BENVENUE ROAD
CORRIDOR IMPROVEMENTS

ROCKY MOUNT, NORTH CAROLINA

JUNE 2016

Prepared By:

Stantec

Stantec Consulting Services Raleigh Office

Complete Streets

For:

City of Rocky Mount North Carolina

CONTEXT & MOBILITY CHARACTERISTICS

BENVENUE ROAD AND THE CITY OF ROCKY MOUNT

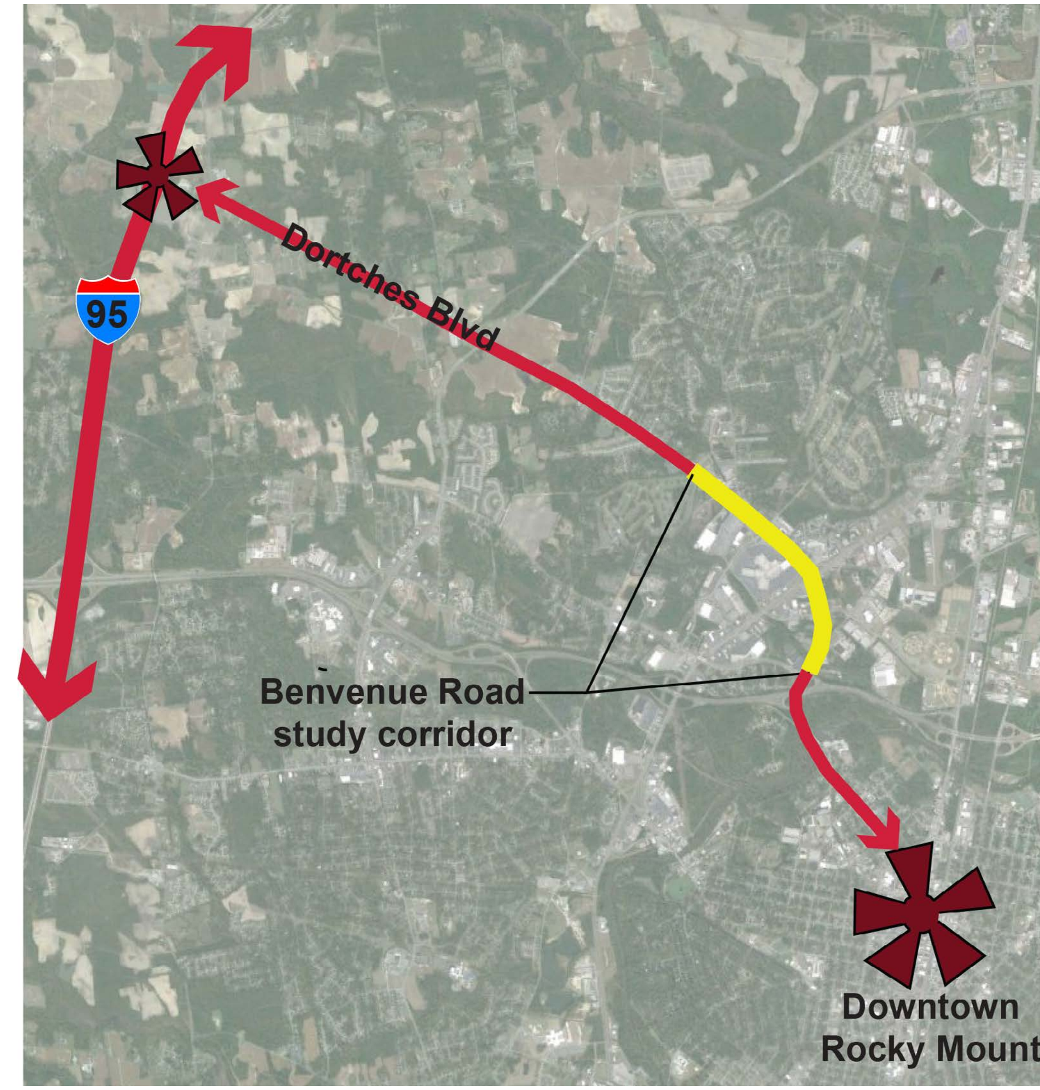
Benvenue Road serves as one of the primary gateways into the City of Rocky Mount, extending from a couplet at the core of a revitalizing downtown and the Tar River northward to the Thomas A. Betts Parkway. At this point, Benvenue Road changes names to Dortches Boulevard, which connects to I-95, the premier artery that feeds the urbanized area. Inside the 1.5-mile-long study corridor, the roadway serves commercial uses in the majority of the study corridor, transitioning to residential at the northern end. In this area. the road connects a major shopping opportunity in the form of Golden East Crossing shopping mall and the US 301 Bypass (North Wesleyan Boulevard). Small, commercial properties serving a familiar highway-oriented marketplace dot the roadside: auto service centers; small distribution and storage facilities; pharmacies; and quick, chain eateries are common.

The following conceptual design of the Benvenue Road corridor from Hunter Hill Road to Northern Boulevard was predicated on the desire to accommodate a changing land use pattern occuring in Rocky Mount and across the country. Initially a strong connection between the downtown core and I-95 (via Dortches Boulevard), Benvenue Road has remained a viable commercial corridor, and one that could also serve a greater spectrum and more balanced set of uses than it does currently. By creating small-scale improvements to vehicular and pedestrian safety, the plan for this corridor should both support connecting existing retailers along Benvenue and help to ensure that a congested and aesthetically unpleasing corridor doesn't deter future customers and business opportunities relective of recent retail trends favoring walkable places. Intelligent placement of medians, lighting, and streetscaping, as well as adjusting some of the geometric specifics at certain locations, should be considered a first, strong step towards achieving these objectives.

MOBILITY CHARACTERISTICS

Benvenue Road typically carried 13,000 to 25,000 vehicles per day (vpd) in 2013, according to the North Carolina Department of Transportation's (NCDOT) most recent counts. The traffic volumes peak in the vicinity of the Golden East Crossing Mall, and drop off the further one travels away from the mall area.

Sidewalks are scarce along both sides of the 1.5-mile corridor (aerial below) with approximately 1,225 linear feet on the north (or east) side and 607 linear feet on the south (or west side), posing significant "gaps" throughout the corridor. Bicycle facilities are virtually non-existent. Additionally, the appearance of the corridor, with numerous curb cuts and a proliferation of regulatory and private signage; lack of consistent streetscaping materials; and poor lighting in some locations collectively create undesirable conditions for motorists and pedestrians alike.



BENVENUE ROAD SIM TRAFFIC ANALYSIS

The software utilized for the following analysis was Synchro 9 (Build 9.1.104.126) for the signalized and unsignalized intersections. SimTraffic was used to determine queueing.

The PM peak hour has the heaviest volumes and was used for the SimTraffic analysis in order to model the “worst case” scenario. The SimTraffic reports provide maximum queue lengths for each leg of the intersections, and were used to compare to existing storage lengths in order to determine if a larger length would need to be considered to accommodate the demand in the roadway design process. The SimTraffic queuing reports are attached to this document.

The table below organizes each intersection by movement with corresponding existing storage length, proposed storage length (according to SimTraffic max queue lengths), and the actual design storage length.

Some of the proposed storage lengths were not possible to accommodate due to geometric design constraints and avoiding design changes to any side streets. For example, at the Jeffreys Road intersection, southbound left storage length does not meet the needs of the current demand. A storage length of 225 feet would provide optimum space, but due to design restrictions, only a maximum of 190 feet is possible.

Storage Length Analysis

Intersection	Movement	Current Storage Length	Proposed Storage Length	ACTUAL DESIGN
Northern Blvd	WBL	175	175	
	NBL	250	250	**250**
	SBL	250	250	
Country Club Rd	NBL	100	100	**220**
Goldrock Rd	WBL	200	250	
	NBL	150	150	**225**
	NBR*	0	200	**200**
Jeffreys Rd	EBL	225	225	
	EBR	275	275	
	WBL	450	450	
	NBL	250	250	**250 (duals)**
	SBL	175	225	**190**
Tiffany Blvd	WBL	150	150	
	WBR	150	250	
	SBL	200	275	**275**
US 301 Ramp	EBL	300	300	
Independence Dr	EBL	150	175	
	WBL	150	200	
	NBL	250	250	**270**
	SBL	150	175	**175**
Thorpe Rd	N/A	N/A	N/A	
Hunter Hill	EBL	200	200	
	EBR	200	200	
	WBL	100	100	
	WBR	175	225	
	NBL	175	175	
	NBR	100	175	
	SBL	200	200	
	SBR	200	200	

*Lane does not currently exist

accomodated on mainline	
not able to accommodate on mainline	
not able to accommodate on side street	

Queuing and Blocking Report

6/22/2016

Intersection: 4: Benvenue Road & Northern

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	L	TR	L
Maximum Queue (ft)	10	30	44	60	25	17	48
Average Queue (ft)	0	11	17	31	3	1	16
95th Queue (ft)	6	35	43	52	15	8	44
Link Distance (ft)	687	687		838		912	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			175		250		250
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Benvenue Road & Thorpe

Movement	WB	NB
Directions Served	R	TR
Maximum Queue (ft)	31	7
Average Queue (ft)	9	0
95th Queue (ft)	31	6
Link Distance (ft)	652	1190
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 14: Benvenue Road & Country Club

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	134	62	2
Average Queue (ft)	52	21	0
95th Queue (ft)	105	53	2
Link Distance (ft)	779		912
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		220	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

6/22/2016

Intersection: 690: Benvenue Road & Hunter Hill

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	R	R	L	T	R	R	L	L	T
Maximum Queue (ft)	32	58	32	58	19	45	67	158	158	31	127	203
Average Queue (ft)	3	17	6	18	1	9	17	83	38	3	38	95
95th Queue (ft)	17	46	23	49	8	32	47	144	102	17	86	174
Link Distance (ft)			740				596					832
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200	200		200	200	100		175	175	175	175	
Storage Blk Time (%)							0	0	0			1
Queuing Penalty (veh)							0	0	0			0

Intersection: 690: Benvenue Road & Hunter Hill

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	T	T	R
Maximum Queue (ft)	174	84	167	140	160	30
Average Queue (ft)	74	13	73	58	70	4
95th Queue (ft)	149	49	140	120	139	17
Link Distance (ft)	832			1190	1190	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		175	200			200
Storage Blk Time (%)	0	0	0		0	
Queuing Penalty (veh)	0	0	0		0	

Queuing and Blocking Report

6/22/2016

Intersection: 401: Benvenue Road & Goldrock

Movement	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	L	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	234	202	207	164	110	123	136	161	123	249	226
Average Queue (ft)	122	90	119	59	31	54	61	55	46	130	101
95th Queue (ft)	203	171	187	117	78	102	112	118	101	213	181
Link Distance (ft)	556			920		1063	1063		485	485	485
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		200	200		225			200			
Storage Blk Time (%)		0	0					0			
Queuing Penalty (veh)		0	0					0			

Intersection: 523: Benvenue Road & US 301 Ramp

Movement	EB	NB	NB	NB	SB	SB
Directions Served	L	LT	T	T	T	TR
Maximum Queue (ft)	201	106	123	117	120	123
Average Queue (ft)	93	43	47	33	46	50
95th Queue (ft)	167	88	98	85	98	103
Link Distance (ft)		646	646	646	1619	1619
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	300					
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 681: Benvenue Road & Tiffany

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	74	104	93	148	164	97	234	239	199	176	181
Average Queue (ft)	25	40	32	19	80	36	122	139	104	83	89
95th Queue (ft)	60	85	73	77	148	80	202	219	179	151	159
Link Distance (ft)	442	442		857		1619	1619	1619		611	611
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			150		150				275		
Storage Blk Time (%)					1						
Queuing Penalty (veh)					1						

Intersection: 704: Benvenue Road & Jeffreys

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (ft)	150	160
Average Queue (ft)	50	61
95th Queue (ft)	117	126
Link Distance (ft)	1063	1063
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 882: Benvenue Road & Independence

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	167	268	144	207	194	159	197	130	152	166
Average Queue (ft)	47	139	52	98	101	65	91	62	74	78
95th Queue (ft)	115	236	106	169	165	131	167	115	130	140
Link Distance (ft)		589		540		635	635		646	646
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	150		150		270			175		
Storage Blk Time (%)	0	8	0	2				0	0	
Queuing Penalty (veh)	0	4	0	2				0	0	

Network Summary

Network wide Queuing Penalty: 10

CHALLENGES

The Stantec Consulting Services Inc. project team met with City staff and conducted a windshield review of the corridor, stopping and walking along several sections as well. The team was directed to avoid moving the curb line or taking private rights-of-way when considering the conceptual designs. The ability to construct a continuous bicycle facility was therefore omitted from consideration, particularly given the physical constraints at the US 301 Business interchange bridge and ramp structures. These facilities could be improved by "tightening" the ramp radii or by installing channelization islands, but major reconstruction across the bridge would be required to make a safe passage from the south end of the corridor to the north. Over time, highway-oriented corridors like this section of Benvenue Road tend to face severe issues with declining property values, commercial occupancy, and an in-migration of low-value services and housing stock in a continuing downward spiral accompanied by ever-greater congestion, crashes, and vehicular delay. The roadway corridor becomes a place to move through as quickly as possible, capable of only supporting a very limited range of retail uses. An important part of the objective of this project was to suggest relatively "constructable" design improvements that would add considerable value to the corridor in terms of safety, appearance, and performance to make the corridor viable for pedestrian movement.

PEDESTRIAN SCALE LIGHTING

As the following sheet layouts show a connected sidewalk system, pedestrians should have the option to use the system at all times. Therefore it is important to have pedestrian- scale lighting along the corridor to improve its safety and encourage access to the many commercial establishments along the corridor. A well-lit sidewalk system can also aid in traffic calming by signaling drivers that they have entered a different zone, and encouraging them to slow their driving speed.

The light pole spacing suggested in the following sheets is supported by typical DOT lighting schemes, approximately spaced every 150'. But this can be altered to achieve the desired outcome. It is important, however, to place fixtures at roadway and driveway crossings for a safety reasons.

As the pedestrian realm becomes safer with lighting and therefore more frequented, placemaking elements such as benches, small plazas, waste receptacles and enhanced bus stops should be implemented in conjunction and create a corridor more conducive to pedestrian and merchant activities. The style of fixture can also bring streetscape character and identity to a city or a particular "district" within a city. To add, lighting fixtures can be the perfect placement for banners to display the city (or district) identity through adopted city logos (image to right) and or temporary special events and holidays.

CONCEPTUAL DESIGN ELEMENTS

The focus of the improvements included the following actions:

1. Improve sight lines and physical geometry at intersections;
2. Modify pavement markings and signage in conjunction with other changes;
3. Create sidewalk and pedestrian facilities (e.g., push-button-activated signals) in several stretches and intersection locations;
4. Suggest cross-connections to improve the overall connectivity around the corridor, thereby allowing for better circulation between properties for motorists, pedestrians, and bicyclists;
5. Suggest streetscaping improvements, particularly lighting and street trees in key locations; and
6. Create a median-divided facility where feasible, including directional cross-overs to direct turning movements, reduce conflicts, and create a more refined, urban appearance to the overall roadway. Several cross-section renderings were produced to help convey the general layout of the roadway conceptual design proposals.

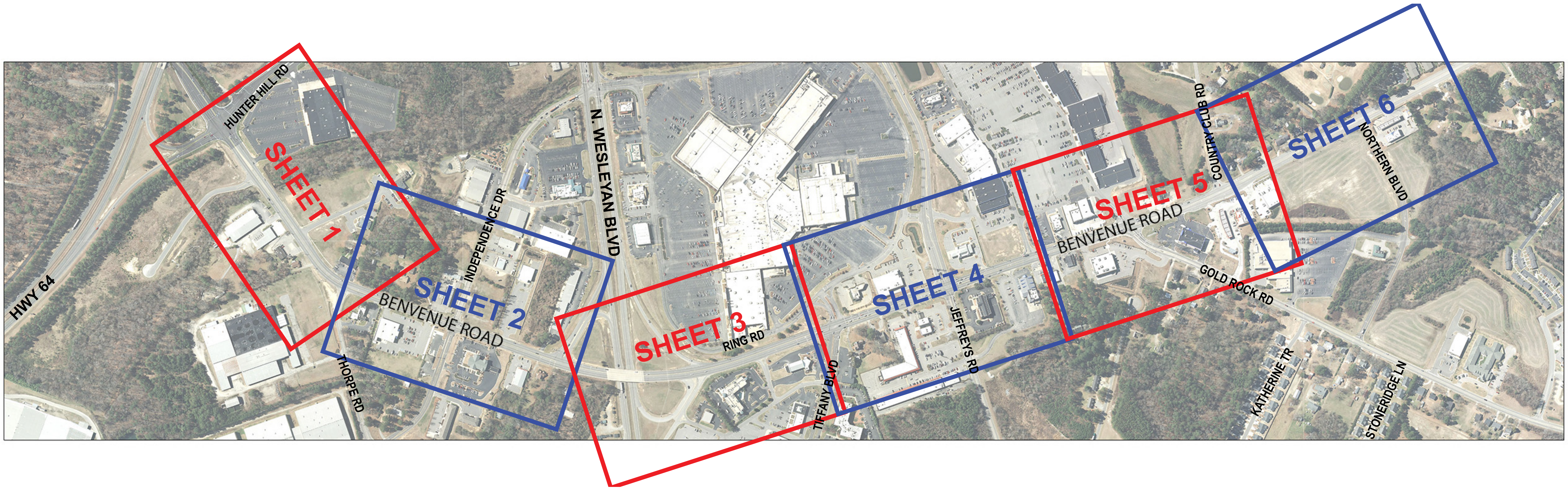
The design concept sheets on the following pages (note also that a "roll plot" showing the full length of the corridor is also available) highlight suggested locations for these improvements. A more robust design effort, including vertical and horizontal surveying, would need to occur to help develop these recommendations more fully before moving to final construction. The opinion of probable costs associated with these improvements are based upon linear quantities, and should be considered a high-level, planning-era estimate only. Again, more refinement in the design of the project recommendations is required before producing a cost that could be considered suitable for budgeting purposes.

STREET TREES

A total of 103 street trees are shown in the following sheets, spaced 40' o.c. Street trees recommended for North Carolina with special attention given to species with the ability to handle air pollution and heat stress involved with urban environments include: Green Ash, Thornless Honeylocust, Bald Cypress, Japanese Zelkova, European Hoenbeam and Eastern Red Cedar. These urban species are recommended from the North Carolina Forest Service with many others found at: http://ncforestservice.gov/Urban/urban_recommendedstreettrees.htm.

PROJECT SHEETS

The below aerial shows where the following 6 project sheets are located along the corridor:



PROJECT REFERENCE NO.	SHEET NO.
171001770	1

Stantec

50' 0' 50' 100'
25'
(ENGLISH)

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

6/20/206
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aisley

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
171001770	2

Stantec

50′ 0′ 50′ 100′ 25′ (ENGLISH)

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

MATCHLINE STA. 25+75.00 SEE SHEET 1

MATCHLINE STA. 40+00.00 SEE SHEET 3

6/20/2016
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aisley

PROJECT REFERENCE NO.	SHEET NO.
171001770	3

Stantec

50' 0' 50' 100'
25' (ENGLISH)

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

8/17/99
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8/17/99

PROJECT REFERENCE NO.	SHEET NO.
171001770	4

Stantec

50' 0' 50' 100'
25' (ENGLISH)

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

5/20/2016
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PROJECT REFERENCE NO.	SHEET NO.
171001770	5

Stantec

50' 0' 50' 100'
25' (ENGLISH)

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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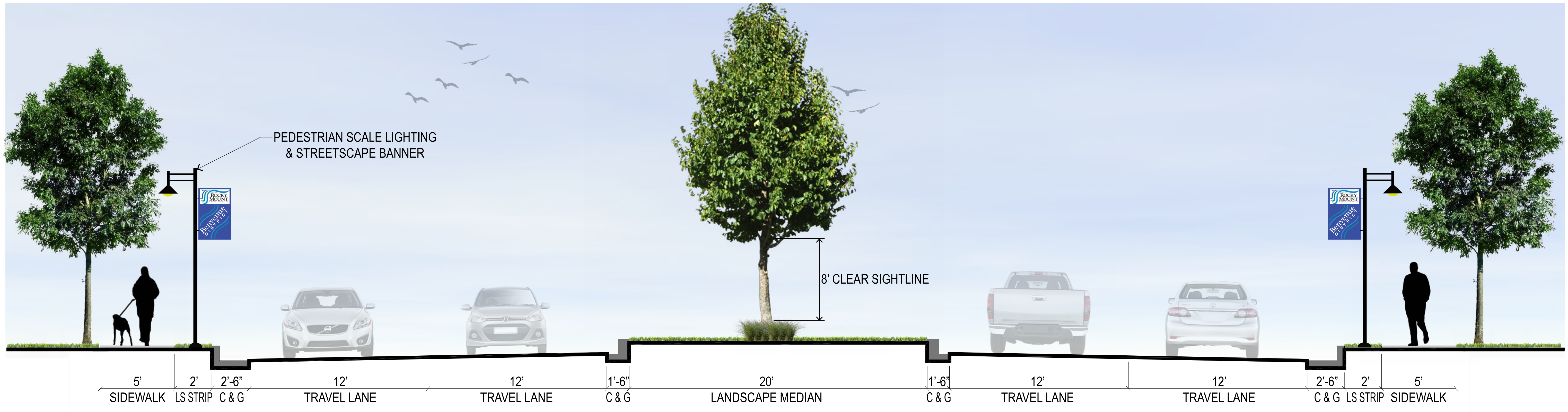
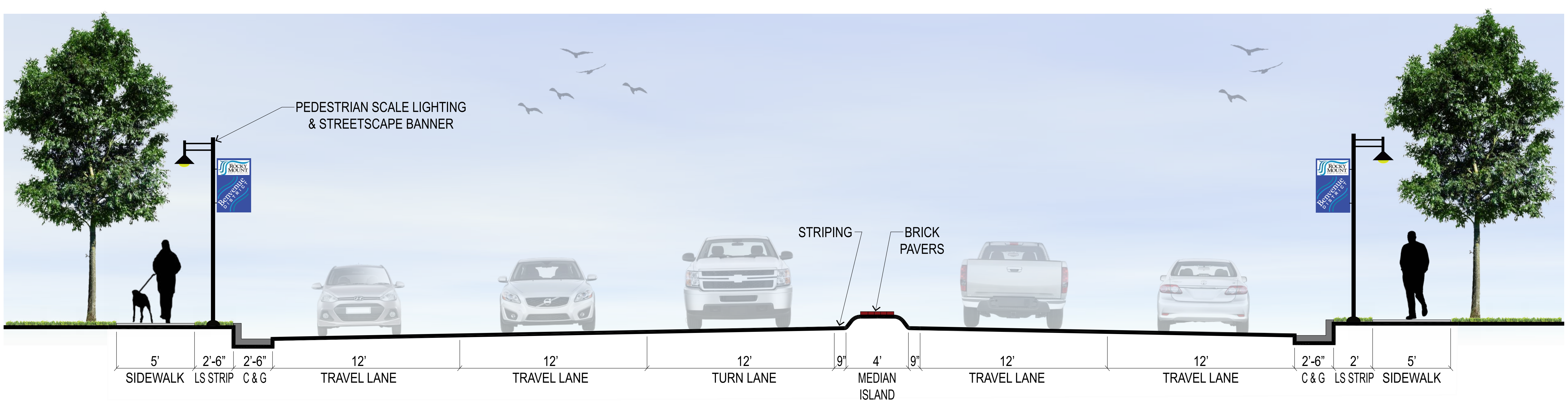
PROPOSED STREET SECTIONS



SECTION A- taken from cross section location on Sheet Layout 1

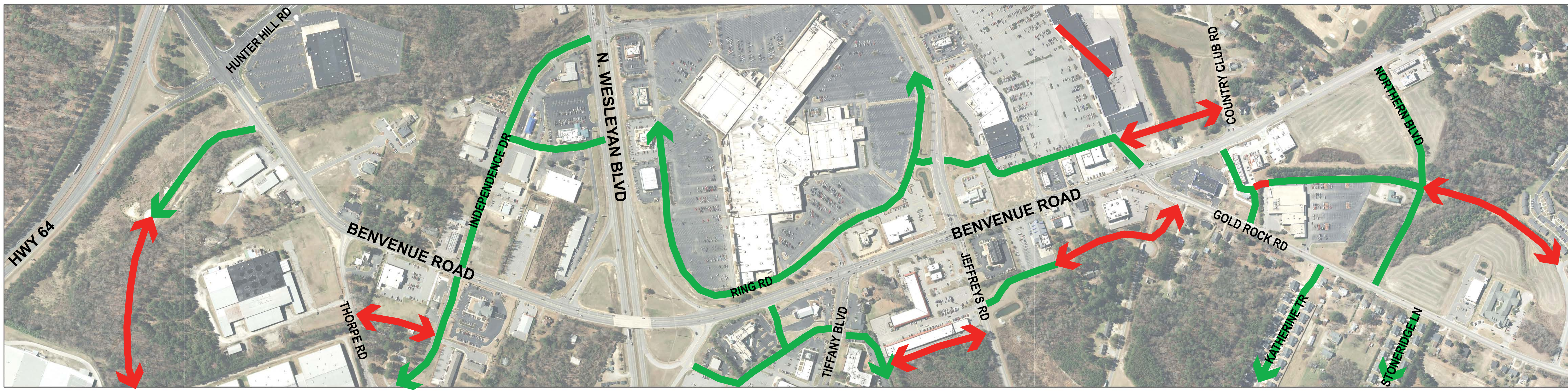


SECTION B- taken from cross section location on Sheet Layout 2

COST ESTIMATES

Bicycle and Pedestrian Facilities	Length (in miles)	Width	Cost (per mile)	Cost (per ft)	Cost
Sidewalks, Including Curb-and-Gutter	2.55	5 ft	$320,000	$61	$816,000
ADA Ramp (ea.)	84	N/A	$1,200		$100,800
Supporting Facilities	**Quantity**	**Cost Per Unit**			**Cost**
Pedestrian Signal (2-way)	20	$1,900			$38,000
Tree (Landscaping)	88	$500			$44,000
Lighting (Pedestrian Scale)	105	$1,500			$157,500
Crosswalk (Tape, Traverse Lines, ea.)	5	$100			$500
Crosswalk (Tape, Ladder, ea.)	20	$300			$6,000
Roadway	**Length (in miles)**		**Cost (per mile)**		**Cost**
3 Lane Curb/Gutter	.3		$2,500,000	$473	$754,893
Widening	1.71(9,049ft)		$1,400,000	$265	$2,394,000
Additional Right Turn Lane	.05 (264ft)		$1,056,000	$200	$56,600
Right-of-Way	**Acres**	**Cost Per Acre**			**Cost**
Neighborhood/Retail	0.9598	$655,000			$628,669
Cost Estimates	**Explanation**				
Subtotal					$4,996,962
Construction Contingency	Percent of Facilities Subtotal- 20%				$873,658
TOTAL CONSTRUCTION COST					**$5,870,621**

CONNECTIONS



-Proposed Connection

-Existing Connection