

Kingston Intersection Study

I-587 AT ALBANY AVENUE/BROADWAY INTERSECTION



Conceptual Design Report
Technical Memorandum



**City of Kingston I-587/Albany/Broadway Intersection Study
Conceptual Design Report**

Prepared for the Ulster County Transportation Council

Prepared by:

Fitzgerald & Halliday, Inc.

In association with:

**AECOM
Alternate Street Design
URS**

February 2011



City of Kingston I-587/Albany/Broadway Intersection Study

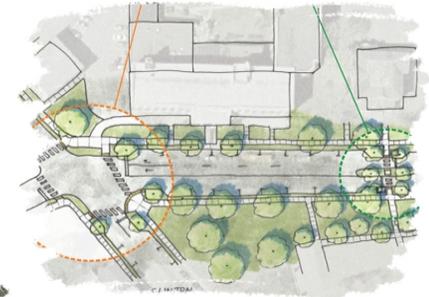


Conceptual Design Report

February 2011

Table of Contents

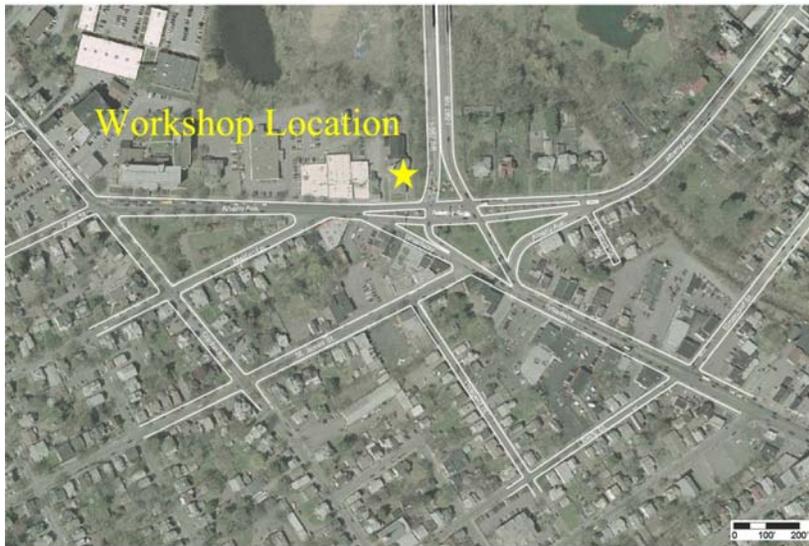
- Introduction 1
- Public Participation 1
 - Public Survey.....1
 - The Design Workshop6
 - Direction for the Future – What We Heard.....7
- Design Drivers 9
 - Components of a place9
 - Organization of Streets 10
 - The Sparse Network 12
- Transportation Solutions 13
 - Interstate 587 13
 - Albany Avenue, I-587 and Broadway Intersection 13
 - Future Capacity 17
 - Albany Avenue Recommendations..... 17
 - Network Expansion 19
- Additional Considerations..... 21
 - Benefits of a Roundabout 21
 - Concept Visualizations 24
 - Conceptual Cost Estimates 28
- Appendix A: Design Workshop – Stakeholder Interview Comments
- Appendix B: Analysis Summaries
- Appendix C: Route 28/I-87/I-587/Washington Avenue Roundabout
- Appendix D: Public Survey
- Appendix E: Advisory Committee Presentation





Introduction

A major component of the Kingston Intersection Study was the public design workshop. This workshop was held over a three-day period in late September of 2010. The location for this workshop was the First Baptist Church on the northeast corner of the intersection, which served as the base of operations for the study team and the site of a number of public events held during the three days.



Study Area, Kingston NY

This report is a summary of the work accomplished over the three-day period and the feedback that was collected from the public and a number of interested stakeholders. The event was well attended and the result highly positive. A conceptual plan for Uptown Kingston was developed, influenced by the citizens of Kingston that not only addresses problems with the existing intersection, but provides a blueprint for longer-term sustainability of the city.

Public Participation

Public Survey

At the start of this study, the Ulster County Transportation Council (UCTC) articulated a set of interrelated goals for its outcome. The project was motivated in large part by the traffic bottleneck at the intersection of I-587, Broadway and Albany Avenue. The more encompassing goals set for the study included the following:

- Reduce vehicle and pedestrian delays
- Improve vehicular and pedestrian safety
- Minimize impacts to area residents and businesses
- Preserve parking capacity
- Improve freight mobility
- Enhance economic vitality
- Incorporate energy efficiencies/green technologies
- Improve gateway appearance
- Protect the historical character of the area
- Incorporate public input into the process and results

As a precursor to the design workshop, a survey was developed and administered electronically via SurveyMonkey.com. This survey was intended to gather preliminary feedback from the community on some of the study area issues and overarching goals stated above. Over 100 responses to the survey were collected and analyzed (a full set of results can be found in the appendix), and the presentation made to the Advisory Committee and the public at the workshop is summarized in the following pages.



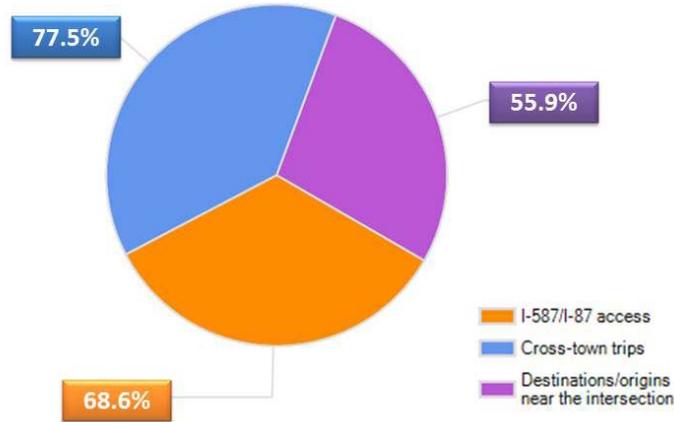
City of Kingston I-587/Albany/Broadway Intersection Study

Conceptual Design Report

February 2011

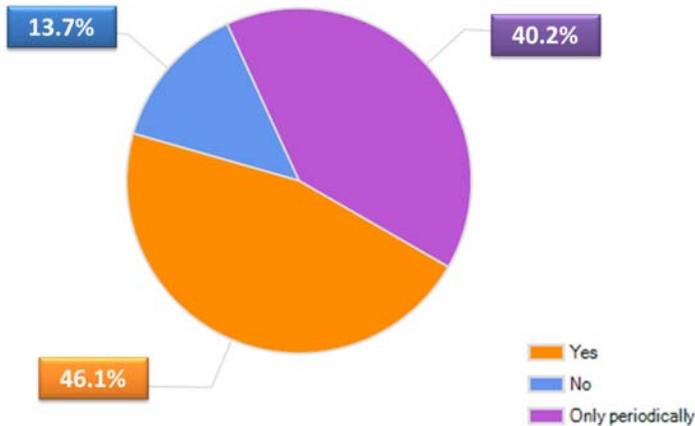


Question: What do you use this intersection for (choose all that apply)?



The results confirm the multi-purpose utility that this intersection provides.

Question: Do you think that traffic congestion is a problem at this intersection?



The results indicate that a majority of the respondents (> 86%) believe congestion is a problem, at least during certain periods of the day.

Question: During what hours (if any) would you avoid driving through this intersection?

Hour	Response Percent	Response Count
6am	2.6%	2
7	19.2%	15
8	57.7%	45
9	50.0%	39
10	9.0%	7
11	7.7%	6
12pm	30.8%	24
1	19.2%	15
2	6.4%	5
3	24.4%	19
4	52.6%	41
5	87.2%	68
6	46.2%	36
7	6.4%	5
8pm	1.3%	1

The responses show a familiar pattern of traffic distribution over the course of a typical work day. The majority of responses point to the usual morning and afternoon peak commuter hours as the ones to avoid, and to a lesser degree, the lunchtime peak hour. As shown in the illustration on the next page, when these responses are overlaid onto the traffic distribution graph that is



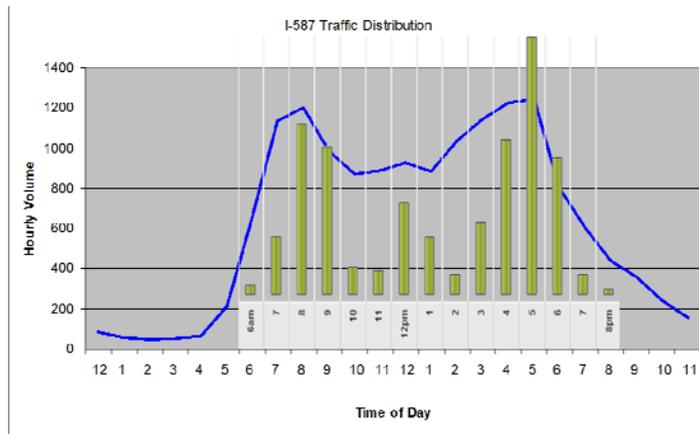
City of Kingston I-587/Albany/Broadway Intersection Study

Conceptual Design Report

February 2011



based on actual traffic counts, the general shape of the graph matches the responses.



It was noted in the presentation that the daily traffic on all approaches to the intersection is relatively balanced, with the lowest volume leg being I-587.

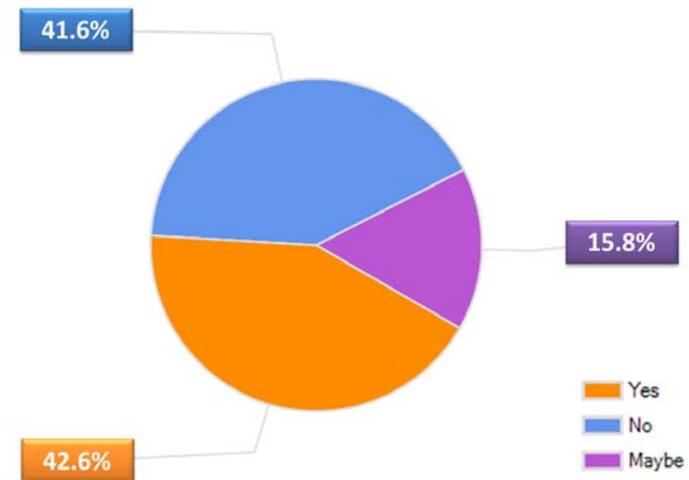


Question: Do you think safety is an issue at this intersection?

Fifty-nine percent (59%) of respondents indicated that safety is an issue and some of the responses were as follows:

- "Cars go straight to I-587 in the left turn only lane from Broadway"
- "Pedestrians are confused; drivers are confused"
- "It is difficult to navigate with a bicycle"
- "I-587 traffic blocks the Albany intersection"
- "I've seen accidents and near misses in many different locations..."

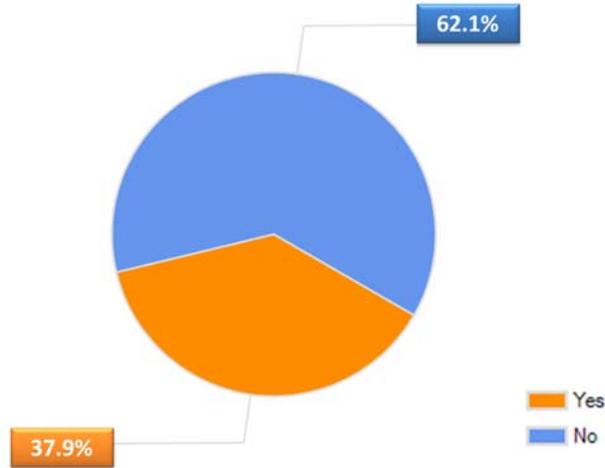
Question: Would you be more likely to walk or bike in the vicinity of this intersection if substantial improvements were made to the sidewalks, crosswalks, bike lanes, and streetscape?



Over half (58.4%) of the respondents indicated that they would walk or bike in the vicinity of the intersection if improvements were made to accommodate those modes. More walking and biking has the potential for reducing congestion created by short trips and also contributes to the economic health of a community.

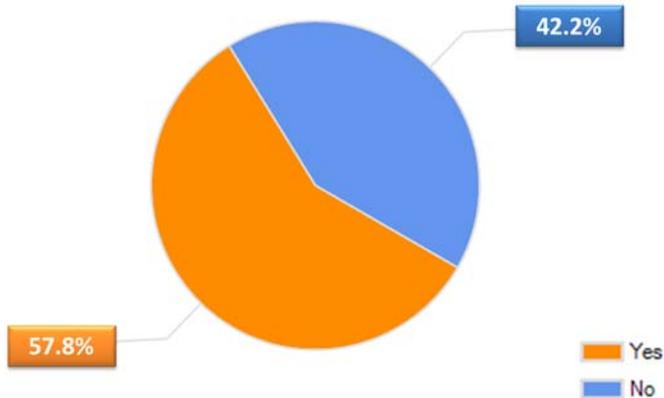


Question: Do you think that there is adequate parking for the businesses in this area?



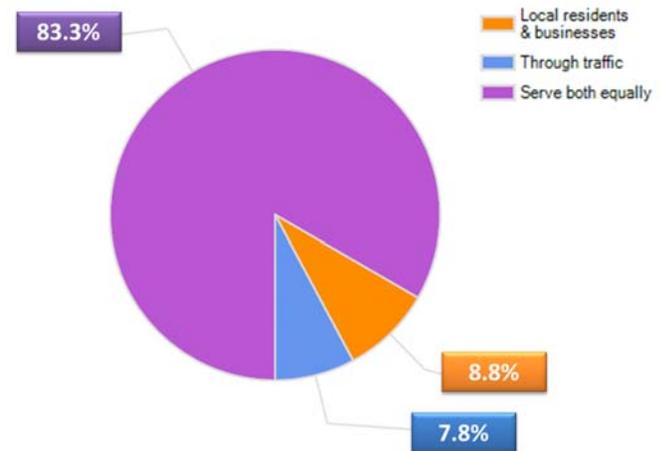
The responses suggest that parking needs are satisfied in the area, but some improvements should be considered.

Question: Is the directional signage at this intersection sufficient?



Although a majority of respondents indicated that directional signage is sufficient, it was noted that the question was potentially misleading since there appears to be an over-supply of directional signage at the intersection that some feel is confusing to drivers. This particular question was requested to be explored in greater detail during the workshop.

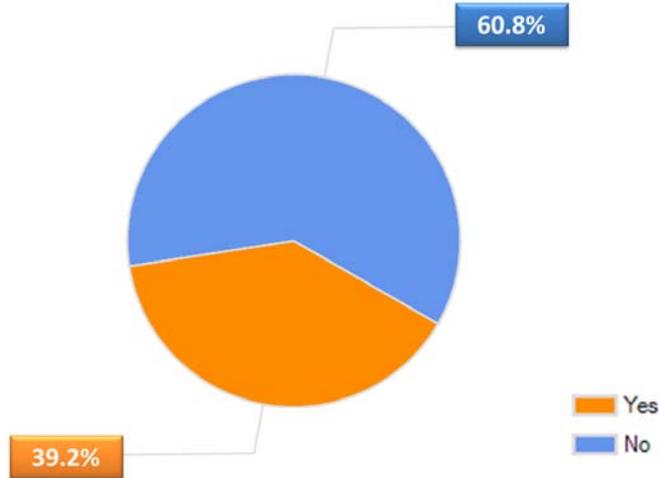
Question: Who do you think this intersection should primarily serve?



The response to this question overwhelmingly points to the recognition that this intersection is important to both local and regional traffic. Any improvement concept developed during the workshop needs to consider the mix of local and through traffic equally.

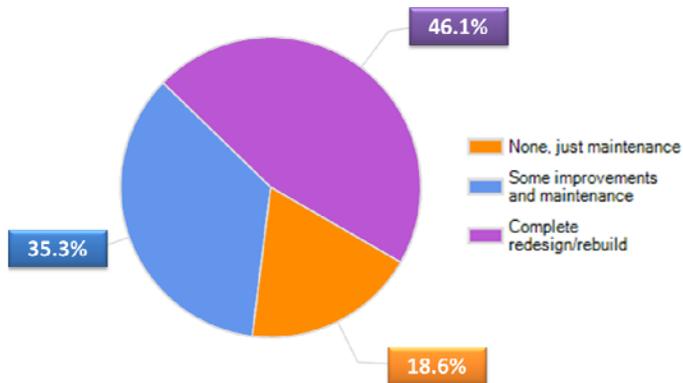


Question: There are many small parcels of green space at this intersection now, if these spaces could be combined, do you think that a small park would be appropriate at this intersection?



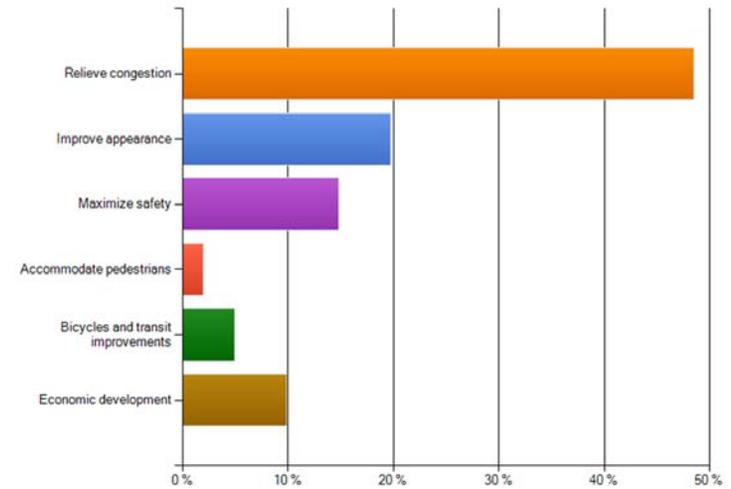
The majority of responses suggest that a small park at the intersection is unnecessary.

Question: How much of an improvement do you think this intersection needs?



Almost half of the responses suggested a complete rebuild of the intersection is necessary. A considerable number of responses also pointed to possible improvements for the intersection, short of a complete rebuild. A small fraction of responses pointed to only maintenance of the existing intersection as a possible solution.

Question: If you had to pick just one type of improvement to this intersection, what should it accomplish?



Clearly congestion reduction should be a major consideration when addressing this intersection. The fact that all of the choices provided in the survey question had some level of importance ascribed to them demonstrates that the overall solution to this intersection should satisfy many goals.



The Design Workshop

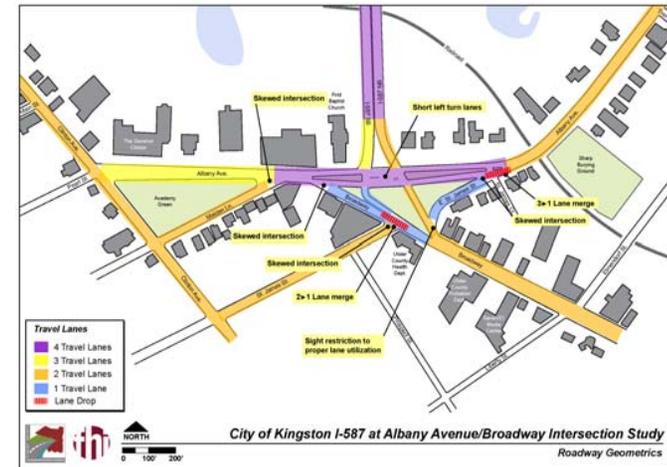
While resolving congestion, accommodating local and regional traffic, and improving safety are important goals, in the end, reclaiming this area as a place of value in the community is an aspiration to aim for. The study must look beyond the limited confines of the I-587-Albany Avenue intersection itself, and understand how travel and conditions there affect the rest of the City; there are impacts to the neighborhoods, to the Stockade Area, to Uptown, to the length of Broadway and as far as the Rondout historic area at the waterfront. Solutions for the intersection must serve the diverse transportation and community quality of life needs of the City as a whole and there is a great opportunity for it to do so.

This design report documents the findings of a three-day workshop which was conducted to develop workable solutions for the I-587/Albany Avenue intersection. The public workshop was conducted over three days in late September, 2010. The general sequence of events was as follows:

Day One

The first day of the workshop was one of discovery. The study team held a meeting with the Project Advisory Committee (PAC) to present information on the findings of their analysis of current conditions and to listen to their concerns and desires for the intersection area. This was followed by a series of interviews with a wide range of stakeholders to ask **a)** what are their experiences with the intersection **b)** what they like/would keep about the area and **c)** what they did not like and would change.

This first long day of discovery was concluded with a public meeting. The community at large was invited to a presentation about conditions and options for the intersection. Then, they were asked to share their issues, experiences and ideas for improving the intersection.



Workshop began with a presentation on study area issues



Public meeting attendees preparing to plan



Day Two

The second day of the workshop was spent interviewing additional stakeholders and sketching out the ideas the study team had heard thus far. This was largely a synthesis of ideas and comments collected from a wide range of study participants and the work produced provided the framework for the ideas presented in the remainder of this report.

Day Three

On the third day of the workshop, the study team did some technical analysis of the feasibility of the ideas or solutions they had sketched. Some preliminary solutions were developed, and drawing of what they would look like developed.



The study team prepares to address the PAC

Also during the day, there was an Open House where the community at large was invited to come see the results of the exploration of options for the intersection and its surroundings. The workshop was concluded with a second meeting of the PAC to share the findings of the three days of work and get their feedback.

Direction for the Future – What We Heard

As the design team listened to the citizens of Kingston, and key stakeholders in the study area, many common themes emerged. The following is a summary of the key ideas expressed during the workshop.

1. **Kingston community is proud of the City!** Many folks who attended one of the workshop events expressed how proud they are of Kingston's heritage as well as its many assets including the surrounding natural beauty of the area.
2. **Intersection improvements are not just about traffic.** Some folks thought the traffic congestion and hazards were a huge problem and some did not. But everyone seemed to agree that the intersection as a space was a "dead zone" of asphalt and grass that does not benefit the City in the way that it should. The intersection poses many concerns that are not traffic related.
3. **This is the gateway to Kingston.** It was the general consensus that the place where I-587 enters Kingston is major entry point. It is a driver's first introduction to the City – a doorway into the City environment. As such, it does not serve the City well. It should be attractive, inviting and welcoming.
4. **Mobility improvement is needed for sustainability.** Sustainability is the efficient use of resources to meet the needs of today's community while not sacrificing the ability of future generations to enjoy the same resources. The transportation network is a resource. It must function well



for all users including those on foot or bicycle. In order for the City of Kingston to be a vibrant community for both today's community and future generations, the transportation network and all modes of travel must function well.

5. **A constrained network is good!** A constrained network is one that allows traffic to flow – but at lower speeds and with room for other uses. An unconstrained network favors traffic over people and community sense of place. There was a consensus that the quality of the intersection area as a place should not be sacrificed to making traffic flow or to continue to handle an increasing number of cars.
6. **A fix at one place should not create problems elsewhere.** There are a variety of things that could be done to 'fix' the I-587/Albany Avenue intersection, but if traffic flow is changed there, it could easily move the congestion safety issues to nearby intersections such as Albany Avenue at Clinton Street, where there are also problems with traffic. It was agreed that this is not a solution. Any solution must take into account the entire local street network and the City mobility needs as a whole, as all the parts are interconnected.
7. **Fulfill Kingston's potential.** Many stakeholders emphasized that Kingston is a City in a strategic location with a wealth of unrealized potential to thrive and be a destination. Revitalizing Kingston is a significant goal for the community.
8. **Aesthetics and sense of place are key goals.** The I-587/Albany Avenue intersection should be an attractive place with not only well designed streets, but landscaping, streetscaping (such as attractive lighting and street art and furniture) as well as complementary architecture, and well placed attractive signage.
9. **Respect the history, hidden potential, and historic and natural assets of Kingston.** The community agreed that

as solutions to traffic issues are developed, Kingston's many assets should be considered and taken into account.

10. **Kingston streets should be complete streets** – good for pedestrians, bicyclists, buses, as well as cars. The intersection solutions need to include bicycle lanes, traffic calming (visual cues to encourage drivers to slow down), well marked pedestrian crossings, a sound sidewalk system and ease of travel for buses and fire trucks.
11. **Improvements should include long and short term options.** Stakeholders suggested that the intersection plan include short term things that are low cost and could be done quickly and compliment the long term solution that may be more costly.

The result of the numerous stakeholder interviews, the meetings with the PAC, and the public workshop was the development of a series of design drivers that set the stage for the types of transportation solutions that evolved over the course of the three-day event.

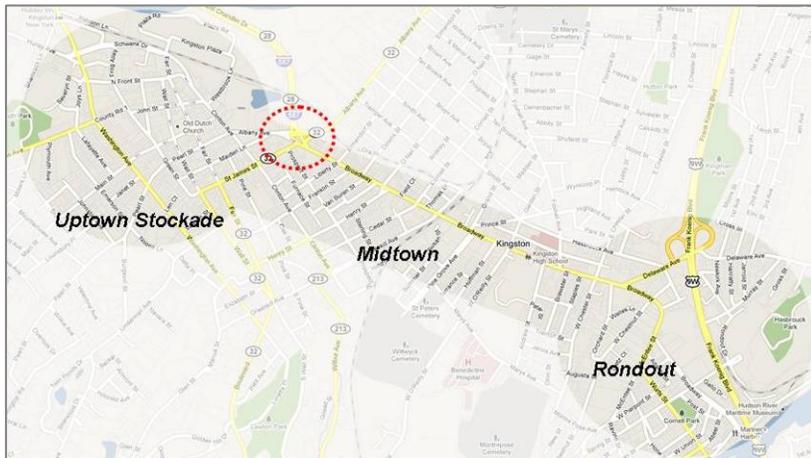
Correlating the eleven themes above to specific design drivers can be generalized in the following way. Themes 3, 7, and 8 speak to the intersection's role as a gateway to Kingston, and the importance of creating a strong sense of place in the area. Themes 1, 2, 9, and 10 relate to the traditional role of Kingston's streets from the early history of the Stockade to today's need for less automobile dominance. The heritage of Kingston needs to be preserved and the orientation of streets is a major factor in the vibrancy of community. Themes 4, 5, and 6 focus on the importance of network in transportation systems. Streets should offer alternatives, and be designed in a way that discourages speeding and prioritizes people. Finally, Theme 11 offers a realistic viewpoint on project funding and implementation, which will be addressed later in the Design Report.

The next chapter in this report provides additional details on these important design drivers.



Design Drivers

The people of Kingston intuitively understand the characteristics of a great place. Comments from a broad array of stakeholders indicate that transportation plays an important role in the shaping of a place. Midtown is viewed as a conduit for traffic (or the bar of a dumbbell) between Rondout and the Stockade district. These later locations are viewed as places that people want to be, and are often cited as sources of community pride by local city residents.



Midtown is sometimes referred to as the handle of the dumbbell

Components of a place

Cities exist because people require access; access to services, jobs, housing, entertainment, social interaction, and information. In the late 19th century, public streets facilitated such access in everyday life. As the horse and buggy averaged about 10 MPH, streets were safe for people to walk and interaction to flourish.

In a sense, the streets themselves were places and busy streets meant a vibrant economy.



City streets were traditionally places that facilitated interaction

Kingston is promoted as a 'place'. As people enter the city via the I-587/Albany/Broadway intersection they are greeted by vibrant banners advertising the unique accommodations that are offered.

The banners are overshadowed by the unnecessary scale and proliferation of signage in the area that communicate vehicular dominance. The sense of place has diminished as a result of a lack of



Gateway Banner

human-scale infrastructure, which is currently prioritized almost solely for the motor vehicle.

Highway-scale signage coupled with multi-lane, one-way streets and dedicated high-speed turn lanes translates to one thing for the driver: **speed**. During times when traffic congestion is not present, the project intersection facilitates high-speed driving behavior that is incompatible with pedestrian and bicycle use. In keeping with directives to balance the needs of all users and develop an enticing gateway to the city, the intersection project should be designed for vehicular speeds of 30 MPH or less.

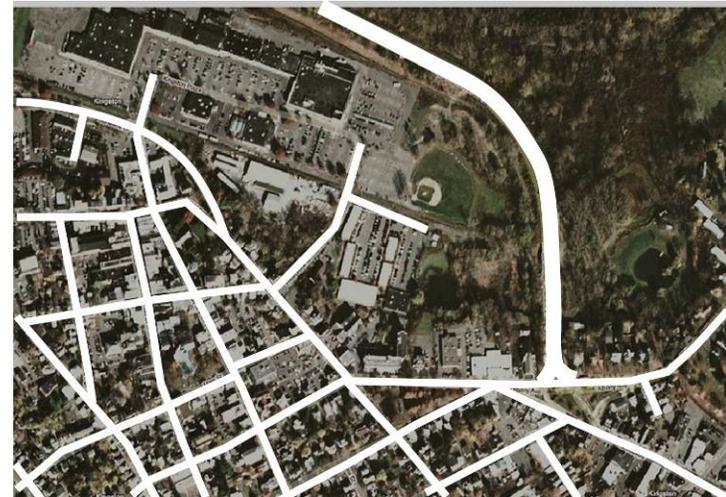


Scale of signage and expansive pavement communicates speed

Organization of Streets

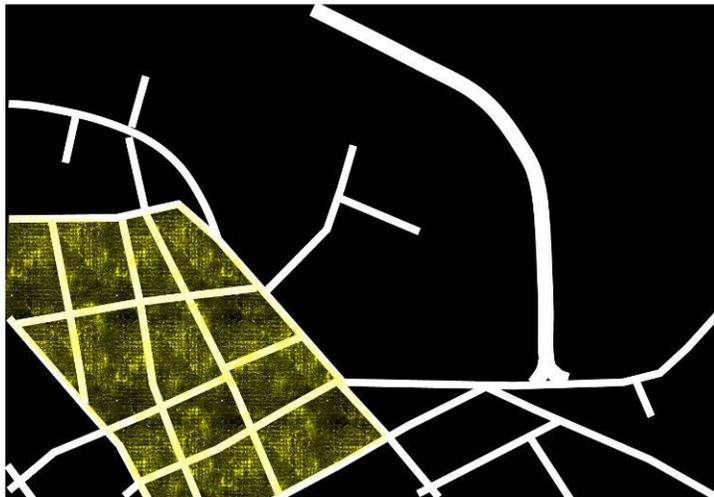
Approaching transportation solutions that achieve long-term sustainability requires an understanding of how the organization of the street network affects mobility and access. Network

structure can be compared to the skeletons in living organisms. The organization of bones in humans and animals is responsible for the way in which they appear, move and perform tasks. Similarly, the 'bone' structure of streets determines how a place will appear and function. The following figure illustrates the network structure in the vicinity of the project area.



Kingston's bones

In 1777, the year the British invaded and burned the City of Kingston, the uptown street network consisted of a traditional grid with small blocks and narrow streets. The Stockade District, as it is now known, is shown in yellow on the figure on the following page. These well-defined blocks were traditionally the way communities were planned and allowed people options for reaching their destinations. Blocks were close together so that people could walk efficiently and buildings were kept close to the street to enhance access.



Grid structure of Kingston in 1777

Today, the Uptown Stockade is still an area that is inviting to visitors and residents alike. Much of this historic area of Kingston is highly walkable and the mix of architectural styles, boutique shopping, dining, and other amenities offers the charm



Uptown Stockade District

to residents and visitors alike.



In the past half century, conventional transportation planning has placed an emphasis on high-capacity streets built for speed and direct access. Instead of the tightly defined grid network, superblocks were formed that contained large scale developments with massive on-site parking supply and limited driveway access. The figure below highlights in yellow the superblock network structure in Uptown Kingston resulting from the development of a shopping center and I-587.



Superblock structure of Kingston in 2010

The network that is created from this style of development consists of wider roads flanking the perimeter of the superblock. The consequence of this type of transportation and land use planning is that traffic volume pressure builds along the edges of the superblock, and in particular, at the intersections of these primary streets. Without a grid to disperse traffic and provide alternate ways to access land, an endless cycle of planning for more and more road widening results.

As evidenced throughout the study area, street life, economic vitality, and aesthetics have been severely compromised by a network that places a disproportionate emphasis on automobile mobility.



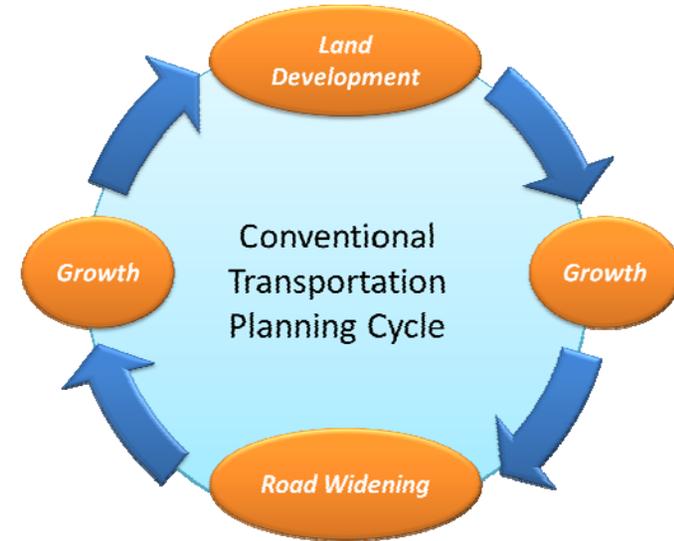
Empty commercial space on Albany Avenue



St. James Street

The Sparse Network

A sparse network limits the overall road system capacity of an area and necessitates the widening of individual roads to solve traffic congestion. This rarely results in long term success. As roads become wider, traffic demand projections are eventually realized and the planning cycle begins all over again. In essence, the constant need for wider roads becomes a self-fulfilling prophecy. The illustration below demonstrates the cycle of traffic growth related to land development, and the need for the constant planning for roadway expansion.



In midtown Kingston, roads such as Albany Avenue and Broadway are already capacity constrained during the peak hours as intersections are unable to process the traffic level that currently exists. Relieving congestion at one intersection has



the effect of moving the problem to another location that likely is already at or approaching its capacity limitation. A return to the grid pattern network can meet multiple objectives associated with growth in the Kingston.

Transportation Solutions

The primary focus of this study was on the intersection of Albany/Broadway Avenue and I-587. This complex intersection is part of a larger overall network and therefore, influenced by surrounding intersections. For this reason, the study team expanded the focus to consider other intersections along Albany Avenue and Clinton Avenue.

It is important to note that sufficient lane capacity exists in the area around the Albany/I-587 intersection to accommodate future growth. Current congestion is primarily related to intersection capacity. The transportation solutions focus on these intersections and include recommendations that meet the goals to improve vehicle capacity along with pedestrian safety and overall character of the area.

Interstate 587

An important element of the overall traffic solution is the potential conversion of I-587 from an Interstate highway to a state road (call it SR 587). This conversion would enable the connection of new streets to SR 587 and divert vehicles currently heading west on Albany Avenue. I-587 carries the lowest vehicular traffic volume of the three roads that comprise the existing intersection. At approximately 15,000 vehicles a day, a two-lane road would be sufficient to accommodate this volume and future growth.

Provided the interstate highway can be re-designated as a state road and reduced to two lanes, the remaining two lanes could

be converted to a wide multi-use trail for bicyclists and pedestrians. Currently bicycle and pedestrian activity along the Interstate has been observed which is an illegal activity.

Albany Avenue, I-587 and Broadway Intersection

The intersection formed at the confluence of I-587, Albany Avenue, and Broadway has outlasted its functional lifespan. The intersection experiences recurrent congestion during the peak travel hours and is unfriendly to pedestrians and bicyclists. Emergency response vehicles avoid the intersection during the busy hours of the day and find alternate routes through neighborhoods. Traffic accidents are frequent and sign clutter contributes to driver confusion.

The workshop developed a number of potential solutions that have various advantages in meeting the design drivers discussed previously. These have been categorized into short- and medium-term time frames. In addition, the workshop produced a network expansion concept as a place-making opportunity for the uptown area.

Short Term Solutions

1. Request a design exception from the NY Department of Transportation to eliminate all of the large overhead signs. Review all other signs with a goal to reduce the number and improve clarity and wayfinding. For example, the proliferation of 'No Parking' signs should be immediately reconsidered and signs eliminated in areas where there is little reason to park due of a lack of immediate destinations. An option is to add a 'No Parking Beyond This Point' sign to the end of the defined parking areas.

2. Move the pedestrian crosswalk on Albany Avenue west of the intersection closer to the intersection (see Figure 1 – page 18).



Sign density and arrangement is confusing

Medium Term Solutions

Option 1: Compact Signalized Intersection. Rebuild the intersection as a compact signalized intersection. This option aims to improve operations over the existing split phased signalized intersection. The compact intersection was analyzed both with and without the high-speed travel lane from Albany Avenue (eastbound) to Broadway (southbound). The lane is marked with a red X on the following illustration.

Goals of this project include creating a gateway to the city and improving safety for pedestrians and bicyclists within the study area. Achieving these goals requires the elimination of the high-speed travel lane from Albany Avenue to Broadway. Eliminating this high-speed lane would force right-turning

vehicles to utilize the redesigned signalized intersection at considerably slower speeds. The elimination of this lane will also limit the overall capacity of the intersection for future growth in traffic; however, this is an essential trade-off if other study goals are to be achieved.



Compact intersection

Option 2: Mixed-Lane Roundabout. Replace the existing signalized intersection with a mixed-lane roundabout. A roundabout would improve both vehicular and pedestrian operations.

Two alternatives for a modern roundabout were explored. The first attempted to reconnect St. James Street and East St. James Street by locating the roundabout southeast of the existing intersection. While this concept is functional, it breaks up the open space component of the intersection into a number of small and unusable parcels.



Modern Roundabout alternative 1

The second alternative places the roundabout in roughly the same location as the existing signalized intersection. This option creates a more effective gateway for midtown and offers ample public space for passive recreation and the relocation of important city monuments.



Modern Roundabout alternative 2

Capacity Analyses

Table 1 lists the results of the capacity analysis performed for each option. The table shows that the roundabout provides comparable operational performance to the compact intersection in most area, but for average delay per vehicle and average queue length, the roundabout is superior.

Additionally, the proposed roundabout layout uses fewer lanes (8 entry lanes) compared to the 11 entry lanes in the signalized intersection option. A picture of the intersection geometry and a copy of the Capacity Analysis Summary Sheets are included in Appendix A.

The roundabout option consists of a single-lane geometry where the I-587 approach has a right turn only lane and a combined through-left lane. A simple change to a through-right lane and a left turn only lane with two circulating lanes makes a considerable difference to the operation of the roundabout, and demonstrates the flexibility of the roundabout design, which provides the opportunity later to refine the lane designation as traffic volumes change.

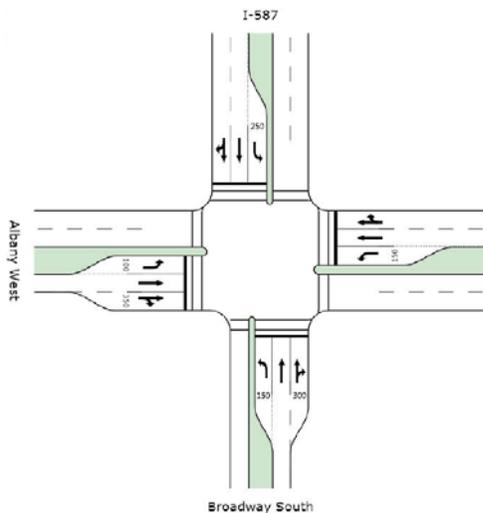
In all but one approach, the roundabout has a shorter 95th percentile queue. This is because at high saturation levels a well-timed, signalized intersection can optimize the balance of the longest queues. However, even though the roundabout may have a longer queue in one case, its throughput is higher, and vehicles are in moving queues that are less frustrating for drivers. Overall delay is less in the roundabout as vehicles are constantly moving rather than being stuck in a static queue waiting at a red light.

Table 1 – Summary of capacity analyses under current traffic levels

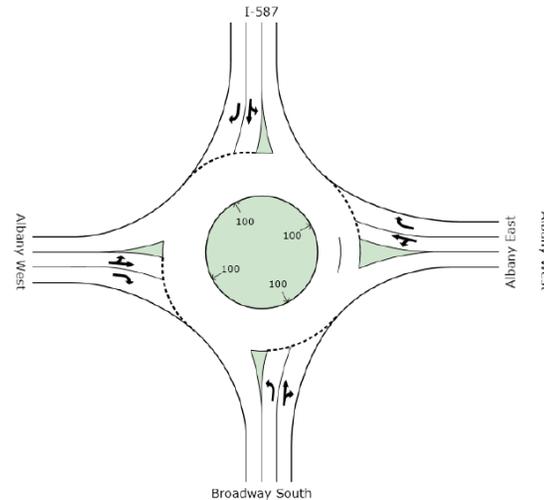
Intersection Alternative	Level-of-service	Average delay (sec)	95 th percentile vehicle queue (ft)	Average Queue (ft)	V/C Ratio
Existing signalized intersection	C	28.1	386	199	.676
Compact signalized intersection (retain high-speed Broadway bypass)	C	27.0	363	180	.733
Compact signalized intersection (without high-speed Broadway bypass)	C	29.4	402	203	.792
Roundabout 1 (right turn only lane and a combined through-left lane with one circulating lane)	B	18.1	355	73	.815
Roundabout 2 (through-right lane and a left turn only lane with two circulating lanes)	B	11.6	156	42	.676

Notes

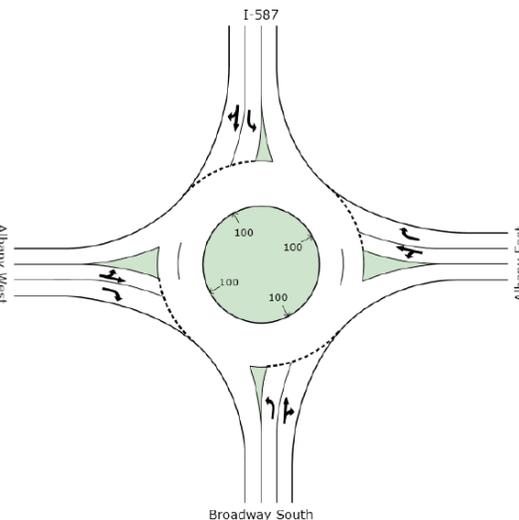
1. All analyses were undertaken in SIDRA 5.0 to provide uniformity in assumptions and analyses.
2. All roundabout analyses were undertaken using an Environmental Factor of 1.2 although it is less relevant as Kingston has had a roundabout for a number of years enabling drivers to become accustomed to it. Therefore, the values for the roundabout could be conservative.
3. All analyses were undertaken using the default peak flow factor of 0.92.
4. Signal analyses were undertaken using fully actuated signals system that will only occur if the signals and loops are fully maintained.
5. Sidra software was allowed to choose the optimum cycle times. Other cycle times will restrain the vehicle flow and reduce the intersection capacity.



Compact Signalized Intersection



Roundabout 1



Roundabout 2



Future Capacity

Table 2 provides an estimation of the amount of traffic growth that potentially can be accommodated by each of the alternatives. In the table, practical spare capacity represents the amount of traffic increase possible before reaching the practical capacity of the intersection (V/C) and creating excessively long vehicle queues. At 2010 traffic levels, 2,528 vehicles enter the existing intersection.

As shown in the table, the compact signalized intersection has minimal additional capacity (6%), roundabout 1 can handle an additional 574 vehicles (23% growth) and roundabout 2 can handle an additional 866 vehicles (34% growth). For this reason, roundabout 2 is the only alternative that will satisfy future traffic growth expectations.

Table 2 – Practical Spare Capacity

Intersection Alternative	Throughput (total entering vehicles)	95 th percentile vehicle queue (ft)	V/C Ratio	Practical Spare Capacity (vehicles)	Practical Spare Capacity (%)
Compact signalized intersection	2,680	458	.853	152	6%
Roundabout 1	3,102	400	.850	574	23%
Roundabout 2	3,394	263	.840	866	34%

Albany Avenue Recommendations

Many intersections along Albany Avenue and Clinton Avenue, such as Albany Avenue/I-587, Albany Avenue/Clinton Avenue, Clinton Avenue/Main Street, and Clinton Avenue/Westbrook Lane are at capacity during the peak period which is

demonstrated by the long vehicle queues at these intersections during peak periods of the day. Of these, only the intersection of Albany Avenue and I-587 can be improved without property acquisition and/or elimination of on-street parking. Minor improvements may be possible to improve pedestrian mobility or perhaps minor improvements in vehicle flow. Given the historic context of the Uptown Stockade, significant expansion of intersections along Clinton Avenue is not recommended.

There are many locations where pedestrians cross Albany Avenue between the I-587 intersection and Clinton Avenue. The following refinements to Albany Avenue to better accommodate this pedestrian demand are as follows and illustrated in Figure 1 on the following page.

1. Relocate the crosswalk across Albany Avenue west of I-587 intersection to the intersection. Where this relocated crosswalk crosses Broadway add pedestrian crossing signs to help highlight the pedestrian crossing. Also the addition of pedestrian crossing signals to the crosswalk across Broadway south of St James Street should have pedestrian crossing signs added to both parts of the crosswalk.
2. Upgrade the signalized pedestrian crossing Maiden Lane, with bulb outs on both sides, new signs, preferably post mounted signals that are closer to the driver's eye and pedestrians, which would not require the driver to take his eyes away from a pedestrian to look into the signal in the air.
3. Provide a signalized pedestrian crossing across Albany Avenue between the Governor Clinton building and the Dialysis Center that includes bulb outs on both sides, a raised pedestrian refuge in the middle and post mounted signs with a signal in the pedestrian refuge.
4. Realigning the pedestrian crosswalk on Albany Avenue, east side of Clinton Avenue, as shown on the attached diagrams.

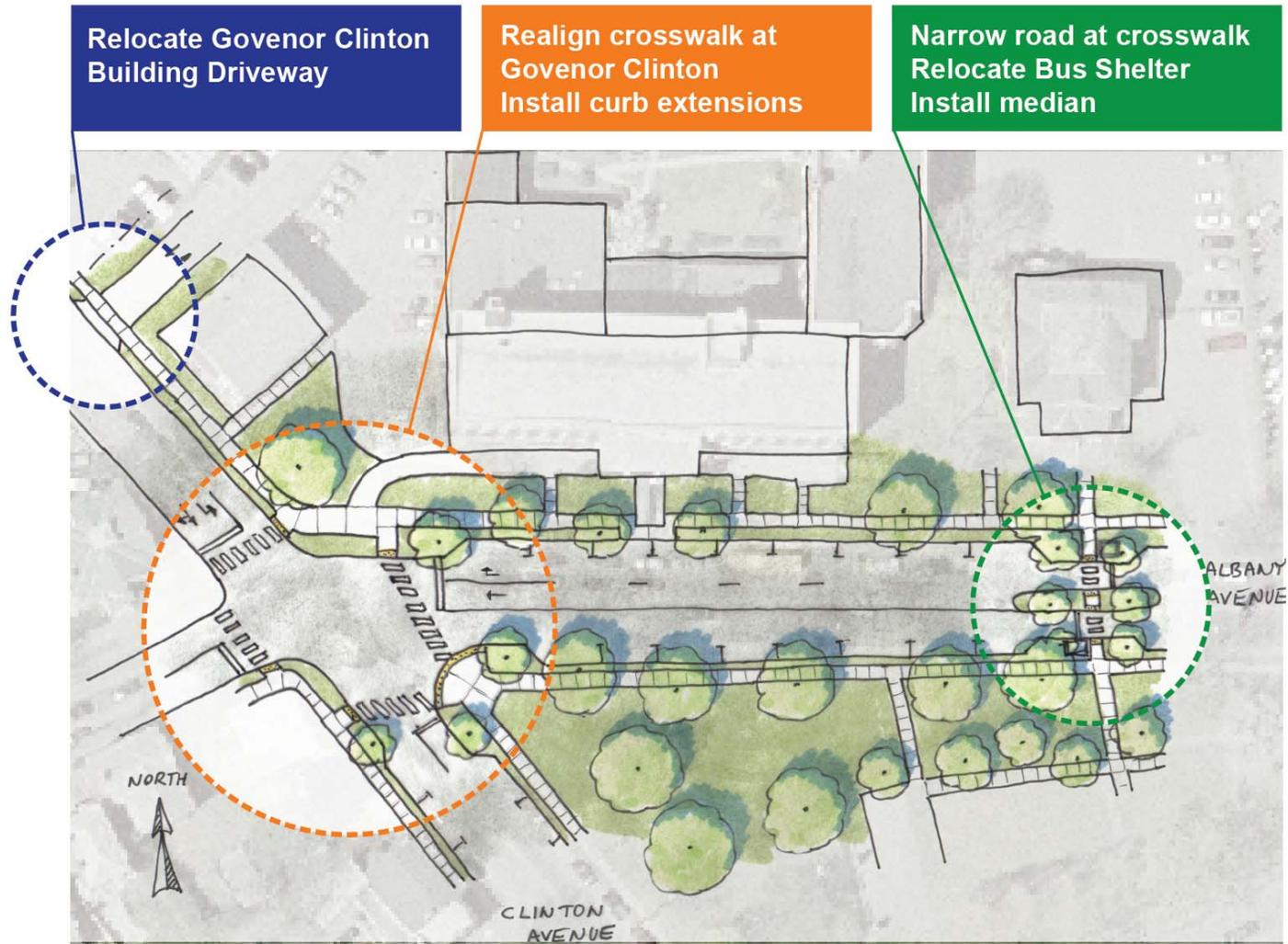
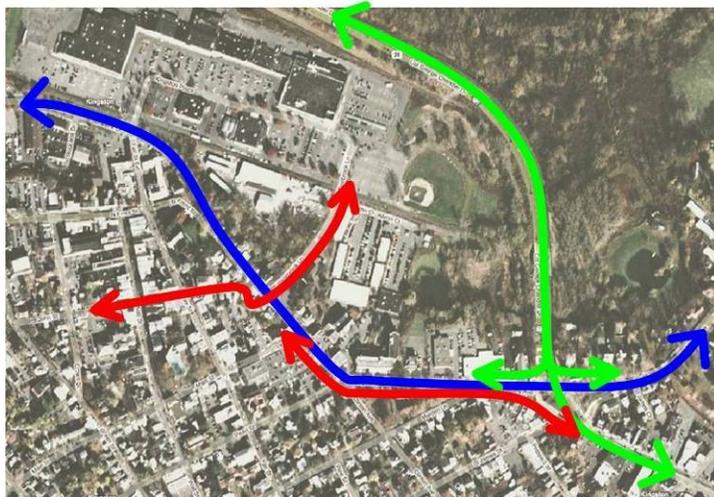


Figure 1: Improvements along Albany Avenue



Network Expansion

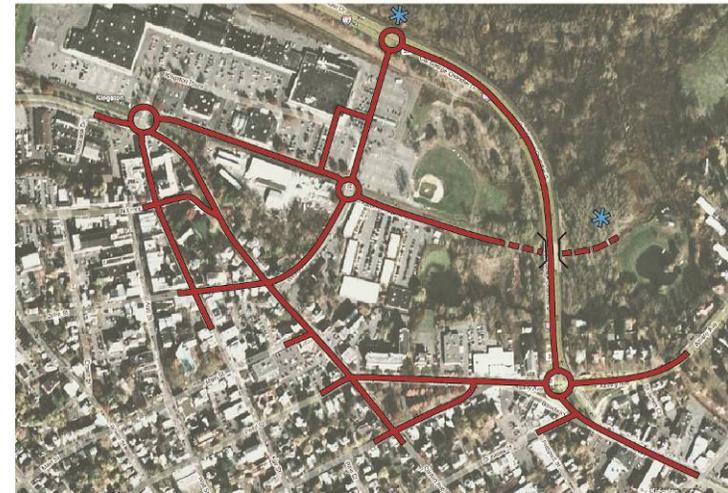
Solving capacity constraints along Albany and Clinton Avenues without major impacts to property and community character requires an extension of the road network north of these two roads. Changing the designation of I-587 to State Road 587 and making a series of new road connections provides alternate access to destinations uptown. In turn, this alternate access alleviates traffic pressure on Albany and Clinton Avenues, and preserves capacity for future economic growth in the city. The following illustration demonstrates how local and regional trips are all routed along Albany and Clinton Avenues under the current network configuration.



Currently, all trips are focused along Albany and Clinton Avenues

The next figure illustrates the expanded network concept. Extending the block structure and street network will provide drivers with a variety of travel routes to their destination and balance the flow through the network. The most important connection is the extension of John Street to Westbrook Lane to

SR-587 (I-587). Intersection control would be handled via roundabouts at SR-587 and the road along the southern boundary of the Kingston Plaza. With only an eight to ten feet grade difference, this connection appears feasible. A roundabout could also be located at the intersection of Clinton Avenue, Fair Street Extension and Schwenk Drive, which would be the terminus for the new road along the southern boundary of the Kingston Plaza. This road could also be extended along the railroad tracks under I-587 and ultimately to Albany Avenue.



Expanded network concept

Place-Making Opportunities

The proposed network expansion concept offers an opportunity to re-imagine how Kingston might be developed in the future. Figure 2 illustrates a conceptual street network with the primary street network in red and a secondary, delivery network in blue. An extension of the street grid would provide a considerable increase in street frontage for additional development.

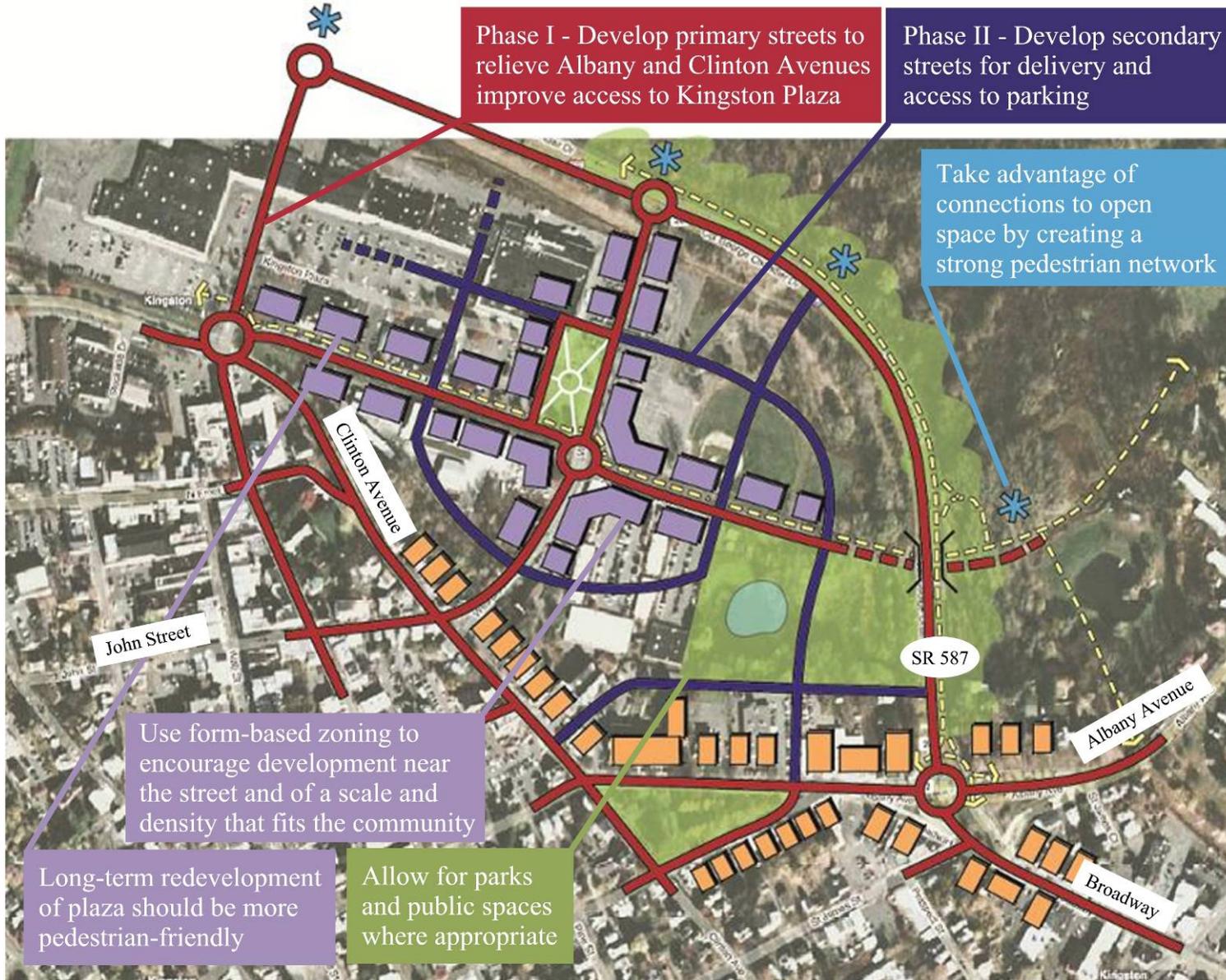


Figure 2: Expanded Street Network and Place Making Opportunities



Additional Considerations

Benefits of a Roundabout

The addition of a roundabout at this intersection would reduce crashes, reduce number and size of signs, and reduce the number of approach lanes from 11 to 8, allowing for 'road diets' on streets such as Albany Avenue, Broadway, and I-587.

Vehicle delay would be substantially reduced, especially in the off peak hours as approaching drivers would only have to slow their vehicle instead of coming to a full stop to enter the roundabout. Slower speeds also create a better environment for bicycles and pedestrians.

Another major benefit of the roundabout design is the improved accessibility into and out of the businesses on the southeast corner of the intersection, which will provide access to and from all directions. This will aid real estate value because of the improved access for customers.

The following sections provide some additional benefits of roundabouts.

Safety

With different crossing and entering movements by drivers, bicyclists and pedestrians, an intersection is one of the most complex traffic situations that drivers can encounter. In a traditional four-way traffic intersection, there are 32 points of conflict in which two vehicles may collide. Modern roundabouts have only eight conflict areas, greatly reducing the potential for crashes. On the other hand, the circulating movement of modern roundabouts nearly eliminates the potential for high-

speed, right angle and left turn/head-on collisions. Rear-end collisions are also often reduced in roundabouts.

Speeds in modern roundabouts are often much slower than in intersections; therefore, any potential roundabout crashes are usually at lower speeds, and at less-dangerous angles (such as sideswipe). This translates into less severe injuries and property damage, if any. A study printed in the Transportation Research Record reported that converting 23 test intersections throughout the U.S. from traffic signals to roundabouts reduced injury crashes by 80 percent, and reduced all crashes by 40 percent, in those areas. Results were much the same for similar studies throughout the U.S. and Europe.¹

Bicycle and Pedestrian Mobility

Roundabouts generally are safer for pedestrians than traditional intersections. In a roundabout, pedestrians walk on sidewalks around the perimeter of the circulatory roadway. If it is necessary for pedestrians to cross the roadway, they cross only one direction of traffic at a time. In addition, crossing distances are relatively short, and traffic speeds are lower than at traditional intersections. Studies in Europe indicate that, on average, converting conventional intersections to roundabouts can reduce pedestrian crashes by about 75 percent.² Single-lane roundabouts, in particular, have been reported to involve substantially lower pedestrian crash rates than comparable intersections with traffic signals.³

¹ Nevada DOT. <http://www.nevadadot.com/safety/roundabout/benefits.asp>

² Schoon, C. and van Minnen, J. 1994. The safety of roundabouts in the Netherlands. *Traffic Engineering and Control* 35:142-48

³ Brude, U. and Larsson, J. 2000. What roundabout design provides the highest possible safety? *Nordic Road & Transport Research* 2:17-21.



Pedestrians can easily cross roundabout

Parking

The roundabout will result in the addition of parking spaces to midtown. The creation of driveways/plazas on the southeast and southwest corners of the intersection will offer more parking than is currently available today.



Additional parking provided in front of existing buildings

Transit/Freight Access

To accommodate vehicles with large turning radii such as trucks, buses, and tractor-trailers, roundabouts provide an area between the circulatory roadway and the central island, known as a truck apron, over which the rear left wheels of these vehicles can safely track. The truck apron generally is composed of a different material texture than the paved surface, such as brick or cobble stones, to discourage routine use by smaller vehicles. Roundabouts provide a better, wider turning radius for semi-trucks and other long vehicles. Even double trailer semi-trucks will be able to easily drive through the roundabouts.

Streetscape/Landscape/Public Realm

Aesthetics of the area would be greatly enhanced especially if a significant feature is added to the center of the roundabout to create a focal point. One of the goals of this study is to create an attractive gateway into the City of Kingston. A roundabout provides an opportunity to do that.



Gateway roundabout in Town of Great Neck Plaza, NY



Roundabout Option 2 - An ideal gateway to Kingston

Green Design

Many vehicles must wait for the light to turn green in a signalized intersection. While stopped, the vehicle's exhaust emits undesirable pollutants and gases into the atmosphere. Because roundabouts often eliminate such stops and improve traffic flow, they also reduce vehicle emissions and fuel consumption. In one study, replacing traffic signals and signs with roundabouts reduced carbon monoxide emissions by 32 percent, nitrous oxide emissions by 34 percent, carbon dioxide emissions by 37 percent and hydrocarbon emissions by 42 percent. Gasoline use is also reduced as traffic moves more efficiently through roundabouts. Studies have shown that fuel savings can be up to 30 percent in roundabouts. Without the stop and start of traditional traffic intersections, roundabouts can also reduce vehicle noise pollution.⁴

⁴ Nevada DOT. <http://www.nevadadot.com/safety/roundabout/benefits.asp>

Maintenance Cost

The modern roundabout will have electrical costs associated with lighting and lower maintenance costs overall. Operational savings from roundabouts have been estimated at an average of \$5,000 per year. In addition, the service life of a roundabout is approximately 25 years, versus approximately 10-20 years of service life for traffic signals.⁵

Economic Revitalization

A modern roundabout is a safe and efficient traffic control solution that is friendly to pedestrians and bicyclists can add value to an area over time. Foot traffic is an essential ingredient for the survival of area businesses.



Roundabout Option 2 – Creation of public space and parking within the footprint of the existing intersection

⁵ Nevada DOT. <http://www.nevadadot.com/safety/roundabout/benefits.asp>

A roundabout offers the opportunity to open up some of the underutilized space at the existing intersection. Also, improving access and circulation in the area will make existing and future business more attractive to customers. The illustration on the previous page shows how a park can be integrated into the design. This space can accommodate existing monuments and public art, and the parking spaces represented by the textured driveway can be a shared resource for pedestrians or vendors during public events.

The following illustration shows how a realignment of Maiden Lane can provide a pocket park or potential outdoor dining area in front of businesses that line the street. The realignment also improves safety and traffic operations.



Realignment of Maiden Lane at Albany Avenue

Midtown is currently economically distressed and the existing roadway environment is diminishing opportunities for improvement. The proposed roundabout solves traffic and safety deficiencies while providing a unique opportunity to remake the area into a place where people want to live, work, and recreate.

Concept Visualizations

Figures 3 through 5 on the following pages are artistic visualizations of the intersection alternatives. The first two are birds-eye perspectives showing the compact signalized intersection and roundabout alternatives hand sketched in pen and ink. These illustrations were products of the three-day workshop and are inclusive of the community feedback received along with the preliminary engineering analysis that was used to determine the proper roadway geometry for each concept.

The third drawing was rendered in Adobe Illustrator to generate the oblique perspective of the roundabout. This visualization was developed to communicate the size of the roundabout within the context of the adjacent environment. Also, numerous community design features have been added to this concept and the rendering offers the flexibility to zoom in to specific areas, as provided in the previous pages of this report.

These illustrations are not intended to be actual designs of the roundabout, but serve to communicate the relationship of the transportation improvement to the surrounding environment. The roundabout concept was received very favorable by the public as well as project stakeholders, and the additional visualizations were created to offer a clearer picture of how the improvement will look when constructed. A traffic simulation of the proposed roundabout compared to the existing intersection was also developed and can be accessed at <http://www.youtube.com/watch?v=YX2bcQuelWc>.



Figure 3: Pen and ink 'birds-eye' view of the compact signalized intersection



Figure 4: Pen and ink 'birds-eye' view of the roundabout

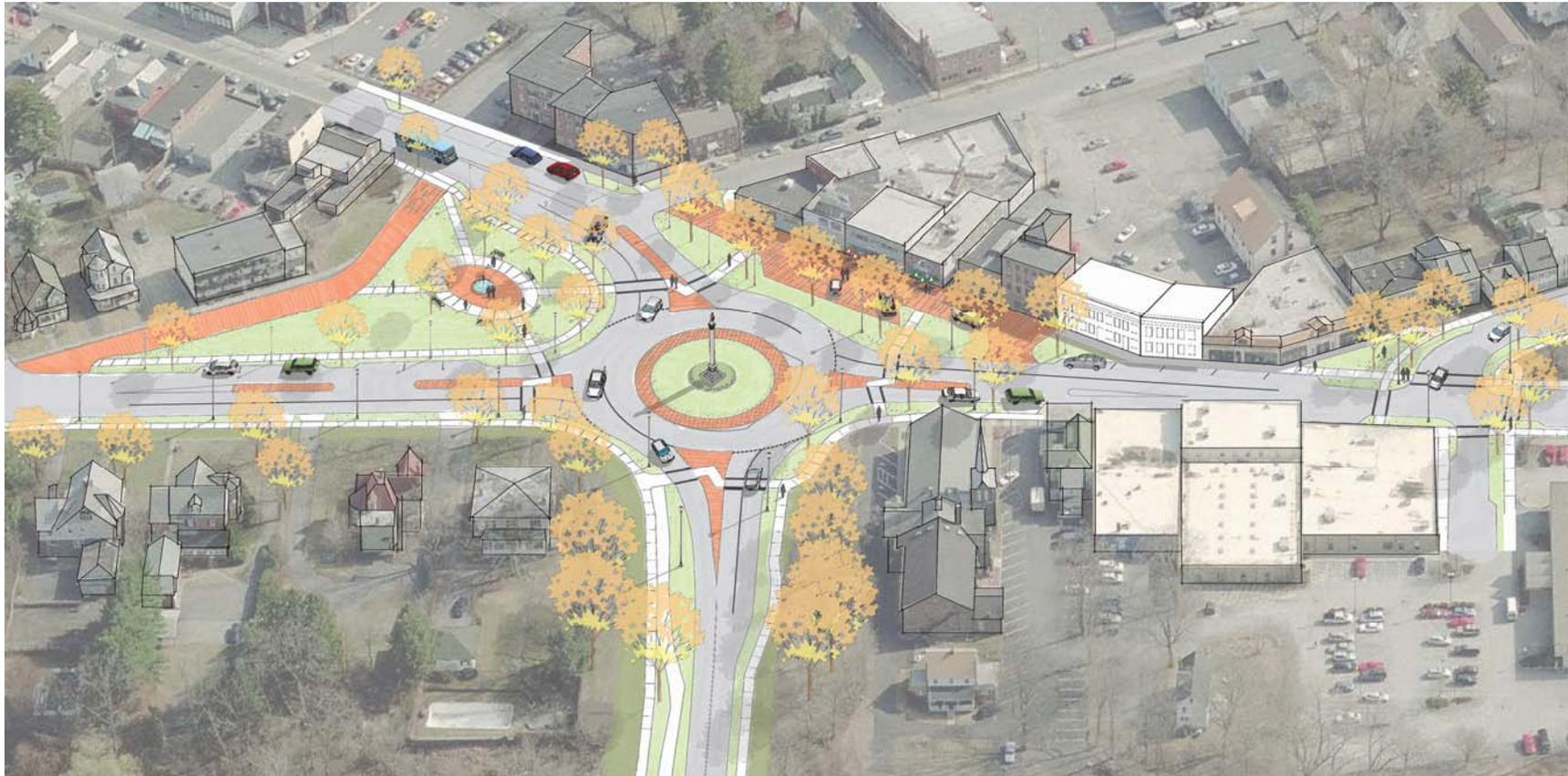


Figure 5: Oblique view of the roundabout looking south from I-587



Compact Signalized Alternative

Conceptual Cost Estimates

The estimated construction cost for the Compact Signalized Intersection alternative is \$5,200,000 and \$4,525,000 for the Roundabout (Option 2 in the preceding text). The estimates assume new full depth asphalt pavement, new concrete curb and new concrete sidewalks throughout the limits of work. They also assume a new storm-water drainage systems consisting of new catch basins, manholes and storm sewer. New signage is included in the estimates. The estimates also include provisions for turf establishment as well as new plantings. New street lighting is also included in the estimates for both alternatives. The estimate for Alternative 2 also includes the cost of a new traffic signal at the intersection.

The estimated construction cost for the improvements to Albany Avenue, as shown in the table on the right, is \$640,000. It assumes new full depth asphalt pavement for the Governor Clinton building driveway relocated from Albany Avenue to Clinton Avenue. No other paving work is included. New concrete curb and new concrete sidewalks were assumed only along the intersection curb "bump-outs" and at the new median at the easternmost crosswalk on Albany Avenue. The estimate includes a provision for minor new storm-water drainage installations consisting of new catch basins, manholes and storm sewer only where water might be trapped as a result of the proposed "bumpouts". It is assumed that any new installations can be tied into the existing system with minimal work. Minimal new signage is included in the estimate. The estimate also includes provisions for turf establishment as well as minimal new plantings. The cost of a new pedestrian crossing signal is included in the estimate; however, no new street lighting is provided in the estimate.

Pavement	\$ 1,500,000
Drainage	\$ 1,200,000
Curbs & Sidewalks	\$ 725,000
Street Lighting	\$ 500,000
Grass & Landscaping	\$ 75,000
Maintenance & Protection of Traffic	\$ 150,000
Traffic Signal	\$ 100,000
Contingencies (+/- 20%)	\$ 950,000
	<u>\$ 5,200,000</u>

Roundabout Alternative 2

Pavement	\$ 1,400,000
Drainage	\$ 1,000,000
Curbs & Sidewalks	\$ 600,000
Street Lighting	\$ 500,000
Grass & Landscaping	\$ 125,000
Maintenance & Protection of Traffic	\$ 150,000
Traffic Signal	\$ -
Contingencies (+/- 20%)	\$ 750,000
	<u>\$ 4,525,000</u>

Albany Avenue Improvements

Pavement	\$ 15,000
Drainage	\$ 250,000
Curbs & Sidewalks	\$ 110,000
Street Lighting	\$ -
Grass & Landscaping	\$ 30,000
Maintenance & Protection of Traffic	\$ 15,000
Traffic Signal	\$ 100,000
Contingencies (+/- 20%)	\$ 120,000
	<u>\$ 640,000</u>