

***APPENDIX F***  
***Population and Wastewater Projections***

## APPENDIX F TOWN OF CARY POPULATION AND WASTEWATER FLOW PROJECTIONS SUPPLEMENTS

### F.1 Population Projection Supplement

The projected service area boundaries for the Town of Cary are shown on Figure F-1. As directed by the Town, buildout conditions were based on the service area delineated on the growth plan map provided in the *Town of Cary Land Use Plan* adopted by Town Council on November 14, 1996, with the exception of the following:

- Rock Quarry North of I-40
- Chatham County – 1-mile buffer to Jordan Lake U.S. Army Corps of Engineers land

To estimate the projected service area populations, the projected service area boundaries were overlaid on the Traffic Analysis Zone (TAZ) data. Adjustments to the population projections from the TAZ data were made at the direction of the Town of Cary for undeveloped areas in the western and extreme southern portions of the Cary service area. These adjustments were made for projected development in planned unit developments (PUDs) and activity centers. Five PUDs are currently planned for the western portion of the Cary service area. These include the following developments:

- Amberly
- Cary Park (1 and 2)
- Stonewater
- Village At The Park

The locations of these PUDs are shown on Figure F-2. Population projections for ultimate buildout of the PUDs were based on dwelling unit projections provided by the Town of Cary and an estimated 2.5 persons per dwelling unit. Populations for the PUDs were then determined by overlay of the PUD areas on the TAZ data and subtraction of the TAZ populations from the projected PUD populations.

Fifteen activity centers (ACs) are projected for the Cary service area, including 12 in the western service area and 3 in the southern service area. An activity center is defined as a “node” where activity is concentrated. It is a cluster of

businesses and establishments, with an associated increased level of surrounding residential development. Three types of activity centers were projected: Regional Activity Centers (RACs), Community Activity Centers (CACs) and Neighborhood Activity Centers (NACs). Potential AC locations and flows for the three types of ACs were provided by the Town of Cary. The AC locations in the western and southern service areas are shown on Figure F-2 above and Figure F-3, respectively. The Town of Cary provided both minimum and maximum levels of development for the different types of ACs. The population projections for the ACs were based on the number of dwelling units for the minimum development level, as provided by the Town, and 2.5 persons per dwelling unit. Populations for ACs were then determined by overlay of the AC areas on the TAZ data and subtraction of the TAZ populations from the projected AC populations.

Service area populations were based on the overlay of the service area boundaries on the TAZ data, plus the above adjustments to the TAZ data. The projected wastewater service area populations for Cary are summarized in Table F-1.

The annexation populations shown in Table F-1 include existing population for developed areas that are outside Town limits but are entirely surrounded by the existing service area. The total population for the areas that qualify for annexation and are projected to be annexed in the future is estimated by the Town of Cary Planning Department at 12,500.

## **F.2 Wastewater Flow Projections for PUDs and ACs**

See attached letter.

**Table F-1  
Cary Wastewater Service Area Projected Populations**

<b>Planning Period</b>	<b>TAZ *</b>	<b>PUDs</b>	<b>ACs</b>	<b>Annexation</b>	<b>Total</b>
2002-03					105,950
2003	98,185	900	400	1,900	101,385
2005**					113,460
2008	113,940	12,465	1,570	3,600	131,575
2010**					145,720
2013	127,250	23,885	3,295	12,500	166,930
2015**					178,380
2018	153,490	25,795	3,765	12,500	195,550
2020**					204,520
2025**					223,730
2030**					242,930
Buildout	198,990	25,790	5,650	12,500	242,930
*Cary TAZ total without Annexation, PUDs or ACs					
**By interpolation					

### **F.3 Commercial Wastewater Flow Projections**

The commercial metered demand category consists of the following customer types: auto sales, auto repair, banks, churches, day care, golf/clubhouse, gas & fuel, general stores, health care, laundromats, motel/hotel, general office, pools/recreation, restaurants, hair styling, and car wash. “Construction trailer” and “Sales trailer” were also added to the commercial category in 1997 and 1998, respectively.

The total commercial metered demand (including irrigation) increased from 1.5 to 2.0 mgd from 1995 to 1998. The total commercial demand historically constituted approximately 21 percent of Cary's total system demand.

The commercial unit demand was estimated by dividing the total 1998 commercial demand provided by the Cary Finance Department (including commercial irrigation) by the 1998 estimated number of commercial employees. The 1998 number of commercial employees was estimated by overlaying Cary's 1998 wastewater service area on the commercial employment data in the "wakeforecasts.xls" file provided by CAMPO. It should be noted that the Town's wastewater service area limits do not necessarily coincide with a TAZ boundary, i.e., some TAZs are partially in Cary. The percent of the TAZ in Cary was estimated based on the percent of the acreage in Cary used by CDM for the *Water System Master Plan* (CDM, 2000).

Based on this method, the number of 1998 commercial employees was estimated to be approximately 27,920, resulting in a commercial unit water demand of approximately 72 gallons per day (gpd)/employee. The projected commercial wastewater flow rate of 65 gpd/employee was based on the commercial water consumption rate of 72 gpd/employee times a water return rate to the wastewater collection system of 0.90, or 90 percent.

As reported in Metcalf & Eddy (2003), wastewater flow rate allowances for commercial development normally range from 800 to 1,500. The 0.09 to 0.12 gpd/ft<sup>2</sup> values shown in the EIS are equivalent to approximately 1,020 to 1,360 gpd/acre as reported in the letter of September 21, 2001, included in this Appendix F.

#### **F.4 Infiltration/Inflow**

Infiltration/inflow (I/I) is extraneous water that enters the wastewater collection system from groundwater and surface water. I/I occurs at a relatively low rate throughout the year and typically increases significantly during rainfall events. I/I enters the collection system through openings in collection lines at joints, through broken lines, through openings in manhole walls, through holes in manhole covers or through missing manhole covers. I/I can occur at a more or less continuous rate from intrusion of groundwater or surface water, or can occur primarily during rainfall events from surface water runoff entering the collection system. Surface runoff can also enter the collection system through cross-

connections with the stormwater collection system or through roof drains tied into the wastewater collection system. An analysis of I/I was performed for the *Town of Cary Wastewater Collection System Master Plan* (Hazen and Sawyer, 2003).

I/I that occurs on a relatively continuous basis, such as through groundwater intrusion, is typically referred to as infiltration. I/I that occurs at high rates primarily during rainfall events is termed inflow. Wastewater collection systems must be sized to convey the wastewater discharged to the collection system, as well as the I/I that occurs and contributes to the peak flows to the collection system.

I/I quantities can be estimated on an annual average basis by determining the expected amount of wastewater entering the collection system and subtracting this value from the total influent flow at the wastewater treatment facilities. The expected amount of wastewater flow generated can be calculated based on billed water demand data times the estimated fraction of the billed water demand that is returned to the wastewater collection system. This calculation was performed for the years 1995 through 1998 based on the water billing data presented in Table 2-5 in the *Water System Master Plan* (CDM, 2000). The results are presented in Table 2-5 in the *Wastewater Collection System Master Plan* (Hazen and Sawyer, 2003). Based on the values in this table, I/I ranged from 5.9 to 15.5 percent of the total North and South Cary Water Reclamation Facility flows for the years 1995 through 1998. The I/I for the four years averaged approximately 12.1 percent of the total WRF flows. The Town of Cary has an aggressive I/I remediation program. Accordingly, a value of 10 percent was used for the flow projections in the *Master Plan* to reflect future reductions in I/I due to I/I rehabilitation. This value is also recommended for use in this EIS.

## **F.5 References**

CDM. Town of Cary Water System Master Plan. March 2000.

Town of Cary. 1996 Land Use Plan. Adopted November 14, 1996.

Hazen and Sawyer. Town of Cary Wastewater Collection System Master Plan. June 2003.

Metcalf and Eddy. 2003. Wastewater Engineering Treatment Disposal and Reuse. Fourth edition. New York NY . McGraw-Hill Inc.

DATE: September 21, 2001

TO: Users of Sewer Service Area Data

FROM: Glen Harrell

SUBJECT: LUP Densities and Potential Activity Center Flows

### LUP DENSITIES

The 1996 Land Use Plan uses the following average densities (Sec 4.3 and table on P 58)  
LDR @ 2.4 to 2.8 units/ac, MDR @ 4.5 to 6 units/ac, HDR @ 12 to 16 units/ac, COMM, OFF, &  
OFF/IND @ 10,000 sf/Ac to 12,600 sf/Ac, INST @ 2,500 sf/Ac

### FLOWRATES

TOC Standard flowrates used are 280(120) gpd/unit(bdrm) for RES., 0.09 gpd/sf for OFF/IND,  
0.12 gpd/sf for COM, and 0.20 gpd/sf for INST

### POTENTIAL FLOWS from ACTIVITY CENTERS

Based on 1996 LUP

#### REVIEW OF TABLE 2.6.4

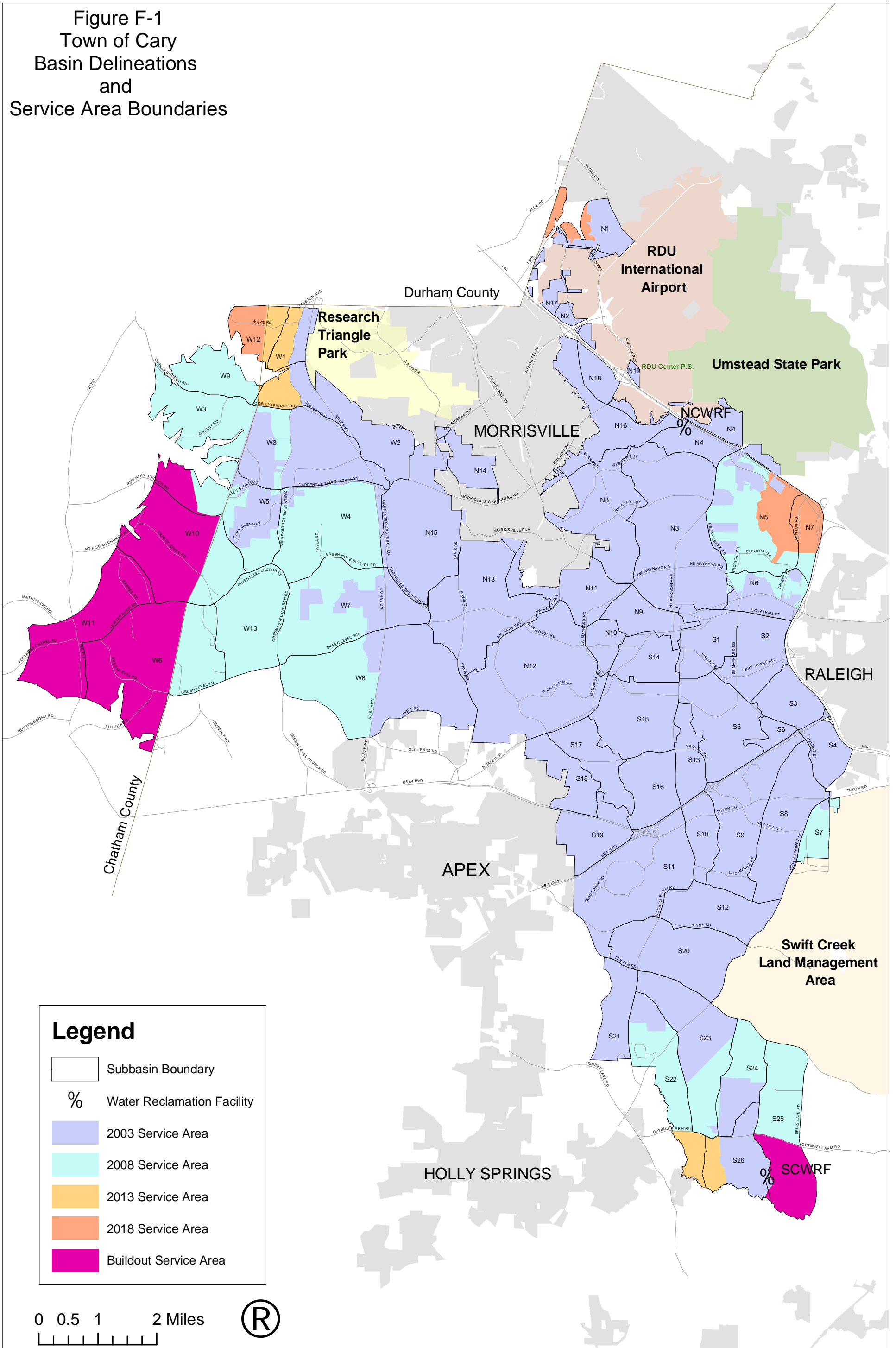
- The current effort to update the LUP includes a table which summarizes the Size and Intensity of Activity Centers which was compiled from the approved LUP. These centers do not have the same effect as clustering. For instance, if an LDR parcel contains an Activity Center, the density of the parcel becomes significantly greater than LDR as shown below.
- The following Table summarizes Average Daily Wastewater Flows from proposed Activity Centers.

ACTIVITY CENTER FLOWS						
	NAC		CAC		RAC	
	Min	Max	Min	Max	Min	Max
Min.Total Area (1)	28	70	67	145	200	500
Support Area (Ac)	20	40	40	80	100	200
Support Area Density (2)	8	16	12	25	16	30
Support Area (# of Dwellings)(2)	140	440	360	1240	1100	3600
Residential Flow (@280gpd/unit)	39200	123200	100800	347200	308000	1008000
Commercial sq.ft.	50000	100000	150000	250000	750000	1500000
Comm. Flow (@0.12gpd/sq.ft.)	6000	12000	18000	30000	90000	180000
Office sq.ft.	25000	100000	100000	300000	500000	2000000
Office Flow (@.09gpd/sq.ft.)	2250	9000	9000	27000	45000	180000
Inst. sq.ft.	2500	25000	5000	100000	10000	100000
Inst. Flow (@0.09gpd/sq.ft.)	225	2250	450	9000	900	9000
Added Flows (gpd) (3) (1)	47675	146450	128250	413200	443900	1377000

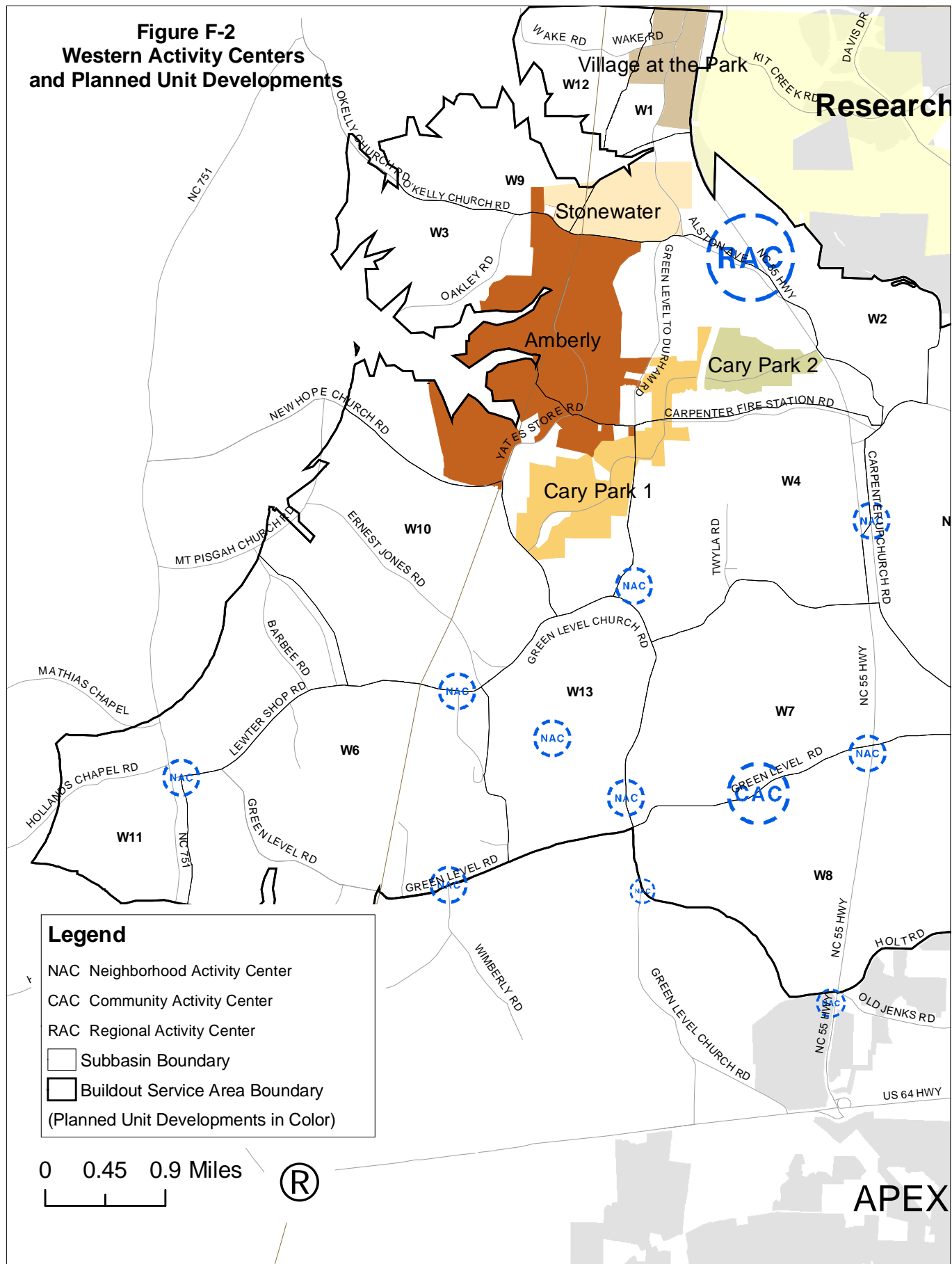
#### NOTES:

- 1- The total basin flow is reduced by the Total Area times the flow factor/Ac before adding the Activity Center Flow
- 2- Half of residential area @ 6 units/ac and half at Density shown
- 3- Sum of Residential, Commercial, Office, and Inst flows

Figure F-1  
Town of Cary  
Basin Delineations  
and  
Service Area Boundaries



**Figure F-2  
Western Activity Centers  
and Planned Unit Developments**



**Legend**

- NAC Neighborhood Activity Center
- CAC Community Activity Center
- RAC Regional Activity Center
- Subbasin Boundary
- Buildout Service Area Boundary
- (Planned Unit Developments in Color)

