Section 4 - Population and Flow Projections

4.1 General

Determining the existing wastewater flow and projecting future wastewater flows is a key aspect of a wastewater collection system master plan. It ultimately sets the schedule for implementing system improvements in phased planning periods. A wastewater collection system master plan must ensure that wastewater collection systems have adequate capacity for existing and projected future wastewater flows. In this project, wastewater flow projections are developed for 5-year (2015), and 15-year (2025) planning periods, as well as build-out conditions.

While wastewater flow projections were addressed in depth in the 2003 Cary Wastewater Collection System Master Plan, they obviously need to be updated in this study due to changes in previously anticipated growth and development patterns during the intervening years. The service area was also altered in profound ways. Two major changes to Cary's wastewater collection system include the Town of Cary's utility merger with the Town of Morrisville and the ongoing projects associated with the Western Wake Regional Water Reclamation Facility (WWRWRF).

4.2 Projection Methodology

While various techniques and methods are available for developing forecasts to minimize both under- and over-estimation of future demand. Recognizing that sewer facilities have high capital costs and require long lead times for planning, permitting, design, and construction, Hazen and Sawyer has adopted a conservative and yet realistic approach when developing wastewater flow forecasts, to forestall neither under-estimation nor over-estimation of future demands.

In this wastewater master plan project, the future wastewater flow is designed to coincide with the base year for the Water System Model and Master Plan project. The wastewater flow projections were developed based on the existing wastewater flow (including both the average day sewer flow and groundwater infiltration components), as well as the incremental wastewater flow increase resulting from the anticipated water demand increase in each of the planning periods on a parcel-level basis, as presented in the Town of Cary Water System Master Plan, dated June 2009, in which CH2M HILL collaborated extensively with the Town of Cary staff to identify projected future water demand increase in each parcel within the service area.

As shown in Figures 2-8 and 2-9, with the expansion of served area and rate increase, the generation of wastewater on per capita basis may continue at a rate less than 3% for the foreseeable future. We would strongly recommend that the Town closely monitor the rate of per capita wastewater generation and adjust the long-term flow projections and CIP plan accordingly. The items below are examples of steps the Town may take to expand its efforts to monitor trends in per capita wastewater generation.

1. Add or relocate more flow meters to the West Service Area and quantify the flow entries to the Kit Creek, Morris Branch and West Cary Regional Pump Stations.

2. Separate single family residence, condominium and apartment categories in the water billing database. There are more apartment buildings in the mixture of future development, which may result in lower per capita wastewater flow generation in the future.
3. The Town may need to recalculate more frequently the wastewater flow balance and understand the sources of the wastewater flow, perhaps on a yearly basis.

4.3 Flow Projection

This parcel-level future water demand data set provided a very detailed depiction of possible future wastewater flow increase as well, with the consideration of future groundwater infiltration contribution. The relationship between the total water demand and the average base flow (the sum of average day sewer flow and groundwater infiltration) can be examined by correlating both parameters for the existing service areas. Table 4-1 summarizes the itemized flow contribution from each component of average base flow for all three existing service areas in Cary and Morrisville. For the first two service areas, the sewer average base flow (ABF) exceeds the total upstream water demand by approximately 20% on an annual average basis due to a high groundwater table in the service area and proximity of a subset of the collection system to adjoining water bodies such as lakes and creeks. This ABF/total upstream water demand ratio is comparable to other surrounding communities in Wake County.

Based on the 2009 Water System Master Plan by CH2M HILL, the estimated incremental water demand increase from 2007 for the same service areas is shown in Table 4-2. Therefore, the total wastewater flows for future planning periods can be projected by adding the existing wastewater flow plus the future water demand increase multiplied by a ratio of the individual service area's ABF/(year 2010) upstream water demand ratio. These values can be found in Table 4-1.

Table 4-1: ABF/Total Water Demand Ratios

WRF	Year 2010 Total Water Demand Upstream, Non-Irrigation	Year 2010 Average Base Flow (MGD)	Year 2010 ABF/Total Water Demand Upstream Ratio
North - North Cary WRF	4.57	6.35	1.39
South - South Cary WRF	4.33	4.82	1.11
West – Durham County Triangle WWTP	2.16	2.11	0.98
Average			1.23

Based on the 2009 Water System Master Plan by CH2M HILL, the incremental water demand increase from 2007 for the three service areas is shown in Table 4-2. Therefore, the projected total wastewater flows for future planning periods can be projected by adding the existing wastewater flow plus the future water demand increase multiplied by a ratio of 1.20 plus the future water demand increase multiplied by the ABF/Upstream Water Demand Ratio for each respective WRF. The results can be found in Table 4-3.

Table 4-2: Future Water Demand Increases Compared to 2010

Basin	Estimated 2015 Future Demand Increase (MGD)	Estimated 2025 Future Demand Increase (MGD)	Estimated Build-out Future Demand Increase (MGD)
North	2.20	2.80	4.87
South	0.73	1.09	2.87
West	3.54	4.46	6.20
Total	6.47	8.35	13.95

Table 4-3: Future Wastewater Flow Projections

Basin	Projected 2015 WW Flows (MGD)	Projected 2025 WW Flows (MGD)	Projected Build-out WW Flows (MGD)
North	9.40	10.24	13.11
South	5.63	6.02	8.00
West	5.57	6.48	8.18
Total	20.6	22.7	29.29

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