

Upper Route 9G Corridor Management Plan

PDCTC
Poughkeepsie-Dutchess County Transportation Council



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Upper Route 9G Corridor Management Plan

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Upper Route 9G Corridor Management Plan

i. Executive Summary

The Upper Route 9G Corridor Management Plan (CMP) is a federally-funded project that is managed by the Poughkeepsie-Dutchess County Transportation Council (PDCTC), the designated Metropolitan Planning Organization (MPO) for Dutchess County. The CMP grew out of concerns about transportation safety along the study corridors. The study area, shown on **Figure 1**, includes a segment of NYS Route 9G from CR 78 (Broadway/West Kerley Corners Road) in the Village of Tivoli to NYS Route 199 (West Market Street) in the Town of Red Hook, CR 78 (Broadway) in Tivoli from NYS Route 9G to the Hudson River, and CR 103 (Annandale Road/River Road) from NYS Route 9G through Bard College to CR 82 (Barrytown Road). Also shown on Figure 1 are the nine (9) intersections that were selected for detailed analysis of both vehicular and non-vehicular operations and safety.



This report (Task 6 of the CMP) provides a summary of the work completed for the CMP, including significant findings from Tasks 1 through 5, and a detailed itemization of the final, consensus-based recommendations to improve transportation safety and operations for all users within the study area.

Throughout the course of developing the CMP, several public meetings and workshops were held to solicit input from residents and key stakeholders on the areas of most concern, and a project website was developed to share information and solicit feedback. A technical Advisory Committee was created to review the data collected, analyses conducted and safety recommendations proposed. Summaries of the public workshops, stakeholder and technical Advisory Committee meetings and website comments received are provided in Appendix A.

Six fatal crashes have occurred in the study area since 2009 and improving safety along the study corridors is of utmost importance. The stated goal of the CMP is to provide a safer environment for people driving, walking, bicycling, and using transit. To that end, the CMP includes an evaluation of current transportation and crash data, a formal road safety assessment, an analysis of future transportation conditions, and recommendations for corridor and intersection improvements. The CMP includes a series of tasks, which are summarized below:

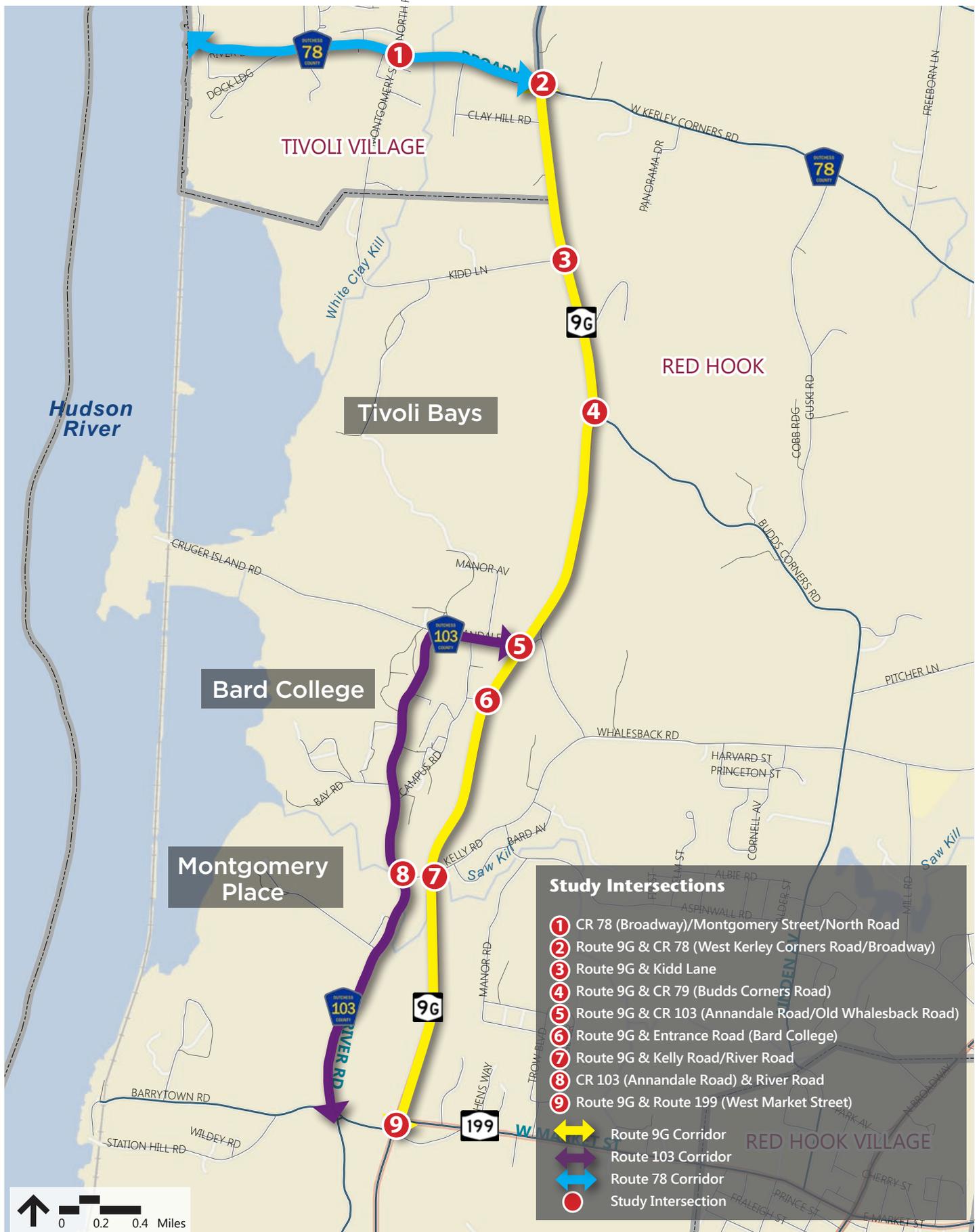
a. Task 1, Existing Conditions (see Chapter 1 - Technical Memorandum No. 1) documents existing conditions and provides an assessment of current transportation and operational issues for the Upper Route 9G CMP study corridors. This task revealed that:

- Most of the roadways have shoulders that are narrower than desirable;
- Sidewalks are provided on CR 78 (Broadway) in the commercial area of the Village of Tivoli and a shared-use path is provided along the west side of CR 103 between Cruger Island Road



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- and the River Road triangle. Sidewalks are not provided along NYS Route 9G within the study area;
- Bicycle facilities such as exclusive bike lanes or wide shoulders are not provided within the study area;
 - Daily traffic volumes on NYS Route 9G range from 4,800 to 8,000 vehicles. On CR 103, daily traffic volumes range from 1,800 to 3,000, while on CR 78, daily traffic volumes range from 200 (at the west end of Broadway) to 2,300 vehicles near Route 9G;
 - Most pedestrian and bicyclist activity observed at the study intersections occurs in the center of the Village of Tivoli. Observations indicate that significant pedestrian and bicyclist activity occurs on the Bard campus and at pedestrian crossings along CR 103 (these locations were not counted as they are not part of the 9 study intersections)
 - Intersection capacity analyses indicate that all of the intersections within the study area currently experience good levels of service during the peak hours and will continue to do so into the foreseeable future;
 - Operating speeds (85th percentile) on all three corridors were documented as exceeding the posted speed limits. For example, the 85th percentile speeds along Route 9G ranged from 55 mph to 60 mph (0 to 5 mph above the posted 55 mph speed limit); and
 - Bus service for area residents is provided by Dutchess County Public Transit, while Bard College also operates a shuttle bus for students and staff.

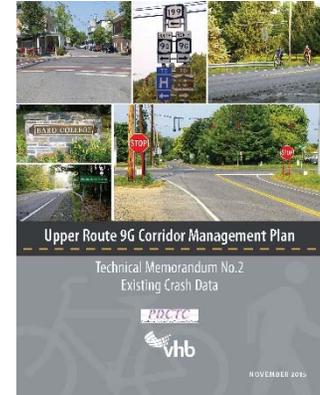




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b. Task 2, Existing Crash Data (see Chapter 2 - Technical Memorandum No. 2) documents and evaluates recent crash history (January 2009 through December 2013) for the study corridors and identifies areas with crash rates above the statewide average. This task indicated the following:

- A total of 249 crashes occurred along the study corridors in the five-year review period with 212 crashes on Route 9G, 16 crashes on CR 103 and 21 crashes on CR 78 (Broadway).
- The predominant crash types are collisions with animals (88 crashes, 35.3%), rear end (36 crashes, 14.5%), right angle (25 crashes, 10.0%), fixed object (23 crashes, 9.2%), run off the road (21 crashes, 8.4%), and parked vehicle crashes (17 accidents, 6.8%).
- Both NYS Route 9G and CR 103 experienced significant patterns of collisions with animals, fixed object crashes, and run off the road crashes.
- CR 78 experienced a significant pattern of parked vehicle crashes.
- A significant number of crashes occurred at night (95 crashes, 38.2%).
- Three crashes resulted in a fatality with each of these crashes involving vehicles running off the road.
- Crash rate calculations indicate that four roadway segments (two on Route 9G, one each on CR 103 and CR 78) exceed the statewide average crash rate for similar roadway facilities.



Three additional fatal crashes occurred outside of the study window (after December 2013).

c. Task 3, Safety Assessment (see Chapter 3 - Technical Memorandum No. 3) documents the results of a safety assessment of the study corridors and intersections. Safety issues that may be contributing to crashes were identified and potential measures to improve safety were developed, as summarized below.

- The Safety Assessment was conducted in September 2015, following the 8-step Road Safety Audit process set forth by the Federal Highway Administration and with a particular focus on the six fatal crashes noted in Task 2.
- The Safety Assessment team included members with expertise in traffic engineering, planning, design, operations, enforcement and safety.
- Recent changes in roadway and traffic control features have provided some benefits, such as the Route 9G shoulder widening project and the installation of pedestrian/bicyclist warning signs with flashing beacons along CR 103, although the shoulder widening project has resulted in uneven pavement.
- Five significant safety issues were identified during the Safety Assessment:
 - Driver/Pedestrian behavior and expectancy;
 - Signing, pavement marking, wayfinding and visibility conditions;
 - Geometry
 - Pavement surface conditions; and
 - Guiderail conditions
- Specific improvements were recommended to address the identified safety issues.

d. Task 4, Future Conditions (see Chapter 4 - Technical Memorandum No. 4) provides an analysis of future operational conditions at the nine study intersections in the year 2025, as summarized below.

- Existing traffic volumes were projected to the 2025 forecast year based on future land use development, historical traffic data and the PDCTC's regional travel demand model.
- A total of six major land use development projects are currently proposed in the Town of Red Hook and Village of Red Hook. Most are within or adjacent to the Village of Red Hook.
- No major projects are proposed in the Village of Tivoli.
- Bard College's planned dormitory expansion is designed to meet current housing needs and is not expected to increase traffic in the area.
- Traffic volumes in the study area were estimated to increase by up to 9 percent from 2015 to 2025 (less than 1 percent per year).
- The existing volumes were increased by 18 percent to account for potential future projects not currently identified.
- Based on intersection capacity analyses, all study intersections are expected to continue to experience good levels of service during peak hours in the year 2025.

e. Task 5, Recommendations (see Chapter 5 - Technical Memorandum No. 5) involved proposing specific recommendations for improving access, operations and safety in the study area, based on the data collection and analysis conducted for the project in Tasks 1 through 4. The recommendations were identified based on a careful review by the Advisory Committee and key stakeholders of the existing conditions, including the road safety assessment, crash history, traffic volumes, speed data and pedestrian and bicyclist activity. Input received from the public was also a key element in identifying safety improvements within the study area.

In considering each of the recommended measures, a determination was made as to the relative urgency or need for the improvement. Each improvement was assigned a suggested timeframe for implementation, as indicated below.

- Immediate-term – within one year
- Mid-term – 2 to 5 years
- Long-term – 6 to 10 years

For each recommendation, the primary responsible agency and key partners in advancing and implementing the improvement were identified.

Many of the recommendations in the immediate- and mid-term timeframes are related to improving signage, enhancing and maintaining pavement markings, reducing speed limits and implementing enforcement and education. Many identified improvements are maintenance-related (pavement markings, sign replacements) and should be added to existing maintenance programs. These improvements can generally be accomplished without a significant capital cost.





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The more significant recommendations (in terms of planning, cost and benefits) are physical changes to the roadway infrastructure to improve safety. These include improvements at the intersection of Route 9G with CR 78 (West Kerley Corners Road), which is being studied by the New York State Department of Transportation (NYSDOT), and may result in the redesign of the intersection and/or roadway profile modifications. Other significant recommendations include a redesign of CR 103 (including pedestrian and bicycle improvements) in coordination with a new Master Plan for Bard College; shared-use paths through the Tivoli Bays Wildlife Management Area and between Bard College and Montgomery Place; and extending sidewalks along Broadway in the Village of Tivoli and along CR 103 between Campus Road and Route 9G.



Existing shared use path (Dutchess Rail Trail)

Other recommendations include traffic calming and gateway elements such as a narrower curbed pavement section and/or roundabouts to encourage motorists on Route 9G to reduce their speed as they approach and travel through the study area.

The recommendations provided in Technical Memorandum No. 5 were reviewed by the Advisory Committee and presented at two Public Workshops in May 2016. Comments received at these meetings were incorporated into the Final Plan recommendations contained herein.

ii. Concurrent Studies

During the course of this CMP, other studies have been initiated to address certain issues in the area. The NYSDOT has commenced a formal study of the NYS Route 9G and CR 78 (West Kerley Corners Road/Broadway) intersection to address safety concerns and identify safety improvements at that location. Bard College is also beginning a new Campus Master Plan which will include developing a vision for the CR 103 corridor to better accommodate all users. A third concurrent study, the Red Hook Trail Plan, has been prepared by the Town of Red Hook and recommends new trails and extensions/connections to the existing trail network. All three concurrent studies focus on key areas identified in this CMP as requiring improvements and work on the CMP has been closely coordinated with these efforts.

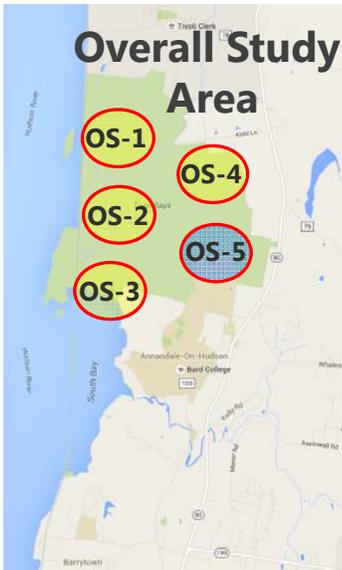


iii. Recommendations

Sheets summarizing all of the final CMP recommendations (excluding maintenance, which are provided in Appendix B) are provided hereafter in **Tables 1 to 8**. The recommendations are generally grouped by location or type. Prefix numbers and letters are used to distinguish the recommendation location/type. Prefix numbers correspond to the intersection numbers in Figure 1, letter prefix OS is for Overall Study Area recommendations, letter prefix P is for Path and Trail recommendations, letter prefix T is for Transit recommendations, letter prefix A is for recommendations on Route 9G, letter prefix B is for recommendations on CR 103 and letter prefix C is for recommendations on CR 78. A key map of the recommendations is provided in **Figure 2**.

Implementation Schedule

-  Immediate (< 1 year)
-  Mid-term (1-5 years)
-  Longer-term (6-10 years)
-  Continuing/Ongoing

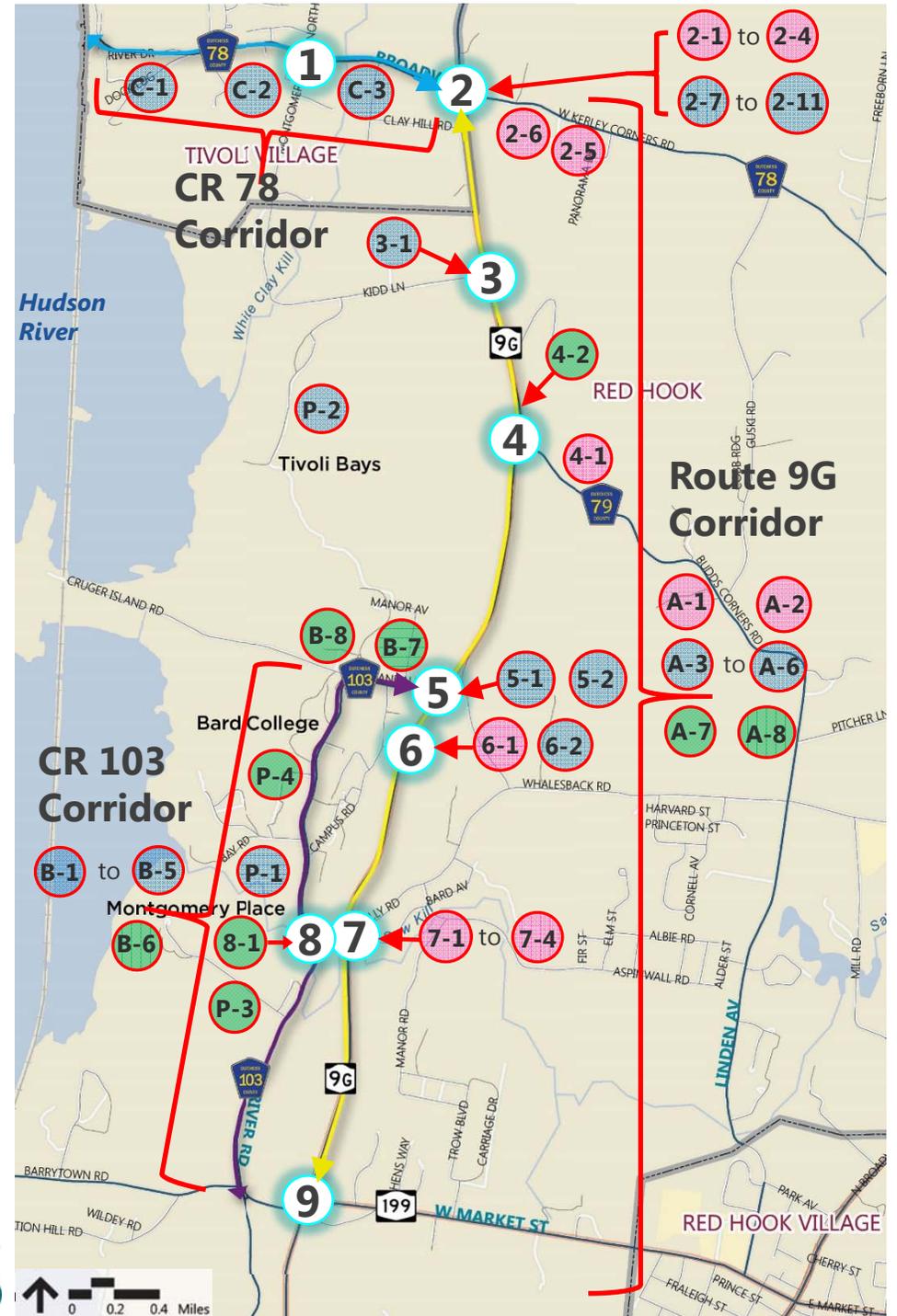


Transit

-  T-1
-  T-2
-  T-3



Figure 2
Recommendations Key Map



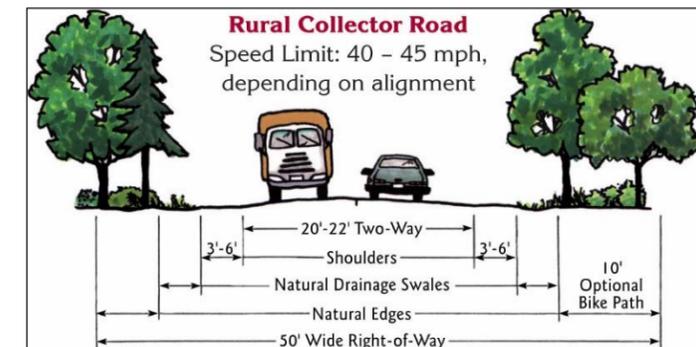
Recommendations

Overall Study Area – Education, Enforcement, Planning & Design (Table 1)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
Ongoing					
OS-1	Make more frequent use of portable driver speed feedback devices. Establish a recurring targeted enforcement area (speed, DUI) along Route 9G, CR 103 and CR 78 in coordination with state and local police departments. Implement a shared service contract with the Town of Red Hook and Dutchess County for equipment. In addition to one-time \$20,000 physical improvement cost, annual cost is estimated as \$17,000.	NYSP, NYSDOT, DC Sheriff, DCDPW, RHPD	-	\$0	\$20,000
OS-2	Implement an annual safety education campaign for motorists, pedestrians and bicyclists to coincide with the start of the Bard College school year. Estimated \$3,000 annual cost.	NYSDOT, DC, Bard, RH, Tivoli		\$0	\$0
OS-3	Per Complete Streets design principles, consider the needs of all users (pedestrians, bicyclists, transit riders and motorists) when approving new or retrofitted development projects.	RH, Tivoli	NYSDOT, DCDPW	-	-
OS-4	In conjunction with new development or redevelopment in the study area, incorporate design principles from the Dutchess County Planning Department’s Greenway Guides, such as: <ul style="list-style-type: none"> Develop local Bicycle Plans (such as the Red Hook Trail Plan) and regional Bicycle Plans, establishing a network of bicycle facilities to safely connect bicyclists of all abilities to schools, jobs, shopping, transit, parks, and other destinations. Place parking lots to the side and rear of buildings in built-up areas. Implement development and access management strategies to: limit strip commercial development and the number of access driveways along major roads: redirect development into already-developed centers; disperse vehicles on interconnected street systems, provide high quality landscaping and architecture as well as connections between sites via cross-access easements; and encourage shared parking and the development of mixed uses closer together to encourage walking and biking. Design narrow streets in cities, villages, and hamlet centers with buildings close to sidewalks, street trees, and other pedestrian- friendly features that promote slower speeds. For low-volume rural roads, retain the narrow widths, natural edges, and scenic winding character of the traditional roads, rather than imposing wider, suburban-scale standards into the countryside. Plant street trees in continuous rows between roadway and sidewalk in centers, as well as along rural roads (in areas outside of roadway clear zones), to create green corridors. 	RH, Tivoli	NYSDOT, DCDPW	-	-
Mid-Term (2 to 5 years) to Long-term (6 to 10 years)					
OS-5	Consider supplementing the existing speed limit signs with permanent driver-feedback speed limit signs as necessary.	NYSDOT, Tivoli, DCDPW	-	-	\$29,000



Example of pedestrian accommodations in a village center (Tivoli).



Example of rural collector road, 22 feet wide plus shoulders (Rt 376; Hopewell Junction).

Legend: NYSDOT = New York State Department of Transportation; DCDPW = Dutchess County Department of Public Works; Bard = Bard College; NYSP = NY State Police; DC Sheriff = Dutchess County Sheriff’s Office; DC = Dutchess County; RH = Town of Red Hook; Tivoli = Village of Tivoli; RHCS D = Red Hook Central School District; DCPD = Dutchess County Planning Department.

(1) – Estimated order of magnitude costs, based on experience of professionals.
(2) – Estimated Cost includes item cost, design & construction; Right-of-Way (ROW) costs not included, unless otherwise noted.

Recommendations
Trails & Shared-Use Paths (Table 2)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
Mid-Term (2 to 5 years)					
P-1	Add a pedestrian-bicycle connection, sidewalk and/or trail, between Bard College Main Campus and newly acquired Montgomery Place. Construct the connection within the Bard College property, to the extent practicable, and consider a pedestrian bridge over the Sawkill Creek. Refer to the Red Hook Trail Plan, which recommends new trails and trail connections within the CMP study area.	Bard	DCDPW, RH	-	\$212,500 ⁽³⁾
P-2	Work with NYSDEC and other agencies with jurisdiction over or interest in the Tivoli Bays Wildlife Management Area to develop a trail through the Management Area which will provide a pedestrian and bicycle connection between Bard College and the Village of Tivoli. Identify state of the art technology which could include motion-activated, path-focused lighting, emergency call boxes and security cameras which might provide for a secure nighttime travel environment without unduly impacting the Management Area wildlife. In the absence of the above lighting improvement, add signage indicating "Dawn to Dusk" usage. If the path is connected to Kidd Lane, add lighting and/or signage on Kidd Lane to promote visibility for trail users and motorists. Engage local stakeholders to assist with maintenance and security.	NYSDEC, RH, Tivoli, Bard	DCDPW	\$40,000	\$660,000
Long-Term (6 to 10 years)					
P-3	Construct an off-street shared-use path through the Montgomery Place property connecting to the Bard College shared use path which terminates just north of the Sawkill Creek. Consider extending this path to Barrytown Road and the Unification Theological Seminary, consistent with the Red Hook Trail Plan.	Bard	DCDPW, RH	-	\$425,000
P-4	Widen the existing 6-foot wide shared use path through Bard College to a minimum of 10 feet. A 10-foot wide path is the minimum width recommended by the FHWA to provide sufficient room for all types of potential users (bicyclists, pedestrians, in-line skaters, and persons with disabilities). Coordinate with the College's Campus Master Plan, which may propose a redesign of CR 103 to provide sufficient width for bicycle travel; if so, the path widening may not be needed.	Bard	DCDPW	-	\$500,000

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- (1) Estimated order of magnitude costs, based on experience of professionals.
- (2) Estimated Cost includes item cost, design & construction; Right-of-Way (ROW) costs not included, unless otherwise noted.
- (3) This may require ROW acquisition if Bard does not control all of the needed ROW.



Examples of a shared use path (Dutchess Rail Trail)

Recommendations
NYS Route 9G Corridor-wide (Table 3)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
Immediate Term (within 1 year)					
A-1	Assess the needs and the benefits of reducing the speed limit on NYS Route 9G to 45 mph in order to provide a consistent speed limit from north of CR 78 to south of NYS Route 199.	NYSDOT	-	\$15,000	\$1,000
A-2	Repave and seal areas of Route 9G that have cracked pavement (especially shoulder area) and potholes and schedule a full repaving of the roadway (see A-8).	NYSDOT	-	-	\$10,000
Mid-Term (2 to 5 years)					
A-3	Install roadside delineators along curved roadway sections (location and spacing to be determined by the responsible agency) where none exist to better delineate roadway alignment.	NYSDOT	-	-	\$10,000
A-4	Review existing signing along NYS Route 9G to determine if some can be consolidated, removed, or relocated further from intersections to reduce sign clutter. Locations include along the Route 9G northbound approach to the Kelly Road intersection and the NYS Route 9G and CR 78 (West Kerley Corners Road) intersection.	NYSDOT	DCDPW, RH, Tivoli	\$10,000	\$1,000
A-5	Evaluate the need for upgrading existing guiderail and end treatments for conformance to the latest applicable standards, and evaluate the need for additional guiderail along the study roadways, in areas where recent crash history indicates a pattern of vehicles leaving the roadway.	NYSDOT	-	\$10,000	\$100,000
A-6	Install a bicycle warning sign and an "In Lane" sign plaque (a "Narrow Lane assembly" ⁽³⁾) along NYS Route 9G at locations to be determined by NYSDOT, to alert motorists of bicyclists riding in the travel lanes.	NYSDOT	-	-	\$1,000
Long-Term (6 to 10 years)					
A-7	Incorporate traffic calming elements to encourage motorists to reduce their speed as they approach and travel through the study area. These improvements could involve gateway elements at the Route 199 intersection and at the CR 78 intersection, such as a narrower curbed pavement section and/or roundabouts with the objective of modifying driver behavior and mindset and helping to reduce driver speed.	NYSDOT	RH, Tivoli, Bard	-	\$200,000 to \$6,000,000 ⁽⁴⁾
A-8	Consider a project to reconstruct Route 9G to provide 11-foot travel lanes with 4-foot (or wider) shoulders, where feasible, per NYSDOT Highway Design Manual Table 7-8 and Section 17.4.5.	NYSDOT	-	-	\$2,000,000 ⁽⁴⁾

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- (1) – Estimated order of magnitude costs, based on experience of professionals.
- (2) – Physical Improvements includes item cost, design & construction; Right-of-Way (ROW) costs not included.
- (3) – Narrow Lane sign assembly (W11-1 and NYW5-32P, show to the right) per NYSDOT Shared Lane Marking policy.
- (4) – Right-of-Way (ROW) costs, particularly for a roundabout, are expected to be a substantial portion of this cost.



Portable driver speed feedback device.



Narrow Lane Sign Assembly (W11-1 and NYW5-32P)

Recommendations

NYS Route 9G Intersections (Table 4)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
2. Route 9G & CR 78 (West Kerley Corners Road/Broadway)					
Immediate Term (within 1 year)					
2-1	Improve the profile and alignment of the CR 78 westbound approach to Route 9G to improve sight lines.	DCDPW	NYSDOT	-	\$750,000
2-2	Continue to monitor, on a regular basis, the effectiveness of the recently installed safety improvements (flashing light) at the intersection (prior to the completion of the effectiveness evaluation discussed in 2-8 below) to ensure that there are no indications that the intersection is still subject to severe crash occurrences.	NYSDOT, DCDPW	RH, Tivoli	-	\$40,000
2-3	Supplement the intersection warning sign located along the northbound NYS Route 9G approach to CR 78 (West Kerley Corners Rd) with a flashing beacon assembly.	NYSDOT	-	-	\$3,000
2-4	Add a sign plaque, "Cross Traffic Does Not Stop" (W4-4P) to the Stop signs on the CR 78 approaches to Route 9G to increase awareness of drivers who misinterpret the intersection as an all-way stop.	NYSDOT, DCDPW	-	-	\$200
2-5	Investigate the need and benefits of reducing the speed limit on CR 78 (West Kerley Corners Road) from 55 mph to 45 mph from a point 2,000 feet east of Route 9G and continuing to Route 9G.	DCDPW	-	\$1,000	\$200
2-6	Replace the static "Stop Ahead" sign on CR 78 westbound with a "Stop Ahead" sign with embedded and flashing LED lights.	NYSDOT, DCDPW	-	-	\$3,000
Mid-Term (2 to 5 years)					
2-7	Improve the lighting at the intersection to provide better visibility.	NYSDOT	DCDPW	-	\$10,000
2-8	Assess the effectiveness the flashing signal and larger stop signs at the intersection of NYS Route 9G and CR 78 (West Kerley Corners Road) to determine whether it has reduced the frequency and severity of crashes at this location.	NYSDOT	DCDPW	\$12,000	-
2-9	Conduct a study to determine justification for replacing the flashing traffic signal with a full traffic signal, based on safety issues. Any signals installed should include pedestrian signal heads and other features suitable for use by the disabled, in compliance with current regulations. Alternatively, consider installing a roundabout at the intersection.	NYSDOT	DCDPW	\$25,000	\$150,000 to \$250,000
2-10	Evaluate the feasibility, costs and benefits of reducing the grade/profile on NY Route 9G immediately south of CR 78 to improve sight distance for northbound drivers approaching CR 78 as well as for motorists exiting from Clay Hill Road (as shown in Figure 5-2 of FHWA's NCHRP Report 500). The evaluation of this and other potential improvements measure may be in conjunction with the installation of a traffic signal or roundabout.	NYSDOT	-	\$35,000	\$400,000 to \$3,000,000 ⁽³⁾
2-11	In conjunction with NYSDOT's study of the intersection of Route 9G with CR 78, evaluate zoning and land use planning in this area as it is envisioned that this area will have more pedestrians in the future. Consider sidewalks, curb ramps, and other measures to allow pedestrians to safely access and cross the intersection.	RH, Tivoli	NYSDOT, DCPD, DCDPW	\$10,000	-



Stop sign (R1-1) with "Cross Traffic Does Not Stop" plaque (W4-4P).



"Stop Ahead" sign with flashing LEDs



Possible Traffic Signal at Rt 9G/CR 78



Possible Roundabout at Rt 9G/CR 78

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- (1) – Estimated order of magnitude costs, based on experience of professionals.
- (2) – Estimated Cost includes item cost, design & construction; Right-of-Way (ROW) costs not included, unless otherwise noted.
- (3) – Right-of-Way (ROW) costs, particularly for a roundabout, will be a substantial portion of this upper total cost.

Recommendations

NYS Route 9G Intersections (Table 4, Continued)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
3. Route 9G & Kidd Lane					
Mid-Term (2 to 5 years)					
3-1	Evaluate the safety of the existing passing lane on NYS Route 9G and request removal if warranted for safety.	NYSDOT	-	\$8,000	\$1,000
4. Route 9G & CR 79 (Budds Corners Road)					
Immediate Term (within 1 year)					
4-1	Evaluate the need and benefit of reducing the speed limit on CR 79 (Budds Corners Road) from 55 mph to 45 mph between Pitcher Lane and NYS Route 9G.	DCDPW	NYSDOT	\$1,000	\$200
Long-Term (6 to 10 years)					
4-2	Initiate a project to evaluate options for reconstructing the intersection of CR 79 (Budds Corners Road) and Route 9G as a perpendicular T-intersection to better control, channelize, and facilitate efficient movements at the intersection, with appropriate turning radii and sight distances provided. (See Exhibit A.2 in Appendix B).	NYSDOT, DCDPW	RH	\$25,000	\$100,000
5. Route 9G & CR 103 (Annandale Road)/Old Whalesback Road					
Mid-Term (2 to 5 years)					
5-1	Perform a traffic signal warrant study to justify the installation of a traffic signal or a Rapid Rectangular Flashing Beacon (RRFB) at the intersection of NYS Route 9G and Old Whalesback Road/CR 103 (Annandale Road). Install high visibility crosswalks across Route 9G in conjunction with the signal or RRFB.	NYSDOT	DCDPW, RH	\$10,000	\$10,000 to \$175,000
5-2	Install sidewalks on the north side of Old Whalesback Road from NYS Route 9G to Whalesback Road.	RH	DCDPW	-	\$27,000
6. Route 9G & Bard College Entrance Road					
Immediate Term (within 1 year)					
6-1	Add "Bard College Entrance Ahead" sign (or similar) along NYS Route 9G north and southbound in advance of the College entrance to indicate that motorists are entering a college campus area. Signage location depends on campus master plan, which may recommend a new location as the primary entrance.	NYSDOT, Bard	-	-	\$1,500
Mid-Term (2 to 5 years)					
6-2	Improve safety for people crossing NYS Route 9G at the Entrance Road. Improvements could include a marked crosswalk with a flashing beacon, a traffic signal or a HAWK signal.	NYSDOT, Bard	-	\$15,000	\$10,000 to \$175,000

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(1) Estimated order of magnitude costs, based on experience of professionals.
 (2) Includes item cost, design & construction; Right-of-Way (ROW) costs not included.



Evaluate passing lane on Route 9G at Kidd Lane

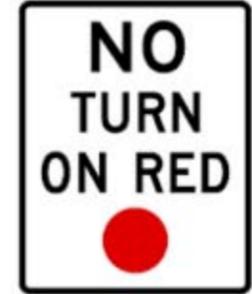


Possible HAWK Signal (Recommendation 6-2)

Recommendations

NYS Route 9G Intersections (Table 4, Continued)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
7. Route 9G & River Road/Kelly Road					
Immediate Term (within 1 year)					
7-1	Install “No Turn on Red” signs (R10-11) on eastbound River Road and westbound Kelly Road at NYS Route 9G.	NYSDOT	RH	-	\$300
7-2	Evaluate the skid resistance characteristics of the pavement surface along the northbound NYS Route 9G approach to River Road/Kelly Road and, if warranted, program an improvement project to remediate.	NYSDOT	-	\$5,000	\$10,000
7-3	Evaluate the grade increase when crossing NYS Route 9G from Kelly Road to River Road and evaluate the signal clearance timings. Modify the signal clearances or road profile as necessary. Add/provide a louver on the westernmost signal head facing Route 9G so that it is not visible from Kelly Road.	NYSDOT, RH	-	\$7,500	\$50,000
7-4	Enhance lighting at the intersection to improve visibility for motorists turning into and out of Kelly Road and River Road.	NYSDOT	-	-	\$20,000



A “No Turn on Red” (R10-11) sign is recommended for eastbound River Road and westbound Kelly Road at NYS Route 9G (Recommendation 7-1).

Legend: NYSDOT = New York State Department of Transportation; DCDPW = Dutchess County Department of Public Works; Bard = Bard College; NYSP = NY State Police; DC Sheriff = Dutchess County Sheriff’s Office; DC = Dutchess County; RH = Town of Red Hook; Tivoli = Village of Tivoli; RHCSD = Red Hook Central School District.

- (1) Estimated order of magnitude costs, based on experience of professionals.
- (2) Includes item cost, design & construction; Right-of-Way (ROW) costs not included.

Recommendations
CR 103 Corridor-wide (Table 5)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
Mid-Term (2 to 5 years)					
B-1	Request that NYSDOT change the functional classification of CR 103 from an Urban Major Collector to an Urban Minor Collector, to better fit the operating characteristics of CR 103. Typically, Minor Collectors are shorter in length, have lower speed limits and lower daily traffic volumes than Major Collectors. CR 103 is 7.7 miles long, has speed limits of 25 to 40 mph and carries 3,000 vehicles per day.	NYSDOT, DCDPW, PDCTC	RH	\$1,500	-
B-2	Develop an improved wayfinding signing plan for Bard College to help visitors efficiently access the campus (and other points of interest), as part of Bard's campus master planning efforts.	Bard	RH, DCDPW	\$ 5,000	\$30,000
B-3	Assess pedestrian crosswalk locations along CR 103 (Annandale Road) between south and north Campus Road to determine if there is an opportunity to better locate and/or consolidate them (coordinate with Bard as part of the College's campus master planning efforts).	DCDPW, Bard	-	\$2,000	\$10,000
B-4	Consider installing rectangular rapid flashing beacons (RRFBs) at pedestrian crossings along CR 103 (Annandale Road) between south and north Campus Road to increase driver yielding rates.	DCDPW, Bard	-	-	\$60,000
B-5	Conduct a study to evaluate the need/benefits of reducing the posted speed limit along the section of CR 103 (Annandale Road) between CR 82 (Barrytown Road) and River Road from 40 MPH to 35 MPH.	DCDPW	Bard	\$7,500	\$500
Long-Term (6 to 10 years)					
B-6	In coordination with Bard's Campus Master Plan, incorporate traffic calming elements along CR 103 (Annandale Road) to encourage lower vehicle speeds through the campus. These improvements could involve a raised pavement surface, curb bump-outs or a narrower pavement section with the objective of better informing motorists that they are about to enter and drive through a section of roadway that has frequent pedestrian activity. Gateway elements should also be considered near the limits of the campus as they are also effective at modifying driver behavior and mindset.	DCDPW, Bard	-	-	\$125,000
B-7	Extend the sidewalk along CR 103 (Annandale Road) from Campus Road to NYS Route 9G.	DCDPW	NYSDOT	-	\$100,000
B-8	At the CR 103 intersection with Cruger Island Road, evaluate options for reconstructing the intersection as a perpendicular T-intersection to better control, channelize and facilitate efficient movements. Consider the access requirements for emergency responders and provide a turnaround area for fire trucks, if needed [See Exhibit A.3 in Appendix B for conceptual improvement plan for this intersection].	DCDPW	RH, Bard	\$25,000	\$75,000

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- (1) – Estimated order of magnitude costs, based on experience of professionals.
- (2) – Estimated Cost includes item cost, design & construction; Right-of-Way (ROW) costs not included.



The study recommends that DCDPW consider installing rectangular rapid flashing beacons (RRFBs) on CR 103 (Annandale Road).

Recommendations
CR 103 Study Intersection (Table 6)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
Long-Term (6 to 10 years)					
8. CR 103 & River Road Triangle					
8-1	Consider reconfiguring the River Road triangle with a one-way circulation system on 2 of the 3 “triangle legs” and add sidewalks and crosswalks connecting to the existing sidewalk along CR 103 (see below and Exhibit A.4 in Appendix B). Instituting a one-way circulation pattern reduces the number of conflict points, which would provide a safety benefit for motorists and pedestrians.	DCDPW	RH, Bard	\$35,000	\$175,000

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- (1) – Estimated order of magnitude costs, based on experience of professionals.
- (2) – Estimated Cost includes item cost, design & construction; Right-of-Way (ROW) costs not included.



Possible reconfiguration of River Road triangle into a partial one-way system.

Note: There are no intersection-specific recommendations for Intersection No. 1 (CR 78 & Montgomery Street/North Road) or Intersection No. 9 (Route 9G & Route 199). A gateway element, such as a roundabout, was suggested as a possible measure to better define the more active sections of Route 9G in the study area (such as Intersection No. 9). These intersections are included in corridor-wide improvements.

Recommendations
CR 78 Corridor-wide (Table 7)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
Mid-Term (2 to 5 years)					
C-1	Add a guiderail on the south side of Broadway, west of Dock Road.	DCDPW	Tivoli	-	\$16,000
C-2	Extend the sidewalk on one side of Broadway from Pine Street to the Hudson River. Also evaluate crosswalk locations and install crosswalks across intersecting roads along CR 78 (Broadway).	DCDPW	Tivoli	-	\$200,000
C-3	Request that NYSDOT change the functional classification of the portion CR 78 between NYS Route 9G and Montgomery Street/North Road from an Urban Major Collector to an Urban Minor Collector, to better fit the operating characteristics of CR 78 and to match the classification of CR 78 to the west of Montgomery Street/North Road. Typically, Minor Collectors are shorter in length, have lower speed limits and lower daily traffic volumes than Major Collectors. CR 78 within the Village of Tivoli is 1.3 miles long, has speed limits of 25 to 30 mph and carries between 200 and 2,260 vehicles per day.	NYSDOT, DCDPW, PDCTC	RH	\$1,500	-

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- (1) – Estimated order of magnitude costs, based on experience of professionals.
- (2) – Estimated Cost includes item cost, design & construction; Right-of-Way (ROW) costs not included.



A sidewalk on CR 72 in Pleasant Valley, similar to the one recommended for CR 78 (Broadway) in Tivoli.



Additional Guiderail



Example of a crosswalk in a downtown area

Recommendations
Transit (Table 8)

No.	Recommendation	Responsible Agencies		Estimated Costs ⁽¹⁾	
		Agency	Partner Agencies	Evaluation /Study	Physical Improvements ⁽²⁾
Immediate Term (within 1 year)					
T-1	Suggest that DCPT and Bard College consider negotiating bus passes for students and staff, subsidized by the College, on existing DCPT bus routes, modeled after the Marist & DCC programs with DCPT.	DCPT, Bard		-	-
Mid-Term (2 to 5 years)					
T-2	Install bus stop shelters with maps and schedules at bus stops within the study area.	DCPT	NYS DOT, DCDPW, Bard	-	\$63,000
T-3	Evaluate ridership levels of the Dutchess County Public Transit bus service in the Tivoli and Red Hook area and the Bard College shuttle bus service and adjust schedules and/or add more frequent service, as necessary.	DCPT	NYS DOT, DCDPW, Bard	\$5,000	-

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- (1) – Estimated order of magnitude costs, based on experience of professionals.
- (2) – Estimated Cost includes item cost, design & construction; Right-of-Way (ROW) costs not included.



Dutchess County Public Transit bus



Bard College Shuttle bus



Example of a bus stop shelter (Bard College).



iv. Estimated Costs

Order-of-magnitude costs associated with the recommendations listed in Tables 1 to 8 were estimated based on VHB’s knowledge and experience of construction practices in the region. The costs include three elements: evaluation/study to justify implementation of improvements, one-time physical improvement costs, and annual costs associated with educational and enforcement activities. The physical improvement cost estimates include design and contingencies but do not include right-of-way (ROW) costs as it is not clear at this time where ROW would be required or how much it would cost. Cost estimates were not developed for maintenance recommendations, as it is assumed that they will be funded as part of the State, County, Town and Village’s normal operational and maintenance budgets.

A summary of the total costs for all the recommendations is provided in the table immediately below. For a detailed list of the estimated costs, see the recommendations tables.

Table 9 – Estimate of Costs

Recommendation Type	Evaluation/Study	Physical Improvements		Total		Annual Education & Enforcement Activities
		From	To	From	To	
Total	\$312,000	\$6,610,000	\$15,440,000	\$6,922,000	\$15,752,000	\$20,000

As can be seen from Table 9, between \$6.6 million and \$15.4 million would be required to study, design and implement all of the recommendations. It is estimated that approximately \$6.5 million of the \$15.4 million (high end) estimate would be for the cost of acquiring right-of-way. In addition, it is estimated that, collectively, the County, Town, Village and College should be spending approximately \$20,000 annually on road safety education and enforcement activities.

The highest-cost recommendations include intersection reconstruction projects (Route 9G and CR 78; Route 9G and CR 79), the Route 9G widening project (to accommodate wider shoulders), shared-use paths/trail construction projects (Tivoli Bays Wildlife Management Area trail; Bard College to Montgomery Place shared-use path) and traffic calming measures along Route 9G.

At \$16,000, potentially the most cost-effective recommendation (if justified and implemented) would be to reduce the speed limit along those sections of Route 9G in the study area where it is currently 55 mph to 45 mph. This would provide a consistent 45 mph speed limit for all of Route 9G in the study area.

v. Maintenance Items

Several of the items identified in the development of recommendations were determined to be maintenance-related and should be added to scheduled maintenance projects and/or the frequency of performing the maintenance should be increased. All of these maintenance items are important as they



Upper Route 9G Corridor Management Plan

will preserve safety and they should be implemented as soon as the resources are available. The maintenance-related improvements are summarized in Tables M-1 to M-3 in Appendix B.

vi. Conclusions

This Upper Route 9G CMP is based upon an extensive and thorough evaluation of the corridors' geometric conditions, roadway infrastructure, and traffic volume and traffic safety history. It presents the consensus recommendations for corridor and intersection safety improvements in the study area. The technical Advisory Committee developed the recommendations based on this in-depth assessment of existing roadway, pedestrian, and safety conditions in the study area, in addition to public input. The key recommendations of the CMP are summarized below:

- Travel lanes and shoulders on the study corridors should be improved (shoulders widened and roadway repaved from edge to edge, as needed) to better accommodate the intended users.
- Sidewalks and trails should be added to improve pedestrian access between the Village of Tivoli, Bard College and other destinations.
- Roadways should be posted and designed to encourage safe travel at appropriate speeds.
- Identified factors contributing to prevalent crash types such as fixed object crashes, run off the road crashes and vehicle/animal crashes should be remedied.
- Immediate-Term (within one year) safety recommendations are generally related to improving the delineation of intersections as well as implementing speed reductions and increasing enforcement efforts.
- Mid-Term (2 to 5 years) and Long-Term (6 to 10 years) recommendations include more significant improvements, such as adding/extending shared-use paths and sidewalks, modifying roadway profiles, and redesigning intersections.
- NYSDOT has begun a study to evaluate a possible redesign of the Route 9G intersection with CR 78 (West Kerley Corners Rd/Broadway).
- Bard College, with input from Dutchess County, is beginning a new Campus Master Plan which will propose a context sensitive redesign of CR 103.



Based on the extensive study and evaluation conducted for the Upper Route 9G Corridor Management Plan, the technical Advisory Committee is confident that the recommended improvements, if implemented, will effectively address identified safety issues and provide a benefit to people walking, bicycling, driving, and using transit in the study area.



Appendix A

Public Meeting Summaries

Public Workshops

Technical Advisory Committee Meetings

Stakeholder Meetings

Compilation of Comments Received

(Included as a separate document due to length)



Appendix B

Maintenance Items

Tables M-1 to M-3



Table M-1 - Maintenance Improvements – NYS Route 9G

No.	Maintenance Improvements	Agency	Partner Agencies
NYS Route 9G - Corridor-wide			
M-1	Trim vegetation and/or relocate signs to avoid sign obstructions. Continue vegetation trimming operations to maintain a clear roadside, clear visibility of signs and maximize sight distance conditions.	NYSDOT	DCDPW
M-2	Replace all damaged guiderail along NYS Route 9G within the study area.	NYSDOT	
M-3	Restripe the pavement markings along NYS Route 9G and side street approaches using an epoxy, which has high retroreflective characteristics and is more durable than paint.	NYSDOT	DCDPW, RH, Tivoli
M-4	Replace the attraction sign along the northbound NYS Route 9G approach to River Road/Kelly Road to improve sign retro-reflectivity.	NYSDOT	
M-5	Perform a review of existing street name signing and upgrade with new signs with standard font size and type.	NYSDOT	DCDPW, RH, Tivoli
M-6	Install additional Deer Crossing warning signs at appropriate locations to be determined by NYSDOT, such as along Route 9G between Route 199 and Bard Entrance Road and between Whalesback Road and Budds Corners Road, areas with a pattern of vehicle vs. animal crashes.	NYSDOT	
M-7	Evaluate the location of existing driveway warning signs or, potentially, other options, such as improving sight distance or consolidating driveways (particularly if there are multiple driveways in close proximity).	NYSDOT	
Route 9G & Kidd Lane			
M-8	Evaluate the location of the existing intersection warning signs along the northbound and southbound NYS Route 9G approaches to Kidd Lane.	NYSDOT	
M-9	Repave the shoulder on the north side of Kidd Lane at its intersection with Route 9G.	RH	NYSDOT
Route 9G & CR 79 (Budds Corners Road)			
M-10	Replace broken, bent guiderails at the intersection of CR 79 (Budds Corners Road) with Route 9G.	NYSDOT, DCDPW	
M-11	Repave CR 79 (Budds Corners Road) travel lanes and shoulder near the intersection with Route 9G.	DCDPW	NYSDOT
M-12	Improve visibility from CR 79 onto Route 9G by cutting back vegetation to improve sight lines. All ongoing efforts to maintain sight lines at the intersection should be included as part of a normal maintenance program.	NYSDOT	DCDPW
Route 9G & Old Whalesback Road/CR 103			
M-13	Repaint stop bars on Old Whalesback Road.	RH	NYSDOT
Route 9G & Bard College Entrance Road			
M-14	Remove existing “No Stopping Any Time” signs along NYS Route 9G in the vicinity of the Bard College Entrance Road.	NYSDOT	

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Upper Route 9G Corridor Management Plan

Table M-2 - Maintenance Improvements – CR 103 (Annandale Road)

No.	Maintenance Improvements	Agency	Partner Agencies
CR 103 - Corridor-wide			
M-15	Check mounting height of signs and adjust as appropriate (observations indicate that a stop sign on the westbound River Road approach to CR 103 (Annandale Road) appears to be too high).	DCDPW	-
M-16	Trim vegetation and/or relocate signs to avoid sign obstructions. Continue vegetation trimming operations to maintain a clear roadside, clear visibility of signs and maximize sight distance conditions.	DCDPW	-
M-17	Restripe all pavement markings, including pedestrian crosswalks, double yellow centerlines, edge lines and stop lines along CR 103 (Annandale Rd) between south and north Campus Road using high visibility, durable pavement markings to better delineate proper paths for pedestrians and motorists and provide an increased awareness of pedestrians by motorists.	DCDPW	Bard
M-18	All proposed and existing use of in-road pedestrian crosswalk warning signing should conform to the requirements of the most current MUTCD which requires that in-road pedestrian crossing signs be placed in the roadway at the crosswalk location on the center line. Many of the existing signs are placed in advance of the crosswalks.	DCDPW	Bard
M-19	Relocate the 25 MPH speed limit sign along CR 103 (Annandale Rd) just west of NYS Route 9G, further to the west to increase visibility.	DCDPW	-
M-20	Relocate the 25 MPH speed limit sign along northbound CR 103 (Annandale Rd) from just north of the Sawkill Creek bridge, to the south side of the bridge, opposite the 40 mph speed limit sign on southbound CR 103.	DCDPW	-
M-21	The existing pedestrian crosswalk warning signs along CR 103 should be reviewed for conformance to the requirements of the most current Manual of Uniform Traffic Control Devices (MUTCD). If necessary, upgrade pedestrian signage by installing new conforming signs using Type XI prismatic fluorescent yellow-green sheeting material (see Exhibit A.1 in Appendix C for typical layout for pedestrian crosswalk signing and striping).	DCDPW	RH, Bard

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Table M-3 - Maintenance Improvements – CR 78 (West Kerley Corners Rd/Broadway)

No.	Maintenance Improvements	Agency	Partner Agencies
CR 78 - Corridor-wide			
M-22	Add pavement markings to delineate on-street parking spaces along both sides of CR 78 (Broadway) east and west of Montgomery Street/North Road.	DCDPW	Tivoli
M-23	Trim vegetation and/or relocate signs to avoid sign obstructions. Continue vegetation trimming operations to maintain a clear roadside, clear visibility of signs and maximize sight distance conditions.	DCDPW	Tivoli, RH
M-24	Install route marker signs at the westbound CR 78 (West Kerley Corners Rd) approach to NYS Route 9G.	DCDPW	NYSDOT

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Appendix C

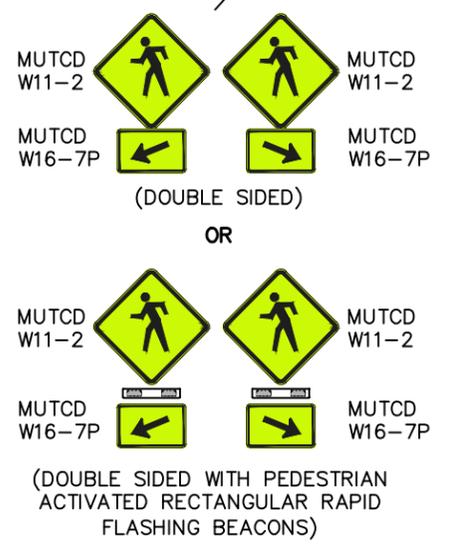
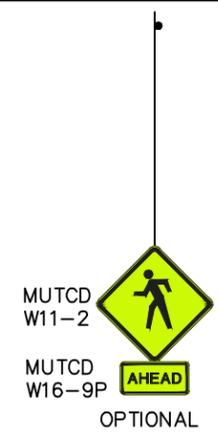
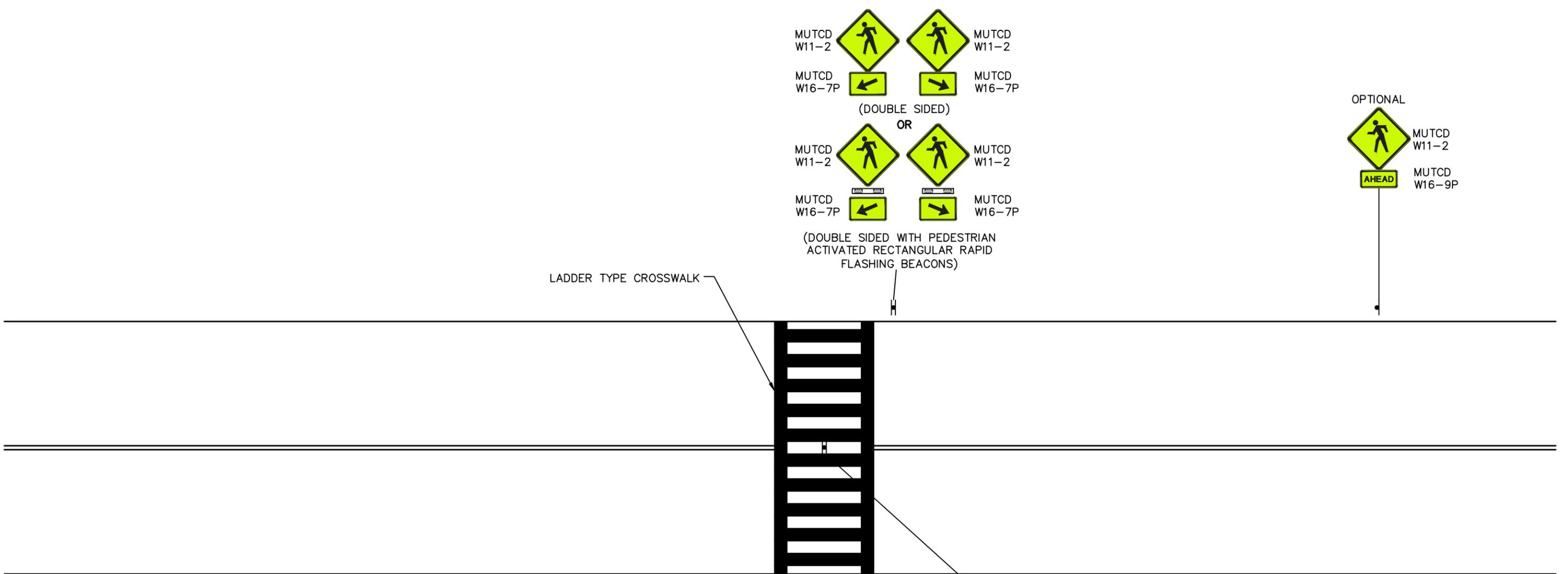
Conceptual Plans

Exhibit A.1 – CR 103 Pedestrian Crosswalk Signing and Striping

Exhibit A.2 – NYS Route 9G & CR 79 (Budds Corners Road)

Exhibit A.3 – CR 103 (Annandale Road) & Cruger Island Road

Exhibit A.4 – CR 103 (Annandale Road) & River Road Triangle Intersection



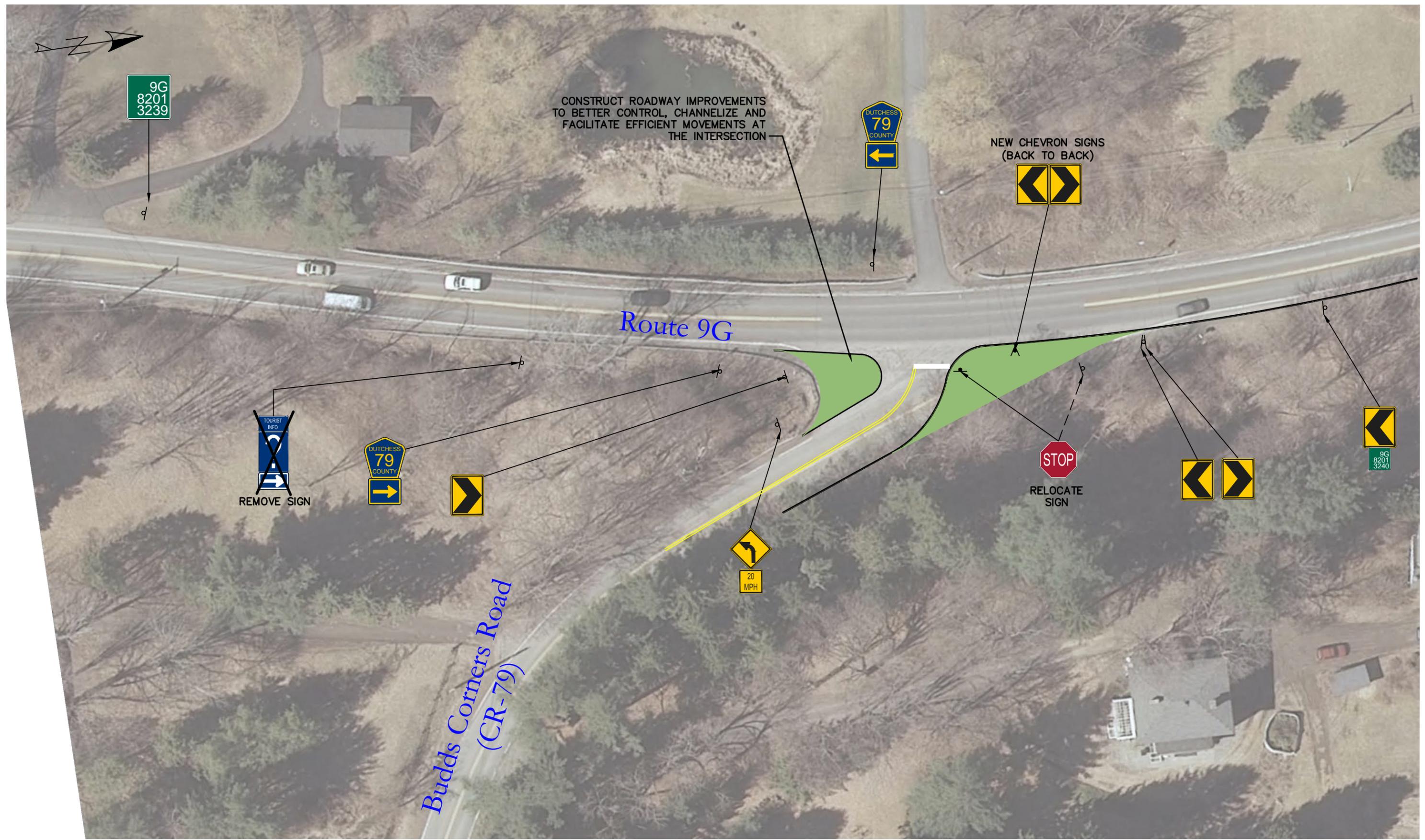
IF IN-STREET PEDESTRIAN CROSSING SIGNS ARE TO BE USED, THEY SHOULD BE PLACED IN THE ROADWAY AT THE CROSSWALK LOCATED ON THE CENTERLINE, ON A LANE LINE, OR IN A MEDIAN ISLAND.

AN IN-STREET PEDESTRIAN CROSSING SIGN SHALL NOT BE PLACED IN ADVANCE OF THE CROSSWALK

NOTES:

1. IT IS RECOMMENDED THAT NEW PEDESTRIAN CROSSWALK SIGNS USE TYPE XI PRISMATIC FLUORESCENT YELLOW-GREEN SHEETING MATERIAL.
2. IT IS RECOMMENDED THAT NEW PEDESTRIAN CROSSWALK MARKINGS USE HIGH VISIBILITY, DURABLE PAVEMENT MARKING MATERIAL.

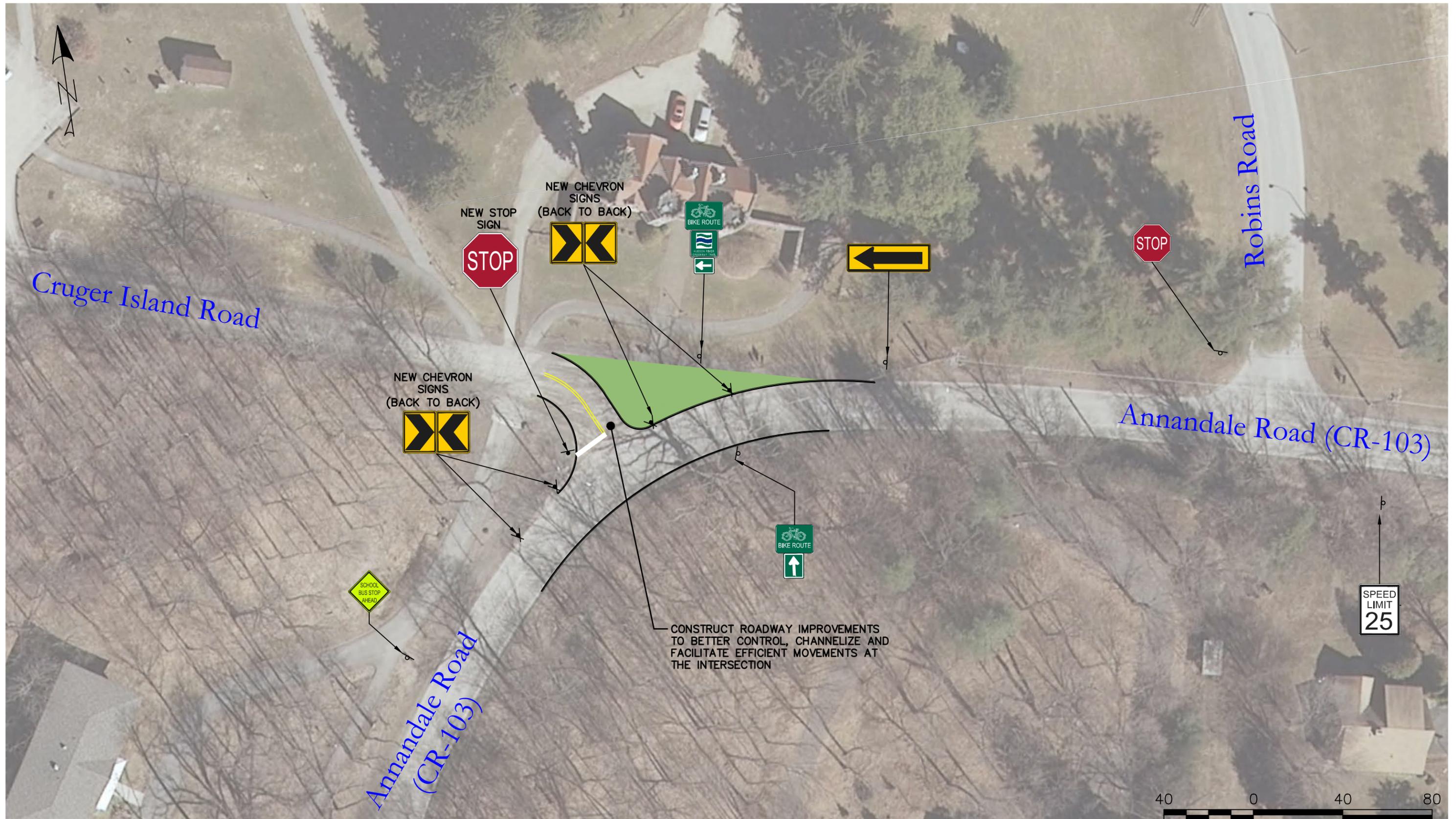




ALL SIGNS ARE EXISTING UNLESS OTHERWISE SHOWN



UPPER ROUTE 9G CORRIDOR MANAGEMENT PLAN Conceptual Improvement Plan			
MUNICIPALITY:	Town of Red Hook	COUNTY:	Dutchess
FILE:	29418.00		
LOCATION:	NYS Route 9G at Budds Corners Road (CR-79)		
BY:	AG		
SCALE:	1"=40'	DATE:	9/2015
			EXHIBIT A.2



ALL SIGNS ARE EXISTING UNLESS OTHERWISE SHOWN



**UPPER ROUTE 9G CORRIDOR MANAGEMENT PLAN
Conceptual Improvement Plan**

MUNICIPALITY: Town of Red Hook COUNTY: Dutchess FILE: 29418.00
 LOCATION: Annandale Road (CR-103) at Cruger Island Road
 BY: AG EXHIBIT **A.3**
 SCALE: 1"=40' DATE: 9/2015



Existing



Proposed

