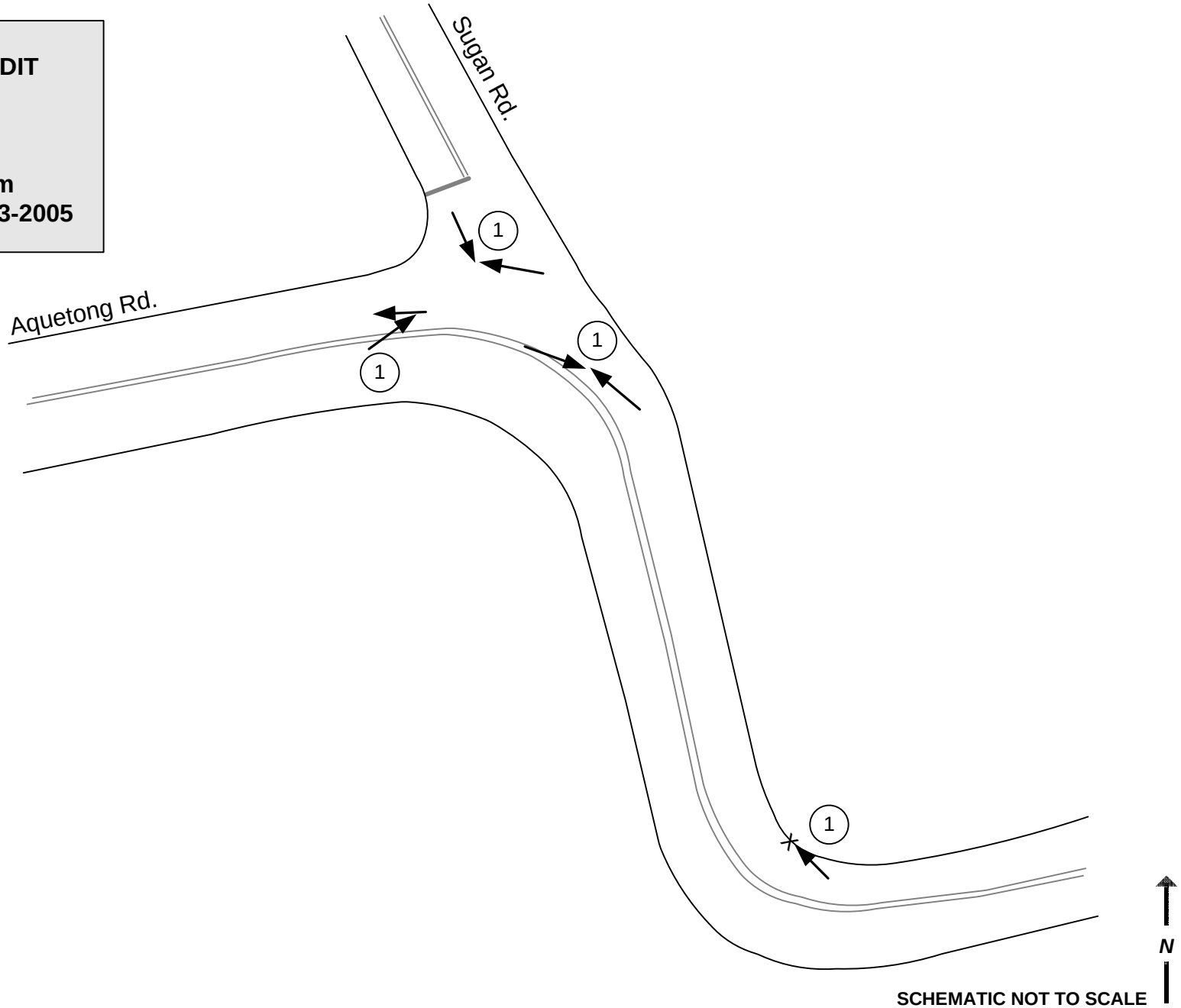
N

NOT TO SCALE

Delaware Valley Regional Planning Commission
August 2007

ROAD SAFETY AUDIT
Aquetong Rd.
Curve at
Sugan Rd.
Collision Diagram
Crash Data Years 2003-2005

Total Crashes = 4
Pedestrian Crashes = 0



LEGEND

1 = # crashes

Angle

Sideswipe

Head On

Hit Fixed Object

N

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August 2007

Road Safety Audit - FY 2008
5. Aquetong Rd. West of the Intersection

Year Range:	**2003**	to	**2005**	Area of: In County	**9**	On Route	**1003**
Between Segment	**30**	Offset	**2000**	and Segment	**30**	Offset	**4566**

COLLISION TYPE

Hit fixed object	1	100%
Total	**1**	

WEATHER

No adverse conditions	1	100%
Total	**1**	

YEAR

2003	1	100%
Total	**1**	

HOUR OF DAY

20	1	100%
Total	**1**	

SEVERITY LEVEL

Minor injury	1	100%
Total	**1**	

ILLUMINATION

Dark – no street lights	1	100%
Total	**1**	

MONTH

APR	1	100%
Total	**1**	

SEVERITY COUNT

Fatalities	0
Major	0
Moderate	0
Minor	1
UNK Severity	0
UNK if injured	0

DRIVER ACTIONS

Other improper driving actions	1	100%
Total	**1**	

DAY OF WEEK

SUN	1	100%
Total	**1**	

VEHICLE TYPE

Small truck	1	100%
Total	**1**	

ENVIR/ROADWAY FACTORS

None	1	100%
Total	**1**	

ROAD CONDITION

Wet	1	100%
Total	**1**	

5. Aquetong Rd. West of the Intersection

Segment 30, Offset 2000 to Segment 30, Offset 4566

COLLISION TYPE	
Hit Fixed Object	1
Total	**1**
ILLUMINATION	
Dark – no street lights	1
Total	**1**
WEATHER	
Clear	1
Total	**1**
SEVERITY COUNT	
Fatalities	0
Minor	1

N

NOT TO SCALE

Delaware Valley Regional Planning Commission
August 2007

APPENDIX D
Photo Log

Edge of roadway deterioration on Aquetong Road between Cover Bridge Road and Rockwood Path

Drain at private property driveway on Aquetong Road west of Cover Bridge Road

Poor drainage on Aquetong Road west of Cover Bridge Road

Edge of pavement drop off on Aquetong Road west of Cover Bridge Road

Edge of pavement drop off on Aquetong Road west of Cover Bridge Road

Edge of pavement drop off and deterioration on Aquetong Road west of Cover Bridge Road

Edge of pavement drop off and drain at Rockwood Path

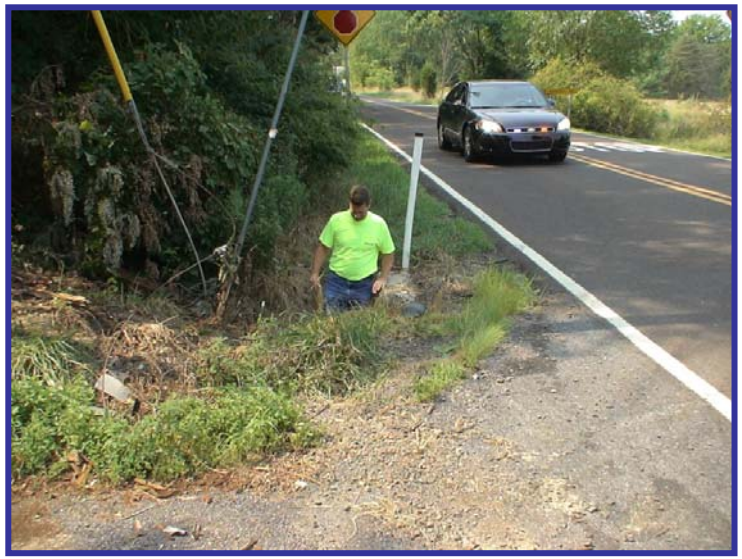
Edge of pavement drop off and deterioration on Aquetong Road west of Cover Bridge Road

Stone headwall on Aquetong Road

Stone headwall and inlet on Aquetong Road

Inlet at the intersection of Aquetong Road and Windy Bush Road

Inlet at the intersection of Old Windy Bush Road and Windy Bush Road



Inlet at the intersection of Old Windy Bush Road and Windy Bush Road

Treated drain on Aquetong Road on curve east of Sugan Road

Edge of pavement drop off and deterioration on Aquetong Road east of Sugan Road

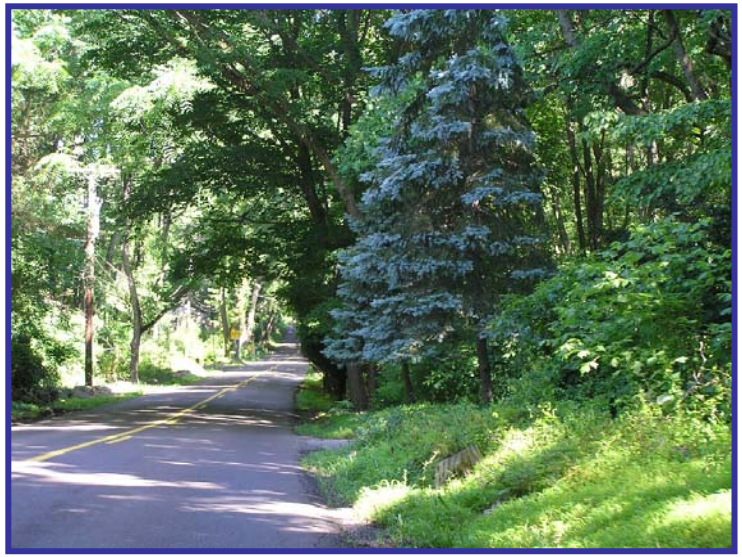
Oversized drain pipe at private property driveway on Aquetong Road west of Sugan Road

Intersection of Aquetong Road and Cover Bridge Road looking west

Vegetation at the intersection of Aquetong Road and Cover Bridge Road limits sight distance looking west

Intersection of Aquetong Road and Cover Bridge Road showing no pavement markings

Tree canopy on Aquetong Road east of Rockwood Path



Trees on Aquetong Road in the clear zone

Trees on Aquetong Road in the clear zone

Utility poles in the clear zone on Aquetong Road east of Sugan Road

Narrow pavement of Windy Bush Road

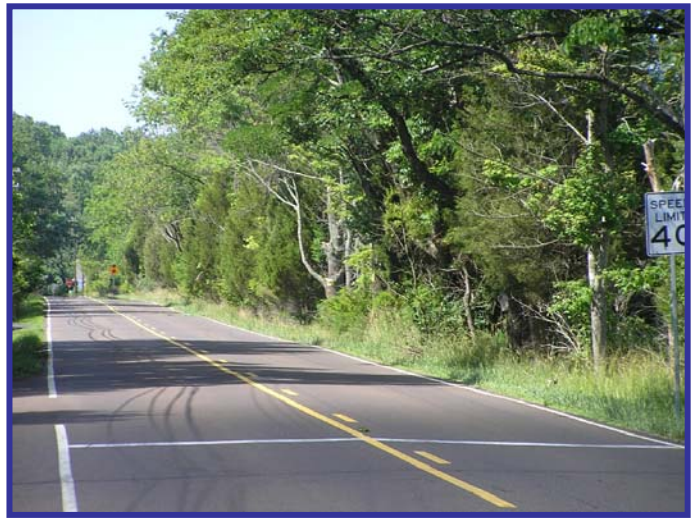
Narrow pavement of Aquetong Road west of Sugan Road

Narrow pavement of Aquetong Road west of Sugan Road, chevron signage at guide rail

Narrow pavement of Aquetong Road, signs delineating inlet

Narrow pavement of Aquetong Road with no pedestrian amenities

Cornwell Drive showing no pavement markings



Windy Bush Road looking south at Cornwell Drive – passing zone, narrow shoulders

Windy Bush Road looking north at Cornwell Drive – passing zone, wider shoulders for decel lane

Windy Bush Road looking north at Cornwell Drive – passing zone, narrow shoulders

Rocks along Aquetong Road in the clear zone

Rocks and tree stumps along Aquetong Road in the clear zone

Rocks along Aquetong Road in the clear zone

Rocks at corner of Aquetong and Old Windy Bush Roads in the clear zone

Rock wall on the curve on Aquetong Road east of Sugan Road

Passing Zone on Aquetong Road

Sign partially hidden by tree branches along Aquetong Road

Sign partially hidden by tree branches along Windy Bush Road

Pavement marking on Windy Bush Road north of the Aquetong Road intersection

Deteriorating pavement marking on Aquetong Road

Pavement marking on Aquetong Road

Pavement marking on Aquetong Road at the Windy Bush Road intersection

Signs at the Aquetong Road/Windy Bush Road intersection

Signs at the Aquetong Road/Windy Bush Road intersection

Aquetong Road/Sugan Road intersection looking south

Aquetong Road/Sugan Road intersection Showing no pavement markings

Delineator pole in the ditch on Aquetong Road
east of Sugan Road

Deteriorating delineator pole on Aquetong Road
east of Sugan Road

Leaning delineator pole on Aquetong Road
west of Sugan Road

APPENDIX E
Checklist

CHECKLIST

Audit Team Member_____

GENERAL ISSUES

Item #	***Description***	***Check***	***Comments***
1 Drainage	Do drainage items seem to be adequate?		
	Are drainage items clear of debris?		
2 Landscaping	Is landscaping in accordance with guidelines (sight distance, clearances etc.)		
3 Public Utilities	Are boxes, poles, and/or posts located in a safe position?		
	Do the above items interfere with sight distance?		
4 Access Management	Are there locations where access management is problematic?		
5 Lighting	Is lighting needed in specific locations?		

ALIGNMENT AND CROSS SECTION

Item #	***Description***	***Check***	***Comments***
1 Visibility	Are sight distances adequate for the speed of traffic on Aquetong Rd.?		
	Is adequate sight distance provided at intersections?		

	Are sight distances adequate for the speed of traffic on Aquetong Rd?		
2 Driver expectation	Are there any sections of the roadway which may cause driver confusion such as:		
	a. Is alignment of roadway clearly defined?		
	b. Are crossroads or hidden driveways properly signed along corridor?		
	c. Are curves properly delineated?		
3 Widths	Are all the traffic lanes and roadway widths adequate?		
4 Design Speed	Is the horizontal and vertical alignment suitable for traffic speed? If not:		
	a. Are advisory speed signs posted?		
	b. Are warning signs installed?		
	c. Are posted advisory speeds for curves appropriate?		
5 Shoulders	Is the shoulder cross slope sufficient to provided proper drainage?		
	Are there locations where guide rail may be appropriate?		
6 Overtaking	Are adequate passing opportunities provided?		

INTERSECTIONS

Item #	***Description***	***Check***	***Comments***
1 Location	Are there any roadside objects nearby which would intrude on driver's line of sight?		
	Are the intersections adequate for all vehicular movements?		
	Are intersections located safely with respect to horizontal and vertical alignment?		
2 Controls	Are pavement markings and intersection control signing satisfactory?		
3 Signage	Is the intersection appropriately signed?		
	Are there advance warning signs indicating the intersection?		
	Are signs appropriately located and of the appropriate size?		
4 Layout	Is the intersection layout obvious to all users?		
	Are turning radii and tapers appropriate?		
	Are driveways located at or near the intersections?		
5 Visibility, sight distance	Is sight distance adequate for all movements and all users?		

TRAFFIC SIGNALS

Item #	***Description***	***Check***	***Comments***
1 Signal Operation	Are traffic signals operating correctly? (Example clearance time)		
2 Visibility	Are traffic signals clearly visible to approaching motorists?		

PEDESTRIANS

Item #	***Description***	***Check***	***Comments***
1 Pedestrians	Are there locations where pedestrian facilities could be used?		

BICYCLISTS

Item #	***Description***	***Check***	***Comments***
1 Bicyclists	Are there share the road signs posted?		
	Is the road surface of suitable quality for bicyclists?		

SIGNAGE, PAVEMENT MARKINGS, DELINEATION AND LIGHTING

Item #	***Description***	***Check***	***Comments***
1 Signage	Are there signs missing from key locations?		
	Are signs easy to understand?		

	Are the correct signs used for each situation, and is each sign necessary?		
	Are signs effective for all likely conditions (i.e. day, night, oncoming headlights etc)?		
	Are all necessary regulatory, warning, and direction signs (including detours) in place? Are they conspicuous?		
2 Pavement Markings and Delineation	Does existing pavement markings need to be re-painted?		
	Have raised pavement markers been installed?		
	Are pavement markings easily visible and effective for all likely conditions (i.e. at night, day, inclement weather etc.)?		
	Are guide posts correctly placed, clean, and visible?		
	Are there locations where chevrons are needed?		
3 Lighting	Is appropriate lighting installed at intersections, pedestrian and bicycle crossings?		
	Are the appropriate types of poles used for all locations and correctly installed?		
	Are all locations free of any lighting which may conflict visually with signs?		

PAVEMENT

Item #	***Description***	***Check***	***Comments***
1 Pavement defects	Is the pavement free of defects (i.e. excessive roughness, potholes) which could result in safety problems?		
2 Ponding	Is the pavement free of areas where ponding may occur resulting in a safety problem?		
3 Skid resistance	Does the pavement appear to have skid resistance on curves, steep grades and approach to intersection?		

APPENDIX F
Response Sheet

Aquetong/Windy Bush Roads – Road Safety Audit

CORRIDOR WIDE

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
Drainage o Poor drainage or the lack of a proper drainage system in the corridor has resulted in a number of safety issues. Potentially resulting in sheeting across roadway during inclement weather. o Edge of roadway eroded due to wash out. o Swells need to be cut back, near S curve east of Sugan Road o Pipes are clogged, some are not visible (due to debris)	o Conduct a comprehensive drainage study for the corridor to identify specific issues and long term solutions. Consideration should be given to additional pipes and new parallel drainage systems. o In the short term: clean clogged pipes and remove debris from the drains. o In addition, where possible excavate and fill in with ballast (rocks).			
Edge Lines and Edge Drop-offs o Lack of edge of pavement delineation is consistent through the corridor. In addition, edge drop offs are consistently evident. This is a result of the poor drainage control.	o Install edge line as appropriate throughout the corridor to guide motorists and prevent run of the road crashes. *PennDOT should consider minimum 9.5 foot lanes as a safety measure*			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
Fixed objects o Numerous fixed objects were observed in the clear zone. These included trees (large and small); boulders (many used for landscaping by property owners and, stone headwalls (approx. 3 feet above the ground)	o All fixed objects in the clear zone should be removed. Initial clearing should be at least four feet from edge of travel. ***Many trees along the corridor were already marked for removal***			
Narrow roadway width o Roadway width throughout the study area on Aquetong and Windy Bush Roads varied between 9 and 10 feet	o Any widening of the roadway may require additional right of way. Given the roadway geometry travel lanes should be at least 12 feet wide in the 40 MPH zone with a shoulder width of at least 2 feet.			
Vegetation o Trees and shrubs obstruct the view of many signs throughout the corridor and interfere with sight lines	o Trimming trees and brush			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
Centerline Delineation o The corridor is shadowed during the day due to the canopy of trees and extremely dark at night, a result of the lack of street lighting. Coupled with narrow pavement width.	o Install raised pavement markers (RPM) the length of the corridor to keep the motorist in his travel lane. Installation of centerline rumble strips to assist in the prevention of cross-over head-on collisions were examined but the narrowness of the travel lanes negates this treatment.			
Speed Limit o Given the geometry of the corridor, the set speed limit of 45 MPH may be excessive	***A speed study was conducted by PennDOT; as a result, the speed limit will be lowered along Aquetong Road from River Road to Sawmill Road to 35 MPH***			
Passing Zones o There are too many passing zones in the corridor given the narrow lanes and edge drop offs which are not forgiving if motorist overcompensate while passing.	o Eliminate passing zones			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
Signs o No "Share the Road" signs. o Construction signs located along Aquetong Road with no construction being conducted o No name plates for advance intersection signs	o Install "Share the Road" signs throughout the corridor so motorists are cognizant of other users. o Remove or cover construction signs at times when there is no work being conducted on the roadway. o Add street name plates to advance intersection signs o Add advance signs for hidden driveways as appropriate			
Pavement Markings o Several intersection approaches with stop control do not have stop bars	o Install stop bars to intersection approaches as appropriate			
Sight Lines o Limited sight lines	o Maximize sightlines around curves by cutting back embankment and removing trees.			

SPECIFIC LOCATIONS

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
At Covered Bridge Road				
o Covered Bridge Road is skewed at the intersection with Aquetong Road. Additionally, there are no pavement markings at the Covered Bridge Road approach.	o Use pavement markings to soften skew allowing easier access to Aquetong Road especially for left turning traffic			
o Utility pole to the west of the intersection on Aquetong Road obstructs sight lines.	o Relocate utility pole			
o Rail fence west of intersection on Aquetong Road next to parking lot is in Right of Way.	o Relocate fence outside Right of Way. ***Fence will be removed as part of new development***			
At Rockwood Path				
o Tree to the west of the intersection blocks sight lines for Rockwood Path approach traffic	o Remove tree			
Between Rockwood Path and Wagner Road (private road)				
o "Curve ahead" (W1-2) sign is too far from the actual curve and is faded	o Upgrade sign (W1-2) and relocate closer to curve			
o "Slow Curve Ahead" pavement markings are too far from curve and are wearing out	o Add pavement marking legend closer to curve and repaint existing ones.			
o Eastbound "No Passing" (W14-3) sign knocked down	o Replace sign (W14-3)			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
Between Rockwood Path and Wagner Road (private road) (continued)				
o Hidden driveway at the curve	o Install advance warning sign for driveway.			
o Night time driving difficult due to the darkness which could makes negotiating the curve difficult.	o Install lighting on curve			
o Illegal speed limit sign is installed within the ROW eastbound before the curve	o Remove sign			
Between Wagner Road (private road) and Old Windy Bush Road				
o Junction sign is blocked by tree limbs	o Trim tree limbs o Relocate street name sign to the post assembly of "Stop Ahead" (W3-1) sign			
o Cut off sign posts are protruding out of the ground	o Remove posts			
At Old Windy Bush Road				
o "Stop Ahead" sign is blocked by vegetation	o Trim vegetation			
At Windy Bush Road				
o Sign clutter, potentially confusing to motorists	o Remove or consolidate signs as appropriate			
o Westbound approach to intersection, poor sight distance which is made worse by vegetation	o Cut away vegetation to improve sight distance			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
At Windy Bush Road (continued)				
o Northeast, northwest and southwest corners of intersection has unprotected drainage holes that lead to pipe	o Install protective grates			
Windy Bush Road between Old Windy Bush and Aquetong Road				
o "Intersection ahead" sign on northbound side of the road is blocked by vegetation	o Trim vegetation			
o No advance street name sign for the Aquetong Road intersection	o Install advance "Aquetong Road" sign (W16-8)			
Old Windy Bush Road at Windy Bush Road				
o Drainage hole on the southeast corner	o Install protective grate			
o Utility pole lying on the ground at the southeast corner of the intersection.	d. Remove pole			
Between Windy Bush Road and Sugan Road				
o Aquetong Road is an S-curve in this area with post mounted warning signs only	o Add "Slow Curve Ahead" pavement markings in both direction			
o Vegetation on the westbound side of the road conceals the edge of pavement	o Cut back vegetation			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
Between Windy Bush Road and Sugan Road (continued)				
o Edge drop off in this section of roadway is pronounced as a result of poor drainage	o ***Currently a PennDOT project to excavate and fill with rocks.*** o This is a temporary fix and in the long term proper drainage should be installed including pipes			
o Reflector poles are in poor condition. Reflector strips have been stripped from the poles and many are down in the drain	o Replace with chevrons (W1-8)			
o Aquetong Road westbound curves while Sugan Road continues straight ahead, there is no directional signage	o Add graphic directional signage with road names			
At Sugan Road				
o At Sugan Road the intersection is on the curve and very wide. Additionally, travel lanes are not delineated	o Add dashed double centerline and single edgeline through intersection. This will alleviate driver confusion			
o Curve needs to be delineated	o Add large warning arrow (W1-6) on the curve for eastbound Aquetong Road traffic			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
Between Sugan Road and Solebury Mountain Road				
o Oversized drainage pipes installed by property owners at driveways are unprotected hazards in the clear zone. Some pipes include headwalls.	o Install appropriate drainage pipes according to regulation.			
Windy Bush Road between Aquetong Road and Pidcock Creek Road				
o Open pipe culvert on the side of the road result in unprotected curb drop off.	o Widen road to 12-foot lanes with paved shoulder to eliminate open pipe culvert that parallels the road.			
o Property owners have installed a variety of drainage pipes and sizes at driveways. They are unprotected hazards in the clear zone and some pipes include headwalls.	o Install appropriate drainage pipes according to regulation.			
o Pipes at property owners driveways are clogged with debris	o Clear pipes to prevent flooding on the roadway			
o Guide rail needs to be updated	o Replace guide rail with upgraded end treatments.			

Title of Report: ***AQUETONG/WINDY BUSH ROADS - ROAD SAFETY AUDIT***

Publication No.: **07042A**

Date Published: October 2007

Geographic Area Covered:
The study area includes sections of Aquetong Road (SR 1003) and Windy Bush Road (SR 232) in Bucks County, Pennsylvania.

Key Words:
Road, safety, audit, potential, fatalities, injuries, reportable, crashes, issues, strategies, coordination, engineering, enforcement, education, prioritize, intersection, speed limit, traffic volumes, PennDOT, stakeholders, audit team, curve, sight distance, clear zone, geometry, pavement markings, signs.

ABSTRACT: This is a documentation of the process and findings of the Aquetong/Windy Bush Roads Road Safety Audit (RSA) undertaken by Delaware Valley Regional Planning Commission (DVRPC) in conjunction with Pennsylvania Department of Transportation (PennDOT). The RSA was done on August 17, 2007. The goal of the audit is to generate improvement recommendations and countermeasures for roadway segments demonstrating a history of, or potential for a high incidence of motor vehicle crashes. The emphasis is placed on identifying low cost, quick turnaround safety projects to address the issues where possible. The roadways studied are identified in the Safety Plan for PennDOT District 6. This corridor is located in a suburban environment with numerous curves and steep gradient. Much of the roadway is covered by the canopy of trees which in many instances are located in the clear zone and presents a potential hazard to road users.

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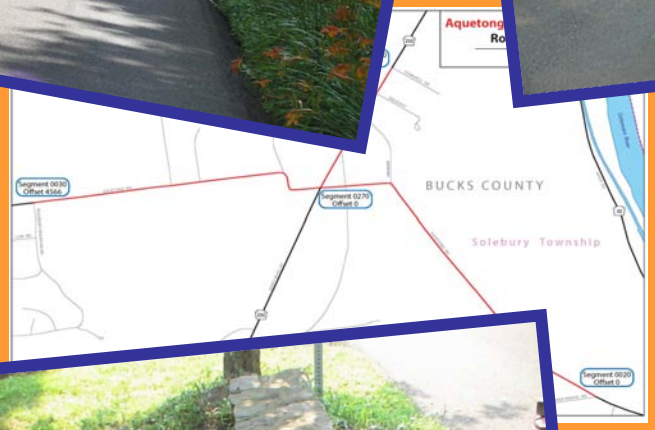

PENNDOT

Delaware Valley Regional Planning Commission

AQUETONG ROAD/ WINDY BUSH ROAD

Road Safety Audit

October 2007