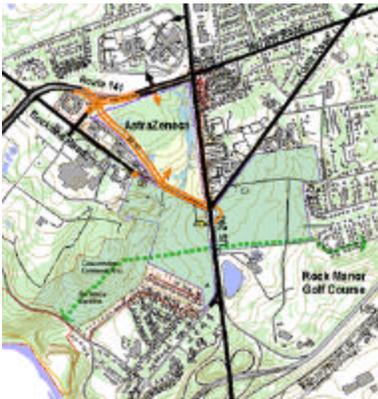


II. BLUE BALL PROPERTIES MASTER PLANNING

A. Summary of Transportation Options Considered

Following the Master Planning Process (Fall 1999), conceptual roadway options were freely developed for each of the three major roadway components associated with the project: Delaware Route 141, Augustine Cut-Off, and Foulk Road. Each of the options considered for these roadway components are summarized below.

Delaware Route 141 Improvement Options (areas highlighted in orange)



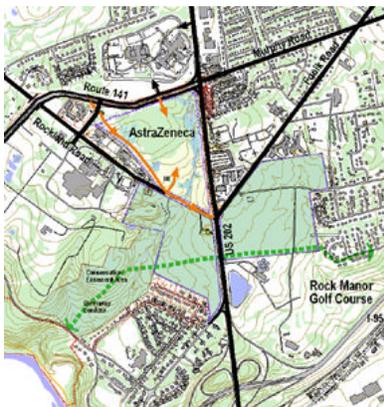
Option I:

Delaware Route 141 would be relocated to the southern end of the AstraZeneca Triangle, intersecting with U.S. Route 202 at the existing location of the Rockland Road/Foulk Road intersection. The intersection at U.S. Route 202 would include a jughandle or underpass to facilitate left turns to Alternate Route 141 (the 141 “Spur”) for northbound traffic on U.S. Route 202. Existing Delaware Route 141 would be retained as a two-way roadway.



Option II:

A two-way Alternate Route 141 would be built along the southern end of the AstraZeneca Triangle, intersecting with U.S. Route 202 at the existing location of the Rockland Road/Foulk Road intersection. The intersection at US Route 202 would include a jughandle or underpass to facilitate left turns to Alternate Route 141 for northbound traffic on US Route 202. Existing Delaware Route 141 would become a one-way westbound roadway between U.S. Route 202 and Childrens Drive (the easternmost section of existing Delaware Route 141 could be considered for two-way circulation to the AstraZeneca site).



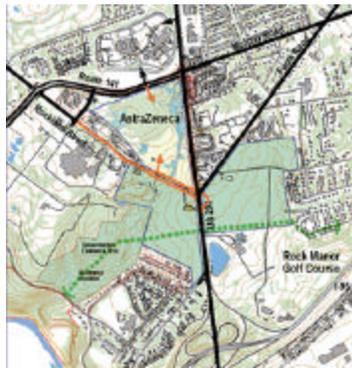
Option III:

A one-way eastbound Alternate Route 141 would be built along the southern end of the AstraZeneca Triangle, intersecting with U.S. Route 202 at the existing location of the Rockland Road/Foulk Road intersection. This option would retain existing Delaware Route 141 as a two-way roadway. No jughandle will be needed because there are no left hand turns from northbound U.S. Route 202 to Alternate Route 141 possible in this option.



Option IV:

This option for Delaware Route 141 is a one-way pair, formed by retaining Existing Delaware Route 141 as a one-way westbound roadway, and by building a new one-way eastbound Alternate Route 141 along the southern end of the AstraZeneca Triangle. No jughandle will be needed because there are no left hand turns from northbound U.S. Route 202 to Alternate Route 141 possible in this option. The easternmost section of existing Delaware Route 141 could allow two-way circulation to the AstraZeneca site.



Option V:

This option would widen Rockland Road from Childrens Drive to U.S. Route 202, intersecting U.S. Route 202 at the existing location of the Rockland Road/Foulk Road intersection. The options take advantage of the existing easement for widening set aside on the north side of Rockland Road. The intersection with U.S. Route 202 would include a jughandle or underpass to facilitate left turns to Rockland Road for northbound traffic on Concord Pike. No change is proposed for Rockland Road west of Childrens Drive. Existing Delaware Route 141 would be retained as a two-way roadway.



Option Va:

In this modification to *Option V*, the section of Rockland Road between the proposed entrance to the AstraZeneca site and Childrens Drive would be severed by the introduction of two cul-de-sacs. The eastern portion of Rockland Road would provide access to AstraZeneca; the western portion of the road would provide access to the A.I. DuPont Institute, Ronald McDonald House and other properties in this area.



Option Vb:

In this version of *Option V*, westbound traffic on Rockland Road, when it reaches Childrens Drive, would be forced to turn right on to Childrens Drive, or left into the A. I. DuPont Institute. Eastbound traffic on Rockland Road would not be affected.



Option VI:

This option requires the construction of an Alternate Route 141 along the southern end of the AstraZeneca Triangle, intersecting with U.S. Route 202 at the existing location of the Rockland Road/Foulk Road intersection. The intersection at U.S. Route 202 would include a jughandle or underpass to facilitate left turns to Alternate Route 141 for northbound traffic on U.S. Route 202. This option would close existing Delaware Route 141 between Childrens Drive and U.S. Route 202 to all traffic except AstraZeneca traffic.



Option VII:

This option requires the construction of an Alternate Route 141 along the southern edge of the AstraZeneca Triangle, with an at-grade intersection with U.S. Route 202 in front of the Independence Mall Shopping Center.

Augustine Cut-Off Improvement Options



Option A:

Retain the existing intersection of Augustine Cut-Off with US Route 202 without any changes.



Option AA:

This modification to Option A would retain the existing intersection of Augustine Cut-Off with U.S. Route 202, but not permit left turns to or from U.S. Route 202. Existing left-turn traffic would be diverted to alternate local roadways.



Option B:

Build a bridge over U.S. Route 202 south of the reservoir and extend Augustine Cut-Off to a new intersection with Foulk and Weldin Roads.



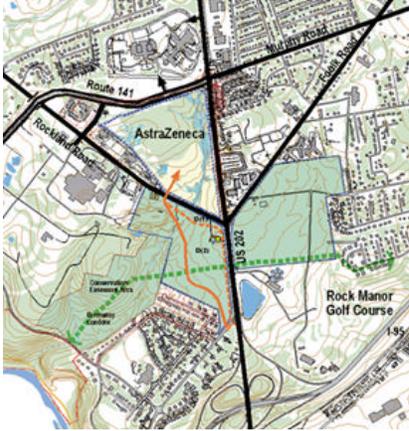
Option C:

Build an underpass below U.S. Route 202 north of the reservoir site. This road would then run easterly along the southern boundary of the Weldin Road tract before swinging north to connect with a relocated Weldin Road and Foulk Road. This road (open at all times to public circulation) could be used to define the eastern edge of the state park. The underpass could also accommodate a greenway crossing of U.S. Route 202.



Option CC:

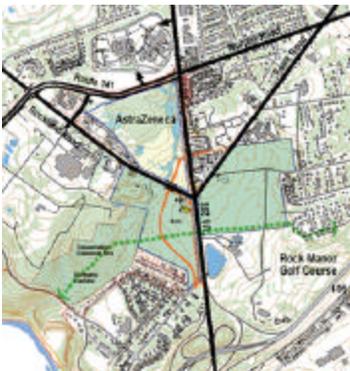
Extend the Augustine Cut-Off parallel to U.S. Route 202, along its west side, and intersect U.S. Route 202 farther north. The intersection could be aligned with the entrance to the city's water treatment facility, or that entrance could be closed and the intersection moved farther north.



Option D:

Extend the Augustine Cut-Off parallel to U.S. Route 202, along its west side, locating it either to the north or the south of the barn, and then connect it to either existing Rockland Road or a new Alternate Route 141 just east of the Ronald McDonald House. *Sub-option D(1)* swings the road north of the barn. In this case, the barn, which is located close to U.S. Route 202, would probably need to be relocated (if feasible) to the south. *Sub-option D(2)* swings the road to the south of the barn. In this option, the barn would not need to be moved, and the road could be used to separate a natural conservation area from active recreation areas in the future park.

In either case, the new extension of the Augustine Cut-Off would intersect either existing Rockland Road or a new Alternate Route 141 just east of the Ronald McDonald House. This intersection could also provide access to the AstraZeneca triangle.



Option E:

Extend the Augustine Cut-Off parallel to Concord Pike, along its west side, locating it either to the north or the south of the barn, and then connect it to U.S. Route 202 just south of Independence Mall or at the existing signalized intersection at Independence Mall. This roadway could be extended across U.S. Route 202, in combination with *Option 2* for Foulk Road, as discussed below. In this option the extension for the Augustine Cut-Off would pass under rebuilt Rockland Road or a new Alternate Route 141. As with *Option D*, two sub-options exist for the location of the road in relation to the historic barn.

Foulk Road Improvement Options



Option 1:

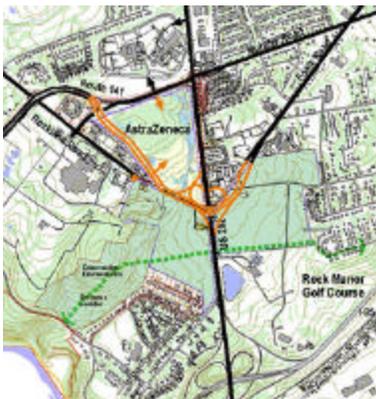
Leave Foulk Road in its present location and function where it intersects U.S. Route 202.



Option 2:
Relocate Foulk Road to immediately south of the Independence Mall Shopping Center.



Option 3:
Connect Foulk Road to U.S. Route 202 with a grade-separated intersection. Southbound traffic on Foulk Road would pass under U.S. Route 202 to the south of the Blue Ball barn before merging with U.S. Route 202. Northbound traffic on US Route 202 would have a right turn lane directly onto Foulk Road. No left turns for traffic on U.S. Route 202 would be permitted onto Foulk Road. Southbound traffic on Foulk Road attempting to go north on U.S. Route 202 could be accommodated with a new one-way connection through the existing parking lot of the Brandywine Plaza office development.



Option 4:
Connect new Alternate Route 141 with Foulk Road via an underpass with U.S. Route 202. Construct a half cloverleaf intersection to the north of the underpass to facilitate connections between U.S. Route 202 and Alternate Route 141/Foulk Road.

B. Evaluation and Screening of Transportation Options

Due to the large number of options (and combinations) suggested by the committees and public involvement process, an initial screening process was developed.

In the initial screening process, options were dismissed or carried forward for further analysis/refinement for the following reasons:

- The option would not meet the “no degradation” criteria, or, if designed to meet the “no degradation” criteria, the option would create unacceptable impacts to surrounding communities, proposed parkland, or natural and cultural resources.
- The option would not provide acceptable access to the A.I. DuPont Hospital and other businesses and residential areas.
- The option would significantly increase traffic on local roads.
- The option would cause unacceptable loss of land and potentially preclude the AstraZeneca expansion.
- The option would be impracticable to construct or would create unacceptable maintenance and protection of traffic issues during construction.

Table II-1 lists each option and the reason for its dismissal during the initial screening process. A description of the options retained is presented below.

Delaware Route 141 Options Retained - Of the seven options for Delaware Route 141, only two (2) options were carried forward. Each included a relocated Delaware Route 141 (later termed the Route 141 Spur) to be located on the south side of the triangle property. *Option I* allowed existing Delaware Route 141 to remain open to general traffic, while *Option VI* closed existing Delaware Route 141 (between U.S. Route 202 and Childrens Drive) to traffic (AstraZeneca traffic would use this vacated roadway as an internal access drive.)

Augustine Cut-Off Options Retained - To most effectively interconnect the local road system, separate local from regional traffic, and provide access to the recreation facilities, it was decided to combine the three remaining Augustine Cut-Off options (*Options AA, C and D*). This combination would allow right-in/right-out movement at the existing U.S. Route 202/Augustine Cut-Off intersection, and would include both west side and east side local roads (Eastpark Drive and Westpark Drive), connected by an underpass of U.S. Route 202 (shared with a “greenway crossing”, a non-motorized multi purpose trail). However, safety concerns were raised over the right-in/right-out operations at the intersection of U.S. Route 202/Augustine Cut-Off, as well as the possibility of traffic being diverted onto city streets just south of the study area. Further options were later developed for Augustine Cut-Off area. These are presented in the next section.

Foulk Road Options Retained - One option was carried forward for Foulk Road (*Option 1* – leave Foulk Road in its current location).

**TABLE II-1
Initial Screening of Transportation Options**

Option	Status	Comments
Delaware Route 141 Options		
Option I	Retained	This option did not have any apparent fatal flaws at this point in the analysis.
Option II	Dismissed	This option would force all eastbound Delaware Route 141 traffic onto Foulk Road, causing an unacceptable increase in traffic on this roadway.
Option III	Dismissed	This option would require a grade-separated interchange at the intersection of U.S. Route 202/Existing Delaware Route 141/Murphy Road, resulting in unacceptable impacts to the surrounding community.
Option IV	Dismissed	This option would require an optimal grade-separated interchange at the intersection of U.S. Route 202/Existing Delaware Route 141/Murphy Road, which would result in unacceptable impacts to the surrounding community.
Option V	Dismissed	This option would cause the U.S. Route 202/Existing Delaware Route 141/Murphy Road intersection to fail the “no degradation” criteria, and would not provide acceptable access to the A.I. DuPont Hospital and other facilities.
Option VI	Retained	This option did not have any apparent fatal flaws at this point in the analysis.
Option VII	Dismissed	This option would result in an unacceptable loss of land for the AstraZeneca development and would incur significant wetland losses.
Augustine Cut-Off Options		
Option A	Dismissed	This option would cause the U.S. Route 202/Augustine Cut-Off intersection to fail the “no degradation” criteria.
Option AA	Retained	This option, combined with Option C and Option D, would provide an interconnected local road system that effectively separates local traffic from regional traffic, and would provide access to proposed parks and the Blue Ball Barn.
Option B	Dismissed	This option included difficult constructability issues and would create difficult maintenance and protection of traffic issues during construction.
Option C	Retained	This option, combined with Option AA and Option D, would provide an interconnected local road system that effectively separates local traffic from regional traffic, and would provide access to proposed parks and the Blue Ball Barn.
Option CC	Dismissed	This option would cause the U.S. Route 202/Augustine Cut-Off intersection to fail the “no degradation” criteria.
Option D	Retained	This option, combined with Option AA and Option C, would provide an interconnected local road system that effectively separates local traffic from regional traffic, and would provide access to proposed parks and the Blue Ball Barn.
Option E	Dismissed	This option would result in an unacceptable loss of land to areas of planned land development.
Foulk Road Options		
Option 1	Retained	This option did not have any apparent fatal flaws at this point in the analysis and minimizes impacts to wetlands and waterways.
Option 2	Dismissed	This option would result in unacceptable community impacts.
Option 3	Dismissed	This option would result in unacceptable loss of land to proposed parks and unacceptable impacts to cultural resources.
Option 4	Dismissed	This option would result in unacceptable loss of land to proposed parks consistent with the Blue Ball Master Plan, and would incur impacts to eligible cultural resources.

C. Defining a Preferred Master Plan Transportation Concept

Based on the results of the transportation option screening process and public input, a limited number of options for Delaware Route 141, Augustine Cut-Off, and Foulk Road were carried forward (*Figure 5: Development of Master Plan Transportation Options*).

To further refine the project alternatives development process, the best options carried forward were combined to form the transportation concepts that would best address the project needs and minimize impacts to the area's resources. As a result, two (2) complete transportation concepts were developed including a combination of options carried forward, differing primarily at existing Delaware Route 141 between Children's Drive and U.S. Route 202.

The first complete transportation concept would include the Delaware Route 141 Spur while maintaining the operation of existing Delaware Route 141. This concept would also include the combined Augustine Cut-Off option and would maintain Foulk Road in its present location.

The second transportation concept would include the Delaware Route 141 Spur while converting existing Delaware Route 141 to a private access road for the AstraZeneca Pharmaceutical company. This concept would also include the combined Augustine Cut-Off option and would maintain Foulk Road in its present location.

Additional analysis was then conducted for these two (2) remaining options for existing Delaware Route 141 between Childrens Drive and U.S. Route 202. Both options meet the "no degradation" criteria, however, based on input from the public and the Transportation Committee, it was recommended that existing Delaware Route 141 remain open to general traffic. Therefore, keeping existing Delaware Route 141 open to traffic was incorporated with the other combined options to further formulate the Preferred Master Plan Transportation Concept.

D. Other Issues and Refinements

To further refine the transportation options that resulted from coordination with the Transportation Committee and the public, and develop a preferred transportation concept, options at the following locations within the project study area were evaluated in detail.

U.S. 202/Foulk Road/141 Spur Interchange

- Bow Tie Option vs. Diamond Option

U.S. 202 and Augustine Cut-Off

- Partial signal (right-out and left-in) vs. no direct connection

New Route 141 at Childrens Drive

- Move Childrens Drive farther south on Rockland Road vs. four-leg intersection at existing Childrens Drive

BLUE BALL PROPERTIES MASTER PLAN DEVELOPMENT OF TRANSPORTATION OPTIONS

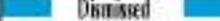
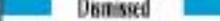
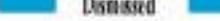
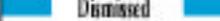
Master Plan Transportation Options	Dismissed / Retained	Refined Transportation Options	Dismissed / Retained	Master Plan Transportation Concept
Delaware Route 141 Options Option I Option II Option III Option IV Option V Option Va Option Vb Option VI Option VII	        	Option I Build Route 141 Spur and retain existing Route 141 to be retained as a two-way roadway. Option VI Build Route 141 Spur and retain existing Route 141 to accommodate Astra Zenica traffic only.	 	Route 141 Option I
Augustine Cut-off Options Option A Option AA Option B Option C Option CC Option D Option E	      	Option AA Option C Option D Full Traffic Signal Allow all movements at signalized intersection. Right-In/Right-Out Southbound right turns into Augustine Cut-Off eastbound right turns onto US 202. Fully Relocated Access Eliminate connection to US 202. Partial Traffic Signal Retain signal eastbound right turns with a left turn	      	Augustine Cut-off Partial Traffic Signal
Foulk Road Options Option 1 Option 2 Option 3 Option 4	   	Option 1 Retain Foulk Road at existing location.		Foulk Road Option 1
US Route 202 / Foulk Road / Route 141 Spur Interchange Bow-Tie Option Diamond Option	 	Bow-Tie Option Loop ramps are provided to serve the westbound to southbound traffic movement, as well as eastbound to north bound. Diamond Option This option brings the two movements served by the loops of the "Bow-Tie" option straight into a signalized intersection with US Route 202.	 	Route 141 / US 202 Diamond Interchange
Childrens Drive Three-Leg Option Four-Leg Option Relocated Childrens Drive Option	  	Four-Leg Option Existing Route 141, the Route 141 spur and Childrens Drive would form a four-leg intersection.		Childrens Drive Four-Leg Option

Figure 5

Rockland Road

- Cul-de-sac south of Ronald McDonald House vs. extended south to connect with local access roads.

U.S. Route 202/Foulk Road/Route 141 Spur Interchange - Throughout the transportation planning effort, several interchange options were discussed at the intersection of U.S. Route 202, Foulk Road, and the Route 141 Spur. Based on traffic modeling and analysis, a grade-separated interchange would be required, rather than an at-grade intersection. However, in order to improve traffic flow and reduce vehicle delays, interchange options restricted some traffic movements to local roads. The consensus of the Transportation Committee was that all moves should be provided at every intersection, to the extent possible. In applying this philosophy, two interchange options emerged which were ultimately named the “Bow Tie” option, and the “Diamond” option.

The “Bow Tie” option (***Figure 6***) eliminates the traffic signal on U.S. Route 202, but would introduce two additional signals on Foulk Road/Route 141 Spur. All traffic movements would be served by this option. Loop ramps (which resemble a bow tie) would be provided to serve the westbound to southbound traffic movement, as well as the eastbound to northbound traffic movement.

Traveling northbound on U.S. Route 202, only traffic exiting from I-95 can access the off-ramp to Foulk Road/Route 141 Spur. Traffic exiting I-95 will be able to take the off-ramp to Foulk Road/Route 141 Spur, or continue north onto U.S. Route 202. A barrier would be located on U.S. Route 202, restricting traffic originating in the city from taking the off-ramp to Foulk Road/Route 141 Spur, due to insufficient weave distances. Instead, traffic wishing to make this movement would be able to utilize a connector road just north of the interchange, and south of Independence Mall. This connector road would be right-in/right-out at the intersection with U.S. Route 202, and will intersect Foulk Road and a connector road from Weldin Road at a full signalized intersection.

The “Diamond” option (***Figure 7***), is a modified diamond-type interchange. This option would retain the traffic signal on U.S. Route 202, and would also introduce two additional signals onto Foulk Road/Route 141 Spur. All traffic movements would be served by this option. The principal difference between this option and the “Bow Tie” option is that this option would bring the two movements served by the loops of the “Bow Tie” option straight into a signalized intersection with U.S. Route 202. This allows the interchange to have sufficiently less impact on the surrounding land, which is planned to be developed for recreational use and storm water management. All other movements provided are the same for the “Diamond” option as for the “Bow Tie” option, including the barrier on northbound U.S. Route 202 and the connector road south of Independence Mall.

Both options would meet the “no degradation” traffic performance criteria. However, the “Diamond” option would use less land and be more compatible with planned land use and the proposed recreation facility development. The “Diamond” option was incorporated into the Preferred Master Plan Transportation Concept.

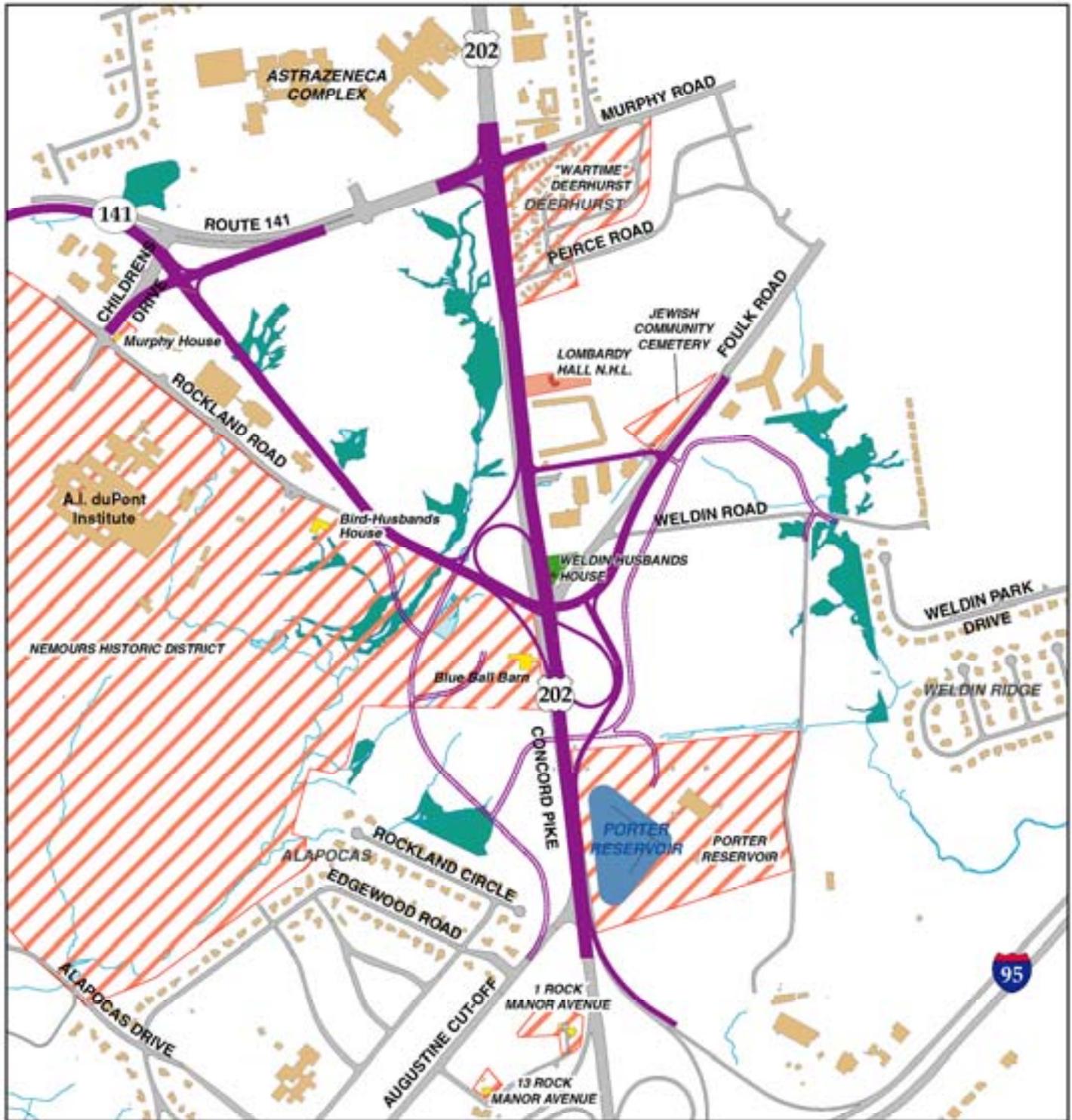
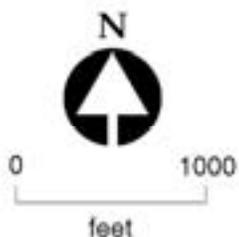


FIGURE 6: COMPLETE MASTER PLAN TRANSPORTATION CONCEPT WITH "BOW TIE" OPTION



- Wetland
- National Historic Landmark (N.H.L.)
- National Register Eligible Property
- Locally Significant Historic House



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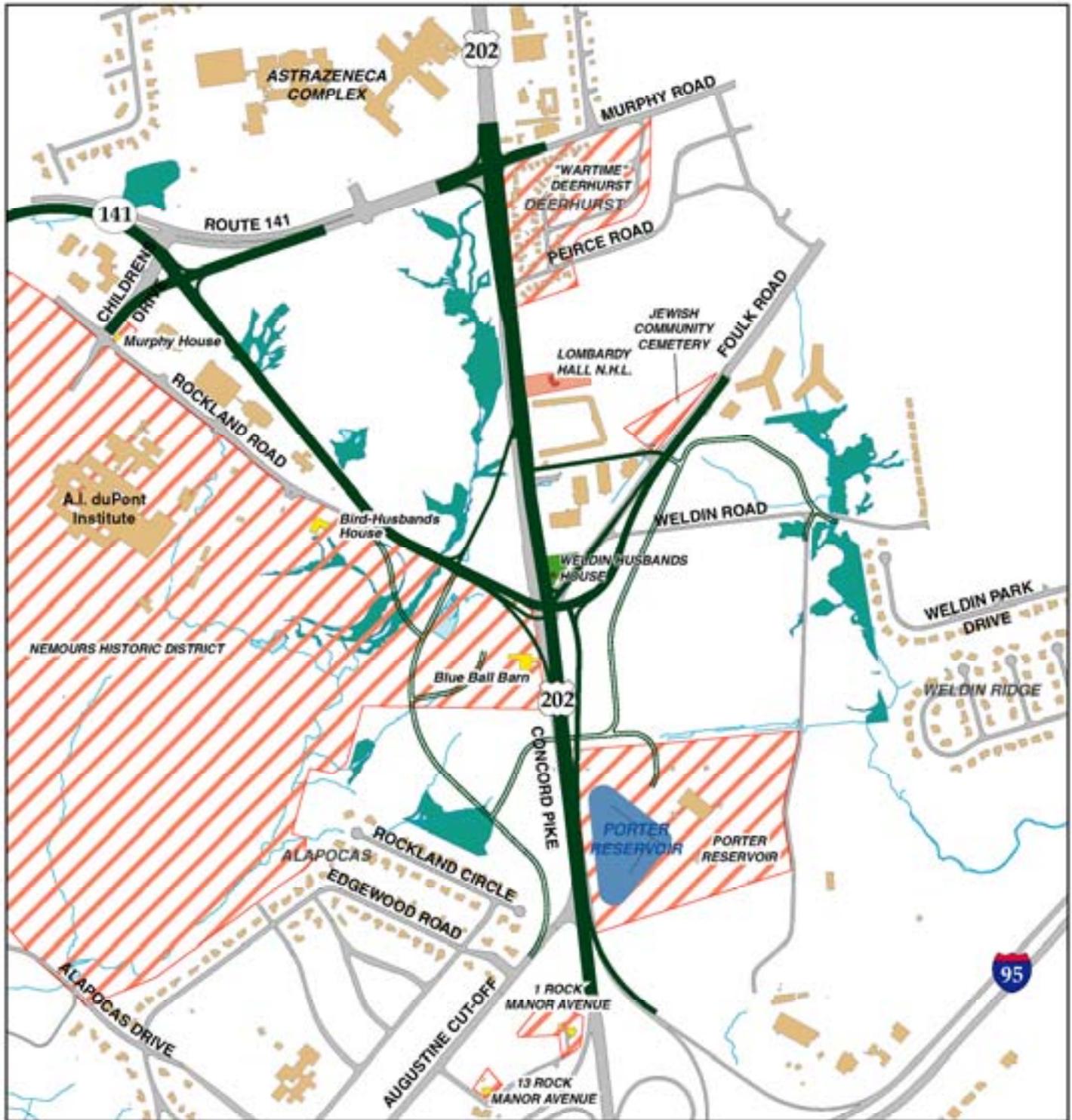
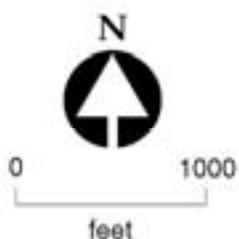


FIGURE 7: COMPLETE MASTER PLAN TRANSPORTATION CONCEPT WITH "DIAMOND" OPTION



- Wetland
- National Historic Landmark (N.H.L.)
- National Register Eligible Property
- Locally Significant Historic House



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U.S. Route 202/Augustine Cut-Off Intersection- Based on public concern and Transportation Committee input, the U.S. Route 202/Augustine Cut-Off intersection was studied further during the refinement of transportation options. Four options were considered:

- *Full Traffic Signal.* This option would continue to allow all movements at this signalized intersection, without making any changes from its current configuration. This option would not meet the “no degradation” criteria, and was therefore dismissed.
- *Right-In/Right-Out.* This option would eliminate the traffic signal on U.S. Route 202, and allow only southbound right-turns into Augustine Cut-Off, and eastbound right turns onto U.S. Route 202. However, because the eastbound right turns would have severe difficulty in merging with the heavy southbound U.S. Route 202 traffic, this option would not meet the “no degradation” criteria. Therefore, this option was dismissed.
- *Fully Relocated Access.* This option would eliminate any connection between U.S. Route 202 and Augustine Cut-Off at their current intersection. All traffic would be forced to utilize the east and/or west side local roads to access the Route 141 Spur or Foulk Road, which would then lead to U.S. Route 202. This option would meet the “no degradation” criteria. Nearly all of the safety problems associated with the existing U.S. Route 202/Augustine Cut-Off intersection would be addressed by this option. However, all traffic patterns in the area would be significantly altered, resulting in some diversions on Wilmington city streets, including Broom Street and 18th Street. In addition, public and committee members were generally opposed to this option. The option was dismissed from further consideration.
- *Partial Traffic Signal.* This option would retain the traffic signal at the intersection, but only allow the eastbound right turn, and the northbound left turn. As these are the two lightest traffic movements at the intersection, the signal timings could be set up so that this intersection satisfies the “no degradation” criteria. Additionally, these two traffic movements would divert onto nearby city streets (such as Broom Street and 18th Street), if not provided directly at this intersection. The other turn movements at this intersection (the eastbound left turn and southbound right turn) would be relocated to the east and/or west side local roads. Many of the safety problems associated with the existing U.S. Route 202/Augustine Cut-Off intersection would be addressed by this option. Based on these results and support from the public and committee members, the “Partial Signal” option was incorporated into the preferred transportation concept.

Childrens Drive - Three options were evaluated at the intersection of existing Delaware Route 141, the Route 141 Spur, and Childrens Drive. They included:

- *Three-Leg Option.* This option would leave existing Delaware Route 141 essentially unchanged, and bring the Route 141 Spur into a T-intersection with Existing Delaware Route 141. Childrens Drive would be slightly relocated to form a T-intersection with the Route 141 Spur. However, this option would not meet the “no degradation” criteria at this intersection without triple left-turn lanes, which are not practical from a safety or operational standpoint. Additionally, this option attracts more traffic to the U.S. Route 202/existing Delaware Route

141/Murphy Road intersection, causing that intersection to fail the “no degradation” criteria. Therefore, this option was dismissed.

- *Relocated Childrens Drive Option.* This option is similar to the “Four-Leg” option, except that the Childrens Drive leg of the intersection would be relocated somewhere to the south. This option would discourage traffic traveling westbound on existing Delaware Route 141 from utilizing Childrens Drive and ultimately Rockland Road as a through traffic route. However, this option would not provide adequate access to the A.I. DuPont Hospital and was strongly opposed by representatives of the hospital. For these reasons, this option was dismissed from further consideration.
- *Four-Leg Option.* This option would bring existing Delaware Route 141, the Route 141 Spur, and Childrens Drive into a four-leg intersection. Traveling eastbound, existing Delaware Route 141 would curve to the south of its existing alignment and tie directly into the Route 141 Spur. Traveling northbound, Childrens Drive would tie directly into the remaining portion of existing Delaware Route 141. Traffic traveling eastbound on existing Delaware Route 141 and wishing to stay on existing Delaware Route 141 would have to make a left turn at the intersection. This option satisfied the “no degradation” criteria and was supported by the public and committee members, therefore it was incorporated into the preferred transportation concept.

Rockland Road – These options would affect whether Rockland Road would be tied into the local road system, or be cut off from the local road system by a cul-de-sac. Maintaining the connection between Rockland Road and the local road system would be consistent with the project criteria of separating local from regional traffic. Maintaining the Rockland Road connection was generally supported by the public and transportation committee. Therefore, maintaining the connection between Rockland Road and the local road system was incorporated into the preferred transportation concept.

The Master Plan Transportation Concept that resulted is shown in ***Figure 8***.

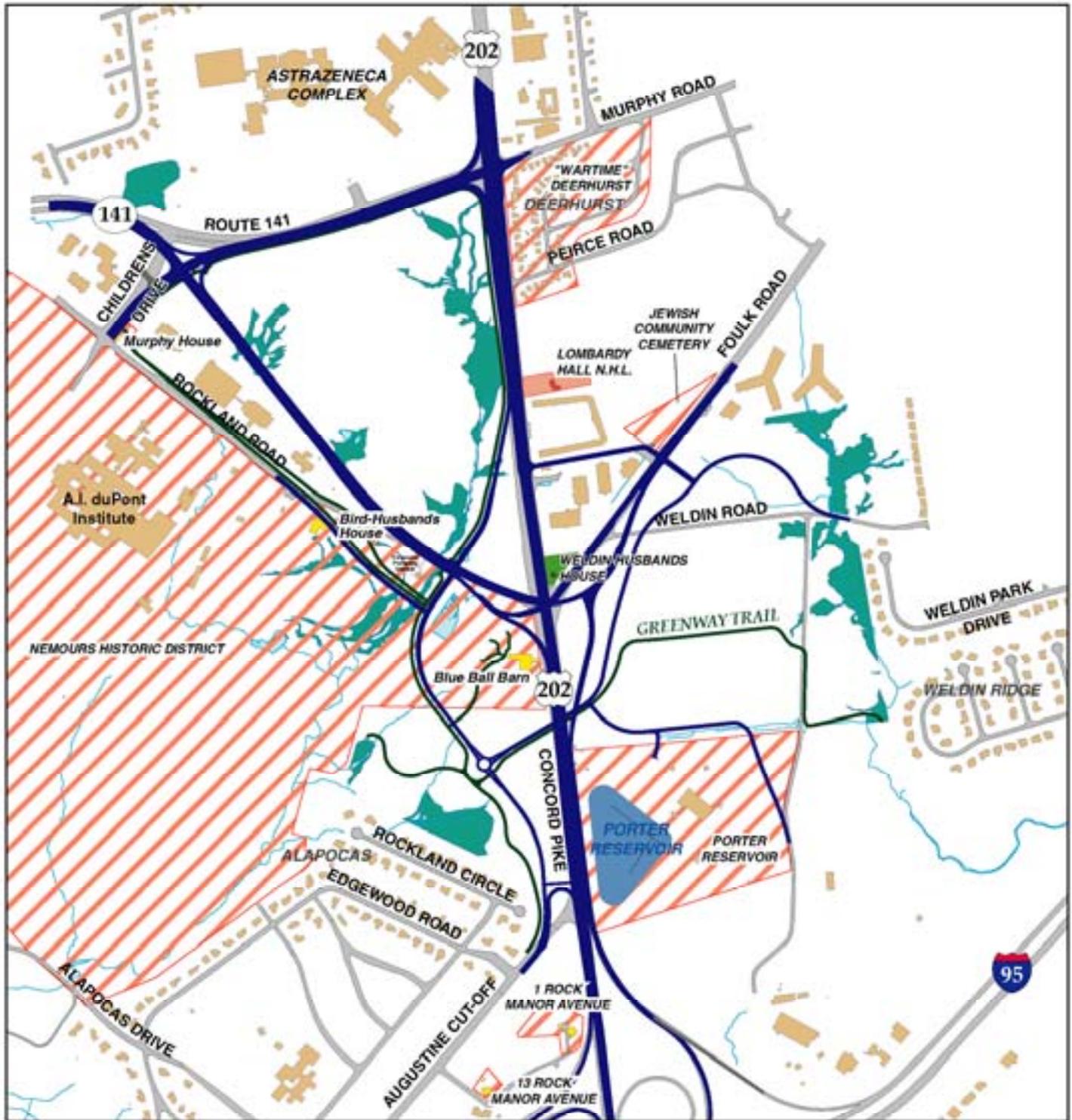


FIGURE 8: PREFERRED TRANSPORTATION CONCEPT

