Section 7 - Capital Improvement Program

7.1 General

This section focuses on the identification and assessment of a capital improvements program (CIP), which also incorporates planning-level cost estimation for projects identified as of the year 2010. The recommended capital improvement program also takes into consideration both costs and non-cost factors, the most important of which is the timing of WWRWRF start-up.

The evaluation was based on the criteria presented in Section 6. The evaluation results are categorized into the following system components:

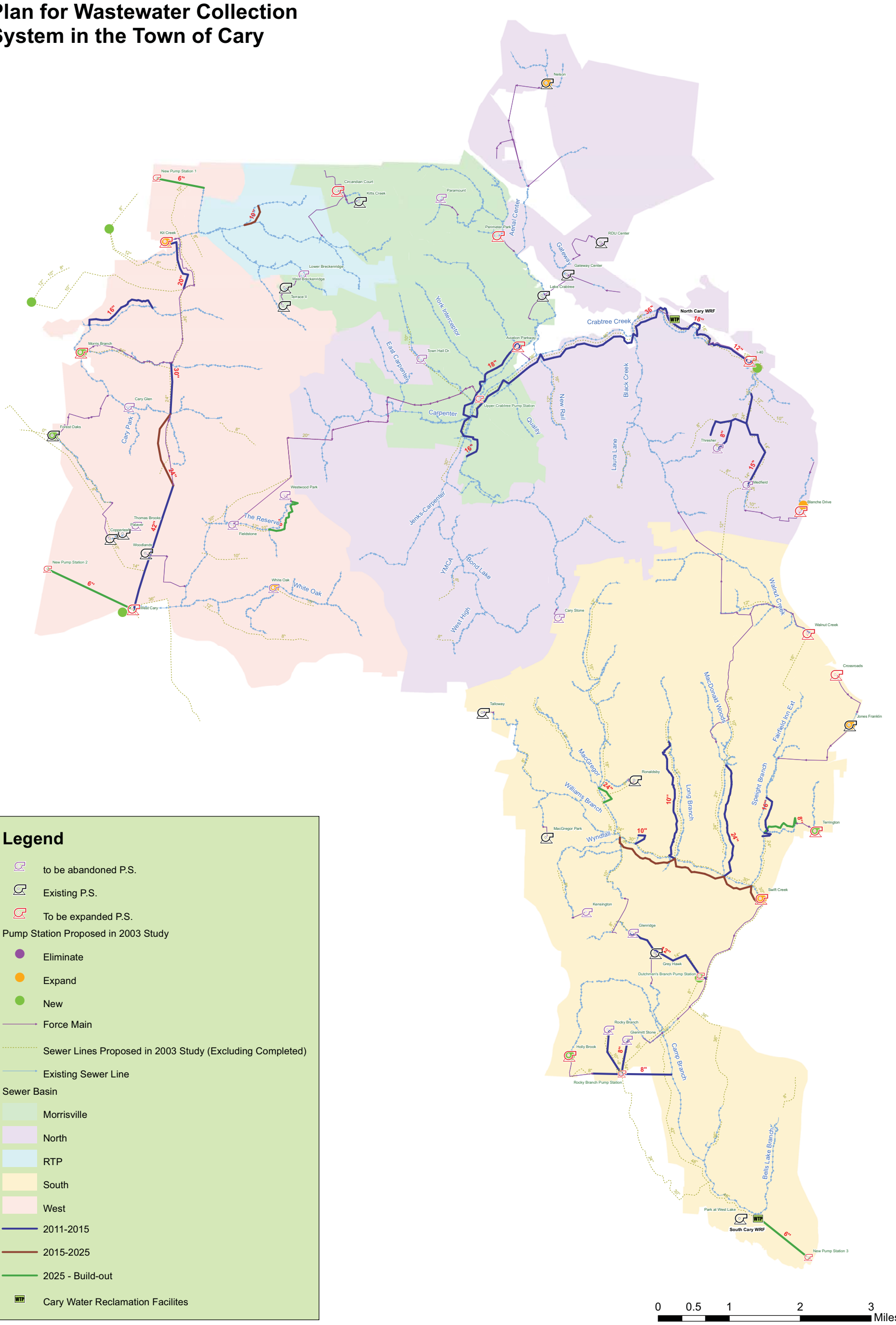
- Gravity Interceptors
- Force Mains
- Pump Stations

Water reclamation facility improvements are not included in this section because they are not within the scope of this study. However, in this study we assumed that the entire flows originating from the West Cary service area would be pumped to the WWRWRF for treatment and discharge, and the North Cary WRF would be continuously expanded hydraulically to receive the future wastewater flows from North Cary service area via the Crabtree Creek Interceptor. In addition, the sewer collection system conveying flows from the West Cary Regional Pump Station to the WWRWRF is entirely associated with the WWRWRF and thus outside the scope of this project. Therefore, they are not discussed in this report.

The system improvements recommended in this report include those improvements necessary to convey projected wastewater flows through build-out within the existing service areas, which consists of the service area within the Town of Cary in Wake County and the existing incorporated area of Cary within Chatham County as discussed in Section 2. Figure 6-5 in Section 6 presents the overall capital improvement program. Recommended gravity interceptor and force main improvements in this report, including both parallel and new gravity interceptors, are summarized in Table 7-1. Those interceptors are sorted by the Town of Cary sewer sub-basin. A description of each interceptor segment is included in the table. Also shown are recommended line sizes, minimum slopes, build flows and total capacities. Figure 7-1 provides a graphical comparison between recommended CIP in this master plan and its counterpart in 2003 Master Plan. As part of this study, a review of the recommendations presented in 2003 Master Plan was performed to determine their applicability. Table 7-2 summarizes the result of comparison for the flow and size information for the recommended CIPs in 2003 report with that of current CIP. Further explanation is provided for the reason of the change.

Figure 7-1: Comparison of Recommendation with 2003 Master Plan for Wastewater Collection System in the Town of Cary

Figure 7-1
Comparison of Recommendation with 2003 Master Plan for Wastewater Collection System in the Town of Cary



Town of Cary
North Carolina

HAZEN AND SAWYER
Environmental Engineers & Scientists

Table 7-1: Gravity Interceptor, Force Main Build-out Flows and Capacity

	DIAMETER		RESULT AT 2/3 FULL					
Interceptor Name	Existing Pipe Diameter (inches)	Slope (%)	Buildout Flow (mgd)	Existing Pipe Capacity (mgd)	Total Capacity with Proposed Pipe (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
Crabtree Creek A	54	0.125	41.95	35.48	45.63	42	2010-2015	
Crabtree Creek B	48	0.08	36.7	20.75	40.29	42	2010-2015	
Long Branch	12	0.30%	1.85	1.15	2.03	10	2010-2015	
Lynn's Branch	21	0.15%	7.82	3.15	9.57	24	2010-2015	
Nancy Branch	16	0.15	3.2	2.95	3.68	16	2010-2015	
Speight Branch	12	0.131	3.89	0.66	4	16	2010-2015	
Crabtree Creek (upper)	15	0.12	2.25	1.15	2.57	16	2010-2015	
York interceptor	18	0.32	6.88	3.29	6.58	18	2010-2015	

Table 7-1: Gravity Interceptor, Force Main Build-out Flows and Capacity (Continued)

	DIAMETER		RESULT AT 2/3 FULL					
Interceptor	Existing Pipe Diameter (inches)	Slope (%)	Buildout Flow (mgd)	Existing Pipe Capacity (mgd)	Total Capacity with Proposed Pipe (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
Harrison Oaks	18	0.249	5.7	2.69	5.38	18	2010-2015	
Dutchman's Branch	-	0.1	0.55		0.58	12	2010-2015	
Glenmitt Stone Extension	—	0.435	0.18		0.95	12	2010-2015	
Green Level B		0.46	24.28		49.75	48	2010-2015	
Holly Brook	—	0.645	0.61		0.91	8	2010-2015	
Reedy Creek A	—	0.267	1.66		1.72	15	2010-2015	

Table 7-1: Gravity Interceptor, Force Main Build-out Flows and Capacity (Continued)

Interceptor Name	DIAMETER Existing Pipe Diameter (inches)	Slope (%)	Buildout Flow (mgd)	RESULT AT 2/3 FULL Existing Pipe Capacity (mgd)	Total Capacity with Proposed Pipe (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
Reedy Creek B	—	0.42	2.1		2.15	15	2010-2015	
Reedy Creek C	—	0.141	2.55		2.33	18	2010-2015	
Reedy Creek Extension	—	0.713	0.07	-	0.53	8	2010-2015	
Rocky Branch	-	0.1	0.14		0.2	8	2010-2015	
Thresher Court Extension A	—	1.139	0.37		0.67	8	2010-2015	
Thresher Court Extension B	—	0.37	0.45		0.69	10	2010-2015	
Paramount Gravity Sewer	-	0.08	0.44		0.52	12	2010-2015	
Swift Creek A	24	0.29	6.65	6.36	12.6	24	2015-2025	

Table 7-1: Gravity Interceptor, Force Main Build-out Flows and Capacity (Continued)

	DIAMETER		RESULT AT 2/3 FULL					
Interceptor Name	Existing Pipe Diameter (inches)	Slope (%)	Buildout Flow (mgd)	Existing Pipe Capacity (mgd)	Total Capacity with Proposed Pipe (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
Swift Creek B	30	0.201	11.5	9.4	18.13	24	2015-2025	
Swift Creek C	40	0.202	19.25	9.4	18.13	30	2015-2025	
Swift Creek D	40	0.205	23.3	20.45	29.96	30	2015-2025	
Upper Kit Creek	10	0.5	1.51	0.8	1.6	10	2015-2025	
Campbell Branch	8	0.8	0.87	0.56	1.12	8	2025-buildout	
The Reserve	8	0.5	0.88	0.48	0.95	8	2025-buildout	
Upper Swift Creek	25	0.08	4.75	3.28	5.12	16	2025-buildout	

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
N3	Crabtree Creek B	Aerial Center Interceptor to Black Creek Interceptor	48	0.08	48	24.89	2008	36.66	42	2010-2015	
N3	Laura Lane A	South of Maynard Road	8	0.48	8	0.76	2008				Less than 10 inch, not modeled
N3	Laura Lane B	Between Maynard Road and Collier Place	12	0.271	12	1.76	2008	1.17			
N4	Crabtree Creek C	Black Creek Interceptor to NCWRF	54	0.125	48	30.2	2008	41.95	36	2010-2015	
N4	Harrison Oaks	Reedy Creek Regional P.S. FM to NCWRF	18	0.249	21	5.8	2013	6.6	18	2025 - buildout	
N5	Reedy Creek A	Medfield P.S. To North of Electra Drive	—	0.267	14	1.22	2013	1.66	15	2010-2015	

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
N5	Reedy Creek B	North of Arrington Rd to South of Thresher Ct. Extension B	—	0.42	14	1.22	2013	2.1	15	2010-2015	
N5	Reedy Creek C	South of Thresher Ct. Extension B to SAS Interceptor	—	0.141	24	3.05	2013	2.55	18	2010-2015	
N5	SAS A	Reedy Creek Trib. 2 to South of SAS Campus Drive	18	0.413	18	4.21	2013	3.15			
N5	SAS B	South of SAS Campus Drive to just North of SAS Campus Drive	18	0.463	18	4.21	2013	3.15			
N5	SAS C	Just North of SAS Campus Drive to I-40	18	0.38	21	5.31	2008	3.25			

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
N5	SAS D	Section to I-40 P.S. parallel to I-40	18	0.62	21	5.59	2013	4.75			
N5	Reedy Creek Extension	Reedy Creek P.S. to Thresher Ct. Extension	—	0.713	8	0.1	2013	0.07	8	2010-2015	
N5	Reedy Creek Trib. 1	Tropical Drive to just north of Medfield P.S.	—	1.174	8	0.07	2013				
N5	Reedy Creek Trib. 2 A	West of Trenton Road	—	0.941	10	0.61	2013				
N5	Reedy Creek Trib. 2 B	West of Trenton Road to Reedy Creek Interceptor	—	1.44	12	1.83	2013				
N5	Thresher Court Extension A	Thresher Ct. P.S. to Reedy Creek Extension	—	1.139	8	0.11	2013	0.37	8	2010-2015	

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
N5	Thresher Court Extension B	Reedy Creek Extension to Reedy Creek Interceptor	—	0.37	10	0.2	2013	0.45	10	2010-2015	
N6	Medfield A	Along Minden Lane to Medfield Interceptor	8	0.683	8	0.5	2018				
N6	Medfield B	Minden Lane to Medfield P.S.	8	0.463	8	0.76	2018				
N8	Crabtree Creek A	Carpenter Interceptor to Aerial Center Interceptor	36	0.058	42	13.17	2008	18	42	2010-2015	Very small segment in flat slope
N8	New Rail A	Between Cary Parkway and 2001 Evans Road Property	12	0.248	12	1.54	2008	0.82			
N8	New Rail B	Short section on 2001 Evans Road Property	15	0.71	10	1.92	2008	1			

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
N8	New Rail C	2001 Evans Road Property to just south of Weston Parkway	15	0.26	10	1.92	2008	1.34			
N8	New Rail D	Just south of Weston Parkway to Weston Parkway, Parallel to Weston Parkway	18	0.31	10	1.92	2008	1.86			
N8	Quality	Morrisville Meters Weston 1 and 2 to Crabtree Creek Interceptor	12	0.17	14	1.51	2008	0.76			
N11	Coles Branch	Before turn in Madison Road to Ferris Wheel Court	8	1.615	10	0.71	2008				Less than 10 inch, not modeled
N12	West High (Upper)	Welchdale Court to SW Cary Parkway	8	0.208	8	0.34	2018				Less than 10 inch, not modeled

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
N12	YMCA	East of Frohlich Drive to 18-inch section near Muir Woods Drive	8	0.272	8	0.42	2018				Less than 10 inch, not modeled
N13	Crabtree Creek (upper)	Coles Branch Interceptor to Carpenter Interceptor	30	0.096	24	8.07	2008	10.61	16	2010-2015	
N14	Crabtree Trib.	North of Treybrooke Drive to Crabtree Creek Interceptor	—	0.281	10	0.1	2008				Completed
S2	Cary Towne	Convention Drive to Walnut Creek Interceptor	12	0.283	8	0.95	2008	0.25			
S5	Lynn's Branch (Upper) A	Imperial Road to Bloomingdale Drive	8	0.217	8	0.42	2008				Less than 10 inch, not modeled

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
S5	Lynn's Branch (Upper) B	Bloomingdale Drive to just north of US 1/64	10	0.5	8	0.42	2008	0.71			
S5	Lynn's Branch (Upper) C	Crosses US 1/64 to Thurston Drive and Cary Parkway	12	0.252	10	1.28	2008	0.71			
S6	Fairfield Inn Extension	US 1/64 Crossing to Upper Lynn's Branch near Forest Parkway	—	0.433	8	0.25	2008				Less than 10 inch, not modeled
S7	Campbell Woods	South of Tryon Road to Campbell Road P.S.	—	0.394	8	0.22	2008				Less than 10 inch, not modeled
S8	Speight Branch (Upper)	Walnut Creek P.S. FM To Tryon Road	24	0.266	10	5.58	2008				Completed
S8	Speight Branch	Tyron Road to Speight Branch (Lower)	12	0.131	30	6.54	2008	3.89	16	2010-2015	

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
S8	Speight Branch (Lower)	Line carrying Campbell Woods flow to Swift Creek Interceptor	24	0.262	18	7.71	2008	4.78		2010-2015	
S8	Swift Creek C	Lynn's Branch Interceptor to Speight Branch Interceptor	40	0.173	30	14.88	2008	19.4	30	2015-2025	
S9	Lynn's Branch A	Thurston Drive to Green Park Lane	21	0.097	16	3.4	2008	7.65	24	2010-2015	
S9	Lynn's Branch B	Green Park Lane to Lochmere Drive	24	0.107	10	3.51	2008	7.65	24	2010-2015	
S9	Swift Creek B	Swift Creek Trib. To Lynn's Branch Interceptor	30	0.083	30	11.02	2008	10.35	24	2015-2025	short segment exceed 2/3 full
S10	Long Branch A	Connors Circle to north of Guernsey Drive	8	0.141	12	0.72	2008	0.53	10	2010-2015	

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
S10	Long Branch B	North of Guernsey Drive to Swift Creek Interceptor	12	0.56	15	1.45	2008	1.85	10	2010-2015	
S11	MacGregor	Upper Swift Creek Interceptor to Swift Creek Interceptor	24	0.244	10	4.68	2008	4.84			
S11	Swift Creek A	Between MacGregor Interceptor and Swift Creek Trib.	24	0.29	27	5.58	2008	6.65	24	2015-2020	
S11	Swift Creek Trib. A	Richelieu Driver to Regency Interceptor	8	0.238	8	0.42	2008	0.18			Less than 10 inch, not modeled
S11	Swift Creek Trib. B	Regency Interceptor to Swift Creek Interceptor	10	0.147	10	0.66	2008	0.34			
S11	Wyndfall (Upper)	End of Whitcomb Lane to Glade Park Road	8	0.214	8	0.36	2013				Less than 10 inch, not modeled

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
S12	Swift Creek D	Speight Branch Interceptor to Swift Creek P.S.	40	0.205	36	22.67	2008	23.3	30	2015-2020	
S14	Upper Swift Creek A	Normandy Street to Dorset Drive	12	0.24	10	0.85	2008	0.56			
S14	Upper Swift Creek B	Dorset Drive to Brownfield Court	15	0.25	10	1.29	2008	1.94			
S15	Upper Swift Creek C	Brownfield Court to Carmichael Interceptor	18	0.195	16	2.67	2008	2.82			
S16	Upper Swift Creek D	Carmichael Interceptor to MacGregor Interceptor	18	0.32	16	3.45	2008	2.96			
S17	MacGregor (Upper) A	Coatbridge Circle to SW Cary Parkway	10	0.232	8	0.52	2013	0.56			
S17	MacGregor (Upper) B	SW Cary Parkway to south of Queensferry Road	12	0.189	8	0.77	2013	0.66			

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

Sub-Basin	Interceptor Name	Reach Description	DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
			Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
S18	Williams Branch (Upper)	East of Lake Pine Drive to US 64	8	0.029	15	0.3	2008	0.17			Less than 10 inch, not modeled
S20	Glenridge	Parallel to Kildaire Farm Road to Glenridge P.S.	8	0.244	8	0.62	2008	0.45	8	2010-2015	
S21	Holly Brook (To PS)	Existing Holly Brook P.S. to new Holly Brook P.S.	—	0.645	10	0.66	2008	0.61	10	2010-2015	
S22	Cotswald Extension A	Rocky Branch P.S. to south of Wyckford Place	—	0.309	10	0.37	2008				
S22	Cotswald Extension B	Holly Brook (from FM) to Rocky Branch Interceptor	—	0.45	12	1.02	2008				
S22	Glenmitt Stone Extension	Glenmitt Stone P.S. to Rocky Branch Interceptor	—	0.435	8	0.12	2008	0.18	12	2010-2015	

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

Sub-Basin	Interceptor Name	Reach Description	DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
			Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
S22	Holly Brook (From FM)	Parallel to Ellinwood Drive to Rocky Branch Interceptor	—	1.999	8	0.66	2008	0.61	8	2010-2015	
S22	Dutchmans Branch (From FM)	Dutchmans Branch P.S. FM to Rocky Branch Interceptor	—	1.62	10	1.08	2013				
S23	Camp Branch A	Camp Branch Trib. to Lamm Drive	42	0.165	30	24.23	2013	27.1			
S23	Camp Branch B	Lamm Drive to Rocky Branch Interceptor	48	0.246	36	24.98	2013	29.5			
S25	Bells Lake A	Between Ten-Ten Road and north of Oxford Green Drive	—	0.809	8	0.08	2008				complete

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

			DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
Sub-Basin	Interceptor Name	Reach Description	Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
S25	Bells Lake B	North of Oxford Green Drive to south of Optimist Farm Road	—	0.73	12	1.11	2008				complete
S25	Bells Lake C	South of Optimist Farm Road to Camp Branch Interceptor	—	0.51	14	1.11	2008				complete
S26	Camp Branch C	Rocky Branch Interceptor to SCWRF	48	0.15	42	29.8	2013	27.28			
W2		Kit Creek PS to Durham Road	14					11.7	20	2010-2015	
W4		Morris Branch interceptor to Panther Branch Interceptor						20.4	30	2010-2015	

Table 7-2: Evaluation of 2003 Report Recommendation Gravity Interceptor and Force Main (Continued)

Sub-Basin	Interceptor Name	Reach Description	DIAMETER		2003 MASTER PLAN			2010 MASTER PLAN			
			Existing Pipe Diameter (inches)	Slope (%)	Proposed Pipe Diameter (inch)	Buildout Flow (mgd)	Year	Buildout Flow (mgd)	Proposed Pipe Diameter (inch)	Year	Remark
W13		from Green Level Church Road to West Cary Regional PS		0.5				20.4	42	2010-2015	
W7		from Panther Creek Interceptor to Green Level Church Road						20.4		2025-buildout	
W1		from Kit Creek PS to Alston Ave.						11.7	20	2010-2015	

7.2 Unit Cost

The unit costs for construction of gravity sewers, force mains and pump stations were estimated, as shown in Table 7-3. These are used as a reference base from which to extrapolate the planning-level cost estimate for future capital improvement projects.

There are many types of pipe materials options allowed in the Town of Cary's specifications. For simplicity and brevity, we assume that ductile iron pipe will be used for both gravity sewers and force mains for pipe parallel and replacement projects.

Table 7-3: Pipeline Unit Construction Cost

Diameter (in)	Unit Cost ($/LF)
8	*$112*
10	*$120*
12	*$130*
16	*$152*
18	*$169*
20	*$182*
24	*$213*
30	*$275*
36	*$338*
42	*$393*
48	*$452*

In addition, we took into consideration other cost elements, such as easements, manholes, erosion control, etc. In this study, we assumed that 30 ft width easements would be provided for new force mains and gravity sewers. We assumed an additional 10 ft with of easement when existing gravity sewers or force mains would be paralleled.

The proposed CIP is presented in Table 7-4. This table shows the sequencing of each project in the improvement scenario. The expansion of the Swift Creek Pump Station and their associated force mains were already included in the Town of Cary's current CIP. Therefore, those improvement projects are not listed in Table 7-4.

The costs reported in the table are estimated planning-level capital costs in 2010 dollars. The costs include construction costs including a 25 percent contingency cost and 10 percent for engineering and other professional services costs.

7.3 Project Description

This section contains a more detailed description of the projects to be started in each phase of the CIP. The project description includes a figure showing the project location and cost for each project at the end of this section. The details of cost estimation for each project can be found in Appendix D.

7.3.1 Projects Starting in Phase I (2011 to 2015)

Gravity Sewer

Project: Crabtree Creek Interceptor A (Figure 7-2)

Install 2,976 feet 42-inch and 8,237 feet of 48-inch parallel gravity sewer from Evans Road to Old Reedy Creek Road on the existing Upper Crabtree Creek Interceptor to eliminate projected future surcharge

Project: Crabtree Creek Interceptor B (Figure 7-3)

Install 3,393 feet of 42-inch and 3,776 feet of 36 inch parallel gravity sewer from Startdale Drive to Evans Road on the existing Crabtree Creek Interceptor to eliminate projected future surcharge

Project: Long Branch Interceptor (Figure 7-4)

Install a parallel 9,559 feet of 10-inch gravity sewer from Cary Parkway to Swift Creek Interceptor to eliminate surcharge in the Long Branch Interceptor

Project: Lynn's Branch Interceptor (Figure 7-5)

Install 8,614 feet of parallel 24-inch gravity interceptor from Tryon Road to Swift Creek Interceptor to eliminate surcharge in the Lynn's Branch Interceptor

Project: Nancy Branch Interceptor (Figure 7-6)

Install 5,429 feet of parallel 16-inch gravity interceptor Sabiston Drive to Corrigan Drive to eliminate surcharge in the Nancy Branch Interceptor

Project: Speight Branch (Figure 7-7)

Install 3,217 feet of 16-inch sewer line parallel to the existing Speight Branch Interceptor from Spring Ridge Road to Cary Parkway to eliminate projected surcharge

Project: Upper Crabtree Creek Interceptor (Figure 7-8)

Install 1,954 feet of 16-inch parallel gravity sewer on the existing Upper Crabtree Creek Interceptor from Kirkeenen Circle to Morrisville Parkway to eliminate projected future surcharge

Project: York Interceptor (Figure 7-9)

Install 5,982 feet of 18-inch and 1,083 feet of 15-inch parallel sewer line from International Drive to Morrisville Square Way to the existing York Interceptor to eliminate existing surcharge

Project: Harrison Oaks Interceptor (Figure 7-10)

Install 6,257 feet of 18-inch parallel gravity interceptor to accommodate the increased capacity at the new Reedy Creek Pump Station

Project: Dutchman's Branch Interceptor (Figure 7-11)

Install 7,263 feet of new 12-inch interceptor Autumngate Drive to Tulip Drive to eliminate Glenridge Pump Station and deliver flows to the new Dutchman's Branch Pump Station

Project: Glenmitt Stone (Figure 7-12)

Install 2,558 feet of new 8-inch gravity sewer from the existing Glenmitt Stone Pump Station to the new Rocky Branch Pump Station to eliminate the Glenmitt Stone Pump Station

Project: Green Level B Interceptor (Figure 7-13)

Install 11,000 feet of new 48-inch gravity interceptor from Green Level Church Road to West Cary Regional Pump Station to deliver upstream wastewater flows to the expanded West Cary Regional Pump Station

Project: Holly Brook Branch (Figure 7-12)

Install 2,107 feet of 8-inch gravity sewer from the Holly Brook force main to the new Rocky Branch Pump Station

Project: Reedy Creek A, B and C (Figure 7-14)

Install 5,636 feet of 15-inch and 2,257 feet of 18-inch sewer lines from north of Chapel Hill Road to the existing SAS Interceptor to serve the northeast portion of the Cary service area west of Trinity Road and east of Harrison Avenue. This interceptor will also allow the existing Medfield and Thresher Court Pump Stations to be taken off-line." The Reedy Creek pump station has already been taken off-line.

Project: Reedy Creek Extension (Figure 7-14)

Install 1,892 feet of 8-inch sewer line from the new Thresher Court Extension to take the Reedy Creek Pump Station offline

Project: Rocky Branch Sewer (Figure 7-12)

Install 3,540 feet of 10-inch gravity sewer from the existing Rocky Branch Pump Station to the new Rocky Branch Pump Station

Project: Thresher Court Extension A and B (Figure 7-14)

Install 2,387 feet of 8-inch and 1,223 feet of 12-inch sewer lines from the new Reedy Creek Interceptor to take the Thresher Court Pump Station offline

Project: Paramount Gravity Sewer (Figure 7-39)

Install a new 3,000 ft 12-inch sewer line from Paramount Pump Station to take it offline

Force Main and Pump Station

Project: Dutchman's Branch Pump Station and Force Main (Figure 7-11)

Install a new Dutchman's Branch Pump Station (0.6 MGD) and 500 feet of 6-inch force main to the Swift Creek Pump Station force main

Project: Green Level Force Main (Figure 7-15)

Install 3,438 feet of 30-inch force main from McCrimmon Parkway to Morrisville Parkway to connect the Kit Creek Pump Station via Alston force main to pump south to the WWRWRF

Project: Alston Force Main (Figure 7-16)

Install 4,000 feet of 20-inch force main to allow the Kit Creek Pump Station to pump south to the WWRWRF

Project: Holly Brook Force Main and Pump Station Upgrade (Figure 7-12)

Install 2,154 feet of 8-inch force main to allow a change in direction for the flow from the Holly Brook Pump Station (0.8 MGD) to connect to the new Rocky Branch Pump Station

Project: New Rocky Branch Pump Station and Force Main (Figure 7-12)

Install a new Rocky Branch Pump Station and 3,704 feet of 8 inch force main to pump into the Camp Branch Interceptor

Project: Reedy Creek Regional Pump Station (Figure 7-17)

Abandon the existing I-40 Pump Station and build a new Reedy Creek Pump Station with a capacity of 5.6 MGD on the same site and install 3,707 feet of 12 inch force main

Project: Kit Creek Pump Station Upgrade (Figure 7-18)

Redirect Kit Creek Pump Station to pump to West Cary Regional Pump Station and increase the capacity to 10.05 MGD to meet future wet weather flow requirements

Project: Medfield Pump Station Elimination (Figure 7-14)

Abandon Medfield Pump Station

Project: Morris Branch Pump Station Upgrade (Figure 7-19)

Redirect Morris Branch Pump Station to pump to West Cary Regional Pump Station and increase the capacity to 5.85 MGD to meet future wet weather flow requirements

Project: Paramount Pump Station Elimination (Figure 7-39)

Abandon Paramount Pump Station and add Paramount gravity sewer

Project: Walnut Creek Pump Station Upgrade (Figure 7-20)

Upgrade Walnut Creek Pump Station to 5.50 MGD

Project: Glenridge Pump Station Elimination (Figure 7-11)

Abandon Glenridge Pump Station

Project: Glenmitt Stone Pump Station Elimination (Figure 7-12)

Abandon Glenmitt Stone Pump Station

Project: Thresher Pump Station Elimination (Figure 7-14)

Abandon Thresher Pump Station

Project: Holly Brook Pump Station Upgrade (Figure 7-12)

Upgrade Holly Brook Pump Station to 0.80 MGD

Project: Aviation Parkway Pump Station Upgrade (Figure 7-21)

Upgrade Aviation Parkway Pump Station to 8 MGD and install 1,502 feet of 16 inch force main.

The current 16 inch paralleling project is not intended for capacity purpose, therefore, a new force main of 16 inch is recommended in addition to the ongoing project.

Project: Blanche Drive Pump Station Upgrade (Figure 7-22)

Upgrade Blanche Drive Pump Station to 0.75 MGD

Project: Crossroads Pump Station Upgrade (Figure 7-23)

Upgrade Crossroads Pump Station to 0.45 MGD

Project: Westwood Park Pump Station Elimination (Figure 7-38)

Abandon Westwood Park Pump Station

7.3.2 Projects Starting in Phase II (2015-2025)

Gravity Sewer

Project: Swift Creek Interceptor A (Figure 7-24)

Install 4,716 feet of 24-inch parallel sewer line from Regency Parkway to the existing Swift Creek Interceptor at Kildaire Farm Road to eliminate future surcharge

Project: Swift Creek Interceptor B (Figure 7-25)

Install 3,982 feet of 24-inch parallel sewer line from Kildaire Farm Road to the existing Swift Creek Interceptor at Greensview Drive to eliminate future surcharge

Project: Swift Creek Interceptor C (Figure 7-26)

Install 2,194 feet of 30-inch parallel sewer line to the existing Swift Creek Interceptor from Greensview Drive to Maitland Drive to eliminate future surcharge

Project: Swift Creek Interceptor D (Figure 7-27)

Install 1,304 feet of 30-inch parallel sewer line to the existing Swift Creek Interceptor from Maitland Drive to Swift Creek Pump Station to eliminate future surcharge

Project: Upper Kit Creek (Figure 7-28)

Install 1,592 feet of 10-inch gravity sewer near Kit Creek Road to eliminate surcharge

Force Main and Pump Station

Project: Circandian Court Pump Station Upgrade (Figure 7-29)

Upgrade Circandian Court Pump Station to 0.30 MGD

Project: Green Level A Force Main (Figure 7-15)

Install 5,424 feet of 20-inch force main to connect the Kit Creek Pump Station and to pump south

7.3.3 Projects Starting in Phase III (2025 to Build-Out)

Gravity Sewer

Project: Campbell Branch (Figure 7-30)

Install 3,165 feet of 8-inch interceptor on the existing Campbell Branch Interceptor along Windstream Drive and Buckden Drive to accommodate upstream flow increase

Project: The Reserve (Figure 7-31)

Install 3,579 feet of 8-inch parallel gravity sewer to eliminate future surcharge

Project: Upper Swift Creek Interceptor (Figure 7-32)

Install 1,242 feet of 24-inch parallel gravity sewer interceptor to the Upper Swift Creek interceptor to minimize local surcharge

Force Main and Pump Station

Project: New Pump Station 1 and Force Main (Figure 7-33)

Install a new Pump Station and 3,600 feet of 4-inch force main to expand service area

Project: New Pump Station 2 and Force Main (Figure 7-34)

Install a new Pump Station and 7,000 feet of 6-inch force main to expand service area

Project: New Pump Station 3 and Force Main (Figure 7-35)

Install a new Pump Station and 5,000 feet of 6-inch force main to expand service area

Project: Terrington Pump Station Upgrade (Figure 7-36)

Upgrade Terrington Pump Station to 0.8 MGD to handle future flow increase

Project: Upper Crabtree Creek Pump Station and Force Main (Figure 7-37)

Install the 6.6 MGD Upper Crabtree Creek Pump station and 20-inch force main to help the Town meet its inter-basin transfer requirements. The size of this facility is based on the 2003 Master Plan.

Project: Kit Creek Pump Station Upgrade (Figure 7-18)

Upgrade Kit Creek Pump Station to 13.82 MGD to meet future wet weather flow requirements

Project: Morris Branch Pump Station Upgrade (Figure 7-19)

Upgrade Morris Branch Pump Station to 7.45 MGD to meet future wet weather flow requirements

Table 7-4: Summary of Capital Improvement Program

Name	Phase 1 (2010-2015)	Phase 2 (2015-2025)	Phase 3 (2025 - Build Out)	Project Total
Crabtree Creek A	$7,285,000			$7,285,000
Crabtree Creek B	$3,825,000			$3,825,000
Long Branch	$2,079,000			$2,079,000
Lynn's Branch	$2,979,000			$2,979,000
Nancy Branch	$1,399,000			$1,399,000
Speight Branch	$824,000			$824,000
Upper Crabtree Creek	$840,000			$840,000
York Interceptor	$1,936,000			$1,936,000
Harrison Oaks	$1,812,000			$1,812,000
Dutchman's Branch	$1,790,000			$1,790,000
Glenmitt Stone	$559,000			$559,000
Green Level B	$7,268,000			$7,268,000
Holly Brook Branch	$463,000			$463,000
Reedy Creek A	$764,000			$764,000
Reedy Creek B	$783,000			$783,000
Reedy Creek C	$680,000			$680,000
Reedy Creek Extension	$430,000			$430,000
Rocky Branch	$776,000			$776,000
Thrasher Court Extension A	$525,000			$525,000
Thrasher Court Extension B	$301,000			$301,000
Paramount Gravity Sewer	$703,000			$703,000
Green Level Force Main	$1,464,000			$1,464,000
Alston Force Main	$1,191,000			$1,191,000
Holly Brook Force Main	$434,000			$434,000
Rocky Branch Force Main	$747,000			$747,000
Reedy Creek Regional PS Force Main	$841,000			$841,000
Dutchman's Branch Force Main	$101,000			$101,000
Kit Creek Pump Station Expansion	$3,530,000		$224,000	$3,754,000
Medfield Pump Station Abandonment	$138,000			$138,000
Morris Branch Pump Station Expansion	$1,745,000		$326,000	$2,071,000
Paramount Pump Station Abandonment	$509,000			$509,000
New rocky Branch Pump Station (1 MGD)	$1,100,000			$1,100,000
I-40 Pump Station Expansion to Reedy Creek Regional Pump Station (to 5.6 MGD)	$4,125,000			$4,125,000
Walnut Creek Pump Station Expansion (to 5.5 MGD)	$1,650,000			$1,650,000
Glenridge Pump Station Abandonment	$138,000			$138,000
Glenmitt Stone Pump Station Abandonment	$138,000			$138,000
Thresher Pump Station Abandonment	$138,000			$138,000
Holly Brook Station Expansion (to 0.80 MGD)	$1,100,000			$1,100,000

Table 7-4: Summary of Capital Improvement Program (Continued)

Name	Phase1 (2010-2015)	Phase2 (2015-2025)	Phase3 (2025-BuildOut)	Project Total
New Dutchman's Branch Pump Station (0.6 MGD)	$1,100,000			$1,100,000
Aviation Parkway Pump Station Expansion	$2,750,000			$2,750,000
Blanche Pump Station Expansion (0.75 MGD)	$1,169,000			$1,169,000
Cross Road Pump Station Expansion (0.45 MGD)	$1,169,000			$1,169,000
Westwood One Pump Station Abandonment	$688,000			$688,000
Swift Creek A		$1,654,000		$1,654,000
Swift Creek B		$1,376,000		$1,376,000
Swift Creek C		$941,000		$941,000
Swift Creek D		$569,000		$569,000
Upper Kit Creek		$335,000		$335,000
Circadian Court Pump Station Expansion to 0.30 MGD		$963,000		$963,000
Green Level A Force Main		$1,765,000		$1,765,000
Campbell Branch			$654,000	$654,000
The Reserve			$743,000	$743,000
Upper Swift Creek			$434,000	$434,000
New Pump Station 01 Force Main			$648,000	$648,000
New Pump Station 02 Force Main			$1,430,000	$1,430,000
New Pump Station 03 Force Main			$1,014,000	$1,014,000
Upper Crabtree Pump Station Force Main			$13,822,000	$13,822,000
Terrington Pump Station Expansion to 0.80 MGD			$1,306,000	$1,306,000
New Upper Crabtree Pump Station (6.6 MGD)			$7,563,000	$7,563,000
New Pump Station 01			$1,375,000	$1,375,000
New Pump Station 02			$1,375,000	$1,375,000
New Pump Station 03			$1,375,000	$1,375,000
Kit Creek Pump Station Expansion			$224,000	$224,000
Morris Branch Pump Station Expansion			$326,000	$326,000
	$63,986,000	$7,603,000	$32,289,000	$103,878,000

7.4 Conclusion and Recommendations

The Town of Cary is moving on many fronts in maintaining its expanding sewer collection system and continuously providing unimpeded sewer conveyance service for customers in the Towns of Cary and Morrisville. The three primary challenges associated with the sewer collection system for the Town of Cary are:

- Prudently manage the growth in the West Cary service area
- Peak flow shifting during wet weather events
- Further investment in reducing groundwater infiltration

The three issues are to some degree inter-related and are dictated by the continued growth of the West Cary service area and the construction of the Western Wake Regional Water Reclamation Facility.

As discussed in Appendix A, three key pump stations in the West Cary service area, the Kit Creek Pump Station, the Morris Branch Pump Station and the West Cary Regional Pump Station and their associated force main systems are in the process of being expanded. It is demonstrated that the capacity of the existing combinations of pumps at those pump stations do not have the firm capacity to handle the peak flow resulting from the existing service areas. Consequently, the peak flow management in the existing West Cary service area is accomplished through shifting peak flow from the West Cary service area to the North Cary service area. However, our analysis in Section 5 has proved that the North Cary service area may itself have the highest unit GWI rate and RDI/I challenge. Therefore, more attention should be directed to the management of surcharging in the York and Crabtree Creek Interceptors. We would recommend that an investigation be conducted to ascertain the cause of surcharge in the Crabtree Creek Interceptor as discussed in Section 5.