

APPENDIX A

U.S. Census Data for Brunswick County and Municipalities

Population Projections 2000-2030

County (State)	Population						
	April 2000	July 2005	April 2010	July 2015	April 2020	July 2025	April 2030
ALAMANCE	130,800	143,343	154,914	167,587	181,031	194,703	208,799
ALEXANDER	33,603	36,624	39,786	42,748	45,754	48,714	51,679
ALLEGHANY	10,677	11,203	11,735	12,190	12,625	13,003	13,365
ANSON	25,275	26,018	26,843	27,561	28,221	28,823	29,335
ASHE	24,384	25,484	26,297	27,025	27,757	28,322	28,908
AVERY	17,167	18,254	18,906	19,648	20,250	20,778	21,164
BEAUFORT	44,958	46,244	47,316	48,160	49,033	49,537	50,088
BERTIE	19,773	19,441	18,946	18,515	18,047	17,512	16,952
BLADEN	32,278	34,028	35,942	37,573	39,170	40,626	42,089
BRUNSWICK	73,143	84,610	93,776	103,731	112,992	122,160	130,688
<i>Growth from Previous 5 year</i>		15.7%	10.8%	10.6%	8.9%	8.1%	7.0%
<i>Growth from 2005</i>				22.6%	33.5%	44.4%	54.5%
BUNCOMBE	206,330	222,398	238,793	255,265	271,754	287,925	303,762
BURKE	89,148	94,858	101,781	108,025	114,870	121,351	128,233
CABARRUS	131,063	150,296	166,897	185,714	205,495	225,813	246,640
CALDWELL	77,415	80,094	83,035	85,462	87,948	90,183	92,336
CAMDEN	6,885	7,455	7,905	8,414	8,991	9,488	10,037
CARTERET	59,383	61,825	64,467	66,557	68,320	69,630	70,592
CASWELL	23,501	24,902	26,307	27,639	29,019	30,218	31,445
CATAWBA	141,685	154,395	165,424	177,372	189,630	201,958	214,315
CHATHAM	49,329	54,999	59,806	65,186	70,524	76,073	81,507
CHEROKEE	24,298	26,216	28,012	29,637	31,106	32,432	33,635
CHOWAN	14,526	14,929	15,448	15,919	16,369	16,709	17,047
CLAY	8,775	9,489	10,043	10,556	11,040	11,415	11,764
CLEVELAND	96,287	101,254	106,530	111,687	117,092	122,358	127,603
COLUMBUS	54,749	57,082	59,745	61,980	64,302	66,337	68,466
CRAVEN	91,436	94,504	97,513	100,212	102,080	103,950	105,070
CUMBERLAND	302,963	316,153	334,040	351,212	366,204	382,577	396,665
CURRITUCK	18,190	20,591	22,644	24,917	27,126	29,288	31,347
DARE	29,967	33,697	36,681	39,868	42,940	45,690	48,315
DAVIDSON	147,246	157,205	166,833	176,493	186,335	196,069	205,603
DAVIE	34,835	38,837	41,932	45,363	48,979	52,506	56,157
DUPLIN	49,063	54,029	59,294	64,677	70,251	76,140	82,205
DURHAM	223,314	241,472	257,367	275,576	292,639	311,374	328,573
EDGECOMBE	55,606	54,381	53,987	53,039	52,079	50,854	49,614
FORSYTH	306,067	327,170	347,165	368,164	390,124	411,887	434,096
FRANKLIN	47,260	53,345	58,726	64,747	70,660	76,820	82,702
GASTON	190,365	197,075	204,156	210,707	216,822	222,810	228,066
GATES	10,516	10,960	11,516	11,991	12,533	12,951	13,411
GRAHAM	7,993	8,329	8,679	8,944	9,212	9,409	9,614
GRANVILLE	48,498	53,539	58,132	62,960	67,790	72,496	77,075
GREENE	18,974	20,749	22,817	24,734	26,718	28,685	30,704
GUILFORD	421,048	457,555	497,365	536,973	577,081	618,012	658,264
HALIFAX	57,370	57,554	58,072	58,373	58,544	58,492	58,291
HARNETT	91,025	104,138	116,559	130,388	144,266	158,925	173,339
HAYWOOD	54,033	57,178	60,247	63,115	65,994	68,605	71,140
HENDERSON	89,173	99,081	108,029	117,295	126,523	135,809	144,944
HERTFORD	22,601	22,395	22,649	22,559	22,522	22,258	22,053
HOKE	33,646	40,031	46,193	52,949	59,949	67,463	75,179
HYDE	5,826	5,922	6,141	6,267	6,396	6,444	6,500
IREDELL	122,660	139,777	153,883	169,988	186,890	203,950	221,371
JACKSON	33,121	35,796	38,332	40,762	43,000	45,127	47,063

Population Projections 2000-2030

	Population						
	April 2000	July 2005	April 2010	July 2015	April 2020	July 2025	April 2030
JOHNSTON	121,965	145,821	167,240	191,248	215,863	242,001	268,249
JONES	10,381	10,627	11,010	11,316	11,574	11,809	11,980
LEE	49,040	53,020	57,492	61,720	66,327	70,787	75,665
LENOIR	59,648	60,151	61,142	61,530	62,016	62,190	62,378
LINCOLN	63,780	70,972	77,592	84,282	91,525	98,239	105,351
MCDOWELL	42,151	45,499	48,664	51,792	54,957	58,028	61,077
MACON	29,811	32,926	35,909	38,834	41,849	44,648	47,529
MADISON	19,635	20,853	22,129	23,281	24,479	25,561	26,657
MARTIN	25,593	25,556	25,808	25,806	25,872	25,771	25,722
MECKLENBURG	695,454	796,285	894,288	998,022	1,102,003	1,210,638	1,317,738
MITCHELL	15,687	16,185	16,557	16,912	17,268	17,501	17,734
MONTGOMERY	26,822	28,509	30,347	32,065	33,937	35,730	37,681
MOORE	74,769	82,379	89,533	96,641	104,051	111,150	118,468
NASH	87,420	92,535	97,505	102,489	107,585	112,432	117,230
NEW HANOVER	160,307	178,754	196,508	214,393	231,402	248,320	264,231
NORTHAMPTON	22,086	22,398	22,851	23,194	23,560	23,801	24,061
ONslow	150,355	152,804	157,963	163,902	166,376	171,364	172,890
ORANGE	118,227	129,791	140,287	150,962	161,605	171,486	181,122
PAMLICO	12,934	13,440	14,143	14,665	15,108	15,467	15,755
PASQUOTANK	34,897	36,325	37,864	39,373	40,628	41,823	42,757
PENDER	41,082	47,046	52,976	59,021	64,845	70,699	76,254
PERQUIMANS	11,368	11,811	12,127	12,482	12,830	13,095	13,360
PERSON	35,623	38,254	40,777	43,333	45,898	48,316	50,678
PITT	133,798	144,044	154,787	165,278	175,749	186,086	196,218
POLK	18,324	20,252	21,939	23,749	25,599	27,423	29,227
RANDOLPH	130,454	142,860	155,600	168,323	181,727	195,119	208,822
RICHMOND	46,564	47,140	47,816	48,288	48,889	49,279	49,735
ROBESON	123,339	131,812	140,932	149,689	158,459	167,123	175,694
ROCKINGHAM	91,928	94,164	96,969	99,114	101,475	103,393	105,379
ROWAN	130,340	140,521	150,967	161,924	173,269	184,727	196,194
RUTHERFORD	62,899	65,628	68,277	70,743	73,404	75,740	78,146
SAMPSON	60,161	67,037	74,290	81,641	89,194	97,050	104,980
SCOTLAND	35,998	36,765	37,991	38,836	39,671	40,317	40,949
STANLY	58,100	61,300	64,281	67,337	70,662	73,587	76,649
STOKES	44,711	48,261	51,798	55,127	58,560	61,784	64,992
SURRY	71,219	75,479	80,329	84,605	89,424	93,970	98,896
SWAIN	12,968	13,858	14,640	15,502	16,336	17,165	17,960
TRANSYLVANIA	29,334	30,752	32,419	33,733	34,908	35,910	36,780
TYRRELL	4,149	4,291	4,460	4,576	4,706	4,786	4,872
UNION	123,677	147,972	166,838	189,355	212,811	237,414	262,441
VANCE	42,954	45,275	47,140	49,123	51,370	53,362	55,575
WAKE	627,846	746,842	851,771	969,438	1,088,545	1,211,810	1,334,100
WARREN	19,972	21,098	22,431	23,643	24,824	25,887	26,902
WASHINGTON	13,723	13,457	13,285	13,039	12,741	12,425	12,077
WATAUGA	42,695	44,574	46,810	48,571	50,311	51,697	53,062
WAYNE	113,329	117,163	121,901	126,121	130,553	134,493	138,638
WILKES	65,632	68,563	71,488	74,007	76,673	79,040	81,472
WILSON	73,814	77,607	81,430	84,940	88,836	92,305	96,082
YADKIN	36,348	39,356	42,646	45,750	49,249	52,570	56,173
YANCEY	17,774	18,836	19,819	20,758	21,639	22,463	23,205
NORTH CAROLINA	8,049,313	8,783,752	9,491,372	10,226,897	10,966,139	11,712,440	12,447,597

**TABLE 5
FASTEST GROWING MUNICIPALITIES
APRIL 2000 - JULY 2003**

RANK	MUNICIPALITY	COUNTY	APRIL 2000	JULY 2003	% CHGE	TOTAL GROWTH	ANNEXED POP.	URBAN GROWTH
1	NAVASSA	BRUNSWICK	1,570	479	227.8	1,091	1,028	63
2	BRUNSWICK	COLUMBUS	1,058	360	193.9	698	697	1
3	STALLINGS	Mecklenburg, UNION	8,847	3,171	179.0	5,676	5,236	440
4	LELAND	BRUNSWICK	4,703	1,938	142.7	2,765	2,631	134
5	MORRISVILLE	Durham, WAKE	10,721	5,208	105.9	5,513	599	4,914
6	ST. JAMES	BRUNSWICK	1,610	804	100.2	806	23	783
7	CAMERON	MOORE	289	151	91.4	138	140	-2
8	NEW LONDON	STANLY	615	326	88.7	289	297	-8
9	CALABASH	BRUNSWICK	1,334	711	87.6	623	595	28
10	LOVE VALLEY	IREDELL	50	30	66.7	20	20	0
11	YOUNGSVILLE	FRANKLIN	1,049	651	61.1	398	348	50
12	WADESBORO	ANSON	5,709	3,568	60.0	2,141	2,209	-68
13	WESLEY CHAPEL	UNION	3,753	2,549	47.2	1,204	818	386
14	CAROLINA SHORES	BRUNSWICK	2,120	1,482	43.0	638	532	106
15	INDIAN TRAIL	UNION	16,152	11,749	37.5	4,403	2,663	1,740
16	HOLLY SPRINGS	WAKE	12,375	9,192	34.6	3,183	1,228	1,955
17	WAKE FOREST	Franklin, WAKE	16,490	12,588	31.0	3,902	2,309	1,593
18	MAGGIE VALLEY	HAYWOOD	787	607	29.7	180	186	-6
19	THOMASVILLE	DAVIDSON, Randolph	25,562	19,788	29.2	5,774	5,024	750
20	CORNELIUS	MECKLENBURG	15,399	11,969	28.7	3,430	1,841	1,589
21	RHODISS	BURKE, Caldwell	896	706	26.9	190	124	66
22	CLAYTON	JOHNSTON	10,245	8,126	26.1	2,119	571	1,548
23	PINE LEVEL	JOHNSTON	1,658	1,319	25.7	339	245	94
24	UNIONVILLE	UNION	5,992	4,797	24.9	1,195	427	768
25	TROY	MONTGOMERY	4,230	3,430	23.3	800	798	2
26	FUQUAY-VARINA	WAKE	9,726	7,898	23.1	1,828	448	1,380
27	MARION	MCDOWELL	6,087	4,943	23.1	1,144	1,159	-15
28	CROSSNORE	AVERY	297	242	22.7	55	0	55
29	FAIRVIEW	UNION	3,694	3,017	22.4	677	0	677
30	APEX	WAKE	24,701	20,212	22.2	4,489	388	4,101
31	WILMINGTON	NEW HANOVER	92,668	75,838	22.2	16,830	14,240	2,590
32	LAKE PARK	UNION	2,554	2,093	22.0	461	0	461
33	WAXHAW	UNION	3,188	2,625	21.4	563	245	318
34	SHALLOTTE	BRUNSWICK	1,662	1,381	20.3	281	140	141
35	WINTERVILLE	PITT	5,761	4,794	20.2	967	892	75
36	KERNERSVILLE	FORSYTH, Guilford	20,494	17,126	19.7	3,368	2,345	1,023
37	CLEMMONS	FORSYTH	16,543	13,827	19.6	2,716	2,341	375
38	BANNER ELK	AVERY	987	828	19.2	159	37	122
39	RENNERT	ROBESON	336	283	18.7	53	46	7
40	HILDEBRAN	BURKE	1,747	1,472	18.7	275	273	2
41	FLETCHER	HENDERSON	4,960	4,185	18.5	775	461	314
42	BALD HEAD ISLAND	BRUNSWICK	205	173	18.5	32	0	32
43	MARVIN	UNION	1,229	1,039	18.3	190	0	190
44	HUNTERSVILLE	MECKLENBURG	29,387	24,960	17.7	4,427	1,107	3,320
45	WEBSTER	JACKSON	568	486	16.9	82	67	15
46	MONROE	UNION	30,392	26,228	15.9	4,164	1,095	3,069
47	TRENTON	JONES	238	206	15.5	32	38	-6
48	BOILING SPRING LAKES	BRUNSWICK	3,427	2,972	15.3	455	0	455
49	PINEVILLE	MECKLENBURG	3,975	3,449	15.3	526	382	144
50	WEDDINGTON	Mecklenburg, UNION	7,708	6,696	15.1	1,012	54	958
51	STANFIELD	Cabarrus, STANLY	1,281	1,113	15.1	168	140	28
52	CASWELL BEACH	BRUNSWICK	425	370	14.9	55	0	55
53	ROSMAN	TRANSYLVANIA	561	490	14.5	71	70	1
54	CREEDMOOR	GRANVILLE	2,548	2,232	14.2	316	0	316

"Urban Growth" is "Total Growth" minus "Annexed Pop.".

For municipalities in more than one county, the county name in all capital letters represents the county where the majority (over 1/2) of the population lives.

COMPREHENSIVE WASTEWATER MASTER PLAN

for



**BRUNSWICK COUNTY,
NORTH CAROLINA**

February 2006

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APPENDICES

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A. Introduction

Brunswick County (County) has been experiencing tremendous growth both in seasonal visitors and in year-round, permanent population. The County has much to offer a growing tourist industry: mild climate, nearly 50 miles of clean beaches, abundant natural beauty, salt-water fishing, water sports, and an abundance of top-flight golf courses. The amenities and relaxed pace of life have made the area an attractive destination for tourists and senior citizens. Because Brunswick County has so many attractive features, continued growth is inevitable.

The purpose of this Comprehensive Wastewater Master Plan (Master Plan) is to provide Brunswick County with a coordinated County-wide plan to adequately serve the present and projected wastewater needs of its residents, businesses, and industry. This report also discusses permanent and seasonal population projections, permanent and seasonal wastewater flow projections, and the regional facilities necessary to meet these demands. The goal of this Master Plan is to evaluate existing facilities and outline the infrastructure needed to meet the County's 2020 wastewater demands.

B. Population Projections

Several sources of population data have been used to serve as a “check and balance” against the approach utilized in this Master Plan. Sources include the North Carolina Office of State Budget and Management, the U.S. Census, and a number of previous planning documents prepared for Brunswick County. The key approach in determining the population projections was to use the land use planning areas (areas with common growth potential) and the service areas (areas where wastewater service is anticipated) to graphically intersect the service areas to define the contributing land use per service area. A set of unit population and wastewater flow generation factors (respective factors for each land use category) was used to convert the service areas' contributing land use to both population and wastewater flow projections.

The Land Use Plan utilized population and zoning information and projections from each of the municipalities within the County as well as from the County Planning office. The Land Use Plan incorporated the existing zoning and development for Brunswick County and other entities that have expressed interest in a regional wastewater management approach, and summarized these by planning area. These growth rates were used to prepare independent land use growth projections for each land use zone within the planning areas. These projections were made for discrete intervals (i.e., 2005, 2010, 2015, and 2020).

C. Regional Service Areas

In order to properly manage the financial burden of implementing regional wastewater management systems, the land area of the County must be divided into manageable service areas. A number of previous reports and actual implementation of regional wastewater systems were evaluated for service area boundaries. The proposed service area boundaries should be dynamic, as conditions such as development, intermunicipal cooperation, and similar factors change over time. Also, it is possible that interim or temporary connections (or permanent interconnections) may be warranted to best utilize system capacities during early years of system start-up and to provide greater numbers of customers and, thus, more cost-effective service.

Recognizing that several areas of the County recently had wastewater systems evaluated, the primary objective of establishing regional service areas was to make use of these established boundaries. The County has been divided into four main regional service areas: the Northeast, Southeast, West, and Southwest. In each of these regional service areas, consideration has been given to the anticipated demand for regional wastewater management services. As such, individual planning areas have been assigned a phase identifier (I, II, III, IV, or open) that will allow the County to prioritize service based upon ultimately providing the most cost-effective solution for each specific region or individual area in a rapidly growing County. It should be noted that these boundaries are dynamic and subject to refinement as detailed assessments or evaluations are conducted.

For the purposes of this Master Plan, no specific timeframe for implementation has been assigned to the respective phases. Each regional service area and its individual planning areas will develop in accordance with its own drivers and influences. This Master Plan has identified the most probable progression of service provision as Phase I to Phase IV. Phase I and Phase II areas are those identified as probable service areas needing wastewater infrastructure within the 2020 planning horizon. Phases III and IV areas do not currently show population or service densities that would support wastewater service within the 2020 planning horizon.

D. Wastewater Flow Projections

As discussed in the population projection section, the same approach was used to develop wastewater generation rates in Brunswick County for the years 2005, 2010, 2015, and 2020. As with population, wastewater flows vary by both season and geographic location. During the peak tourist season, the projected flow for residential dwelling units (i.e., flow per dwelling unit) is expected to be higher than during the winter months. Primarily, this is due to the average



population per dwelling unit being lower during the winter months. However, the more inland towns and areas are less affected by seasonal population changes. To compensate for these population density changes, multiple sets of unit flow factors were used for generating flow projections. A separate set of unit flow factors was used for inland and coastal areas. Wastewater flow projections were made based on the land use for each of the individual planning areas in the four main regional service areas.

The maximum monthly flow is significant because NPDES discharge permits and Non-Discharge permits are based on monthly values, and therefore permitted wastewater treatment plant capacity applies to monthly flows. Maximum monthly flow must be less than the permitted capacity to avoid violating the discharge permit. Before the peak seasonal flow exceeds 80 percent of capacity, the permittee must submit an engineering evaluation of future wastewater treatment needs. Before the peak seasonal flow exceeds 90 percent of the permitted capacity, the facility must submit approvable plans and specifications, together with a construction schedule, for expansion of the wastewater treatment system. (Failure to meet these requirements may result in a moratorium on extension of sewer lines.)

In addition to the land-use based flows, wastewater flows from other municipal sources, such as Sunset Beach, Holden Beach, and Oak Island, were assigned directly to the individual planning areas. The assigned point flows are based on wastewater flow projections associated with current or recent wastewater studies or evaluations.

E. Wastewater Infrastructure

All four of the main regional service areas (Northeast, Southeast, West, and Southwest) are in different stages of providing regional wastewater service. The Southeast area is the only area where the County does not currently own or operate any wastewater collection, treatment, or disposal systems. This Master Plan discusses in detail the current wastewater management practices and the needed infrastructure to meet the current and future demands of the respective regional service areas. Wastewater collection systems will be evaluated on a 20-year (2005 – 2025) anticipated service need, and wastewater treatment and disposal/utilization will be based upon the 2020 anticipated service need. Facilities will be evaluated to accommodate peak flows for the respective timeframe. The following facility summaries and cost estimates are provided for each regional service area:

Northeast Regional Service Area

To provide the anticipated 2020 collection, treatment, and disposal/reuse needs associated with the Northeast Regional Service Area, the following system components will be needed:

<u>Needed</u>	<u>Currently Provided</u>
2.0-mgd wastewater treatment capacity	1.65 mgd
2.0-mgd wastewater disposal/utilization capacity	1.65 mgd ⁽¹⁾
10.7 miles of regional sewers	None ⁽²⁾
1 regional pumping station	None

- Notes: (1) Wastewater treatment facility is permitted (NPDES) and rated for 1.65 mgd. A Non-Discharge Permit has been issued for a reclaimed water project to provide 0.325 mgd to Magnolia Greens Golf Course. To date, the reuse system has not been implemented.
- (2) Current collection system is designed to accommodate wastewater flows from the Northeast Sanitary District, the Navassa area, the Town of Leland, and the Brunswick County Industrial Park. It is possible that some segments closer to the treatment facility may have capacity to serve the 2025 needs, but that analysis would need to be conducted in a future PER or design stage.

The system components to accommodate the 2020 wastewater demands are identified below.

Northeast Wastewater Infrastructure Needs

Component	Description	Quantity
Regional Collection System:		
Regional Pump Stations		1
Regional Sewers		10.7 miles
Regional Treatment System:		
Minor Additional Capacity Needed		0.35 mgd
Regional Disposal / Utilization System:		
No Additional Capacity Needed		NA
Additional Land Needs:		0 acres

Southeast Regional Service Area

To provide the anticipated 2020 collection, treatment, and disposal/reuse needs associated with the Southeast Regional Service Area, the following system components will be needed:

<u>Needed</u>	<u>Currently Provided</u>
5.0-mgd wastewater treatment capacity	0.40 mgd ⁽¹⁾
5.0-mgd wastewater disposal/utilization capacity	0.40 mgd ⁽¹⁾
27.4 miles of regional sewers	None
1 regional pumping station	None

Notes: (1) Oak Island owns a non-discharge type wastewater treatment facility that is permitted and rated for 0.40 mgd. The facility was owned by the former Town of Yaupon Beach and tertiary quality effluent is disposed via rapid infiltration basins.

The system components to accommodate the 2020 wastewater demands are identified below:

Southeast Wastewater Infrastructure Needs

Component	Description	Quantity
Regional Collection System:		
Regional Pump Stations		1
Regional Sewers		27.4 miles
Regional Treatment System:		
5.0-mgd Water Reclamation System		1
Regional Disposal / Utilization System:		
On-Site Land Application System		2,400 acres
Additional Land Needs:		1,400 acres

West Regional Service Area

To provide the anticipated 2020 collection, treatment and disposal/reuse needs associated with the West Regional Service Area, the following system components will be needed:

<u>Needed</u>	<u>Currently Provided</u>
9.0-mgd wastewater treatment capacity	3.0 mgd ⁽¹⁾
9.0-mgd wastewater disposal/utilization capacity	3.0 mgd ⁽²⁾
41.0 miles of regional sewers	35.4 miles
3 regional pumping stations	3

Notes: (1) The West Brunswick Regional Water Reclamation System is currently under construction and should be operational by early 2006. The first phase under construction is rated at 3.0 mgd. The current site plan accommodates the layout for a 6.0-mgd facility.

(2) The West Brunswick Reclaimed Water Utilization System is rated for 3.0 mgd. This includes 1.1 mgd of reuse associated with two golf course communities, Winding River and St. James Plantations, and a County-owned silvicultural system that can accommodate 1.9 mgd.

The system components to accommodate the 2020 wastewater demands are identified below:

West Wastewater Infrastructure Needs

Component	Description	Quantity
Regional Collection System:		
Regional Pump Stations		0
Regional Sewers		5.6 miles
Regional Treatment System:		
5.0-mgd Expansion		1
Regional Disposal / Utilization System:		
		NA
Additional Land Needs:		
On-Site Land Application System		2,280 acres

Southwest Regional Service Area

To provide the anticipated 2020 collection, treatment, and disposal/reuse needs associated with the Southwest Regional Service Area, the following system components will be needed:

<u>Needed</u>	<u>Currently Provided</u>
7.0-mgd wastewater treatment capacity	1.5 mgd ⁽¹⁾
7.0-mgd wastewater disposal/utilization capacity	5.2 mgd ⁽²⁾
27.3 miles of regional sewers	None ⁽³⁾
3 regional pumping stations	None

- Notes: (1) The Ocean Isle Beach facility is the only facility in the region that would be suitable for long-term (2025 and beyond) wastewater management needs.
- (2) Includes the Ocean Isle Beach land application system and estimated utilization rates for courses already designed and/or permitted for reuse (Brunswick Plantation, Crow Creek, Ocean Ridge Plantation, Sandpiper, Sea Trail Plantation, and The Thistle Golf Courses).
- (3) Most, if not all, existing sewers in the region are not suitable to meet the 2020 demands.

The system components to accommodate the 2020 wastewater demands are identified below:

Southwest Wastewater Infrastructure Needs

Component	Description	Quantity
Regional Collection System:		
Regional Pump Stations		3
Regional Sewers		27.3 miles
Regional Treatment System:		
4.8-mgd Plant Upgrade/Expansion		1
Regional Disposal / Utilization System:		
Reclaimed Pumping Stations		1
Reclaimed Distribution System		26.3 miles
Golf Course Irrigation System Retrofits		20
Additional Land Needs:		0 acres

F. Recommendations

To further the County's goal of providing environmentally responsible, timely, equitable, and cost-effective wastewater service to its citizens, the County needs to develop a plan of action to ensure these objectives are met.

The following recommendations are offered:

- ◆ The County should continue to establish priorities and a wastewater management action plan for each regional service area.
- ◆ The County should prepare Preliminary Engineering Reports (PERs) for each specific regional service area to aid in specific technical, environmental, and financial aspects associated with implementation or expansion of regional wastewater management facilities.
- ◆ The County should meet with appropriate regulatory representatives to discuss the various regional implementation strategies so that appropriate environmental documentation, such as Environmental Assessments (EAs) or 201 Facilities Plans, can be prepared.
- ◆ A Financial Plan should be developed to address wastewater management funding strategies and to develop guidance relative to specific County financial goals and objectives.
- ◆ The Wastewater Master Plan should be updated and revised on a periodic basis.
- ◆ The Water Master Plan should be updated and revised on a periodic basis as well to ensure consistency between the two plans.
- ◆ A Biosolids/Residuals Management Plan should be prepared to address solids management from all water and wastewater management facilities owned or operated by the County.
- ◆ Due to the high dependence on reclaimed water utilization for wastewater management, several objectives and strategies need to be considered:
 - The County should either designate an existing staff member to be a Reuse Coordinator or create such a position.

- Focus on community-related reuse as opposed to reuse on County-owned and managed properties.
- Explore, cultivate, and nurture opportunities for reuse that integrate well with current situations or future development trends.
- ◆ A Reclaimed Water Master Plan should be prepared to address reclaimed water utilization from all wastewater management facilities owned or operated by the County.
- ◆ Consideration should be given to use of “decentralized” or “distributive” approaches due to the unique seasonal flow variations of the coastal communities.
- ◆ Consideration should be given to the use of advanced treatment and control technologies to meet wastewater management goals and objectives.
- ◆ Public Education and Outreach activities should be continued to emphasize to the citizens of the County the importance of water/wastewater/reclaimed water services.
- ◆ The County should continue to work with the municipalities to explore opportunities to implement regional wastewater management systems together.

Specific Regional Service Area Recommendations

In addition to the above-mentioned general recommendations, specific recommendations for each regional service area have been developed.

Northeast Regional Service Area

- ◆ Due to potential growth and development along the Highway 74/76 corridor, it is recommended that a regional pumping station be constructed in the vicinity of the Towns of Northwest and Sandy Creek.
- ◆ The actual timeframe for construction of these facilities is based on the priorities of the County. Minor improvements would be necessary to the Northeast Wastewater Treatment Plant to accommodate the 2020 projected demands.

Southeast Regional Service Area

- ◆ Due to the substantial investment necessary to implement a regional wastewater system in the Southeast Regional Service Area, the first step is to determine the extent of the

wastewater management system needed based on the firm commitments of communities in the area.

- ◆ The County should engage the area municipal representatives to once again determine which communities may be interested in a cooperative approach to regional wastewater management. These discussions may require participation up to the point of developing specific objectives of the regional system so costs can be prepared. Once these objectives are determined, a Preliminary Engineering Report or work approaching this level of analysis will be required.
- ◆ Timeframes are important since the planning, property acquisition, agreements, environmental documentation, design, and construction of such systems can take five years or longer to bring to fruition.

West Regional Service Area

- ◆ Shallotte's potential participation and interim wastewater service for both Oak Island and Sunset Beach would deplete the current wastewater management capacity associated with the West Brunswick Water Reclamation Facility. This is not necessarily a concern, but it definitely puts pressure and constraints on the intermediate and long-term plans for both the Southeast and Southwest Regional Service Areas. Discussions and negotiations should continue with all three of these prospective partners and appropriate Plan of Actions and/or Preliminary Engineering Reports prepared to address these interim needs.
- ◆ 2020 needs of the West Regional Service Area are primarily related to treatment plant expansion needs and associated reclaimed water utilization sites. The only regional collection system need is associated with the line that would extend to the Shallotte area.
- ◆ Implementing local collection systems will continue to be a challenge unless a West Brunswick Regional Collection System Plan is developed to identify the specific local area needs. Although the County can rely on the development community to provide this "infill" network of sewer systems, there are going to be a number of gaps and possibly some areas completely unserved.
- ◆ Special attention needs to be paid to the development of future reclaimed water utilization sites in the West Brunswick Service Area. The first phase essentially exhausted the golf course irrigation opportunities and, unless other reuse opportunities such as residential lawn irrigation are nurtured, the County may find itself buying more and more land to

meet this need. This is a double negative because of the significant expense to acquire and develop land application sites and the County loses the opportunity to generate revenue from the sale of reclaimed water in the future.

Southwest Regional Service Area

- ◆ The Preliminary Engineering Report under development for the Southwest Regional Service Area will address the immediate needs (2005 – 2010) of the two wastewater treatment facilities (Sea Trail and Carolina Shores) and the service needs of the Town of Sunset Beach.
- ◆ Similar to the Southeast Regional Service Area, firm commitments need to be obtained from prospective participants so that specific regional goals and objectives can be identified and implemented in the most cost-effective approach possible. The overall regional system costs are expensive, but the potential customer base makes the provision of regional wastewater management possible.
- ◆ Although a “Greenfield” wastewater treatment facility may sound attractive, it potentially can be a much more expensive approach to meeting the service demand needs of the Southwest Regional Service Area. There are two municipal systems (Shallotte and Ocean Isle Beach) that offer sufficient sites for regional plants, and incorporation of advanced technologies such as Membrane Bio-Reactors (MBRs) may make the existing Sea Trail and Carolina Shores treatment system sites viable as components of a decentralized or distributive treatment system approach. The closer the placement of water reclamation facilities to the end use of reclaimed water will result in the most cost-effective regional wastewater management solution. This will save costs associated with pumping wastewater to facilities and pumping reclaimed water back to the points of use.
- ◆ Although there is an abundance of golf courses in the West Brunswick Regional Service Area where reclaimed water could be utilized, a number of them have exhibited some reservation about a simple agreement to use reclaimed water for irrigation. Although the County has an ordinance requiring such, it is apparent that some additional energy and efforts will be needed to meet the objectives and desires of both parties. The County should continue to work closely with the golf course managers and superintendents to ensure that reasonable agreements can be developed and implemented within the next 12 to 18 months.

1.1 General

Brunswick County was established in 1764 and is located in the lower Coastal Plain at the southern-most coast of North Carolina. The land ranges in elevations from 75 feet to sea level, and its 550,713 acres are primarily woodland with the remaining areas occupied by cropland, beaches, marsh, and small urban and industrial areas. Industry in Brunswick County includes a large nuclear power plant and chemical plants producing synthetic fibers, fertilizer, and citric acid. Harvesting of wood for paper mills is an important trade for the County as is fishing, which remains a vital part of the economy of Brunswick County. However, in recent years, tourism has represented one of the most important factors in the economy of the County.

The climate is very favorable for tourism. The summers are generally hot and humid, but the coast is frequently cooled by sea breezes. The average summer temperature is 78°F with an average daily maximum of 86°F. Winters are seldom cold and boast an average temperature of 47°F.

Brunswick County has been experiencing tremendous growth both in seasonal visitors and in year-round, permanent population. The County has much to offer a growing tourist industry: mild climate, nearly 50 miles of clean beaches, abundant natural beauty, salt-water fishing, water sports, and an abundance of top flight golf courses. The amenities and relaxed pace of life have made the area an attractive destination for senior citizens. Because Brunswick County has so many attractive features, continued growth is inevitable.

One result of growth is increased wastewater generation. Another is increased population density. In the face of such changes, existing wastewater facilities can become overloaded, and treatment and disposal practices (e.g., septic tank/nitrification field treatment and disposal) that were suitable at low density no longer provide adequate protection for public health or the environment at higher densities.

1.2 Objectives of Wastewater Master Plan Update

The purpose of this Master Plan is to provide Brunswick County with a coordinated County-wide plan to adequately serve the present and projected wastewater needs of its residents, businesses, and industry. This Master Plan discusses population trends, wastewater demands, wastewater infrastructure, and the cost anticipated to serve the County's growing population. The goal of this wastewater planning report is to outline the projected short- and long-term improvements required to meet current and future wastewater demands through the year 2020. This information

will assist the County in its pursuit to make sound wastewater management decisions for the County.

1.3 Wastewater Master Plan Approach

A number of water and wastewater reports have been prepared for the County over the past decade. Included in these reports are water and wastewater master plans and system specific plans such as the Northeast 201 Facilities Plan and the West Brunswick 201 Facilities Plan. Emphasis has been placed on utilizing this information as a basis for the assessment of current and future wastewater infrastructure needs. Specific references utilized include:

- ◆ Water and Sewer Study, May 1996, HDR Engineering, Inc.
- ◆ Land Use Plan for Water System Planning, Technical Memorandum 1.1, February 1998, HDR Engineering, Inc.
- ◆ Northeast Brunswick Regional Wastewater Facility, 201 Facilities Plan, August 1998, W.K. Dickson.
- ◆ Wastewater Master Plan, Phase I, October 1998, HDR Engineering, Inc.
- ◆ Wastewater Master Plan, Phase II, June 1999, HDR Engineering, Inc.
- ◆ Brunswick County 201 Facilities Plan, East Brunswick and West Brunswick Regional Wastewater Treatment Facilities, July 2001, HDR Engineering, Inc.
- ◆ Brunswick County 201 Facilities Plan, West Brunswick Regional Wastewater Treatment Facilities, October 2002, HDR Engineering, Inc.
- ◆ Southwest Brunswick Service Area, Conceptual Wastewater Plan, July 2004, HDR Engineering, Inc.
- ◆ Preliminary Engineering Reports for Service Districts Nos. 1 – 5, February 2004, HDR Engineering, Inc.

A number of other sources were utilized including the U.S. Census Bureau, NC State Data Center, and municipalities and their planning consultants.

Much of this information was used as a starting point for the current evaluation and as a “check and balance” to ensure that population and/or wastewater flow projections generally coincided or paralleled previous estimates. Some of the technical aspects where previous plans have been implemented have also been used to establish boundaries or system attributes. Examples include 201 Service Areas for the Northeast Brunswick and West Brunswick Regional Systems and their



associated infrastructure. Current information that affects future planning aspects but may have been handled differently in the past has also been incorporated into the Master Plan. Examples include service area boundaries for the Southeast, West, and Southwest portions of the County.

2.1 Historical Basis

Population projections attempt to predict future growth and where it will occur for planning purposes. It is difficult to predict major factors such as natural catastrophes, changes in ways of life, medical innovations, large developments, industrial expansions, or other unpredictable events; but, in order to provide a basis for planning, a projection as to the future population is essential. Anticipated future populations are most confidently determined by intensive studies of past and present trends and then correlating this data with knowledge of the areas being analyzed.

Population information was obtained from the U.S. Census Bureau, the Office of State Budget and Management, and interviews with County personnel. In 1990, the total population of Brunswick County was 50,985. Continuing development is responsible for the total population increase to 73,143 by 2000, representing an increase of 43% (3.7% Annual Rate). U.S. Census data for Brunswick County and its municipalities can be found in Appendix A.

Population growth in all areas of Brunswick County is expected to continue due to the County's mild climate, recreational opportunities, and attractive beaches. Brunswick County continues to be a favored area for retirees, and the County's location on the eastern seaboard makes it an attractive alternative to northerners and many others who may have historically retired to the Florida area.

2.2 Population Projections

The North Carolina Office of State Budget and Management develops population projections for each county in the state. These projections serve as reference points for planning, development, and implementation by various state agencies. For the purpose of this planning report, these figures will be used along with historical information and projections published in a number of previous planning reports prepared for the County. According to the Office of State Budget and Management, Brunswick County will experience an overall population increase of 54% between the years of 2000 – 2020. Thus, population is expected to increase from 73,143 to 112,992.

Several of the communities in the County have developed plans to construct new wastewater management facilities or increase capacities of existing facilities. While the future plans of each municipality will be considered through planning and implementation, all of the land use within the regional districts was considered to estimate the total wastewater generation potential. This is to ensure that the proposed wastewater management system addresses the needs of all County residents. Should a municipality desire not to be included in the County plan, the plan will be modified during the Preliminary Engineering stage. Letters were sent to municipalities in the

County requesting their input relative to cooperation with the County on future wastewater management needs. Copies of these letters and responses can be found in Appendices B and C, respectively.

The County's population, as it relates to wastewater flow, is also greatly impacted by the large tourist contingent that vacations in its coastal areas. There is no organized method for tracking the actual number of people who come to the County as tourists, making it somewhat difficult to determine either seasonal populations or the wastewater flow generated by this visiting population. In 1998, HDR developed a Land Use Plan for Water System Planning in an attempt to quantify water use in the County. The County's Planning and GIS Departments have incorporated updates to keep the changes in land use current. This 2004 Land Use layer provided by the County was compared to the earlier Water System Land Use Plan to determine if there were major differences or trends in the changes of land use versus projected land use. Recent development related information provided by the County was also used to update projections for various sections of the County where growth may be stronger and more rapid than anticipated in the earlier plans. This information was also used as the basis for population and wastewater projections. Due to the rapid nature of the growth in Brunswick County, as well as the significant seasonal population, these population and flow projections were determined to be more accurate than the NC Office of State Budget and Management. Although the current population projections do not directly match other sources, these numbers are considered accurate based upon the above assessment. The projections were based upon the best available information regarding current known and future projected development in the County. A copy of Brunswick County rezoning requests and approvals for significant projects can be found in Appendix D.

The key approach in determining the population projections was to use the land use planning areas (areas with common growth potential) and the service areas (areas where wastewater service is anticipated) to graphically intersect the service areas to define the contributing land use per service area. The land use is defined as dwelling units for residential land use and gross area units for commercial and industrial areas. A set of unit population generation factors and wastewater flow generation factors (respective factors for each land use category) was used to convert the service areas' contributing land use to both population and wastewater flow projections.

The anticipated population in Brunswick County varies both by season and geographic location. During the peak tourist season, the projected population for residential dwelling units is expected to be higher than during the winter months. However, the more inland towns and areas are less affected by seasonal population changes. To compensate for these population density changes,

multiple sets of unit flow factors were used for generating population projections. A separate set of population projection factors was used for inland areas and coastal areas. The unit population factors used for these population projections are shown in Table 2-1.

The Land Use Plan utilized population and zoning information and projections from each of the municipalities within the County as well as from the County Planning office. The Land Use Plan incorporates the existing zoning and development for Brunswick County and other entities that have expressed interest in a regional wastewater management approach, and summarized these by planning area. A planning area represents an area with common growth potential. Using the anticipated growth rates and development information obtained from the entities and the County, each planning area was assigned an anticipated land use growth rate. These growth rates were used to do independent land use growth projections for each land use zone within the planning areas. These projections were made for discrete intervals (i.e., 2005, 2010, 2015, and 2020). Population projections for the individual planning areas can be found in Appendix E.

Table 2-2 summarizes the projected permanent population for each municipality and Brunswick County for the years 2005, 2010, 2015, and 2020. Table 2-3 summarizes the projected seasonal population for each municipality and Brunswick County for the same time periods.

It should be noted that population forecasts represent only estimates of future growth. It is emphasized that each area's growth rate will be dependent on many interrelated factors: housing, supply, cost of labor, and transportation facilities. More importantly, in many cases the availability of public utilities will determine the growth potential of the area.

Table 2-1. Population Projection Factors

Land Use Category	Description	Land Use Density	Population Density	
			Permanent	Seasonal
AF	Agricultural/Forestry	1.00 ac/acre	-	-
CB	Central Business District	2.80 du/acre	-	-
CG	General Commercial	1.40 du/acre	1.27 pop/du	2.37 pop/du
CHB	Highway Business District	2.80 du/acre	-	-
CM	Commercial - Manufacturing	1.40 du/acre	-	-
CN	Neighborhood Commercial	4.40 du/acre	1.30 pop/du	2.37 pop/du
CON	Conservation	1.00 ac/acre	-	-
FP	Floodplains	1.00 ac/acre	-	-
IH	Heavy Industrial	0.70 du/acre	-	-
IL	Light Industrial	1.40 du/acre	-	-
INS	Institutional	1.40 du/acre	-	-
MF1-C	Multi-Family Residential	13.60 du/acre	0.48 pop/du	5.45 pop/du
MF1-I	Multi-Family Residential	13.60 du/acre	2.69 pop/du	2.69 pop/du
MH-C	Mobile Home Residential	6.00 du/acre	0.85 pop/du	4.62 pop/du
MH-I	Mobile Home Residential	6.00 du/acre	2.70 pop/du	2.70 pop/du
MS	Municipal Services	1.00 ac/acre	-	-
OS	Open Space	1.00 ac/acre	-	-
PUD-C	Planned Unit Development	7.25 du/acre	1.60 pop/du	5.05 pop/du
PUD-I	Planned Unit Development	7.25 du/acre	1.60 pop/du	4.00 pop/du
REC	Parks and Recreation	1.00 ac/acre	-	-
RG-C	Golf Course Community	5.80 du/acre	2.09 pop/du	4.58 pop/du
RG-I	Golf Course Community	5.80 du/acre	2.09 pop/du	3.37 pop/du
RU-C	Rural Residential	2.90 du/acre	2.71 pop/du	4.12 pop/du
RU-I	Rural Residential	2.90 du/acre	2.71 pop/du	3.49 pop/du
SF1-C	Low Density Residential	5.80 du/acre	2.71 pop/du	5.03 pop/du
SF1-I	Low Density Residential	5.80 du/acre	2.71 pop/du	2.71 pop/du
SF2-C	Medium Density Residential	7.25 du/acre	2.09 pop/du	4.17 pop/du
SF2-I	Medium Density Residential	7.25 du/acre	2.09 pop/du	3.65 pop/du
SF3-C	High Density Residential	13.60 du/acre	2.33 pop/du	4.17 pop/du
SF3-I	High Density Residential	13.60 du/acre	2.33 pop/du	3.53 pop/du
WL	Wetlands	1.00 ac/acre	-	-

NOTES:

- 1) Land use categories with a "-C" suffix (e.g., "RU-C") apply to coastal areas.
- 2) Land use categories with an "-I" suffix (e.g., "RU-I") apply to inland areas.

Table 2-2. Permanent Population Projections - Municipalities and Brunswick County

	Permanent Population Projections			
	2005	2010	2015	2020
Bald Head Island	1,053	1,148	1,254	1,370
Belville	428	484	547	619
Boiling Springs Lakes	3,565	3,937	4,346	4,798
Bolivia	190	225	250	275
Calabash	1,471	1,877	2,396	3,058
Carolina Shores	2,249	2,607	3,023	3,504
Caswell Beach	475	600	650	700
Holden Beach	925	1,192	1,536	1,930
Leland	5,019	5,903	6,944	8,167
Navassa	1,640	1,828	2,039	2,273
Northwest	768	882	1,013	1,163
Oak Island	7,793	9,225	10,739	11,103
Ocean Isle Beach	465	509	558	612
St. James	1,741	2,119	2,578	3,136
Sandy Creek	285	325	375	425
Shalotte	1,815	2,262	2,819	3,513
Southport	2,710	3,132	3,619	4,182
Sunset Beach	2,087	2,419	2,805	3,251
Varnamtown	537	603	677	759
Municipal Totals	35,216	41,277	47,165	55,838
Unincorporated County	53,410	57,977	65,905	70,852
Grand Totals	88,626	99,254	113,070	126,690

Table 2-3. Seasonal Population Projections - Municipalities and Brunswick County

	Seasonal Population Projections			
	2005	2010	2015	2020
Bald Head Island	7,052	7,718	8,447	9,245
Belville	470	530	600	680
Boiling Springs Lakes	3,922	4,331	4,781	5,168
Bolivia	200	236	263	289
Calabash	12,400	13,600	14,800	16,000
Carolina Shores	1,556	2,361	2,737	3,174
Caswell Beach	3,425	3,783	3,903	3,911
Holden Beach	15,412	16,493	16,493	16,493
Leland	5,521	6,493	7,638	8,984
Navassa	1,804	2,011	2,243	2,500
Northwest	806	926	1,064	1,221
Oak Island	32,729	38,744	45,105	46,634
Ocean Isle Beach	11,306	11,898	12,538	13,230
St. James	2,259	2,740	3,323	4,031
Sandy Creek	299	341	394	446
Shalotte	1,997	2,488	3,101	3,864
Southport	7,115	7,785	8,522	9,322
Sunset Beach	12,874	14,258	17,500	20,000
Varnamtown	681	748	822	903
Municipal Totals	121,828	137,484	154,274	166,095
Unincorporated County	96,811	111,250	122,500	136,523
Grand Totals	218,639	248,734	276,774	302,618

3.1 General

The area comprising Brunswick County offers a challenge to provide cost-effective wastewater service, due to its very large land area (855 square miles). Several other factors complicate regional wastewater service as well. Many rural areas are sparsely populated, and provision of a regional wastewater collection system would not be cost-effective due to its high unit cost on a customer service basis. Other areas along the coast easily support the expense of sewer collection systems based upon density (units per acre), but often the wastewater demand is focused in the summer months as opposed to a year-round demand. The County has to ensure that the financial burden to provide wastewater service to its growing communities is fairly distributed and that all areas of the County be afforded the same opportunities for economic growth in conformance with the established zoning.

3.2 Service Areas

In order to properly manage the financial burden of implementing regional wastewater management systems, the land area of the County must be divided into manageable service areas. A number of previous reports and actual implementation of regional wastewater systems were evaluated for service area boundaries. The proposed service area boundaries should be considered dynamic, as conditions such as development, intermunicipal cooperation, and similar factors change over time. Also, it is possible that interim or temporary connections (or permanent interconnections) may be warranted to best utilize system capacities during early years of system start-up and to provide greater numbers of customers and thus more cost-effective service.

Recognizing that several areas of the County have recently had wastewater systems evaluated, the primary objective of establishing regional service areas was to make use of these established boundaries. As mentioned before, these boundaries are dynamic and subject to refinement as detailed assessments or evaluations are conducted. Figure 3-1 shows the proposed regional service areas.

Within each of these larger regional service areas, the area is further delineated to provide smaller service areas (individual planning areas) from which population (permanent and seasonal) and wastewater flows (permanent and seasonal) can be further refined. Figure 3-2 represents the further refinement of these smaller service areas.

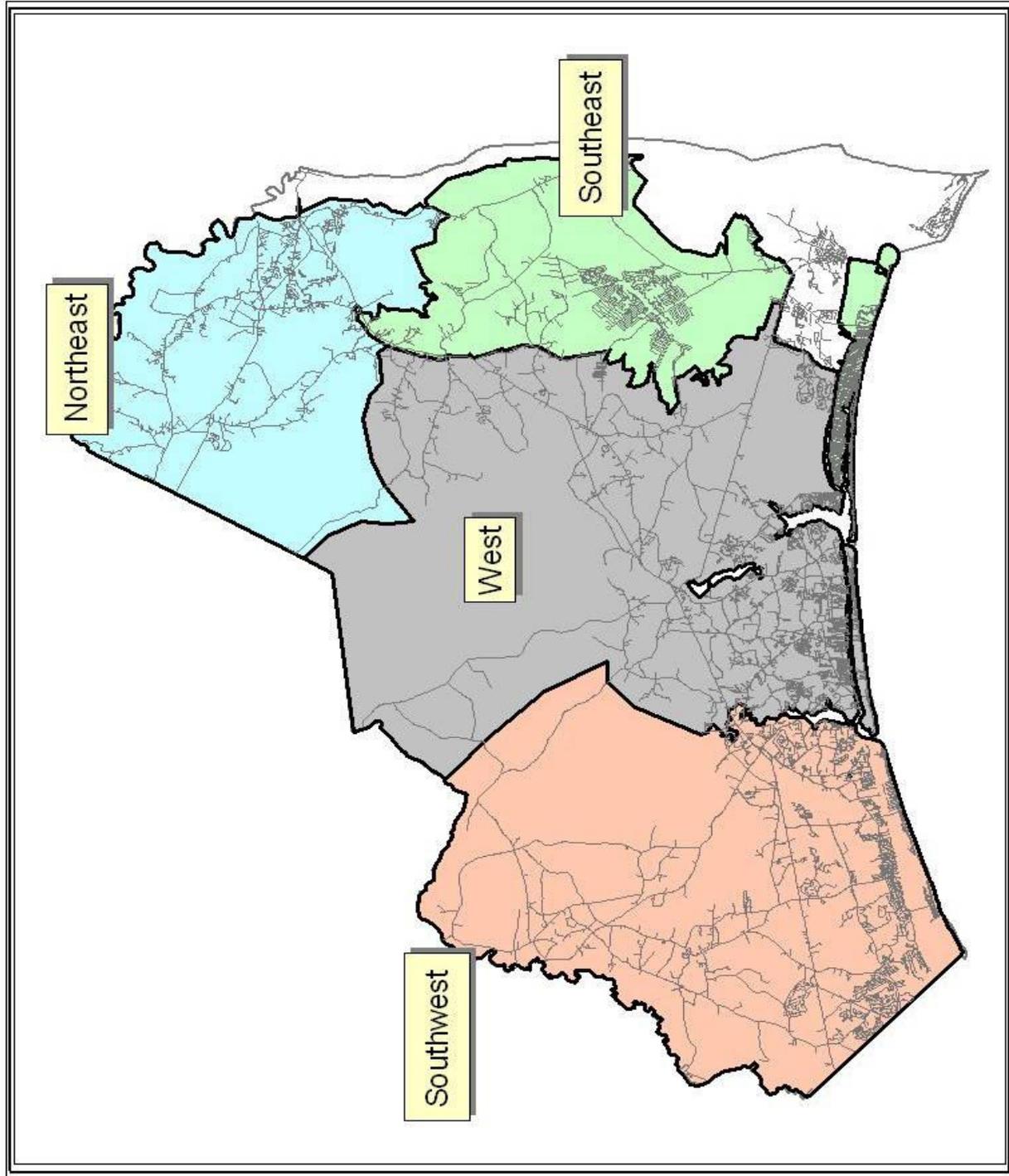


Figure 3-1. Brunswick County Regional Service Areas

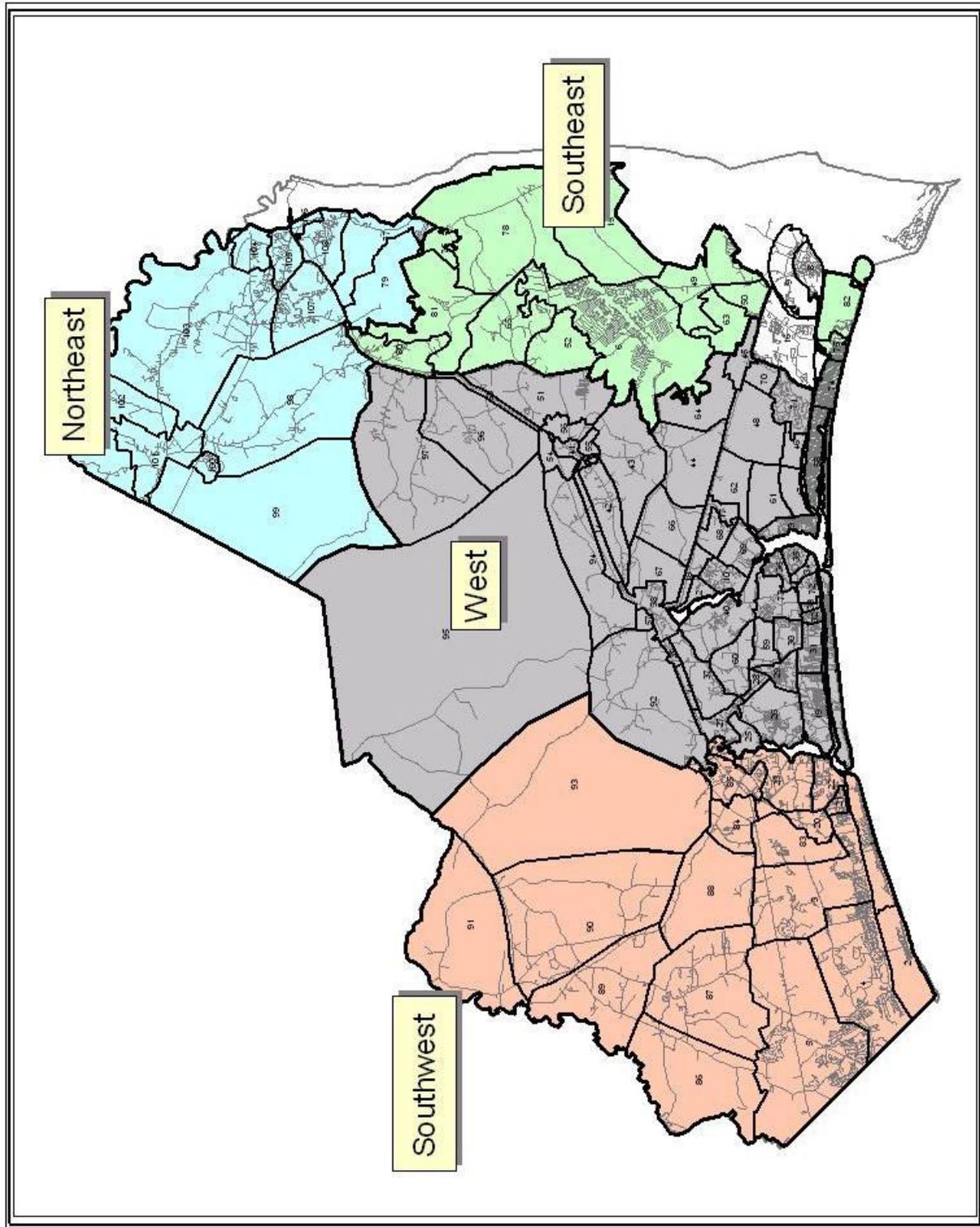


Figure 3-2. Brunswick County Regional Service Area Refinements – Individual Planning Areas

4.1 General

Wastewater systems do not receive wastewater at a constant rate. Actual hourly and daily demand rates can vary considerably over a year with respect to geographic locale and type of community. The characteristics of the community being served largely influence infrastructure requirements based on the type and extent of residential, commercial, and industrial development. Seasonal flow influence in Brunswick County is very important because significantly higher wastewater flowrates occur in the summer as opposed to the winter. Collection and treatment facilities need to incorporate these factors into their design to ensure that cost-effective systems are implemented.

4.2 Wastewater Flow Projections

As explained in Section 3.0, Population Projections, the 2004 Land Use GIS coverage was used as the basis for estimating the projected population and land use in Brunswick County. This approach was used to project population for each municipality and Brunswick County for the years 2005, 2010, 2015, and 2020. The same approach was used to develop wastewater generation rates in the County. The unit flow factors used for these wastewater flow projections are shown in Table 4-1.

The maximum monthly flow is significant because NPDES discharge permits and Non-Discharge permits are based on monthly values, and therefore permitted wastewater treatment plant capacity applies to monthly flows. Maximum monthly flow must be less than the permitted capacity to avoid violating the discharge permit. Before the peak seasonal flow exceeds 80 percent of capacity, the permittee must submit an engineering evaluation of future wastewater treatment needs. Before the peak seasonal flow exceeds 90 percent of the permitted capacity, the facility must submit approvable plans and specifications, together with a construction schedule, for expansion of the wastewater treatment system. (Failure to meet these requirements may result in a moratorium on extension of sewer lines.)

In addition to the land-use based flows, wastewater flows from other municipal sources, such as Sunset Beach, Holden Beach, and Oak Island, were assigned directly to the individual service areas. The assigned point flows are based on wastewater flow projections associated with current or recent wastewater studies or evaluations.

Table 4-1. Wastewater Flow Projection Factors

Land Use Category	Description	Land Use Density	Unit Flows	
			Permanent	Seasonal
AF	Agricultural/Forestry	1.00 ac/acre	-	-
CB	Central Business District	2.80 du/acre	429 gpd/du	429 gpd/du
CG	General Commercial	1.40 du/acre	127 gpd/du	237 gpd/du
CHB	Highway Business District	2.80 du/acre	571 gpd/du	571 gpd/du
CM	Commercial - Manufacturing	1.40 du/acre	1,143 gpd/du	1,143 gpd/du
CN	Neighborhood Commercial	2.80 du/acre	130 gpd/du	237 gpd/du
CON	Conservation	1.00 ac/acre	-	-
FP	Floodplains	1.00 ac/acre	-	-
IH	Heavy Industrial	0.70 du/acre	2,286 gpd/du	2,286 gpd/du
IL	Light Industrial	1.40 du/acre	1,143 gpd/du	1,143 gpd/du
INS	Institutional	1.40 du/acre	893 gpd/du	893 gpd/du
MF1-C	Multi-Family Residential	10.00 du/acre	28 gpd/du	545 gpd/du
MF1-I	Multi-Family Residential	10.00 du/acre	269 gpd/du	269 gpd/du
MH-C	Mobile Home Residential	6.00 du/acre	69 gpd/du	462 gpd/du
MH-I	Mobile Home Residential	6.00 du/acre	270 gpd/du	270 gpd/du
MS	Municipal Services	1.00 ac/acre	1,250 gpd/ac	1,250 gpd/ac
OS	Open Space	1.00 ac/acre	-	-
PUD-C	Planned Unit Development	4.00 du/acre	48 gpd/du	505 gpd/du
PUD-I	Planned Unit Development	4.00 du/acre	160 gpd/du	400 gpd/du
REC	Parks and Recreation	1.00 ac/acre	-	-
RG-C	Golf Course Community	1.50 du/acre	103 gpd/du	458 gpd/du
RG-I	Golf Course Community	1.50 du/acre	209 gpd/du	337 gpd/du
RU-C	Rural Residential	0.50 du/acre	161 gpd/du	283 gpd/du
RU-I	Rural Residential	0.05 du/acre	199 gpd/du	349 gpd/du
SF1-C	Low Density Residential	1.50 du/acre	49 gpd/du	503 gpd/du
SF1-I	Low Density Residential	1.50 du/acre	271 gpd/du	271 gpd/du
SF2-C	Medium Density Residential	3.00 du/acre	91 gpd/du	417 gpd/du
SF2-I	Medium Density Residential	3.00 du/acre	186 gpd/du	365 gpd/du
SF3-C	High Density Residential	4.50 du/acre	92 gpd/du	417 gpd/du
SF3-I	High Density Residential	4.50 du/acre	196 gpd/du	353 gpd/du
WL	Wetlands	1.00 ac/acre	-	-

NOTES:

- 1) Land use categories with a "-C" suffix (e.g., "RU-C") apply to coastal areas.
- 2) Land use categories with an "-I" suffix (e.g., "RU-I") apply to inland areas.

4.3 Individual Regional Service Area Flow Projections

As described previously, the County has been divided into four main regional service areas. The main regional service areas have been further refined into individual planning areas. In each of these regional service areas, consideration has been given to the anticipated demand for regional wastewater management services. As such, each individual planning area has been assigned a phase identifier (I, II, III, IV, or open). These phases allow the County to prioritize service based upon ultimately providing the most cost-effective solution for each specific region or individual area in a rapidly growing County.

For the purposes of this Master Plan, no specific timeframe for implementation has been assigned to the respective phases. Each regional service area and its individual planning areas will develop in accordance with their own drivers and influences. This Master Plan has identified the most probable progression of service provision as Phase I to Phase IV. Phase I and Phase II areas are those identified as probable service areas needing wastewater infrastructure within the 2020 planning horizon. Phases III and IV areas do not currently show population or service densities that would support wastewater service within the 2020 planning horizon. Individual planning area wastewater flow projections can be found in Appendix F.

4.4 Northeast Regional Service Area

The Northeast Regional Service Area incorporates the existing Northeast Sanitary District and the other incorporated and unincorporated areas of the northeastern portion of the County. The area is bounded by the Cape Fear River and New Hanover County to the north and east; Highway 17 and roughly Town Creek Road to the south; and Bladen and Columbus Counties to the north and west. Municipal entities in this service area include Belville, Leland, Navassa, Sandy Creek, and Northwest. Figure 4-1 provides the anticipated phasing for the individual planning areas.

The wastewater flow projections for the Northeast Brunswick Regional Service Area are summarized in Table 4-2.

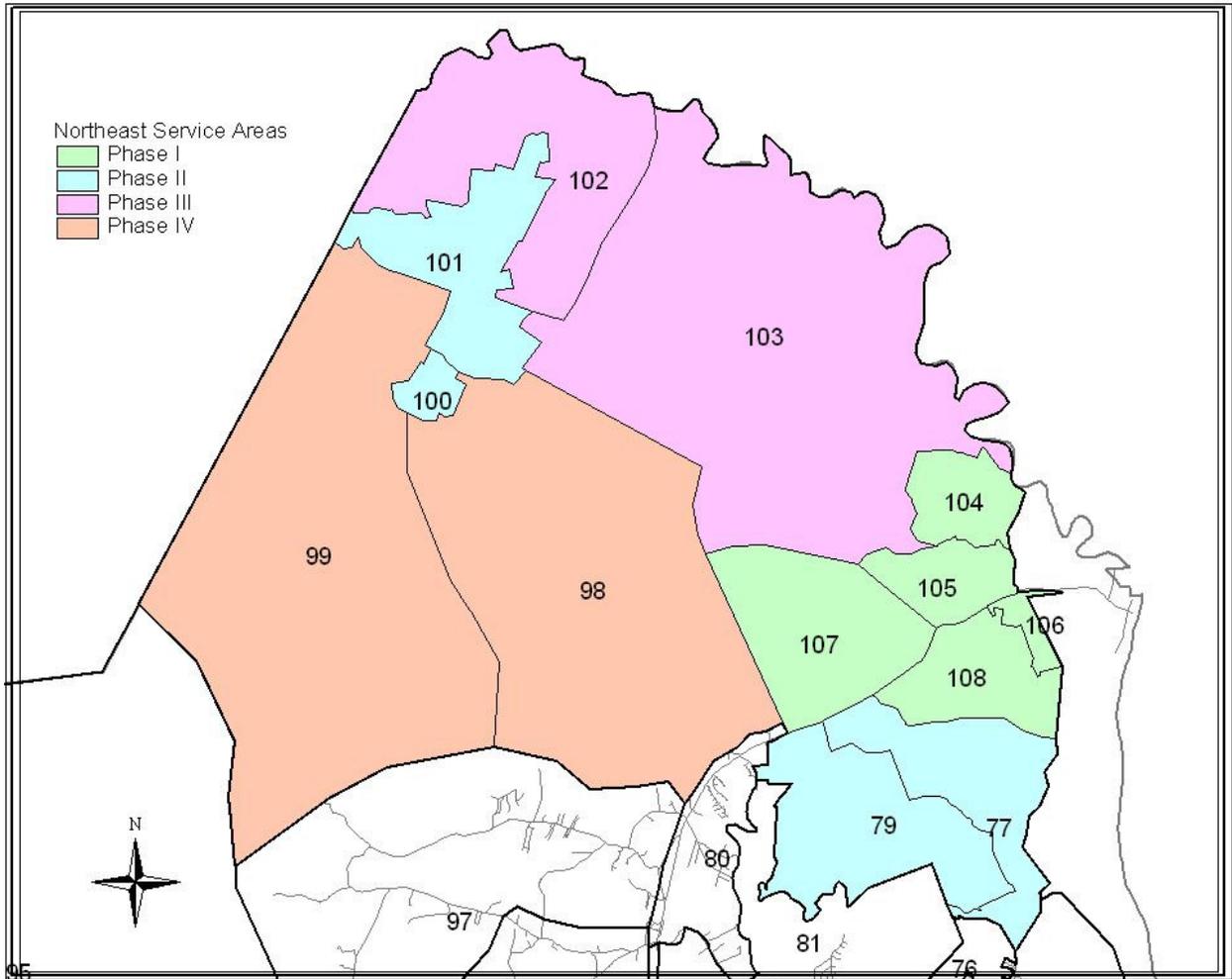


Figure 4-1. Northeast Regional Service Area – Phasing of Individual Planning Areas

Table 4-2. Northeast Regional Service Area Wastewater Flow Projections (Average Daily Flow, mgd)

Cumulative Phase Flow	2005		2010		2015		2020	
	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal
Phase I	0.74	0.88	0.85	1.01	0.95	1.15	1.07	1.30
Phase II	0.92	1.10	1.06	1.28	1.21	1.47	1.37	1.68
Phase III	1.30	1.62	1.49	1.85	1.67	2.10	2.17	2.72
Phase IV	1.46	1.84	1.66	2.10	1.87	2.37	2.45	3.09

From the data summarized above, the 2020 treatment capacity demand for the regional treatment facility is determined to be approximately 1.7 mgd. This is based upon providing service for both the Phase I and Phase II service areas of the regional system. To account for monthly maximum flows, a ratio of 1.2 (maximum monthly flow to seasonal average daily flow) is applied and the treatment capacity will be approximately 2.0 mgd.

4.5 Southeast Regional Service Area

The Southeast Regional Service Area incorporates the eastern portion of the County. The area is bounded by the Cape Fear River and New Hanover County to the east; the Atlantic Ocean to the south, and the West Regional Service Area to the west. Municipal entities in this service area include Bald Head Island, Boiling Springs Lakes, Southport, Oak Island, and Caswell Beach. It should be noted that Bald Head Island was not considered part of the anticipated service area of the Southeast Regional System because of its physical separation from the mainland area. Southport was not considered part of the service area either since the Town has indicated in a number of forums that it is not currently interested in participating with the County on regional wastewater management strategies. Figure 4-2 provides the anticipated phasing for the individual planning areas.

The wastewater flow projections for the Southeast Brunswick Regional Service Area are summarized in Table 4-3.

Table 4-3. Southeast Regional Service Area Wastewater Flow Projections (Average Daily Flow, mgd)

Cumulative Phase Flow	2005		2010		2015		2020	
	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal
Phase I	0.83	2.36	0.96	2.88	1.10	3.27	1.14	3.39
Phase II	1.08	2.70	1.21	3.25	1.38	3.68	1.44	3.84
Phase III	1.11	2.75	1.25	3.30	1.42	3.73	1.49	3.90
Phase IV	1.26	2.92	1.42	3.52	1.61	3.98	1.71	4.18

From the data summarized above, the 2020 treatment capacity demand for the regional treatment facility is determined to be approximately 3.8 mgd. This is based upon providing service for both the Phase I and Phase II service areas of the regional system. To account for monthly maximum flows, a ratio of 1.2 (maximum monthly flow to seasonal average daily flow) is applied and the treatment capacity will be approximately 4.6 mgd.

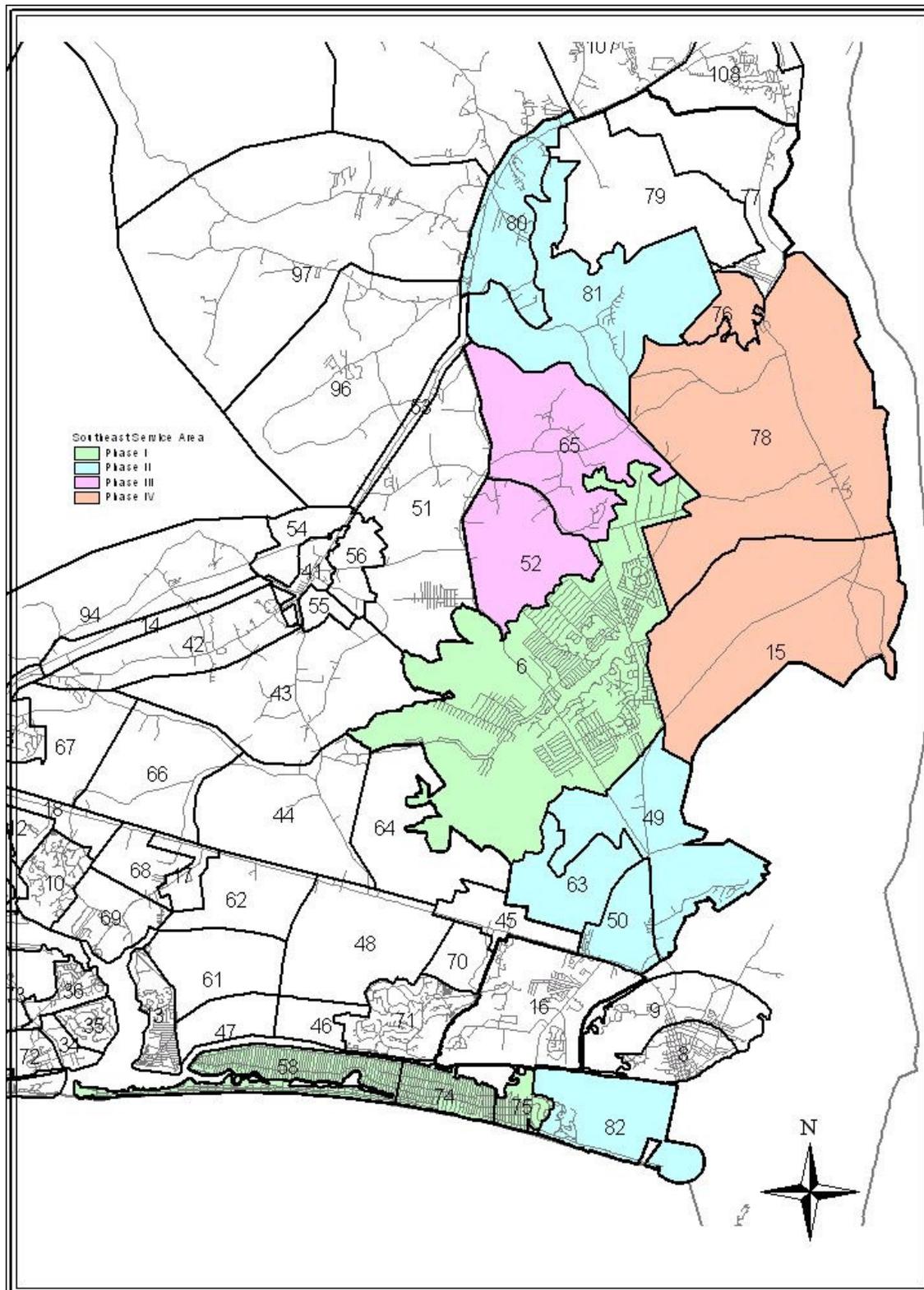


Figure 4-2. Southeast Regional Service Area – Phasing of Individual Planning Areas

4.6 West Regional Service Area

The West Regional Service Area incorporates the central portion of the County. The area is bounded by the Southeast Service Area to the east; the Atlantic Ocean to the south, Columbus County to the north, and the Southwest Regional Service Area to the west. Municipal entities in this service area include St. James, Bolivia, Holden Beach, and Varnamtown. Figure 4-3 provides the anticipated phasing for the individual planning areas.

The wastewater flow projections for the West Brunswick Regional Service Area are summarized in Table 4-4.

Table 4-4. West Regional Service Area Wastewater Flow Projections (Average Daily Flow, mgd)

Cumulative Phase Flow	2005		2010		2015		2020	
	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal
Phase I	0.78	1.94	1.23	2.80	1.45	3.43	1.73	3.98
Phase II	1.59	3.64	2.35	4.94	2.94	6.12	3.60	7.28
Phase III	1.77	3.87	2.54	5.21	3.17	6.24	3.85	7.61
Phase IV	1.92	4.08	2.71	5.44	3.35	6.67	4.05	7.89

From the data summarized above, the 2020 treatment capacity demand for the regional treatment facility is determined to be approximately 7.3 mgd. This is based upon providing service for Phase I and Phase II service areas of the regional system. To account for monthly maximum flows, a ratio of 1.2 (maximum monthly flow to seasonal average daily flow) is applied and the treatment capacity will be approximately 8.8 mgd.

4.7 Southwest Regional Service Area

The Southwest Regional Service Area incorporates the westernmost portion of the County adjacent to the state of South Carolina. The area is bounded by the West Service Area to the east; the Atlantic Ocean to the south, Columbus County to the north, and Horry County, South Carolina, to the west. Municipal entities in this service area include Shallotte, Ocean Isle Beach, Sunset Beach, Calabash, and Carolina Shores. Figure 4-4 provides the anticipated phasing for the individual planning areas.

The wastewater flow projections for the Southwest Brunswick Regional Service Area are summarized in Table 4-5.

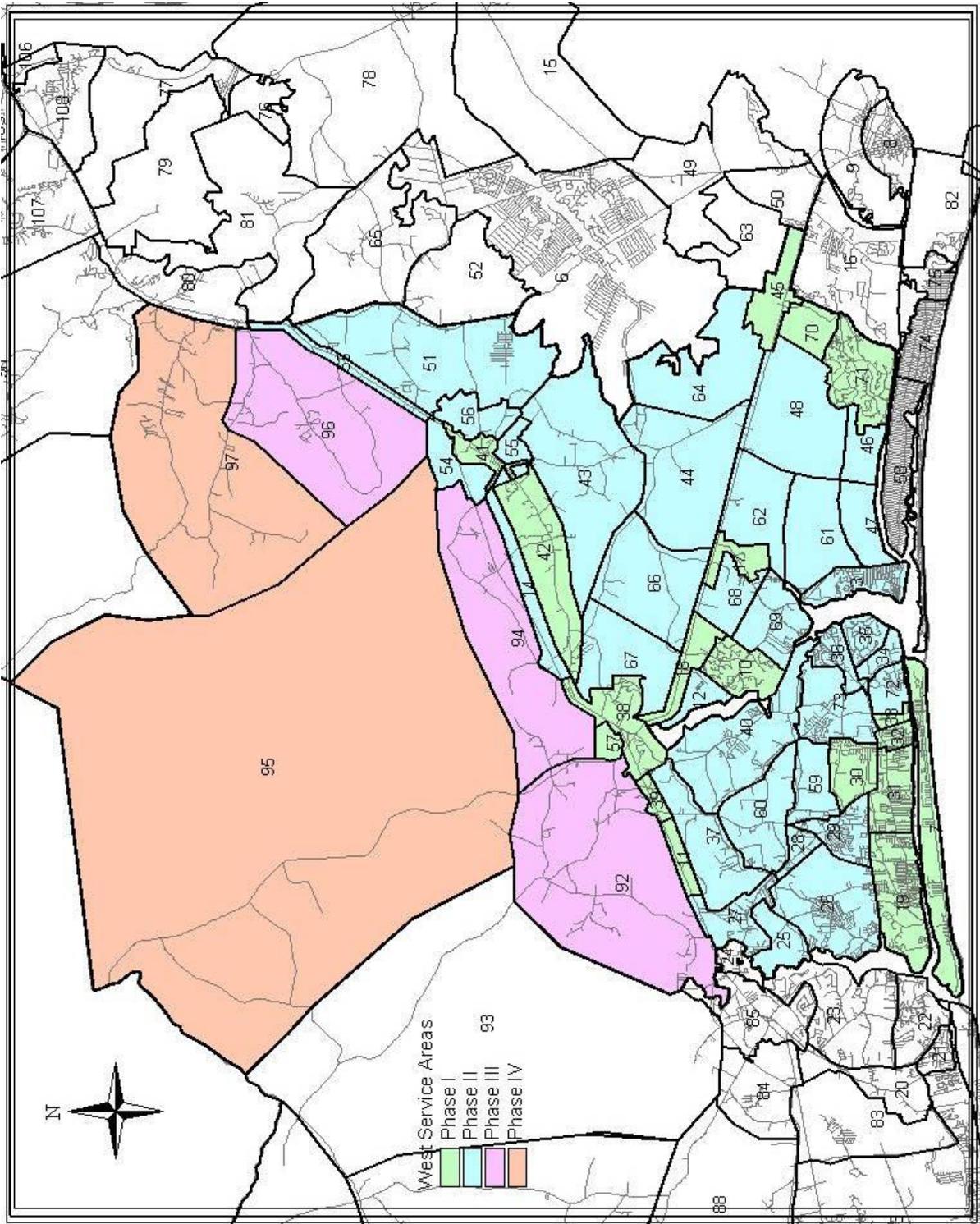


Figure 4-3. West Regional Service Area – Phasing of Individual Planning Areas

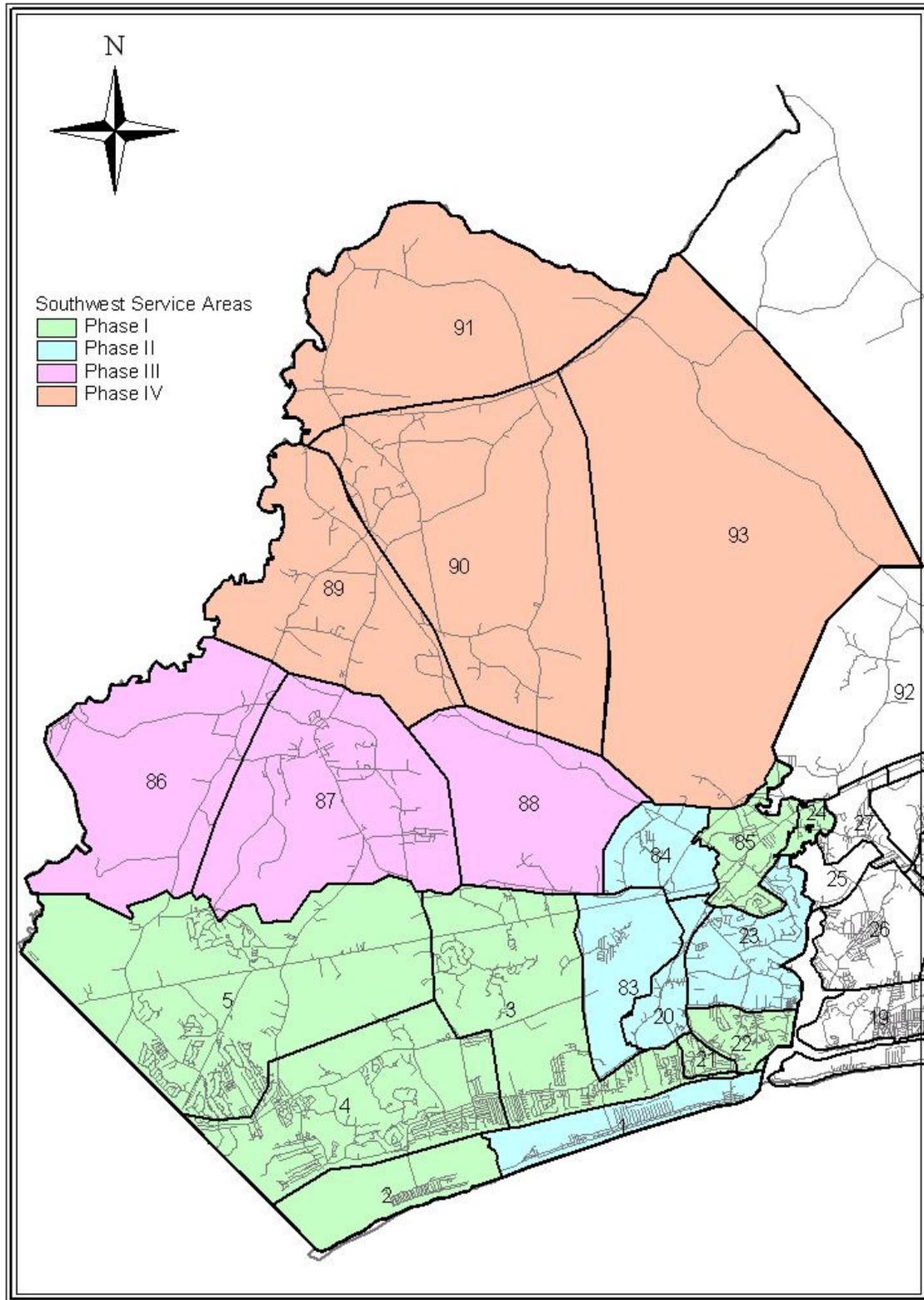


Figure 4-4. Southwest Regional Service Area – Phasing of Individual Planning Area

Table 4-5. Southwest Regional Service Area Wastewater Flow Projections (Average Daily Flow, mgd)

Cumulative Phase Flow	2005		2010		2015		2020	
	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal	Permanent	Seasonal
Phase I	1.02	3.18	1.14	3.53	1.26	3.85	1.40	4.19
Phase II	1.47	4.31	1.67	4.80	1.91	5.31	2.16	5.84
Phase III	1.62	4.54	1.84	5.05	2.09	5.58	2.36	6.12
Phase IV	1.84	4.83	2.08	5.37	2.36	5.94	2.65	6.52

From the data summarized above, the 2020 treatment capacity demand for the regional treatment facility is determined to be approximately 5.8 mgd. This is based upon providing service for the Phase I and Phase II service areas of the regional system. To account for monthly maximum flows, a ratio of 1.2 (maximum monthly flow to seasonal average daily flow) is applied and the treatment capacity will be approximately 7.0 mgd.

5.1 General

All four of the main regional service areas are in different stages of providing regional wastewater service. The Southeast area is the only area where the County does not currently own or operate any wastewater collection, treatment, or disposal systems. This section discusses the current wastewater management practices and the needed infrastructure to meet the current and future demands of the respective regional service areas. Wastewater collection systems will be evaluated on a 20-year (2005–2025) anticipated service need, and wastewater treatment and disposal/utilization will be based upon the 2020 anticipated service need. Facilities will be evaluated to accommodate maximum monthly flows for the respective timeframe.

5.2 Northeast Regional Service Area

The Northeast Sanitary District currently serves a portion of the larger Northeast Regional Service Area. The Sanitary District currently serves the communities of Belville, Leland, and Navassa. Facilities include a sewer collection system and a wastewater treatment facility that has an NPDES permit allowing for a discharge of 1.65 mgd into the Cape Fear River. The system was constructed and placed into operation in late 2004. Flows at the facility are currently averaging approximately 0.5 mgd. The system also includes a planned reclaimed distribution and utilization system to serve Magnolia Greens Golf Course. The reuse system is permitted to accommodate 0.325 mgd.

As discussed in Section 4.4, the wastewater demand to serve the 2005 – 2015 timeframe includes regional collection, treatment, and disposal/utilization facilities to serve the Phase I and Phase II areas. The envisioned infrastructure is shown in Figure 5-1.

5.2.1 Wastewater Treatment

The wastewater treatment capacity needed to serve the Phase I and Phase II needs in the 2005 – 2020 timeframe was identified in Section 4.4 as 2.0 mgd. The existing facility has the capacity to serve 1.65 mgd. This size facility would be adequate to serve the area through 2015 as long as the rate and character of growth continue in accordance with the current land use and associated Land Use Plan for this area of the County. 2020 treatment needs for Phase I and Phase II could be met by some plant modification (re-rating or physical improvements), but the method of effluent disposal would be expected to occur through reuse for flows greater than 1.65 mgd. Development of areas into Phase III or Phase IV areas would necessitate a more significant expansion of the wastewater treatment facility as well.

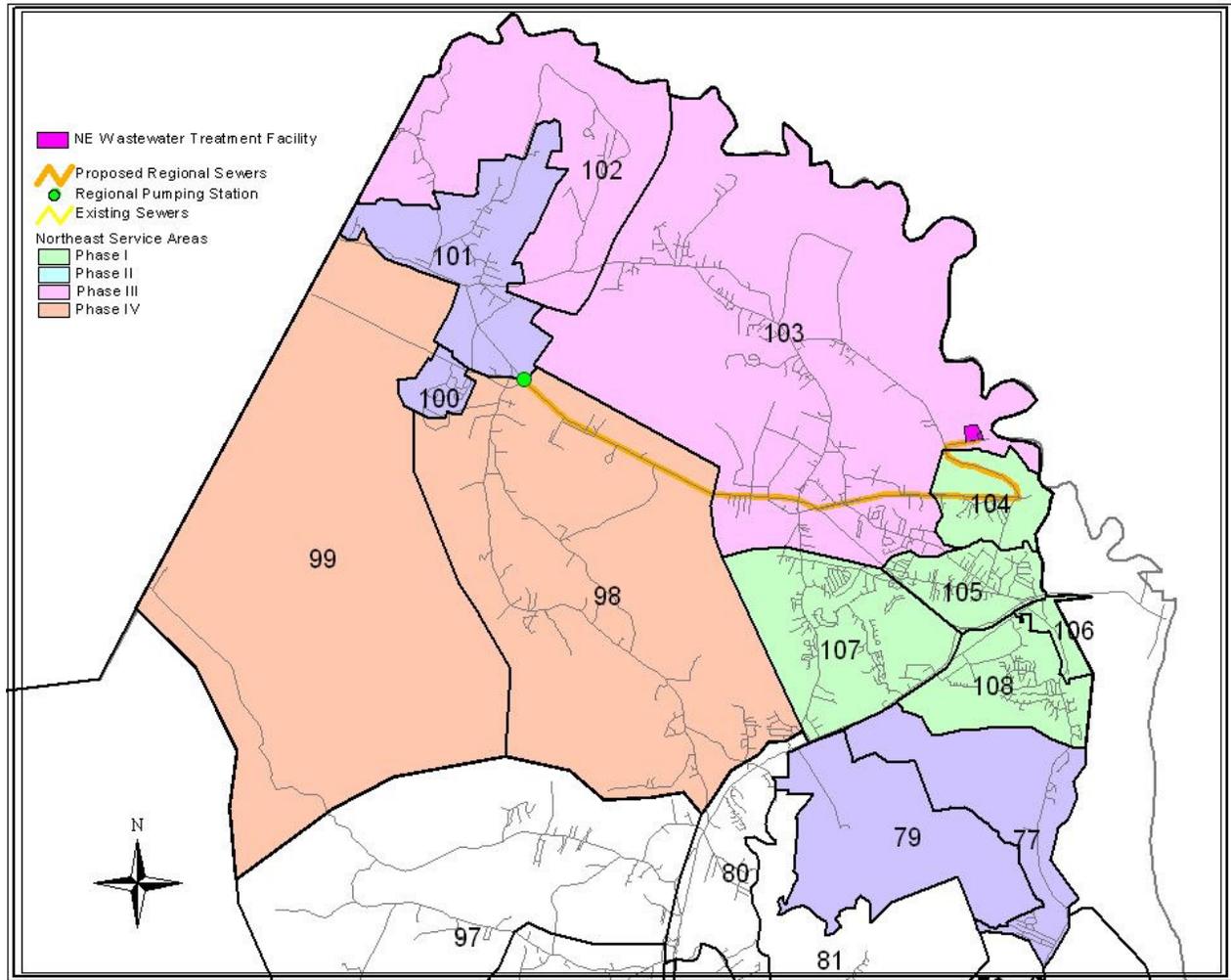


Figure 5-1. Northeast Regional Service Area – Wastewater Infrastructure

5.2.2 Sewer Collection

Phase I regional sewer collection system needs are already provided via the Northeast Sanitary District. Additional regional sewer collection system improvements will be required to serve the Phase II needs of the Northeast Regional Service Area. This infrastructure is limited to approximately 8.6 miles of regional collection line and one wastewater pump station. The Phase II service area would provide sewer service to the Towns of Northwest and Sandy Creek and the Highway 74/76 corridor.

5.2.3 Effluent Disposal or Reuse

The current Northeast Sanitary District has capacity to accommodate 1.65 mgd of treated wastewater. The current practice is to discharge the treated effluent to the Cape Fear River. This particular NPDES permit was probably one of the last NPDES permits granted in the lower Cape Fear River Basin due to limited assimilative capacity and water quality concerns. It is likely that any requests to increase the discharge capacity into the lower Cape Fear River will meet significant opposition with the NC Department of Environment and Natural Resources (DENR). Any future expansion needs should strongly consider reuse as the means of ultimate wastewater management. Maintaining the option to discharge via the NPDES permit is very important because it will allow the ability to have a conjunctive system whereby discharges can occur during wet weather conditions so no large wet weather storage would be required.

5.2.4 Residuals Management

As described in Section 5.2.1, the current Northeast Sanitary District has capacity to accommodate 1.65 mgd of treated wastewater. Screened materials from the headworks (coarse solids and grit) are currently separated and disposed at the County landfill. Biosolids (digested solids) from the biological treatment process are managed by a contract firm and are land applied at agronomic rates to sites in the surrounding areas as allowed by the contractor’s non-discharge permit. Since there are no significant sources of residuals anticipated to be generated in the Northeast Service Area, no increased residual management will be needed.

5.3 Southeast Regional Service Area

The Southeast Regional Service Area is currently unserved by any County owned or operated wastewater systems. Most of the unincorporated areas of the service area are served by on-site septic systems. With respect to municipal systems, the Towns of Oak Island, Southport, and St. James are served by community-based wastewater treatment systems. The Town of Oak Island has a 0.4-mgd reuse system that was owned by the former Town of Yaupon Beach. This system is a package style tertiary plant that utilizes both spray irrigation and a rapid infiltration pond for utilization of the effluent. The Town of Oak Island is currently investigating wastewater management options to either meet its needs alone or join with the County in a cooperative approach. The Southeast Sanitary District currently serves a portion of the Town of St. James via a wastewater treatment and reclaimed distribution system. Reclaimed water produced by the Sanitary District is used for golf course irrigation at one of the St. James Plantation courses

(Players Club) and includes additional reclaimed water use for streetscape and common area irrigation. The Town of Southport currently treats and disposes its wastewater through an NPDES permitted discharge to the Atlantic Intracoastal Waterway. Although Southport will be faced with a regulatory challenge to increase pollutant or hydraulic loadings to this discharge point, they have not expressed any interest in joining the County in a regional wastewater system approach.

As discussed in Section 4.5, the wastewater demand to serve the 2005 – 2020 timeframe includes regional collection, treatment, and disposal/utilization facilities to serve the Phase I and Phase II areas. The envisioned infrastructure is shown in Figure 5-2.

5.3.1 Wastewater Treatment

The wastewater treatment capacity needed to serve the Phase I and Phase II needs in the year 2020 was identified in Section 4.5 as approximately 5.0 mgd. There are currently no wastewater facilities of significant size that could serve as a regional facility. The County purchased a 600-acre site in 2001 near the Sunny Point Military Terminal for the express purpose of a regional wastewater system to serve this same geographic region of the County. Due to the large amount of wetlands on this site and the presence of a “blast zone” associated with the Sunny Point Munitions Terminal, it is most likely that only the water reclamation treatment facilities would be located on the site. Wet weather storage and reclaimed water utilization would have to be managed off-site. The Town of Oak Island owns an undeveloped site, approximately 100 acres, that could serve as a regional facility (or some component thereof) or a land application site, although its location does not conform to current County criteria for the selection of regional sites.

The Town of Oak Island also owns a small non-discharge type wastewater treatment facility that serves the former Town of Yaupon Beach area and a small part of the Caswell Beach area. This plant would continue to operate and service these two areas for the useful life of this system. Any flows in excess of its current design capacity (0.40 mgd) would have to be diverted to the Southeast Regional Wastewater System.

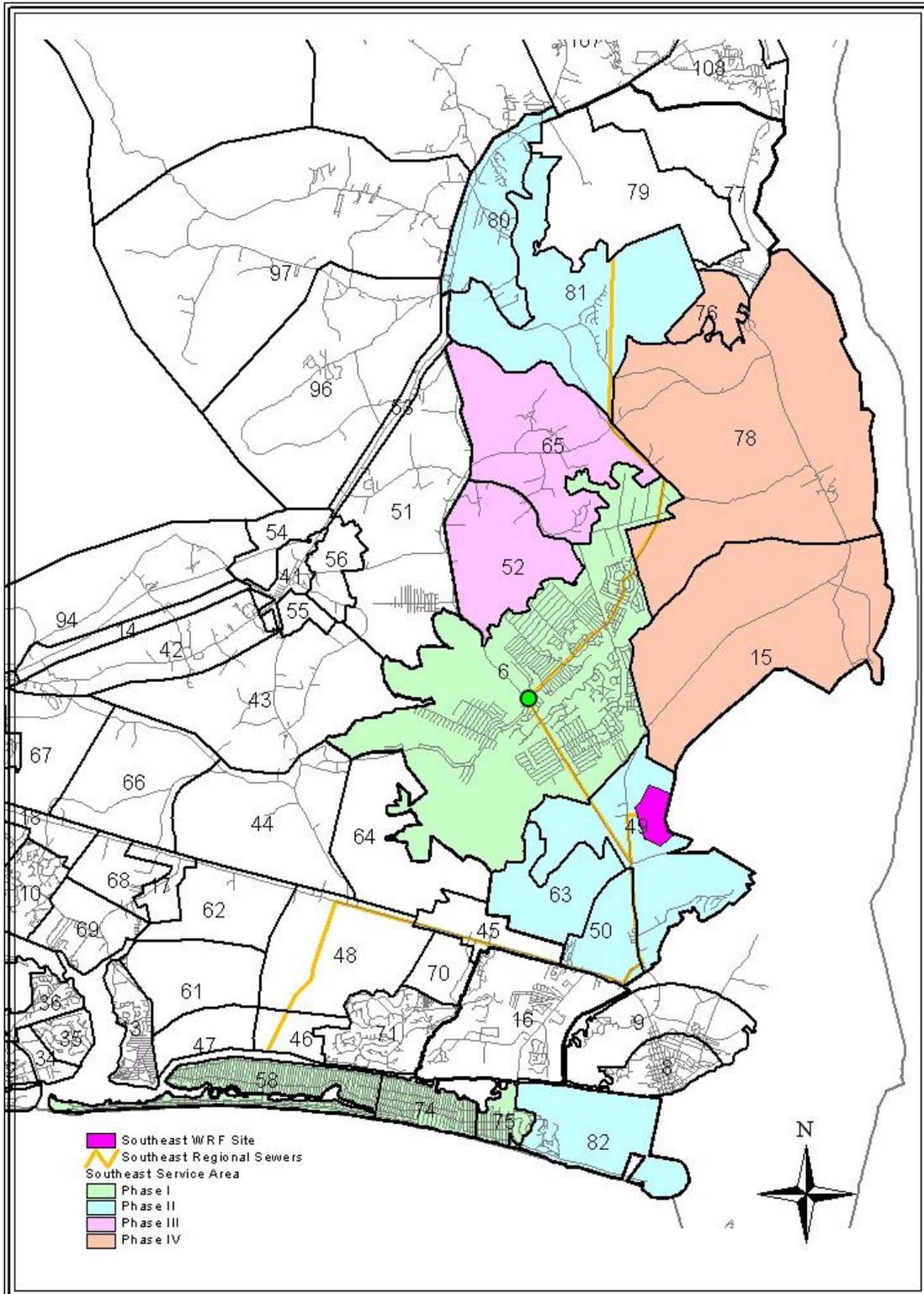


Figure 5-2. Southeast Regional Service Area – Wastewater Infrastructure

5.3.2 Sewer Collection

No components of the Phase I or Phase II regional sewer collection system needs are currently provided. There is one segment of the proposed Southeast regional collection system that extends outside of the current Southeast Regional Service Area into the West Regional Service Area. The reason for this is that it is thought that a second crossing to Oak Island should be planned for the western side of the island, and this crossing would follow the route of the proposed second bridge and road corridor planned for Middleton Avenue. This line would either parallel the existing West Brunswick 16-inch wastewater line or actually connect to it to provide an interconnection between the two wastewater systems (interim or long-term). Assuming that new sewer infrastructure would be required to serve the area's 10-year wastewater demands, approximately 27.4 miles of new sewer lines would be required. Additionally, one regional wastewater pumping station in the vicinity of the north side of the Town of Boiling Springs Lakes would be required to service the area.

5.3.3 Effluent Disposal or Reuse

Similar to wastewater treatment capacity for the Southeast Regional Service Area, little reclaimed water utilization or disposal systems exist. To accommodate the 10-year demand of 5.0 mgd will either be by surface water discharge or reuse. Relative to a surface water discharge, it is believed that NCDENR would be adamantly opposed to any new discharge of this magnitude. The vast majority of surface waters along the Brunswick County coast are designated Shellfish waters (classified "SA" Waters) and, as such, do not allow domestic wastewater discharges no matter how highly they may be treated.

With respect to surface water discharges, there are only a few exceptions in Brunswick County and two of those lie in the Southeast Regional Service Area. The Town of Southport initiated its discharge to the Atlantic Intracoastal Waterway decades ago before the adoption of the Federal Clean Water Act and the associated NPDES permitting program. When this program was established, many communities were discharging raw or inadequately treated wastewaters into the nation's surface waters. It was a challenge for the program to get all the discharges accounted for and under a permit that allowed for protection or enhancement of the receiving streams. Although the objective of this program is to eliminate all surface water discharges, this is probably not currently a reasonable or achievable goal. The state's water quality program acquiesced to

Southport’s discharge years ago by reclassifying the surface waters around its discharge to “SC” waters, which allow domestic or municipal quality wastewater discharges. Southport will most likely be required to demonstrate that it has no reasonable economical alternative to its discharge every five years (NPDES Permit Renewal Cycle) but, as long as it can manage its wastewater within the constraints of its NPDES permit, it will most likely be allowed to continue the discharge indefinitely.

The other surface water discharge exception is the Progress Energy Brunswick Nuclear Power Station. The nuclear power generation facility uses intake water from the Atlantic Intracoastal Waterway for “once through” cooling water. This “once through” process uses an extreme amount of water, approximately 1.4 billion gallons per day, and discharges it through a canal and into a relatively short ocean outfall, approximately 1 mile, into the Atlantic Ocean. Included in this discharge is a minute amount of domestic wastewater that is generated from Progress Energy’s operations. There have been conversations between Progress Energy, NCDENR, and other interested municipal parties over the years about allowing a town (or regional) discharge, but, to date, no firm commitments or even conceptual approvals have been obtained for such a scenario. It is thought that these and any other similar discharge alternatives will meet a severe and rigorous regulatory process that would involve significant time and resources to obtain approval.

The most expedient and cost-effective approach is the development of a regional reclaimed water distribution and utilization program. Although this approach can be land intensive, it is recognized that a comprehensive reuse program that encourages the use of reclaimed water instead of potable and other sources of non-potable water (surface and groundwaters) can accommodate the area’s reclaimed water production. Irrigation can serve as the principal means of reclaimed water utilization, but other options such as commercial (example - car washes) or industrial (example - cooling water) uses need to be nurtured and developed. Two irrigation opportunities that need to be emphasized are residential reuse (lawn and common area irrigation) and agricultural (non-food chain crop irrigation – including silviculture). Residential reuse is a strong viable option due to the significant residential growth in the area, and many of the communities are upscale in that they are using irrigation for their lawns and common areas. Traditional sources such as golf courses are still good viable options, but growth of new course construction has dramatically slowed down due to supply and demand aspects.

5.3.4 Residuals Management

As described in Section 5.3.1, the planned wastewater treatment system will require a capacity of approximately 5.0 mgd. Screened materials from the headworks (coarse solids and grit) will be separated and disposed at the County landfill. Biosolids (digested solids) from the biological treatment process in addition to the other facilities either currently in operation or under construction will continue to utilize outside resources for these activities until the County determines that it can manage these efforts more cost effectively with its own staff and equipment.

5.4 West Regional Service Area

Portions of the West Regional Service Area are currently served by County owned and/or operated wastewater systems. Currently, the County operates the St. James Plantation and Winding River Plantation wastewater collection, treatment, and disposal/utilization systems. Treated effluent (reclaimed water) produced by these two facilities is irrigated on golf courses associated with the two respective developments. The County also owns wastewater treatment systems serving the Brunswick County Government Complex and the Brunswick County Community College. A 3.0-mgd regional wastewater collection, treatment, and disposal/utilization system is under construction and should become operational at the beginning of 2006. All of the current wastewater systems mentioned above will be tied into the West Regional Water Reclamation Facility shortly after it is placed into operation. Most of the remaining unincorporated areas of the service area are served by on-site septic systems. With respect to municipalities located in the West Brunswick Service Area, the Towns of Bolivia, Holden Beach, and Varnamtown are served by on-site septic tank systems. Holden Beach is a partner in the current West Brunswick Regional System and will be tied into the system after the facility's start-up as well. The Town of Shallotte owns and operates a 0.5-mgd secondary treatment (facultative lagoons) and land application system to serve its customers. The Town of Shallotte is currently investigating wastewater management options to either meet its needs alone or join with the County in a cooperative regional approach.

As discussed in Section 4.6, the wastewater demand to serve the 2005 – 2020 timeframe includes regional collection, treatment, and disposal/utilization facilities to serve the Phase I and Phase II areas. The envisioned 2020 infrastructure is shown in Figure 5-3.

5.4.1 Wastewater Treatment

The wastewater treatment capacity required to serve the Phase I and Phase II needs in the year 2020 was identified in Section 4.6 as 9.0 mgd. This value varies from the design numbers associated with the West Brunswick 201 Facilities Plan (October 2002) for two principal reasons. The first is that two mainland planning service areas previously associated with Oak Island are now included with this approach. The second reason is that there has been some more aggressive development and rezoning requests in this area as a result of the West Brunswick System being constructed. It is thought that some “pent-up” demand is being realized as a result of installation of the regional system and this increase in activity will level off in the next year or two.

The West Brunswick Regional Water Reclamation Facility under construction to serve Phase I of the service area is 3.0 mgd. The current design drawings’ site plan reflects a future expansion of the facilities to replicate the 3.0-mgd facility to a 6.0-mgd facility. The 275-acre site has adequate land to support a much greater sized facility in the future when necessary. 2020 Phase I and Phase II needs of 9.0 mgd can easily be met by a future expansion. Other wastewater facilities of significant size in the area that could serve as a potential location for a regional facility include the Town of Shallotte’s facility. This particular site could become either part of the West Brunswick Regional System, or the Southwest Brunswick Regional System assuming that Shallotte becomes a regional partner in the future. The Shallotte system consists of a 0.5-mgd secondary treatment (facultative lagoons) and land application system on an approximate 800-acre site. The West Brunswick facility is an attractive alternative for short-term needs encountered by both the Southwest and Southeast Service Areas due to its central location. From a long-term perspective, the West Brunswick Facility would not be as economical due to substantial pumping costs for conveying wastewater to the plant and conveying reclaimed water back to distant reuse sites.

5.4.2 Sewer Collection

A significant component of the Phase I and Phase II regional sewer collection system needs is currently provided and under construction as a result of the West Brunswick Regional System. There is one 5.6-mile segment that would need to be constructed to serve the unincorporated areas of the Shallotte area. If the Town of Shallotte joins the County in a regional approach, this line would need to be larger than just the needs of the

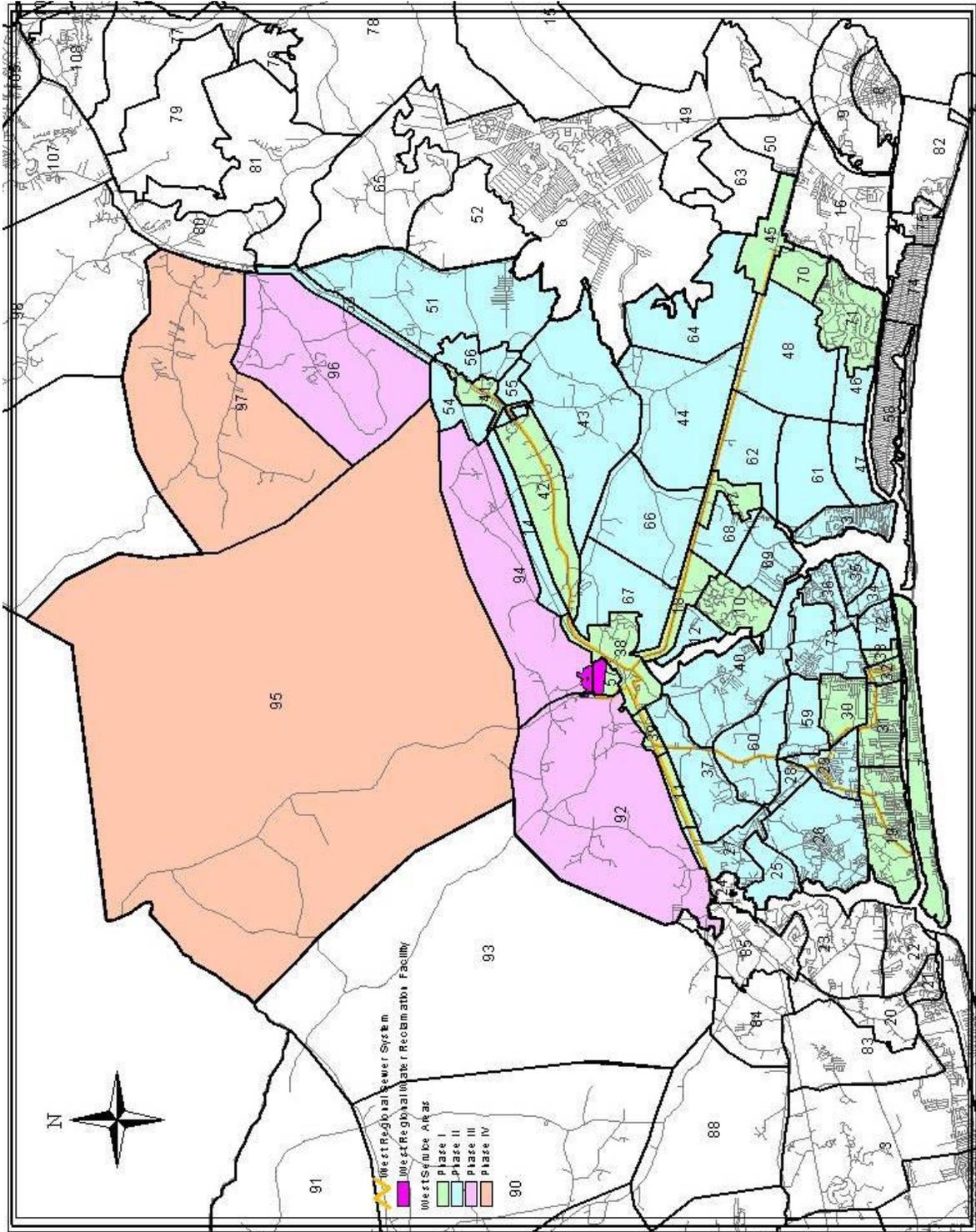


Figure 5-3. West Regional Service Area – Wastewater Infrastructure

unincorporated areas. This same line could also serve as a component of a West-Southwest interim connection. It is not anticipated that any additional regional pumping stations would be necessary to handle this sewer system extension. Line work to provide an interim connection between the West-Southeast service areas has been discussed in Section 5.3.2. Line work to provide an interim connection between the West-Southwest service areas will be discussed in Section 5.5.

5.4.3 Effluent Disposal or Reuse

Future reclaimed water utilization in the West Brunswick Service Area will be a challenge unless appropriate incentives or controls are enacted. The current West Brunswick Regional Water Reclamation System has 3.0 mgd of reclaimed water utilization capacity, but more than half (1.9 mgd) is being accomplished via a County owned silvicultural operation. The remaining (1.1 mgd) portion is being managed via golf course irrigation at both Winding River and St. James Plantation golf courses. A potential exists for additional golf course irrigation at these two communities, but it will not meet 2020 needs (9.0 mgd). The 2015 demand (4.0 mgd) will be relatively easy to meet, but the future needs will be increasingly difficult.

It is still believed that the most expedient and cost-effective approach for the West Brunswick Service Area is the nurturing and development of a proactive reclaimed water utilization program. Details of this approach were explained in Section 5.3.3.

5.4.4 Residuals Management

As described in Section 5.4.1, the planned wastewater treatment system will require a capacity of approximately 9.0 mgd. Screened materials from the headworks (coarse solids and grit) will be separated and disposed at the County landfill. Biosolids (digested solids) from the biological treatment process, in addition to the other facilities either currently in operation or under construction, will continue to utilize outside resources for these activities until the County determines that it can manage these efforts more cost effectively with its own staff and equipment. Any interim connections from either the Southeast or Southwest Regional Systems will require appropriate analysis or consideration to ensure that the residuals handling facilities are properly sized to manage these additional sources.

5.5 Southwest Regional Service Area

Portions of the Southwest Regional Service Area are currently served by County owned and/or operated wastewater systems. The County owns and operates the Carolina Shores (formerly Carolina Blythe Utilities) and Sea Trail (formerly South Brunswick Water and Sewer Authority) wastewater collection, treatment, and disposal/utilization systems. The former Carolina Blythe facility has an NPDES permit for 0.53 mgd into an unnamed tributary to Persimmon Swamp, which is ultimately tributary to the Waccamaw River. The Sea Trail facility is rated for 0.2 mgd, but the system has been designed and permitted for 0.5 mgd. The three golf courses at Sea Trail utilize the reclaimed water for irrigation purposes.

Most of the remaining unincorporated areas of the service area are served by on-site septic systems or privately owned and managed wastewater treatment systems. Ocean Ridge Plantation currently operates a 0.4-mgd system that currently utilizes its three golf courses for reclaimed water utilization. A fourth course is under construction and is being designed and constructed to incorporate reuse for irrigation as well. The expanded system has been permitted for 0.6 mgd. Bricklanding and Oyster Bay developments are community systems utilizing package style wastewater treatment systems with on-site disposal of the treated effluent. With respect to municipalities located in the Southwest Brunswick Service Area, portions of the Town of Sunset Beach, the island, and some mainland areas are served by on-site septic tank systems. The Sea Trail development, some other areas of Sunset Beach, and the downtown area of Calabash are provided wastewater management services by the Sea Trail facility. The Town of Carolina Shores is provided wastewater management services by the former Carolina Blythe facility. The Town of Ocean Isle Beach owns and operates its own 1.5-mgd facility (2.0-mgd capacity if solids handling facilities are improved). Ocean Isle's facility was upgraded in 2003 to reclaimed water standards and utilizes its 645-acre property for reclaimed water irrigation.

As discussed in Section 4.7, the wastewater demand to serve the 2005–2020 timeframe includes regional collection, treatment, and utilization facilities to serve the Phase I and Phase II areas. The envisioned 2020 infrastructure is shown in Figure 5-4.

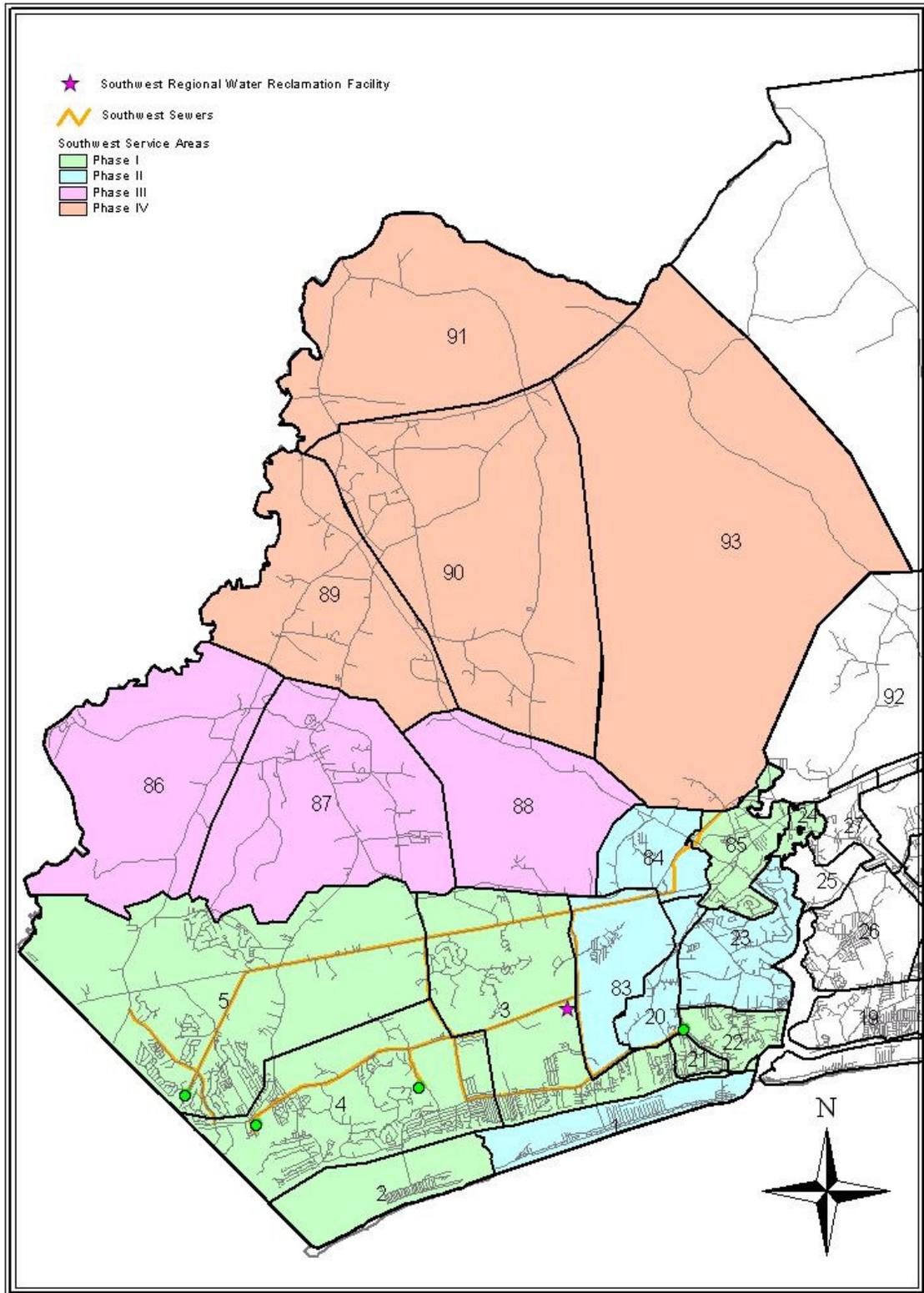


Figure 5-4. Southwest Regional Service Area – Wastewater Infrastructure

5.5.1 Wastewater Treatment

The wastewater treatment capacity needed to serve the Phase I and Phase II needs in the year 2020 was identified in Section 4.7 as 7.0 mgd. Based upon rezoning requests and project approval submittals, the Southwest area is under substantial growth pressure due to the large number of golf course communities in the area and its proximity to the Myrtle Beach area.

A Conceptual Wastewater Plan was developed for this area in July 2004. The Conceptual Plan evaluated three different alternatives for long-term wastewater management. The alternatives included:

- ◆ Expansion of the West Brunswick Water Reclamation Facility.
- ◆ Decentralized Water Reclamation Facilities without participation of the Town of Ocean Isle Beach.
- ◆ Decentralized Water Reclamation Facilities with participation of the Town of Ocean Isle Beach.

Capital costs for each of the alternatives were relatively high (\$55.5 – \$92.2 million) but, based upon the anticipated number of customers, the monthly regional sewer system fee ranged from approximately \$30 – \$55 (5,000 gallons per month basis). The least cost alternative was the use of a decentralized approach with the participation of Ocean Isle Beach. A principal advantage of Ocean Isle Beach’s participation is the number of sewer customers (2,150) that the Town’s participation would add.

Since the development of the Conceptual Plan, County staff representatives of the Brunswick County Board of Commissioners have met with representatives of the Town of Ocean Isle Beach regarding the Town’s participation. The Town’s current perspective on wastewater management is that its recent investments to upgrade its system should provide them capacity for the foreseeable future, but it would remain flexible about a long-term possibility of participation with the County. For purposes of this Master Plan evaluation, it is assumed that the Town of Ocean Isle Beach and the County will work together to meet the long-term (2020 and beyond) wastewater needs of the area.

A Preliminary Engineering Report (PER) is currently under development to identify the immediate wastewater management needs (2005 – 2010) for portions of the Southwest Regional Service Area. This PER is focused on the operational and facility improvements

to the Sea Trail and the former Carolina Blythe wastewater treatment facilities to achieve the following objectives:

- ◆ Evaluate the short-term wastewater demand associated with providing sewer service to the Town of Sunset Beach (island and other municipal boundaries not currently served).
- ◆ Optimize and maximize the wastewater treatment capabilities of the Sea Trail and Carolina Shores wastewater treatment facilities.
- ◆ Evaluate cost-effective upgrades or expansions of the Sea Trail and Carolina Shores facilities to accommodate the area’s immediate sewer needs.
- ◆ Evaluate the cost of providing an interim connection to the West Brunswick Regional Water Reclamation Facility for the management of wastewater in excess of what can be managed by the Sea Trail and Carolina Shores facilities.

All of these objectives include a focus on maintaining compliance with all applicable environmental regulatory requirements.

As explained in Section 5.4.1, the capacity of the West Brunswick Regional Water Reclamation Facility under construction to serve Phase I is 3.0 mgd. The current design drawings’ site plan reflects a future expansion of the facilities to replicate the 3.0-mgd facility to become a 6.0-mgd facility. The 275-acre site has adequate land to support a much greater sized facility in the future, if necessary. 2020 Phase I and Phase II needs of 7.0 mgd can easily be met by a future expansion of the West Brunswick facility, but long-term costs associated with long distance pumping, both to and from, make this option more costly from a long-term perspective. Other wastewater facilities of significant size in the area that could serve as a regional facility include the Town of Shallotte and the Town of Ocean Isle Beach. Neither the Town of Shallotte nor the Town of Ocean Isle Beach has fully committed to the County to be a regional participant, but either could be cost-effective alternatives. A principal driver in this determination is the proximity of the wastewater treatment facility to the reclaimed water utilization sites. This will be discussed in further detail in Section 5.5.3.

The Shallotte system consists of a 0.5-mgd secondary treatment (facultative lagoons) and land application system on an approximate 800-acre site. The Ocean Isle Beach system consists of a 1.5-mgd tertiary treatment (reclaimed water) and land application system on

an approximate 645-acre site. The West Brunswick facility is an attractive alternative for short-term needs encountered by both the Southwest and Southeast Service Areas due to its central location. From a long-term perspective, the West Brunswick Facility would not be as economical due to substantial pumping costs for conveying wastewater to the plant and conveying reclaimed water back to distant reuse sites.

5.5.2 Sewer Collection

Sewer system infrastructure currently exists in the Southwest Regional Service Area, but it is primarily isolated to smaller municipal components or private developments. These smaller components are referred to as “local” collection system components as opposed to “regional” sewer components. In order to provide the regional sewer components to serve the Phase I and Phase II components of the Southwest Regional Service Area, approximately 26.8 miles of regional lines would be needed. It is anticipated that three regional pumping stations would be necessary to handle the Phase I and Phase II wastewater needs.

5.5.3 Effluent Disposal or Reuse

Reclaimed water utilization in the Southwest Brunswick Service Area appears to be very viable given that there are more than 25 equivalent 18-hole golf courses in the service area. Although this traditional opportunity for reclaimed water usage exists, there still is a lot of energy and effort necessary to get so many different entities (owners, managers, golf course superintendents, etc.) to commit to participation. Fortunately, many of the golf course communities in the County have already implemented reclaimed water systems and many others recognize the importance of reuse in the successful implementation of a regional sewer system. The County should continue to work with area golf course owners and large property tract owners to obtain appropriate reuse agreements.

Additionally, as with other areas of the County, it is believed that the most expedient and cost-effective approach for wastewater management is the nurturing and development of a robust reclaimed water utilization program. Details of this approach were explained in Section 5.3.3.

5.5.4 Residuals Management

As described in Section 5.5.1, the planned wastewater treatment system will require a capacity of approximately 7.0 mgd. Screened materials from the headworks (coarse solids and grit) will be separated and disposed at the County landfill. Biosolids (digested solids) from the biological treatment process, in addition to the other facilities either currently in operation or under construction, will continue to utilize outside resources for these activities until the County determines that it can manage these efforts more cost effectively with its own staff and equipment. It is believed that the residuals management needs of the Southwest Regional Service Area would be best served by a centralized facility located in the same regional area. This is true whether or not the County pursues a decentralized or centralized regional approach.

SewerCAD models were developed for each of the regional service areas to determine the most appropriate pumping station and line sizes. The SewerCAD Model outputs can be found in Appendix G. A Countywide map of the 20-year sewer collection system infrastructure can be found in Appendix H.

6.1 General Discharge Evaluation Criteria

The discharge of treated wastewater to surface waters is a common practice across the State of North Carolina and the nation as well. Discharges to the nation's surface waters are governed by the Federal Clean Water Act. The United States Environmental Protection Agency (US EPA) is responsible for the management of these systems and regulates surface water discharges via the National Pollutant Discharge Elimination System (NPDES) permitting program. The State of North Carolina has received primacy for the management of this program from the US EPA and, as such, is responsible for evaluating surface water discharges to ensure the water quality standards and uses of the receiving stream are protected.

North Carolina manages this program within the Department of Environment and Natural Resources (DENR) and, specifically, the Division of Water Quality (DWQ). DWQ has established water quality standards (numerical, such as dissolved oxygen and heavy metals, and narrative, such as odor, taste, aesthetic quality or deleterious effects) and uses (recreation, water supply, aquatic life propagation, etc.). Existing surface water discharges operating under NPDES Permits are evaluated periodically to ensure that they are protecting both surface water standards and designated uses of the receiving streams. Expansion of existing discharges or proposed new discharges are evaluated on the merits of protecting the water quality standards and receiving stream uses as well. If new or expanding discharges cannot protect these standards or uses, a permit request is denied.

Several regulatory aspects make new or expanding discharges in the Brunswick County area a challenge. One major issue is the ability of a receiving stream to demonstrate a positive 30Q2 flow. This figure applies to the lowest average flow, expressed in cubic feet per second (cfs), over a two-year period in a 30-day, continuous interval. This is an important figure because, if the flow is stagnant or non-flowing, the number is zero. If it is tidally influenced, it can be negative. These low-flow conditions can exist in a number of streams in Brunswick County, but this criterion does not take into account the true assimilative capacity of such streams. 7Q10 and 30Q2 conditions of zero may be suitable for surface water discharge evaluations in the mountains or Piedmont areas of the state, but may be inappropriate criteria for the coastal or estuarine areas.

Many smaller streams or even wetland areas exist in the region that might serve as receiving bodies for tertiary quality effluent. These options have generally been discouraged by the DWQ due to past problems with facilities consistently producing a high quality effluent that ensured surface water protection. Wastewater technology (treatment and controls) and consistency in producing high quality effluents have made great strides over the past decade and, as such, may

provide some basis for new or expanding surface water discharges. Since many of the County’s wastewater management systems are reuse systems, the potential for use of high quality reclaimed water for wetland restoration or enhancement is a viable alternative as well.

6.2 Northeast Surface Water Discharge Options

The Cape Fear River adjoins the northeast and east borders of the Northeast Region. The Northeast Sanitary District has an NPDES Permit that allows the discharge of up to 1.65 mgd of tertiary treated effluent into the Cape Fear River. It is likely that any requests to increase the discharge capacity into the lower Cape Fear River will meet opposition with NC DENR due to concerns about limited assimilative capacity in the lower Cape Fear River. Any requests to expand this discharge or any new discharges into the Cape Fear River will likely require an Environmental Assessment (EA) or Environmental Impact Statement (EIS) and a water quality model to demonstrate that the surface water standards are protected.

6.3 Southeast Surface Water Discharge Options

The Cape Fear River adjoins the eastern border of the Southeast Region. The Atlantic Intracoastal Waterway (AIWWA) and the Atlantic Ocean adjoin the southern border. The Town of Southport has an NPDES Permit that allows the discharge of up to 0.8 mgd of secondary treated effluent into the AIWWA. It is likely that any requests to increase the discharge capacity into the lower Cape Fear River, the AIWWA, and/or the Atlantic Ocean will meet opposition with NC DENR due to concerns about limited assimilative capacity or potential for surface water impacts. Any requests to expand any of the existing discharges or any new discharges into the Cape Fear River are expected to require an EA or EIS and a water quality model to demonstrate that the surface water standards are protected. One factor that would be a major challenge to overcome is that a significant portion of the surface waters along the Brunswick County coast are designated Shellfish waters (classified “SA” Waters) and, as such, do not allow domestic wastewater discharges regardless of the degree of treatment.

6.4 West Surface Water Discharge Options

The AIWWA and the Atlantic Ocean adjoin the southern border of the West Region. There are no current NPDES discharges to the AIWWA and/or the Atlantic Ocean. It is anticipated that any such requests will meet opposition with NC DENR due to concerns about limited assimilative capacity or potential for surface water impacts. Any requests for a new domestic or municipal discharge into either the AIWWA or the Atlantic Ocean will likely require an EA or EIS and a water quality model to demonstrate that the surface water standards are protected. One

factor that would be a major challenge to overcome is that a significant portion of the surface waters along the Brunswick County coast are designated Shellfish waters (classified “SA” Waters) and, as such, do not allow domestic wastewater discharges regardless of the degree of treatment.

6.5 Southwest Surface Water Discharge Options

The AIWWA and the Atlantic Ocean adjoin the southern border of the Southwest Region. The County has acquired the Carolina Shores wastewater treatment facility, which is permitted for a 0.53-mgd discharge. There are no current NPDES discharges to the AIWWA and/or the Atlantic Ocean. It is anticipated that any requests for a new surface water discharge to the AIWWA or Atlantic Ocean will meet opposition with NC DENR due to concerns about limited assimilative capacity or potential for surface water impacts. Any requests for a new domestic or municipal discharge into either the AIWWA or the Atlantic Ocean is expected to require an EA or EIS and a water quality model to demonstrate that the surface water standards are protected. One factor that would be a major challenge to overcome is that a significant portion of the surface waters along the Brunswick County coast are designated Shellfish waters (classified “SA” Waters) and, as such, do not allow domestic wastewater discharges regardless of the degree of treatment.

7.1 General

The previous sections have outlined the current status of wastewater management in Brunswick County along with a strategy to develop four main regional service areas. This section will provide more detailed evaluations of the long-term (2020) wastewater management options for these regional service areas. These evaluations will include preliminary sizing and cost estimates of facilities for each regional service area. Wastewater and disposal/reclaimed water utilization systems are based upon the design consideration associated with the 2020 needs identified in Section 5.0, Service Area Wastewater Infrastructure. The sewer collection system sizing is based upon the anticipated 2025 (20-year) demands.

7.2 Northeast Regional Service Area

To provide the anticipated 2020 collection, treatment, and disposal/reuse needs associated with the Northeast Regional Service Area, the following system components will be needed:

<u>Needed</u>	<u>Currently Provided</u>
2.0-mgd wastewater treatment capacity	1.65 mgd
2.0-mgd wastewater disposal/utilization capacity	1.65 mgd ⁽¹⁾
10.7 miles of regional sewers	None ⁽²⁾
1 regional pumping station	None

Notes: (1) Wastewater treatment facility is permitted (NPDES) and rated for 1.65 mgd. A Non-Discharge Permit has been issued for a reclaimed water project to provide 0.325 mgd to Magnolia Greens Golf Course. To date, the reuse system has not been implemented.

(2) Current collection system is only designed to accommodate wastewater flows from the Northeast Sanitary District, the Navassa area, the Town of Leland, and the Brunswick County Industrial Park. It is possible that some segments closer to the treatment facility may have capacity to serve the 2025 needs, but that analysis would need to be conducted in a future PER or design stage.

The system components and associated preliminary cost estimates to accommodate the 2020 wastewater demands are identified in Table 7.1.

Table 7-1. Northeast Wastewater Infrastructure Needs and Preliminary Cost Estimates

Component	Description	Quantity	Costs
Regional Collection System:			
Regional Pump Stations		1	\$600,000
Regional Sewers		10.7 miles	\$2,150,000
Regional Treatment System:			
Minor Additional Capacity Needed		0.35 mgd	\$1,750,000
Regional Disposal / Utilization System:			
No Additional Capacity Needed		NA	\$0
		Subtotal	\$4,500,000
		Engineering (15%)	\$675,000
		Contingency (20%)	\$900,000
Additional Land Needs:		0 acres	\$0
		Total Cost	\$6,075,000

7.3 Southeast Regional Service Area

To provide the anticipated 2020 collection, treatment, and disposal/reuse needs associated with the Southeast Regional Service Area, the following system components will be needed:

<u>Needed</u>	<u>Currently Provided</u>
5.0-mgd wastewater treatment capacity	0.40 mgd ⁽¹⁾
5.0-mgd wastewater disposal/utilization capacity	0.40 mgd ⁽¹⁾
27.4 miles of regional sewers	None
1 regional pumping station	None

Notes: (1) Oak Island owns a non-discharge type wastewater treatment facility that is permitted and rated for 0.40 mgd. The facility was owned by the former Town of Yaupon Beach and tertiary quality effluent is utilized via spray irrigation and a rapid infiltration pond.

The system components and associated preliminary cost estimates to accommodate the 2020 wastewater demands are identified in Table 7.2.

Table 7-2. Southeast Wastewater Infrastructure Needs and Preliminary Cost Estimates

Component	Description	Quantity	Costs
Regional Collection System:			
Regional Pump Stations		1	\$700,000
Regional Sewers		27.4 miles	\$10,300,000
Regional Treatment System:			
5.0-mgd Water Reclamation System		1	\$32,500,000
Regional Disposal / Utilization System:			
On-Site Land Application System		2,400 acres	\$15,300,000
		Subtotal	\$58,800,000
		Engineering (15%)	\$8,820,000
		Contingency (20%)	\$11,760,000
Additional Land Needs:			
On-Site Land Application System		1,400 acres	\$7,000,000
		Total Cost	\$86,380,000

7.4 West Regional Service Area

To provide the anticipated 2020 collection, treatment, and disposal/reuse needs associated with the West Regional Service Area, the following system components will be needed:

<u>Needed</u>	<u>Currently Provided</u>
9.0-mgd wastewater treatment capacity	3.0 mgd ⁽¹⁾
9.0-mgd wastewater disposal/utilization capacity	3.0 mgd ⁽²⁾
41.0 miles of regional sewers	35.4 miles
3 regional pumping stations	3

Notes: (1) The West Brunswick Regional Water Reclamation System is currently under construction and should be operational by early 2006. The first phase under construction is rated at 3.0 mgd. The current site plan accommodates the layout for a 6.0-mgd facility.

(2) The West Brunswick Reclaimed Water Utilization System is rated for 3.0 mgd. This includes 1.1 mgd of reuse associated with two golf course communities, Winding River and St. James Plantations, and a County-owned silvicultural system that can accommodate 1.9 mgd.

The system components and associated preliminary cost estimates to accommodate the 2020 wastewater demands are identified in Table 7.3.

Table 7-3. West Wastewater Infrastructure Needs and Preliminary Cost Estimates

Component	Description	Quantity	Costs
Regional Collection System:			
Regional Pump Stations		0	\$0
Regional Sewers		5.6 miles	\$600,000
Regional Treatment System:			
6.0 mgd Expansion		1	\$39,000,000
Regional Disposal / Utilization System:			
On-site Land Application System		2,280 acres	\$19,100,000
		Subtotal	\$58,700,000
		Engineering (15%)	\$8,805,000
		Contingency (20%)	\$11,740,000
Additional Land Needs:			
On-site Land Application System		2,280 acres	\$11,400,000
		Total Cost	\$90,645,000

7.5 Southwest Regional Service Area

To provide the anticipated 2020 collection, treatment, and disposal/reuse needs associated with the Southwest Regional Service Area, the following system components will be needed:

<u>Needed</u>	<u>Currently Provided</u>
7.0-mgd wastewater treatment capacity	1.5 mgd ⁽¹⁾
7.0-mgd wastewater disposal/utilization capacity	5.2 mgd ⁽²⁾
27.3 miles of regional sewers	None ⁽³⁾
3 regional pumping stations	None

Notes: (1) The Ocean Isle Beach facility is the only facility in the region that would be suitable for long-term (2025 and beyond) wastewater management needs.

(2) Includes the Ocean Isle Beach land application system and estimated utilization rates for courses already designed and/or permitted for reuse

(Brunswick Plantation, Crow Creek, Ocean Ridge Plantation, Sandpiper, Sea Trail Plantation, and The Thistle Golf Courses).

- (3) Most, if not all, existing sewers in the region are not suitable to meet the 2020 demands.

The system components and associated preliminary cost estimates to accommodate the 2020 wastewater demands are identified in Table 7.4.

Table 7-4. Southwest Wastewater Infrastructure Needs and Preliminary Cost Estimates

Component	Description	Quantity	Costs
Regional Collection System:			
Regional Pump Stations		3	\$2,400,000
Regional Sewers		27.3 miles	\$8,500,000
Regional Treatment System:			
4.8 mgd Plant Upgrade/Expansion		1	\$24,000,000
Regional Disposal / Utilization System:			
Reclaimed Pumping Stations		1	\$1,600,000
Reclaimed Distribution System		26.3 miles	\$9,900,000
Golf Course Irrigation System Retrofits		20	\$3,000,000
		Subtotal	\$49,400,000
		Engineering (15%)	\$7,410,000
		Contingency (20%)	\$9,880,000
Additional Land Needs:		0 acres	\$0
		Total Cost	\$66,690,000

8.1 General

The previous sections have identified the current and anticipated wastewater demands for all of Brunswick County. The County probably does not have the financial resources to meet all the infrastructure demands at once. The various regions of the County will need priorities established so that the infrastructure demands can be met in a fair and equitable manner. A strong driver for implementation of these improvements will be the ability of each project to be fiscally viable. Although there has been no general criteria developed to aid in these “go / no go” decisions, the County’s desire to maintain reasonable wastewater rates dictates a strong customer base for debt retirement. The County’s vast land area (855 square miles) makes provision of regional sewer systems a challenge, but the County has already demonstrated that it can implement regional sewer systems in a fiscally responsible manner.

8.2 2020 Needs for Wastewater Infrastructure

Section 6.0 identified the 2020 Wastewater Infrastructure Needs. Table 8.1 summarizes the regional system needs and associated costs.

Table 8-1. Regional Service Area Wastewater Infrastructure Needs

Region	Description	Costs
Northeast Regional Service Area:		
	Wastewater Collection System	\$2,750,000
	Wastewater Treatment Facilities	\$1,750,000
	Disposal / Utilization / Land Needs	\$0
	Engineering / Contingency	\$1,575,000
	Northeast Total Cost	\$6,075,000
Southeast Regional Service Area:		
	Wastewater Collection System	\$11,000,000
	Wastewater Treatment Facilities	\$32,500,000
	Disposal / Utilization / Land Needs	\$22,300,000
	Engineering / Contingency	\$20,580,000
	Southeast Total Cost	\$86,380,000

Table 8-1. Regional Service Area Wastewater Infrastructure Needs (Cont.)

Region	Description	Costs
West Regional Service Area:		
	Wastewater Collection System	\$600,000
	Wastewater Treatment Facilities	\$39,000,000
	Disposal / Utilization / Land Needs	\$30,500,000
	Engineering / Contingency	\$20,545,000
	West Total Cost	\$90,645,000
Southwest Regional Service Area:		
	Wastewater Collection System	\$10,900,000
	Wastewater Treatment Facilities	\$24,000,000
	Disposal / Utilization / Land Needs	\$14,500,000
	Engineering / Contingency	\$17,290,000
	Southwest Total Cost	\$66,690,000

8.3 General Recommendations

To further the County's goal of providing environmentally responsible, timely, equitable, and cost-effective wastewater service to its citizens, it needs to develop a plan of action to ensure these objectives are met. This strategy must address both short- and long-term goals and objectives and should be reviewed on an annual basis. The strategy should be updated and adjusted as needed, since the growth and direction of the County is very dynamic.

The following recommendations are offered:

- ◆ The County should continue to establish priorities and a wastewater management action plan for each regional service area. These priorities should include:
 - Necessary environmental assessments or evaluations to ensure that implementation of a regional wastewater system or expansion of an existing regional wastewater system is done in an environmentally responsible manner.
 - Conduct any special studies or evaluations that are necessary to address specific concerns or issues related to the implementation of a given wastewater management objective.

- Identification of specific service areas and service prioritization based upon meeting demonstrated need (such as existing public health or environmental impacts) and/or where provision of service is deemed to be cost effective.
- ◆ The County should prepare Preliminary Engineering Reports (PERs) for each specific regional service area to aid in specific technical, environmental, and financial aspects associated with implementation or expansion of regional wastewater management facilities.
- ◆ The County should meet with appropriate regulatory representatives to discuss the various regional implementation strategies so that appropriate environmental documentation, such as Environmental Assessments (EAs) or 201 Facilities Plans, can be prepared.
- ◆ A Financial Plan should be developed to address wastewater management funding strategies and to develop guidance relative to specific County financial goals and objectives. The Plan should evaluate water, wastewater, and reclaimed rate structures and provide an integrated and equitable structure to aid in meeting the County’s financial goals and objectives.
- ◆ The Wastewater Master Plan should be updated and revised on a periodic basis. Due to the rapid growth of the County and the significance of seasonal population influences, these updates should be conducted at least every five years.
- ◆ The Water Master Plan should be updated and revised on a periodic basis as well. Due to the rapid growth of the County and the significance of seasonal population influences, and the need to ensure consistency between the Wastewater and Water Master Plans, these updates should be conducted every five years.
- ◆ A Biosolids/Residuals Management Plan should be prepared to address solids management from all water and wastewater management facilities owned or operated by the County. The implementation of regional wastewater systems producing high quality effluent will generate significant volumes of solids and appropriate solids management practices will need to be followed. Similar to water treatment and wastewater treatment facilities, the day-to-day management and operation of these activities may be more cost effective if County staff and equipment resources are utilized.

- ◆ Due to the high dependence upon reclaimed water utilization for wastewater management, several objectives and strategies need to be considered:
 - The County should either designate an existing staff member to be a Reuse Coordinator or create such a position. A reuse coordinator is needed to focus on creating new or enhancing existing opportunities for reuse. There are a number of opportunities where reuse can benefit both the water and wastewater management systems.
 - Focus on community-related reuse as opposed to reuse on County-owned and managed properties. Finding end-users who are willing to use reclaimed water will be much more cost effective than the County purchasing and developing such reclaimed water utilization sites.
 - Explore, cultivate, and nurture opportunities for reuse that integrates well with current situations or future development trends. Examples include agricultural reuse in many areas of the County where development pressures have not forced farmers out of non-food chain crop production activities, common area (residential or commercial) irrigation, and residential lawn irrigation in new developments in high growth areas.
- ◆ A Reclaimed Water Master Plan should be prepared to address reclaimed water utilization from all wastewater management facilities owned or operated by the County. The Master Plan should address reuse program goals and objectives and associated implementation strategies. Specifics include integration of reuse into the Planning Department review process, public education and outreach, streamlining reuse service implementation, regional reuse service area emphasis, reuse agreements, enforcement of current reuse ordinances, and benefits of reuse.
- ◆ Regional systems do not necessarily need to be isolated from each other. Opportunities for interconnections of both wastewater collection systems and reclaimed distribution system may provide several advantages. For example, interconnected collection systems may allow excess wastewater flows during peak events (seasonal influences) to be routed to other facilities that have capacity to treat such high flows; off-season low-flow situations may allow wastewater flows to be diverted to one facility to maximize/optimize its operation and possibly save operation costs by placing one or more other facilities off-line; and similar opportunities may exist for interconnected reclaimed distribution

systems. Consideration should be given to these “decentralized” or “distributive” approaches due to the unique seasonal flow variations of the coastal communities.

- ◆ Advanced wastewater treatment and control technologies allow high quality water to be produced and may allow quicker implementation of wastewater management needs. Membrane Bio-Reactors (MBRs) can be utilized in both satellite and decentralized configuration close to the reclaimed water point-of-use, thus mitigating the cost of pumping to and from distant facilities. Consideration should be given to the use of advanced treatment and control technologies to meet wastewater management goals and objectives.
- ◆ Public Education and Outreach activities should be continued to emphasize to the citizens of the County the importance of water/wastewater/reclaimed water services. Special efforts should be given to inform the public of the true value of water and the importance of an integrated water resource management approach.
- ◆ The County should continue to work with the municipalities to explore opportunities to implement regional wastewater management systems together. Non-biased evaluations should be prepared to provide preliminary cost estimates for joint projects. The County should consider practical incentives to encourage regional cooperation. Where communities have expressed concerns about regional cooperation, the County should listen to these concerns and see if there are any opportunities for reasonable compromise.

8.4 Specific Regional Service Area Recommendations

In addition to the above mentioned general recommendations, specific recommendations for each regional service area have been developed.

8.4.1 Northeast Regional Service Area

- ◆ Due to potential growth and development along the Highway 74/76 corridor, it is recommended that a regional pumping station be constructed in the vicinity of the Towns of Northwest and Sandy Creek. The force main along the Highway 74/76 corridor should aid with economic development opportunities in this section of the County due to its close proximity to Wilmington, major highways (current and future), the State Port, and commercial, industrial and residential development. Sizing of the regional pumping station and force main should be such that the 2020 demands are satisfied.

- ◆ The actual timeframe for construction of these facilities is based upon the priorities of the County. Minor improvements would be necessary to the Northeast Wastewater Treatment Plant to accommodate the 2020 projected demands.

8.4.2 Southeast Regional Service Area

- ◆ Due to the substantial investment necessary to implement a regional wastewater system in the Southeast Regional Service Area, the first step is to determine the extent of the wastewater management system needed based upon the firm commitments of communities in the area. If few are prepared to initiate the regional approach, an interim approach to use the West Brunswick Regional Water Reclamation Facility for the first five years or so is the least capital cost intensive method until enough participants (and customers) commit to the larger regional plan.
- ◆ The County should engage the area municipal representatives to once again determine which communities may be interested in a cooperative approach to regional wastewater management. These discussions may require participation up to the point of developing specific objectives of the regional system so costs can be prepared. Once these objectives are determined, a Preliminary Engineering Report or work approaching this level of analysis will be required.
- ◆ Timeframes are important since the planning, property acquisition, agreements, environmental documentation, design, and construction of such systems can take five years or longer to bring to fruition.

8.4.3 West Regional Service Area

- ◆ Shallotte's potential participation and potential interim wastewater service for both Oak Island and Sunset Beach would deplete the current wastewater management capacity associated with the West Brunswick Water Reclamation Facility. This is not necessarily a concern, but it definitely puts pressure and constraints on the intermediate and long-term plans for both the Southeast and Southwest Regional Service Areas. Discussions and negotiations should continue with all three of these prospective partners and appropriate Plan of Actions and/or Preliminary Engineering Reports should be prepared to address these interim needs.
- ◆ 2020 needs of the West Regional Service Area are primarily related to treatment plant expansion needs and associated reclaimed water utilization sites. The only regional

collection system need is associated with the line that would extend to the Shallotte area.

- ◆ Implementing local collection systems will continue to be a challenge unless a West Brunswick Regional Collection System Plan is developed to identify the specific local area needs. Although the County can rely on the development community to provide this “infill” network of sewer systems, there are going to be a number of gaps and possibly some areas completely unserved.
- ◆ Special attention needs to be paid to development of future reclaimed water utilization sites in the West Brunswick Service Area. The first phase essentially exhausted the golf course irrigation opportunities and, unless other reuse opportunities such as residential lawn irrigation are nurtured, the County may find itself buying more and more land to meet this need. This is a double negative because of the significant expense to acquire and develop land application sites and the County loses the opportunity to generate revenue from the sale of reclaimed water in the future.

8.4.4 Southwest Regional Service Area

- ◆ The Preliminary Engineering Report under development for the Southwest Regional Service Area will address the immediate needs (2005 – 2010) of the two wastewater treatment facilities (Sea Trail and Carolina Shores) and the service needs of the Town of Sunset Beach.
- ◆ Similar to the Southeast Regional Service Area, firm commitments need to be obtained from prospective participants so that specific regional goals and objectives can be identified and implemented in the most cost-effective approach possible. The overall regional system costs are expensive, but the potential customer base makes the provision of regional wastewater management possible.
- ◆ Although a “Greenfield” wastewater treatment facility may sound attractive, it potentially can be a much more expensive approach to meeting the service demands needs of the Southwest Regional Service Area. There are two municipal systems (Shallotte and Ocean Isle Beach) that offer sufficient sites for regional plants, and incorporation of advance technologies such as Membrane Bio-Reactors (MBRs) may make the existing Sea Trail and Carolina Shores treatment system sites viable as components of a decentralized or distributive treatment system approach. The closer



- the placement of water reclamation facilities to the end use of reclaimed water will result in the most cost-effective regional wastewater management solution. This will save costs associated with pumping wastewater to facilities and pumping reclaimed water back to the points of use.
- ◆ Although there is an abundance of golf courses in the West Brunswick Regional Service Area where reclaimed water could be utilized, a number of them have exhibited some reservations about a simple agreement to use reclaimed water for irrigation. Although the County has an ordinance requiring such, it is apparent that some additional energy and efforts will be needed to meet the objectives and desires of both parties. The County should continue to work closely with the golf course managers and superintendents to ensure that reasonable agreements can be developed and implemented within the next 12 to 18 months.

APPENDIX D

Rezoning Requests and Approvals for Significant Projects

Received from Brunswick County Planning Department

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ID #	File #	Development	Acreage	Density	Location	Open Space	# Units	type	Approved
1	SE-55	The Lakes at Lockwood Planned Unit Development	81.31	1.54 du/ac	Stone Chimney Rd SW adjacent to Stanbury Heights Subdivision	18.73 ac.	125	s/f	19-Mar-97
2	SS-149	Blue Banks Ridge Major Subdivision	353	1.33 du/ac	Blue Banks Loop Rd NE	0	471	s/f	18-Aug-99
3	SE-40	Seascape Planned Unit Development	501.6	1.25 du/ac	On Stone Chimney Rd at the Intracoastal Waterway	123.2 ac.	626	s/f	18-Aug-99
4	SE-43	Strand River Planned Unit Development	706	1.57 du/ac	East of Shallotte River, south of NC Hwy 130 on either side of Gray Bridge Rd	374 ac.	1,107	819 s/f 288 m/f	6-Dec-99
5	SE-45	S & K Mobile Home Park Mobile Home Park	5.6	1.25 du/ac	482 McMilly Rd SW	.60 ac.	7	s/f	15-Dec-99
6	SS-158	Battle Royal Estates Major Subdivision	11.96	.75 du/ac	Between 1939 and 1959 Colon Mintz Rd	n/a	9	s/f	8-Jan-00
7	SE-42	St. James Plantation (Consolidation) Planned Unit Development	1006	.14 du/ac	NC Hwy 211 adjacent to Arbor Creek	186.2 ac.	1,436	1,122 s/f 314 m/f	19-Jan-00
8	SS-152	Marsh Bay Major Subdivision	48.45	1.44 du/ac	West side of Sunset Harbor Rd across from Retreat St.	0	71	s/f	19-Apr-00
9	SE-48	Leach Mobile Home Park Mobile Home Park	6.42	1.87 du/ac	7820 Ocean Hwy West	.50 ac.	12	s/f	19-Apr-00
10	SE-50	Sandpiper Bay Planned Unit Development	545.61	2.71 du/ac	Off of Old Georgetown Rd at Sandpiper Bay Golf Course	246.28 ac.	1,531	581 s/f 950 m/f	20-Sep-95 20-May-98

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11	SS-154	Raintree Plantation Major Subdivision	54.49	1.30 du/ac	Hwy 87 approximately 1 mile north of Old Mill Creek Rd	1.64 ac.	71	s/f	17-May-00
12	SS-153	Dutchman Village Commercial Subdivision (Southport)	48.3	.20 du/ac	Hwy 211 approximately 6000 ft. west of Doshier Cut-off	n/a	10	s/f	21-Jun-00
13	SS-156	Airedale Subdivision Major Subdivision	9.6	1.5 du/ac	West side of Goose Neck Rd, 550 ft. south of Foxwood Drive	n/a	15	s/f	9-Oct-00
14	SS-155	Cedar Greens Major Subdivision	8.46	1.76 du/ac	On Stone Chimney Rd, approximately 700 ft. north of Cedar Grove Rd	n/a	15	s/f	9-Oct-00
15	SE-53	St. James Plantation (Player's Club) Planned Unit Development	300.62	.91 du/ac	NC Hwy 211 adjacent to Arbor Creek	64.64 ac.	273	s/f	13-Nov-00
16	SE-54	Carolina Bay Planned Unit Development	488.9	1.00 du/ac	Southeast of the intersection of Sunset Harbor Rd and Southport-Supply Rd	53.73 ac.	488	s/f	11-Dec-00
17	SE-57	Brunswick Forest Planned Unit Development	5,546	1.79 du/ac	Between US 17, NC 133 and NC 87 bordered on the south by Town Creek	554.78 ac.	9,915	8,035 s/f 1,880 m/f	13-Aug-01
18	SE-58	Ocean Ridge Farms Planned Unit Development	688.48	1.79 du/ac	Northwest quadrant of the intersection of US 17 and NC 904	119.47 ac.	1,625	617 s/f 1,008 m/f	10-Sep-01
19	SS-161	The Farms of Snowfield Major Subdivision	63.1	.24 du/ac	East of US 17 at SR 1522 intersection	1.62 ac.	15	s/f	8-Oct-01
20	SS-162	Hoods Creek Village Section 6 Major Subdivision	88.37	.54 du/ac	End of Black Chestnut Drive off of Mt. Misery Rd	3.90 ac.	48	s/f	13-Nov-01

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21	SE-59	Magnolia Mobile Home Estates Mobile Home Park	5.92	2.53 du/ac	8911 King Road Leland	.30 ac.	15	s/f	13-Nov-01
22	SE-64	St. James Plantation (Paladin Club) Planned Unit Development	669.66	.76 du/ac	NC Hwy 211 adjacent to Arbor Creek	112.41 ac.	512	s/f	10-Dec-01
23	SE-62	The Lakes at Lockwood II Planned Unit Development	95.97	1.09 du/ac	Located on the east side of Stone Chimney Road between Maple Creek Road SW and Stanbury Road	32.22 ac.	105	s/f	10-Dec-01
24	SE-63	Ocean Ridge Plantation Planned Unit Development	1,948.60	1.26 du/ac	Located at the southeast quadrant of the intersection of US 17 and NC 904	889.10 ac.	2,471	1,259 s/f 1,212 m/f	10-Dec-01
25	SE-65	St. James Plantation (The Reserve) Planned Unit Development	2,277.17	.98 du/ac	NC Hwy 211	247.80 ac.	2,202	1,082 s/f 1,120 m/f	10-Dec-01
26	SS-165	Skylee Place Major Subdivision	101.74	1.25 du/ac	Located off of Shell Point Road (SR 1132) between Jack & Johnny Road and Eagle Lake Drive SW	3.80 ac.	127	s/f	14-Jan-02
27	SE-66	Brantley Island Planned Unit Development	32	1.07 du/ac	4404 Devane Rd, Ocean Isle Beach	1.00 ac.	30	s/f	11-Mar-02
28	SS-166	West Wing	16.8	1.07 du/ac	Northwest Township two miles off Mt. Misery	0	18	s/f	8-Apr-02
29	SE-71	Wilmington West Planned Unit Development (now Mallory Creek - Leland)	211.74	2.13 du/ac	Located off of River Road (NC 133) west of Brunswick Cove Subdivision	50.36 ac.	452	372 s/f 80 m/f	8-Jul-02

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30	SE-75	Westport (Leland) Planned Unit Development	82.8	2.50 du/ac	Located off of River Road (NC 133) south of Atkinson Trail	13.44 ac.	207	133 s/f 74 m/f	9-Dec-02
31	SE-76	The Pearl Planned Unit Development	881.82	4.75 du/ac	Located off of Old Georgetown Road (NC 179)	409.07 ac.	4,186	m/f	10-Feb-03
32	SS-167	Cedar Crossing Major Subdivision	37.95	1.13 du/ac	Located at the intersection of Stanley Road (SR 1119) and Cedar Grove Road (SR 1125)	1.74 ac.	43	s/f	10-Mar-03
33	SS-168	Marsh Bay (Phase 5 & 6) Major Subdivision	29.27	1.38 du/ac	Located in the Smithville Township off of Sunset Harbor Road (SR 1112)	6.90 ac.	41	s/f	10-Mar-03
34	SE-70 <small>SE-72 masterplan</small>	Mercer Mill Planned Unit Development (SeaWatch at Sunset Harbor)	622.76	1.50 du/ac	Located along Sunset Harbor Road (SR 1112) adjacent to Mercer Mill Creek	34.0 ac.	932	621 s/f 311 m/f	10-Mar-03
35	SE-49	Oyster Harbor Planned Unit Development	360.3	1.10 du/ac	Located at Boones Neck Rd at Windy Point Rd	36.5 ac.	393	s/f	15-Mar-00 12-May-03
36	SE-77	Oyster Harbor (Phase 5) Planned Unit Development	41.9	1.98 du/ac	Located at the end of Boones Neck Road (SR 1137) and intersection at Windy Point Road (SR 1138)	45.90 ac.	476	s/f	12-May-03
37	SS-169	Rivergate Estates (Phase II) Major Subdivision	10.49	1.81 du/ac	Located off of Rivergate Drive in Ash, NC	3.09 ac.	19	s/f	9-Jun-03
38	SS-170	Sweet Bay Village Major Subdivision (Vested Rights)	45.33	2.96 du/ac	Located off of Long Beach Road (NC 133) and Sweet Bay Drive SE adjacent to Sea Pines Subdivision	n/a	134	s/f	11-Aug-03
39	SE-78	Arbor Creek (Phase 7 & 8) Planned Unit Development	134.19	2.05 du/ac	Located off of NC 211 adjacent to St. James Plant.	33.15 ac.	92	s/f	8-Sep-03

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40	SE-68	Lockwood Plantation Planned Unit Development (now RiverSea Plantation)	460.5	1.44 du/ac	Located off of NC 211 towards Supply	63.5 ac.	595	463 s/f 132 m/f	13-Oct-03
41	SS-172	Trotters Ridge Major Subdivision	28	1.68 du/ac	Located off of Sunset Harbor Rd (SR 1112) extending off of Harbor Ridge Dr SE in the Marsh Bay Subdivision	1.00 ac.	47	s/f	13-Oct-03
42	SS-173	Hunters Run Major Subdivision	53.25	.54 du/ac	Located off of Sunset Harbor Rd (SR 1112) extending off of Harbor Ridge Dr SE in the Marsh Bay Subdivision	4.42 ac.	29	s/f	13-Oct-03
43	SE-80	Lockwood Plantation (Revised) Planned Unit Development (Renamed RiverSea Plantation)	460.5	1.29 du/ac	Located off of NC 211 towards Supply	63.5 ac.	595	463 s/f 132 m/f	13-Oct-03
44	SE-82	Carolina Place (Expansion) Planned Unit Development	56.71	3.21 du/ac	Located off of North Hampton Drive SE via Long Beach Road (NC 133)	8.08 ac.	182	122 s/f 60 m/f	8-Dec-03
45	SE-81	Brunswick Plantation (Phase 5) Planned Unit Development	333.66	3.40 du/ac	Located to the north of No. 5 School Road NW (SR 1305)	123.19 ac.	3,922	1,706 s/f 2,216 m/f	15-Jan-97 9-Feb-04
46	SS-175	Hidden Shores Major Subdivision	11.07	1.26 du/ac	Located off of Sussex Drive SW via Shell Point Road (SR 1132) in the Lockwood Folly Township	0	14	s/f	9-Feb-04
47	SE-83	Wyndfall Ph. 3 Sandpiper Bay Planned Unit Development	51.17	2.93 du/ac	Located off of Old Georgetown Road (NC 179) adjacent to Wyndfall Phase 1	16.42 ac.	150	s/f	9-Feb-04
48	SS-176	Eastbrook Estates Major Subdivision	34.3	3.18 du/ac	Located off of Lincoln Road NE (SR 1455)	3.10 ac.	109	s/f	9-Feb-04
49	SS-177	Old Ferry Estates Major Subdivision	12.08	3.89 du/ac	Located off of Old Ferry Road (SR 1115) just north of Alvin Street SW in Lockwood Folly Township	.62 ac.	47	s/f	9-Mar-04

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50	SE-86	Ibis Bay Planned Unit Development	560.8	2.0 du/ac	Located off of Shell Point Road SW (SR 1132) just north of the Shallotte River	56.08 ac.	1,120	689 s/f 431 m/f	10-May-04
51	SE-87	Seawatch at Sunset Harbor (PUD Expansion of existing Seawatch at Sunset Harbor)	555.8	2.0 du/ac	Located east of Sunset Harbor Road SE (SR 1112) and south of Southport-Supply Road (NC 211) adjacent to the existing Seawatch at Sunset Harbor	56 ac.	1,111	586 s/f 525 m/f	10-May-04
52	SE-88	Brunswick Plantation Revised (North Tract/Smithfield/Lakes)	333.66	5.69 du/ac	Located to the north of No. 5 School Road NW (SR 1305)	100.52 ac.	1,900	500 s/f 1,400 m/f	14-Jun-04
53	SS-179	Ashton Place (formerly - Old Fayetteville Estates)	22.62	4.47 du/ac	Located between King Road and Old Fayetteville Road (SR 1437) and is adjacent to Azalea MHP	.72 ac.	101	s/f	14-Jun-04
54	SS-180	Brunswick Medical Park (Commercial Subdivision)	21.53	7-lots	Located directly off of US Hwy 17 south across from Quilt Road SW (SR 1203)	0	7	CLD	14-Jun-04
55	SE-89	Seawatch at Sunset Harbor (PUD West Tract)	88.2	3 du/ac	Located west of Sunset Harbor Road SE (SR 1112) and south of Mercer Mill Creek	23.1 ac.	264	142 s/f 122 mf/	12-Jul-04
56	SE-90	Seawatch at Sunset Harbor (PUD Yellow Banks North Tract)	475.6	1.3 du/ac	Located east of Sunset Harbor Road SE (SR 1112) and north of the Town of Oak Island ETJ	36.4 ac.	620	335 s/f 285 m/f	12-Jul-04
57	SE-91	The Reserve at St. James (PUD Expansion 2,169 acres)	2,169.20	1.7 du/ac	Located south of NC 211 and west of St. James main entrance and east of Midway Road (SR 1500)	237.1 ac.	3,753	1,105 s/f 11 Legacy 1,795 m/f	9-Aug-04
58	SE-92	The Reserve at St. James (PUD formerly The Paladin Club)	711.68	.78 du/ac	Located at St. James Plantation off NC 211 on the western side of St. James Drive	196.34	554	526 s/f 28 m/f	9-Aug-04
59	SS-181	Christina Subdivision Major Subdivision	3.13	3.5 du/ac	Located at the end of Oak Court SW accessed via Ocean View Ave SW from Sabbath Home Road (SR 1120)	0	11		9-Aug-04

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60	SE-93	Ibis Bay (Revised) Planned Unit Development	612.4	2.0 du/ac	Located off Shell Point Road SW (SR 1132) just north of the Shallotte River	67.0 ac.	1221	757 s/f 464 m/f	13-Sep-04
61	SE-94	Meadowlands Planned Unit Development	18.48	2.49 du/ac	SE of Hickman Road NW (SR 1303) & Calabash Rd NW (SR 1300) & West of Shingletree Rd NW (SR 1302)	19.18 ac	50	s/f	11-Oct-04
62	SE-95	Brunswick Plantation PUD - Revised	341.15	5.57 du/ac	Along OHW (US 17) & No. 5 School Rd (SR 1305)	50.25	1901	167 s/f 334 patio 1400 m/f	11-Oct-04
63	SS-182	Cobblestone (Formally Seaside) Major Subdivision	33.16	3.83 du/ac	Located off of Seaside Road SW (NC 904)	1.79	127	s/f	8-Nov-04
64	SS-184	Pamlico Creek Major Subdivision	32	.84 du/ac	Located on Stone Chimney Rd (SR 1115) just north of Cedar Grove Rd (SR 1125)	0.87	27	s/f	8-Nov-04
65	SS-187	Lancaster Woods Major Subdivision	9	2.2 du/ac	Located on Stone Chimney Rd (SR 1115) between Taft Rd and Field View Lane SW	0.27	20	s/f	8-Nov-04
66	SE-97	Juniper Creek Planned Unit Development	140.51	1.99 du/ac	Located between Old Fayetteville Road (SR 1437) and Andrew Jackson Highway (US 74/76).	16	280	100 s/f 180 m/f	13-Dec-04
67	SS-186	Rutledge Major Subdivision	90.84	2.37 du/ac	Located off of Gray Bridge Road (SR 1134) off on Tar Landing Road (SR 1135).	2.96	215	s/f	13-Dec-04
68	SE-96	Caison's Creek Planned Unit Development	31.56	3.7 du/ac	Located on NC 130 (Holden Beach Road) just east of Seashore Rd SW (SR 1139)	3.51	118	38 s/f 80 m/f	13-Dec-04
69	SS-188	Sunset Ridge Major Subdivision	148.5	3.14 du/ac	Fronting Seaside Road (NC 904) between Beach Drive (NC 904) and Old Georgetown Road (SR 1163)	6.82	467	s/f	10-Jan-05

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70	SS-189	Expansion of Colt's Neck Farmettes Major Subdivision	181.94	.26 du/ac	Located off of Gilbert Rd (SR 1501) on Clemmons Rd (SR1505)	7.6	48	s/f	14-Mar-05
71	SS-190	Green Hill Estates Major Subdivision	109	.25 du/ac	Located off of Andrew Jackson Hwy (US 17) on Green Hill Road	4.3	27	s/f	14-Mar-05
72	SS-191	Meadow Ridge Major Subdivision	31.25	7 Lots	Located on Seaside Rd (NC 904), just before Old Georgetown Rd	n/a	7	s/f	14-Mar-05
73	SS-193	Fletcher Grove Major Subdivision	7.05	2.98 du/ac	Located off of Fletcher Road (SR 1472) on Liz Lane	0.5	21	s/f	27-Jun-05
74	SS-194	Lewis Ridge Major Subdivision	8.71	1.49 du/ac	Located off of Mt. Misery Road (SR 1426)	n/a	13	s/f	27-Jun-05
75	SS-195	Southbend Major Subdivision	5.21	4.22 du/ac	Located off of Lanvale Road (SR 1438)	0.5	22	s/f	27-Jun-05
76	SS-196	Live Oakes Major Subdivision	9.49	4.64du/ac	Located off of Old Ferry Road (SR 1121)	1.13	44	s/f	27-Jun-05
77	SS-197	Doe Creek Plantation Major Subdivision	38.1	2.39	Located on Stone Chimney Rd (SR 1115)	1.67	91	s/f	28-Jul-05
78	SS-198	Lanvale Forest Major Subdivision	94.36	2.46	Located on Old Forest Rd and Glasgow Dr.	3.77	232	s/f	28-Jul-05
79	SE-102	Crow Creek Expansion Planned Unit Development	11.89	2.43	Located on Hickman Rd (SR 1303) and HWY 17	194.14 total	20	s/f	28-Jul-05

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80	SE-103	Holden Beach Isle Planned Unit Development	99.26	6.9	Located on Holden Beach Rd (NC 130)	42.9	686	m/f	28-Jul-05
81	SE-104	St. James Expansion Planned Unit Development	19.2	1.41	Located at St. James Plantation off NC 211, on Harborside Way	182.7 total	21	s/f	28-Jul-05
82	SE-101	Palmetto Creek of the Carolinas Planned Unit Development	214	2.28	Located on and between Old Lennon Rd. (SR 1504) and Southport-Supply Rd (NC 211)	56.72	487	393 s/f 94 m/f	8-Aug-05
83	SE-105	Pocosin Ridge Planned Unit Development	113.5	3.06	Located on Old Georgetown Rd (SR 1163)	23	225	141 s/f 84 m/f	8-Aug-05
84	SS-199	Brookstone Major Subdivision	38.31	2.3	Located on Sunset Harbor Rd (SR1112)	1.17	88	s/f	12-Sep-05
85	SE-107	Riversea Expansion A & B Planned Unit Development	A 39.3 B 40	0.83 new total	Located on 211	70.37 new total	A 67 B 50	s/f	12-Sep-05
86	SE-109	Southgate Planned Unit Development (changed to Waterbrook Woods)	238.55	1.27	Located on Old Georgetown Rd. SR 1163	22.05	303	s/f	12-Sep-05
87	SE-106	Stanbury Creek Planned Unit Development	87.76	2.64	Located on Stone Chimney Road (SR 1119), across from Stanbury Road (SR 1124)	20.12	232	147 s/f 85 m/f	10-Oct-05
88	SS-200	Goose Marsh Major Subdivision	400	1.99	Located on Gilbert Road (SR 1501)	34.18	794	794 s/f	10-Oct-05
89	SS-201	Oak Creek at Maritime Shores Major Subdivision	25.68	1.95	Located on Old Town Creek Rd. (SR 1412)	2	50	s/f	14-Nov-05

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90	SE-111	Avalon Planned Unit Development	226.25	1.94	Located on and between Old Lennon Rd (SR 1504) and Southport-Supply Rd (Hwy 211)	22.63	440	344 s/f 96 m/f	14-Nov-05
91	SE-112	Spring Lake at Maritime Shores Planned Unit Development	20.55	1.8	Located on Wolfridge Rd (SR 1146)	2.05	37	s/f	14-Nov-05
92	SS-202	Ruffins River Landing Major Subdivision	62.94	1.46	Located on Eden Road, off of Stone Chimney Road (SR 1115)	1.89	92	s/f	28-Nov-05
93	SE-110	Hawkeswater at the River Planned Unit Development	166.24	2.7	Located on River Road (NC 133)	33.25	455	317 s/f 138 m/f	28-Nov-05
94	SE-114	Midway Landing Commercial Center	13.1	n/a	Located at the NE quadrant of the intersection of Southport-Supply Road (NC 211) and Midway Road (SR 1500)	n/a	n/a	n/a	28-Nov-05
95	SE-115	Midway Station Commercial Center	98.14	n/a	Located at the SW quadrant of the intersection of Southport Supply Road (NC 211) and Midway Road (SR 1500)	n/a	n/a	n/a	28-Nov-05

APPENDIX E

Individual Planning Area Population Projections

**Northeast Brunswick Service Area
Phase 1**

SA_ID	SA_AREA	Permanent Population Projections			
		2005	2010	2015	2020
104	1,609	1,640	1,828	2,039	2,273
105	1,599	1,804	2,011	2,234	2,500
106	408	71	80	90	101
107	4,591	1,340	1,480	1,631	1,835
108	2,554	974	1,083	1,204	1,338
10,762		5,829	6,481	7,197	8,047

SA_ID	SA_AREA	Seasonal Population Projections			
		2005	2010	2015	2020
104	1,609	705	752	800	849
105	1,599	2,164	2,413	2,680	3,125
106	408	104	117	132	148
107	4,591	2,086	2,303	2,540	2,857
108	2,554	1,573	1,747	1,940	2,156
10,762		6,632	7,332	8,092	9,135

**Northeast Brunswick Service Area
Phase 2**

SA_ID	SA_AREA	Permanent Population Projections			
		2005	2010	2015	2020
77	3,779	714	785	862	947
79	4,947	333	700	1,000	1,300
100	588	285	325	375	425
101	4,155	768	882	1,013	1,163
104	1,609	1,640	1,828	2,039	2,273
105	1,599	1,804	2,011	2,234	2,500
106	408	71	80	90	101
107	4,591	1,340	1,480	1,631	1,835
108	2,554	974	1,083	1,204	1,338
24,230		7,929	9,173	10,447	11,882

SA_ID	SA_AREA	Seasonal Population Projections			
		2005	2010	2015	2020
77	3,779	1,201	1,320	1,450	1,594
79	4,947	554	1,000	1,500	2,000
100	588	299	341	394	446
101	4,155	806	926	1,064	1,221
104	1,609	705	752	800	849
105	1,599	2,164	2,413	2,680	3,125
106	408	104	117	132	148
107	4,591	2,086	2,303	2,540	2,857
108	2,554	1,573	1,747	1,940	2,156
24,230		9,493	10,919	12,500	14,396

**Northeast Brunswick Service Area
Phase 3**

SA_ID	SA_AREA	Permanent Population Projections			
		2005	2010	2015	2020
77	3,779	714	785	862	947
79	4,947	333	700	1,000	1,300
100	588	285	325	375	425
101	4,155	768	882	1,013	1,163
102	7,505	416	457	503	624
103	21,886	2,678	2,942	3,232	3,653
104	1,609	1,640	1,828	2,039	2,273
105	1,599	1,804	2,011	2,234	2,500
106	408	71	80	90	101
107	4,591	1,340	1,480	1,631	1,835
108	2,554	974	1,083	1,204	1,338
53,622		11,023	12,572	14,182	16,159

SA_ID	SA_AREA	Seasonal Population Projections			
		2005	2010	2015	2020
77	3,779	1,201	1,320	1,450	1,594
79	4,947	554	1,000	1,500	2,000
100	588	299	341	394	446
101	4,155	806	926	1,064	1,221
102	7,505	687	755	829	1,019
103	21,886	4,259	4,679	5,141	5,803
104	1,609	705	752	800	849
105	1,599	2,164	2,413	2,680	3,125
106	408	104	117	132	148
107	4,591	2,086	2,303	2,540	2,857
108	2,554	1,573	1,747	1,940	2,156
53,622		14,439	16,353	18,470	21,218

**Northeast Brunswick Service Area
Phase 4**

SA_ID	SA_AREA	Permanent Population Projections			
		2005	2010	2015	2020
77	3,779	714	785	862	947
79	4,947	333	700	1,000	1,300
98	17,680	1,100	1,209	1,328	1,461
99	21,519	824	906	995	1,093
100	588	285	325	375	425
101	4,155	768	882	1,013	1,163
102	7,505	416	457	503	624
103	21,886	2,678	2,942	3,232	3,653
104	1,609	1,640	1,828	2,039	2,273
105	1,599	1,804	2,011	2,234	2,500
106	408	71	80	90	101
107	4,591	1,340	1,480	1,631	1,835
108	2,554	974	1,083	1,204	1,338
	92,821	12,948	14,687	16,505	18,714

SA_ID	SA_AREA	Seasonal Population Projections			
		2005	2010	2015	2020
77	3,779	1,201	1,320	1,450	1,594
79	4,947	554	1,000	1,500	2,000
98	17,680	1,804	1,981	2,177	2,395
99	21,519	1,373	1,509	1,658	1,821
100	588	299	341	394	446
101	4,155	806	926	1,064	1,221
102	7,505	687	755	829	1,019
103	21,886	4,259	4,679	5,141	5,803
104	1,609	705	752	800	849
105	1,599	2,164	2,413	2,680	3,125
106	408	104	117	132	148
107	4,591	2,086	2,303	2,540	2,857
108	2,554	1,573	1,747	1,940	2,156
	92,821	17,615	19,843	22,305	25,434

**Southeast Brunswick Service Area
Phase 1**

SA_ID	SA_AREA	Permanent Population Projections			
		2005	2010	2015	2020
6	15,351	3,565	3,937	4,346	4,698
58	2,326	4,675	5,535	6,443	6,662
74	1,045	1,948	2,306	2,685	2,776
75	585	1,170	1,384	1,611	1,665
82	2,985	475	600	650	700
22,293		11,833	13,762	15,735	16,501

SA_ID	SA_AREA	Seasonal Population Projections			
		2005	2010	2015	2020
6	15,351	3,922	4,331	4,781	5,168
58	2,326	19,637	23,246	27,063	27,980
74	1,045	8,183	9,686	11,276	11,658
75	585	4,909	5,812	6,766	6,996
82	2,985	3,425	3,783	3,903	3,911
22,293		40,075	46,857	53,788	55,712

**Southeast Brunswick Service Area
Phase 2**

SA_ID	SA_AREA	Permanent Population Projections			
		2005	2010	2015	2020
6	15,351	3,565	3,937	4,346	4,698
49	4,726	280	307	337	371
50	1,415	464	510	560	616
58	2,326	4,675	5,535	6,443	6,662
63	2,210	97	107	117	128
74	1,045	1,948	2,306	2,685	2,776
75	585	1,170	1,384	1,611	1,665
80	2,789	236	259	285	313
81	6,869	381	600	800	1,000
82	2,985	475	600	650	700
40,301		13,291	15,545	17,835	18,929

SA_ID	SA_AREA	Seasonal Population Projections			
		2005	2010	2015	2020
6	15,351	3,922	4,331	4,781	5,168
49	4,726	483	531	583	641
50	1,415	769	844	928	1,019
58	2,326	19,637	23,246	27,063	27,980
63	2,210	167	184	202	221
74	1,045	8,183	9,686	11,276	11,658
75	585	4,909	5,812	6,766	6,996
80	2,789	400	440	483	531
81	6,869	637	1,000	1,200	1,500
82	2,985	3,425	3,783	3,903	3,911
40,301		42,531	49,856	57,184	59,624

**Southeast Brunswick Service Area
Phase 3**

SA ID	SA AREA	Permanent Population Projections			
		2005	2010	2015	2020
6	15,351	3,565	3,937	4,346	4,698
49	4,726	280	307	337	371
50	1,415	464	510	560	616
52	3,280	168	184	202	222
58	2,326	4,675	5,535	6,443	6,662
63	2,210	97	107	117	128
65	5,330	342	376	413	454
74	1,045	1,948	2,306	2,685	2,776
75	585	1,170	1,384	1,611	1,665
80	2,789	236	259	285	313
81	6,869	381	600	800	1,000
82	2,985	475	600	650	700
48,911		13,801	16,105	18,450	19,604

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
6	15,351	3,922	4,331	4,781	5,168
49	4,726	483	531	583	641
50	1,415	769	844	928	1,019
52	3,280	280	307	338	371
58	2,326	19,637	23,246	27,063	27,980
63	2,210	167	184	202	221
65	5,330	572	629	691	759
74	1,045	8,183	9,686	11,276	11,658
75	585	4,909	5,812	6,766	6,996
80	2,789	400	440	483	531
81	6,869	637	1,000	1,200	1,500
82	2,985	3,425	3,783	3,903	3,911
48,911		43,383	50,792	58,212	60,753

**Southeast Brunswick Service Area
Phase 4**

SA ID	SA AREA	Permanent Population Projections			
		2005	2010	2015	2020
6	15,351	3,565	3,937	4,346	4,698
15	9,152	504	553	608	668
49	4,726	280	307	337	371
50	1,415	464	510	560	616
52	3,280	168	184	202	222
58	2,326	4,675	5,535	6,443	6,662
63	2,210	97	107	117	128
65	5,330	342	376	413	454
74	1,045	1,948	2,306	2,685	2,776
75	585	1,170	1,384	1,611	1,665
76	914	47	300	500	750
78	14,413	979	1,075	1,181	1,298
80	2,789	236	259	285	313
81	6,869	381	600	800	1,000
82	2,985	475	600	650	700
73,391		15,330	18,034	20,739	22,320

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
6	15,351	3,922	4,331	4,781	5,168
15	9,152	841	924	1,015	1,115
49	4,726	483	531	583	641
50	1,415	769	844	928	1,019
52	3,280	280	307	338	371
58	2,326	19,637	23,246	27,063	27,980
63	2,210	167	184	202	221
65	5,330	572	629	691	759
74	1,045	8,183	9,686	11,276	11,658
75	585	4,909	5,812	6,766	6,996
76	914	77	400	600	900
78	14,413	1,608	1,767	1,942	2,133
80	2,789	400	440	483	531
81	6,869	637	1,000	1,200	1,500
82	2,985	3,425	3,783	3,903	3,911
73,391		45,910	53,883	61,769	64,902

**West Brunswick Service Area
Phase 1**

SA ID	SA AREA	Permanent Population Projections			
		2005	2010	2015	2020
7	2,200	925	1,192	1,536	1,930
10	1,193	300	500	700	800
11	424	18	19	21	23
17	677	33	200	250	300
18	930	59	64	71	78
19	2,193	2,986	1,700	1,800	1,900
30	1,049	1,617	1,776	1,952	2,144
31	1,252	2,057	2,260	2,483	2,728
32	306	548	603	662	727
33	197	302	400	600	800
38	1,696	270	297	326	357
39	283	37	41	45	49
41	618	190	225	250	275
42	2,922	237	260	286	314
45	1,179	121	133	146	161
57	312	39	42	47	51
70	852	53	58	63	70
71	2,003	11,795	11,780	13,252	14,727
	20,289	21,584	21,550	24,489	27,434

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
7	2,200	15,412	16,493	16,493	16,493
10	1,193	400	600	900	1,200
11	424	30	33	36	40
17	677	56	250	300	350
18	930	99	108	119	131
19	2,193	5,394	7,000	7,800	8,800
30	1,049	2,896	3,182	3,496	3,841
31	1,252	3,700	4,065	4,466	4,907
32	306	984	1,082	1,188	1,305
33	197	541	750	1,000	1,500
38	1,696	470	516	567	622
39	283	66	72	79	87
41	618	200	236	263	289
42	2,922	401	440	484	531
45	1,179	228	250	275	302
57	312	67	73	81	88
70	852	115	126	139	153
71	2,003	2,144	2,614	3,184	3,878
	20,289	33,201	37,892	40,870	44,517

**West Brunswick Service Area
Phase 2**

SA ID	SA AREA	Permanent Population Projections			
		2005	2010	2015	2020
7	2,200	925	1,192	1,536	1,930
10	1,193	300	500	700	800
11	424	18	19	21	23
12	556	24	600	700	800
13	1,060	1,681	1,847	2,029	2,229
14	1,038	74	81	89	98
17	677	33	200	250	300
18	930	59	64	71	78
19	2,193	2,986	1,700	1,800	1,900
25	913	312	400	500	600
26	3,168	3,341	2,200	2,400	2,600
27	1,208	629	691	759	834
28	395	184	202	222	244
29	1,027	1,825	2,005	2,202	2,420
30	1,049	1,617	1,776	1,952	2,144
31	1,252	2,057	2,260	2,483	2,728
32	306	548	603	662	727
33	197	302	400	600	800
37	2,392	328	360	395	434
38	1,696	270	297	326	357
39	283	37	41	45	49
40	3,702	357	464	657	871
41	618	190	225	250	275
42	2,922	237	260	286	314
43	6,175	438	481	529	581
44	4,617	289	317	348	383
45	1,179	121	133	146	161
46	826	358	393	432	475
47	1,097	322	500	600	700
48	3,940	183	600	800	1,000
51	6,352	358	393	432	475
53	691	40	44	49	53
54	1,042	31	36	42	51
55	452	66	73	81	92
56	961	106	107	108	110
57	312	39	42	47	51
59	1,129	680	747	821	902
60	2,176	240	264	290	318
61	2,254	304	400	600	800
62	2,117	112	123	135	149
64	3,569	145	160	175	193
66	3,461	300	600	1,000	1,350
67	2,492	191	210	231	253
68	1,115	52	57	63	69
69	1,547	143	250	429	571
70	852	53	58	63	70
71	2,003	1,715	2,091	2,547	3,102
72	599	264	291	319	351
73	1,766	1,226	1,347	1,480	1,626
	84,124	26,107	28,104	32,702	37,440

**West Brunswick Service Area
Phase 2**

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
7	2,200	15,412	16,493	16,493	16,493
10	1,193	400	600	900	1,200
11	424	30	33	36	40
12	556	41	650	800	900
13	1,060	3,011	3,308	3,634	3,992
14	1,038	124	136	150	164
17	677	56	250	300	350
18	930	99	108	119	131
19	2,193	5,394	7,000	7,800	8,800
25	913	502	650	800	1,000
26	3,168	6,048	7,500	8,000	9,000
27	1,208	995	1,093	1,201	1,319
28	395	330	363	398	438
29	1,027	3,281	3,605	3,961	4,352
30	1,049	2,896	3,182	3,496	3,841
31	1,252	3,700	4,065	4,466	4,907
32	306	984	1,082	1,188	1,305
33	197	541	750	1,000	1,500
37	2,392	538	591	650	714
38	1,696	470	516	567	622
39	283	66	72	79	87
40	3,702	500	650	920	1,220
41	618	200	236	263	289
42	2,922	401	440	484	531
43	6,175	737	810	890	977
44	4,617	484	532	584	642
45	1,179	228	250	275	302
46	826	714	785	862	947
47	1,097	643	800	900	1,000
48	3,940	344	450	1,200	1,750
51	6,352	599	658	723	794
53	691	68	74	82	90
54	1,042	54	63	75	90
55	452	114	126	142	162
56	961	178	179	181	184
57	312	67	73	81	88
59	1,129	1,211	1,331	1,462	1,606
60	2,176	409	450	494	543
61	2,254	526	750	1,000	1,500
62	2,117	188	206	226	249
64	3,569	243	267	294	322
66	3,461	425	900	1,400	1,900
67	2,492	322	354	388	427
68	1,115	88	97	106	117
69	1,547	200	350	600	800
70	852	115	126	139	153
71	2,003	2,144	2,614	3,184	3,878
72	599	468	514	565	620
73	1,766	2,166	2,380	2,615	2,873
	84,124	58,753	68,513	76,172	85,208

West Brunswick Service Area Phase 3

SA_ID	SA_AREA	Permanent Population Projections			
		2005	2010	2015	2020
7	2,200	925	1,192	1,536	1,930
10	1,193	300	500	700	800
11	424	18	19	21	23
12	556	24	600	700	800
13	1,060	1,681	1,847	2,029	2,229
14	1,038	74	81	89	98
17	677	33	200	250	300
18	930	59	64	71	78
19	2,193	2,986	1,700	1,800	1,900
25	913	312	400	500	600
26	3,168	3,341	2,200	2,400	2,600
27	1,208	629	691	759	834
28	395	184	202	222	244
29	1,027	1,825	2,005	2,202	2,420
30	1,049	1,617	1,776	1,952	2,144
31	1,252	2,057	2,260	2,483	2,728
32	306	548	603	662	727
33	197	302	400	600	800
37	2,392	328	360	395	434
38	1,696	270	297	326	357
39	283	37	41	45	49
40	3,702	357	464	657	871
41	618	190	225	250	275
42	2,922	237	260	286	314
43	6,175	438	481	529	581
44	4,617	289	317	348	383
45	1,179	121	133	146	161
46	826	358	393	432	475
47	1,097	322	500	600	700
48	3,940	183	600	800	1,000
51	6,352	358	393	432	475
53	691	40	44	49	53
54	1,042	31	36	42	51
55	452	66	73	81	92
56	961	106	107	108	110
57	312	39	42	47	51
59	1,129	680	747	821	902
60	2,176	240	264	290	318
61	2,254	304	400	600	800
62	2,117	112	123	135	149
64	3,569	145	160	175	193
66	3,461	300	600	1,000	1,350
67	2,492	191	210	231	253
68	1,115	52	57	63	69
69	1,547	143	250	429	571
70	852	53	58	63	70
71	2,003	1,715	2,091	2,547	3,102
72	599	264	291	319	351
73	1,766	1,226	1,347	1,480	1,626
92	11,886	827	924	1,034	1,160
94	7,186	462	508	558	613
96	8,578	483	531	583	641
	111,775	27,880	30,067	34,878	39,853

West Brunswick Service Area Phase 3

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
7	2,200	15,412	16,493	16,493	16,493
10	1,193	400	600	900	1,200
11	424	30	33	36	40
12	556	41	650	800	900
13	1,060	3,011	3,308	3,634	3,992
14	1,038	124	136	150	164
17	677	56	250	300	350
18	930	99	108	119	131
19	2,193	5,394	7,000	7,800	8,800
25	913	502	650	800	1,000
26	3,168	6,048	7,500	8,000	9,000
27	1,208	995	1,093	1,201	1,319
28	395	330	363	398	438
29	1,027	3,281	3,605	3,961	4,352
30	1,049	2,896	3,182	3,496	3,841
31	1,252	3,700	4,065	4,466	4,907
32	306	984	1,082	1,188	1,305
33	197	541	750	1,000	1,500
37	2,392	538	591	650	714
38	1,696	470	516	567	622
39	283	66	72	79	87
40	3,702	500	650	920	1,220
41	618	200	236	263	289
42	2,922	401	440	484	531
43	6,175	737	810	890	977
44	4,617	484	532	584	642
45	1,179	228	250	275	302
46	826	714	785	862	947
47	1,097	643	800	900	1,000
48	3,940	344	450	1,200	1,750
51	6,352	599	658	723	794
53	691	68	74	82	90
54	1,042	54	63	75	90
55	452	114	126	142	162
56	961	178	179	181	184
57	312	67	73	81	88
59	1,129	1,211	1,331	1,462	1,606
60	2,176	409	450	494	543
61	2,254	526	750	1,000	1,500
62	2,117	188	206	226	249
64	3,569	243	267	294	322
66	3,461	425	900	1,400	1,900
67	2,492	322	354	388	427
68	1,115	88	97	106	117
69	1,547	200	350	600	800
70	852	115	126	139	153
71	2,003	2,144	2,614	3,184	3,878
72	599	468	514	565	620
73	1,766	2,166	2,380	2,615	2,873
92	11,886	1,308	1,454	1,617	1,802
94	7,186	776	853	937	1,030
96	8,578	809	888	976	1,072
111,775	61,646	71,708	79,703	89,112	

West Brunswick Service Area Phase 4

SA_ID	SA_AREA	Permanent Population Projections			
		2005	2010	2015	2020
7	2,200	925	1,192	1,536	1,930
10	1,193	300	500	700	800
11	424	18	19	21	23
12	556	24	600	700	800
13	1,060	1,681	1,847	2,029	2,229
14	1,038	74	81	89	98
17	677	33	200	250	300
18	930	59	64	71	78
19	2,193	2,986	1,700	1,800	1,900
25	913	312	400	500	600
26	3,168	3,341	2,200	2,400	2,600
27	1,208	629	691	759	834
28	395	184	202	222	244
29	1,027	1,825	2,005	2,202	2,420
30	1,049	1,617	1,776	1,952	2,144
31	1,252	2,057	2,260	2,483	2,728
32	306	548	603	662	727
33	197	302	400	600	800
37	2,392	328	360	395	434
38	1,696	270	297	326	357
39	283	37	41	45	49
40	3,702	357	464	657	871
41	618	190	225	250	275
42	2,922	237	260	286	314
43	6,175	438	481	529	581
44	4,617	289	317	348	383
45	1,179	121	133	146	161
46	826	358	393	432	475
47	1,097	322	500	600	700
48	3,940	183	600	800	1,000
51	6,352	358	393	432	475
53	691	40	44	49	53
54	1,042	31	36	42	51
55	452	66	73	81	92
56	961	106	107	108	110
57	312	39	42	47	51
59	1,129	680	747	821	902
60	2,176	240	264	290	318
61	2,254	304	400	600	800
62	2,117	112	123	135	149
64	3,569	145	160	175	193
66	3,461	300	600	1,000	1,350
67	2,492	191	210	231	253
68	1,115	52	57	63	69
69	1,547	143	250	429	571
70	852	53	58	63	70
71	2,003	1,715	2,091	2,547	3,102
72	599	264	291	319	351
73	1,766	1,226	1,347	1,480	1,626
92	11,886	827	924	1,034	1,160
94	7,186	462	508	558	613
95	65,336	1,388	1,525	1,675	1,840
96	8,578	483	531	583	641
97	14,935	947	1,040	1,143	1,255
	192,047	30,215	32,632	37,696	42,949

West Brunswick Service Area Phase 4

SA_ID	SA_AREA	Seasonal Population Projections			
		2005	2010	2015	2020
7	2,200	15,412	16,493	16,493	16,493
10	1,193	400	600	900	1,200
11	424	30	33	36	40
12	556	41	650	800	900
13	1,060	3,011	3,308	3,634	3,992
14	1,038	124	136	150	164
17	677	56	250	300	350
18	930	99	108	119	131
19	2,193	5,394	7,000	7,800	8,800
25	913	502	650	800	1,000
26	3,168	6,048	7,500	8,000	9,000
27	1,208	995	1,093	1,201	1,319
28	395	330	363	398	438
29	1,027	3,281	3,605	3,961	4,352
30	1,049	2,896	3,182	3,496	3,841
31	1,252	3,700	4,065	4,466	4,907
32	306	984	1,082	1,188	1,305
33	197	541	750	1,000	1,500
37	2,392	538	591	650	714
38	1,696	470	516	567	622
39	283	66	72	79	87
40	3,702	500	650	920	1,220
41	618	200	236	263	289
42	2,922	401	440	484	531
43	6,175	737	810	890	977
44	4,617	484	532	584	642
45	1,179	228	250	275	302
46	826	714	785	862	947
47	1,097	643	800	900	1,000
48	3,940	344	450	1,200	1,750
51	6,352	599	658	723	794
53	691	68	74	82	90
54	1,042	54	63	75	90
55	452	114	126	142	162
56	961	178	179	181	184
57	312	67	73	81	88
59	1,129	1,211	1,331	1,462	1,606
60	2,176	409	450	494	543
61	2,254	526	750	1,000	1,500
62	2,117	188	206	226	249
64	3,569	243	267	294	322
66	3,461	425	900	1,400	1,900
67	2,492	322	354	388	427
68	1,115	88	97	106	117
69	1,547	200	350	600	800
70	852	115	126	139	153
71	2,003	2,144	2,614	3,184	3,878
72	599	468	514	565	620
73	1,766	2,166	2,380	2,615	2,873
92	11,886	1,308	1,454	1,617	1,802
94	7,186	776	853	937	1,030
95	65,336	2,318	2,547	2,798	3,073
96	8,578	809	888	976	1,072
97	14,935	1,582	1,738	1,909	2,098
	192,047	65,546	75,993	84,410	94,282

**Southwest Brunswick Service Area
Phase 1**

SA ID	SA AREA	Permanent Population Projections			
		2005	2010	2015	2020
2	3,321	365	425	500	575
3	9,887	4,651	5,079	5,547	6,060
4	9,368	4,100	4,500	4,700	5,000
5	16,894	3,500	3,800	4,100	4,400
21	422	420	462	507	557
22	1,301	1,076	1,182	1,298	1,427
24	428	65	80	98	120
85	2,248	1,815	2,262	2,819	3,513
43,870		15,991	17,789	19,570	21,651

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
2	3,321	9,048	10,414	10,687	11,031
3	9,887	8,557	9,341	10,197	11,134
4	9,368	19,000	20,000	21,000	22,000
5	16,894	12,000	14,000	16,000	18,000
21	422	760	835	917	1,007
22	1,301	1,949	2,141	2,352	2,584
24	428	66	81	100	123
85	2,248	1,997	2,488	3,101	3,864
43,870		53,377	59,300	64,354	69,744

**Southwest Brunswick Service Area
Phase 2**

SA ID	SA AREA	Permanent Population Projections			
		2005	2010	2015	2020
1	2,557	465	509	558	612
2	3,321	365	425	500	575
3	9,887	4,651	5,079	5,547	6,060
4	9,368	4,100	4,500	4,700	5,000
5	16,894	3,500	3,800	4,100	4,400
20	1,490	280	321	367	415
21	422	420	462	507	557
22	1,301	1,076	1,182	1,298	1,427
23	3,432	1,164	1,348	1,546	1,740
24	428	65	80	98	120
83	3,479	1,003	1,429	2,143	2,714
84	2,400	469	564	679	819
85	2,248	1,815	2,262	2,819	3,513
57,228		19,372	21,959	24,862	27,951

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
1	2,557	11,306	11,898	12,538	13,230
2	3,321	9,048	10,414	10,687	11,031
3	9,887	8,557	9,341	10,197	11,134
4	9,368	19,000	20,000	21,000	22,000
5	16,894	12,000	14,000	16,000	18,000
20	1,490	448	507	573	644
21	422	760	835	917	1,007
22	1,301	1,949	2,141	2,352	2,584
23	3,432	1,910	2,195	2,510	2,839
24	428	66	81	100	123
83	3,479	1,404	2,000	3,000	3,800
84	2,400	559	664	792	946
85	2,248	1,997	2,488	3,101	3,864
57,228		69,002	76,564	83,767	91,204

**Southwest Brunswick Service Area
Phase 3**

SA ID	SA AREA	Permanent Population Projections			
		2005	2010	2015	2020
1	2,557	465	509	558	612
2	3,321	365	425	500	575
3	9,887	4,651	5,079	5,547	6,060
4	9,368	4,100	4,500	4,700	5,000
5	16,894	3,500	3,800	4,100	4,400
20	1,490	280	321	367	415
21	422	420	462	507	557
22	1,301	1,076	1,182	1,298	1,427
23	3,432	1,164	1,348	1,546	1,740
24	428	65	80	98	120
83	3,479	1,003	1,429	2,143	2,714
84	2,400	469	564	679	819
85	2,248	1,815	2,262	2,819	3,513
86	10,857	210	231	253	278
87	11,951	1,335	1,460	1,598	1,749
88	7,694	354	388	427	468
87,729		21,270	24,038	27,140	30,446

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
1	2,557	11,306	11,898	12,538	13,230
2	3,321	9,048	10,414	10,687	11,031
3	9,887	8,557	9,341	10,197	11,134
4	9,368	19,000	20,000	21,000	22,000
5	16,894	12,000	14,000	16,000	18,000
20	1,490	448	507	573	644
21	422	760	835	917	1,007
22	1,301	1,949	2,141	2,352	2,584
23	3,432	1,910	2,195	2,510	2,839
24	428	66	81	100	123
83	3,479	1,404	2,000	3,000	3,800
84	2,400	559	664	792	946
85	2,248	1,997	2,488	3,101	3,864
86	10,857	349	383	421	462
87	11,951	2,198	2,402	2,627	2,874
88	7,694	591	649	713	782
87,729		72,140	79,999	87,528	95,322

**Southwest Brunswick Service Area
Phase 4**

SA ID	SA AREA	Permanent Population Projections			
		2005	2010	2015	2020
1	2,557	465	509	558	612
2	3,321	365	425	500	575
3	9,887	4,651	5,079	5,547	6,060
4	9,368	4,100	4,500	4,700	5,000
5	16,894	3,500	3,800	4,100	4,400
20	1,490	280	321	367	415
21	422	420	462	507	557
22	1,301	1,076	1,182	1,298	1,427
23	3,432	1,164	1,348	1,546	1,740
24	428	65	80	98	120
83	3,479	1,003	1,429	2,143	2,714
84	2,400	469	564	679	819
85	2,248	1,815	2,262	2,819	3,513
86	10,857	210	231	253	278
87	11,951	1,335	1,460	1,598	1,749
88	7,694	354	388	427	468
89	9,577	456	501	550	605
90	18,819	643	707	776	853
91	13,244	452	497	546	600
93	31,461	862	967	1,088	1,227
160,830		23,683	26,710	30,101	33,730

SA ID	SA AREA	Seasonal Population Projections			
		2005	2010	2015	2020
1	2,557	11,306	11,898	12,538	13,230
2	3,321	9,048	10,414	10,687	11,031
3	9,887	8,557	9,341	10,197	11,134
4	9,368	19,000	20,000	21,000	22,000
5	16,894	12,000	14,000	16,000	18,000
20	1,490	448	507	573	644
21	422	760	835	917	1,007
22	1,301	1,949	2,141	2,352	2,584
23	3,432	1,910	2,195	2,510	2,839
24	428	66	81	100	123
83	3,479	1,404	2,000	3,000	3,800
84	2,400	559	664	792	946
85	2,248	1,997	2,488	3,101	3,864
86	10,857	349	383	421	462
87	11,951	2,198	2,402	2,627	2,874
88	7,694	591	649	713	782
89	9,577	770	846	930	1,021
90	18,819	1,082	1,188	1,306	1,435
91	13,244	758	832	914	1,005
93	31,461	1,339	1,493	1,667	1,864
160,830		76,088	84,358	92,345	100,647

APPENDIX F

Individual Planning Area Wastewater Flow Projections

**Northeast Brunswick Service Area
Phase 1**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
104	1,609	0.10	0.11	0.11	0.12
105	1,599	0.33	0.40	0.46	0.51
106	408	0.02	0.02	0.02	0.03
107	4,591	0.15	0.16	0.18	0.22
108	2,554	0.14	0.16	0.17	0.19
	10,762	0.74	0.85	0.95	1.07

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
104	1,609	0.11	0.11	0.12	0.13
105	1,599	0.37	0.45	0.53	0.59
106	408	0.02	0.03	0.03	0.03
107	4,591	0.20	0.22	0.24	0.30
108	2,554	0.19	0.21	0.23	0.25
	10,762	0.88	1.01	1.15	1.30

**Northeast Brunswick Service Area
Phase 2**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
77	3,779	0.05	0.05	0.05	0.06
79	4,947	0.02	0.04	0.06	0.08
100	588	0.02	0.02	0.02	0.03
101	4,155	0.09	0.10	0.12	0.13
104	1,609	0.10	0.11	0.11	0.12
105	1,599	0.33	0.40	0.46	0.51
106	408	0.02	0.02	0.02	0.03
107	4,591	0.15	0.16	0.18	0.22
108	2,554	0.14	0.16	0.17	0.19
	24,230	0.92	1.06	1.21	1.37

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
77	3,779	0.07	0.08	0.09	0.10
79	4,947	0.03	0.06	0.09	0.12
100	588	0.03	0.03	0.03	0.04
101	4,155	0.09	0.10	0.11	0.13
104	1,609	0.11	0.11	0.12	0.13
105	1,599	0.37	0.45	0.53	0.59
106	408	0.02	0.03	0.03	0.03
107	4,591	0.20	0.22	0.24	0.30
108	2,554	0.19	0.21	0.23	0.25
	24,230	1.10	1.28	1.47	1.68

**Northeast Brunswick Service Area
Phase 3**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
77	3,779	0.05	0.05	0.05	0.06
79	4,947	0.02	0.04	0.06	0.08
100	588	0.02	0.02	0.02	0.03
101	4,155	0.09	0.10	0.12	0.13
102	7,505	0.03	0.03	0.03	0.04
103	21,886	0.36	0.39	0.43	0.77
104	1,609	0.10	0.11	0.11	0.12
105	1,599	0.33	0.40	0.46	0.51
106	408	0.02	0.02	0.02	0.03
107	4,591	0.15	0.16	0.18	0.22
108	2,554	0.14	0.16	0.17	0.19
53,622		1.30	1.49	1.67	2.17

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
77	3,779	0.07	0.08	0.09	0.10
79	4,947	0.03	0.06	0.09	0.12
100	588	0.03	0.03	0.03	0.04
101	4,155	0.09	0.10	0.11	0.13
102	7,505	0.04	0.04	0.04	0.05
103	21,886	0.48	0.53	0.59	0.99
104	1,609	0.11	0.11	0.12	0.13
105	1,599	0.37	0.45	0.53	0.59
106	408	0.02	0.03	0.03	0.03
107	4,591	0.20	0.22	0.24	0.30
108	2,554	0.19	0.21	0.23	0.25
53,622		1.62	1.85	2.10	2.72

**Northeast Brunswick Service Area
Phase 4**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
77	3,779	0.05	0.05	0.05	0.06
79	4,947	0.02	0.04	0.06	0.08
98	17,680	0.11	0.12	0.13	0.21
99	21,519	0.05	0.06	0.06	0.07
100	588	0.02	0.02	0.02	0.03
101	4,155	0.09	0.10	0.12	0.13
102	7,505	0.03	0.03	0.03	0.04
103	21,886	0.36	0.39	0.43	0.77
104	1,609	0.10	0.11	0.11	0.12
105	1,599	0.33	0.40	0.46	0.51
106	408	0.02	0.02	0.02	0.03
107	4,591	0.15	0.16	0.18	0.22
108	2,554	0.14	0.16	0.17	0.19
92,821		1.46	1.66	1.87	2.45

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
77	3,779	0.07	0.08	0.09	0.10
79	4,947	0.03	0.06	0.09	0.12
98	17,680	0.15	0.16	0.18	0.27
99	21,519	0.07	0.08	0.09	0.10
100	588	0.03	0.03	0.03	0.04
101	4,155	0.09	0.10	0.11	0.13
102	7,505	0.04	0.04	0.04	0.05
103	21,886	0.48	0.53	0.59	0.99
104	1,609	0.11	0.11	0.12	0.13
105	1,599	0.37	0.45	0.53	0.59
106	408	0.02	0.03	0.03	0.03
107	4,591	0.20	0.22	0.24	0.30
108	2,554	0.19	0.21	0.23	0.25
92,821		1.84	2.10	2.37	3.09

**Southeast Brunswick Service Area
Phase 1**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
6	15,351	0.13	0.13	0.14	0.15
58	2,326	0.40	0.47	0.55	0.56
74	1,045	0.17	0.20	0.23	0.24
75	585	0.10	0.11	0.13	0.14
82	2,985	0.04	0.04	0.04	0.04
	22,293	0.83	0.96	1.10	1.14

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
6	15,351	0.39	0.41	0.43	0.46
58	2,326	1.07	1.36	1.58	1.63
74	1,045	0.45	0.57	0.66	0.68
75	585	0.27	0.34	0.39	0.41
82	2,985	0.18	0.20	0.21	0.21
	22,293	2.36	2.88	3.27	3.39

**Southeast Brunswick Service Area
Phase 2**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
6	15,351	0.13	0.13	0.14	0.15
49	4,726	0.09	0.10	0.10	0.11
50	1,415	0.08	0.09	0.10	0.10
58	2,326	0.40	0.47	0.55	0.56
63	2,210	0.02	0.02	0.02	0.02
74	1,045	0.17	0.20	0.23	0.24
75	585	0.10	0.11	0.13	0.14
80	2,789	0.03	0.02	0.02	0.02
81	6,869	0.03	0.04	0.05	0.06
82	2,985	0.04	0.04	0.04	0.04
	40,301	1.08	1.21	1.38	1.44

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
6	15,351	0.39	0.41	0.43	0.46
49	4,726	0.12	0.13	0.14	0.15
50	1,415	0.11	0.12	0.14	0.15
58	2,326	1.07	1.36	1.58	1.63
63	2,210	0.02	0.03	0.03	0.03
74	1,045	0.45	0.57	0.66	0.68
75	585	0.27	0.34	0.39	0.41
80	2,789	0.04	0.03	0.03	0.03
81	6,869	0.04	0.06	0.07	0.09
82	2,985	0.18	0.20	0.21	0.21
	40,301	2.70	3.25	3.68	3.84

**Southeast Brunswick Service Area
Phase 3**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
6	15,351	0.13	0.13	0.14	0.15
49	4,726	0.09	0.10	0.10	0.11
50	1,415	0.08	0.09	0.10	0.10
52	3,280	0.01	0.01	0.01	0.01
58	2,326	0.40	0.47	0.55	0.56
63	2,210	0.02	0.02	0.02	0.02
65	5,330	0.02	0.03	0.03	0.03
74	1,045	0.17	0.20	0.23	0.24
75	585	0.10	0.11	0.13	0.14
80	2,789	0.03	0.02	0.02	0.02
81	6,869	0.03	0.04	0.05	0.06
82	2,985	0.04	0.04	0.04	0.04
48,911		1.11	1.25	1.42	1.49

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
6	15,351	0.39	0.41	0.43	0.46
49	4,726	0.12	0.13	0.14	0.15
50	1,415	0.11	0.12	0.14	0.15
52	3,280	0.01	0.02	0.02	0.02
58	2,326	1.07	1.36	1.58	1.63
63	2,210	0.02	0.03	0.03	0.03
65	5,330	0.03	0.04	0.04	0.04
74	1,045	0.45	0.57	0.66	0.68
75	585	0.27	0.34	0.39	0.41
80	2,789	0.04	0.03	0.03	0.03
81	6,869	0.04	0.06	0.07	0.09
82	2,985	0.18	0.20	0.21	0.21
48,911		2.75	3.30	3.73	3.90

**Southeast Brunswick Service Area
Phase 4**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
6	15,351	0.13	0.13	0.14	0.15
15	9,152	0.09	0.09	0.10	0.10
49	4,726	0.09	0.10	0.10	0.11
50	1,415	0.08	0.09	0.10	0.10
52	3,280	0.01	0.01	0.01	0.01
58	2,326	0.40	0.47	0.55	0.56
63	2,210	0.02	0.02	0.02	0.02
65	5,330	0.02	0.03	0.03	0.03
74	1,045	0.17	0.20	0.23	0.24
75	585	0.10	0.11	0.13	0.14
76	914	0.00	0.02	0.03	0.05
78	14,413	0.06	0.06	0.07	0.08
80	2,789	0.03	0.02	0.02	0.02
81	6,869	0.03	0.04	0.05	0.06
82	2,985	0.04	0.04	0.04	0.04
	73,391	1.26	1.42	1.61	1.71

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
6	15,351	0.39	0.41	0.43	0.46
15	9,152	0.09	0.09	0.10	0.10
49	4,726	0.12	0.13	0.14	0.15
50	1,415	0.11	0.12	0.14	0.15
52	3,280	0.01	0.02	0.02	0.02
58	2,326	1.07	1.36	1.58	1.63
63	2,210	0.02	0.03	0.03	0.03
65	5,330	0.03	0.04	0.04	0.04
74	1,045	0.45	0.57	0.66	0.68
75	585	0.27	0.34	0.39	0.41
76	914	0.00	0.02	0.04	0.05
78	14,413	0.09	0.11	0.12	0.13
80	2,789	0.04	0.03	0.03	0.03
81	6,869	0.04	0.06	0.07	0.09
82	2,985	0.18	0.20	0.21	0.21
	73,391	2.92	3.52	3.98	4.18

**West Brunswick Service Area
Phase 1**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
7	2,200	0.14	0.14	0.14	0.14
10	1,193	0.05	0.08	0.10	0.20
11	424	0.00	0.00	0.00	0.00
17	677	0.01	0.01	0.02	0.02
18	930	0.01	0.01	0.01	0.01
19	2,193	0.08	0.10	0.11	0.11
30	1,049	0.08	0.08	0.09	0.10
31	1,252	0.09	0.09	0.10	0.11
32	306	0.04	0.04	0.05	0.05
33	197	0.02	0.02	0.04	0.05
38	1,696	0.05	0.06	0.07	0.07
39	283	0.01	0.01	0.01	0.01
41	618	0.09	0.11	0.14	0.16
42	2,922	0.03	0.03	0.04	0.04
45	1,179	0.02	0.02	0.03	0.03
57	312	0.01	0.01	0.01	0.01
70	852	0.03	0.20	0.25	0.30
71	2,003	0.03	0.20	0.25	0.30
	20,289	0.78	1.23	1.45	1.73

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
7	2,200	0.60	0.80	1.00	1.20
10	1,193	0.08	0.10	0.15	0.25
11	424	0.00	0.00	0.00	0.00
17	677	0.01	0.02	0.02	0.02
18	930	0.01	0.01	0.01	0.01
19	2,193	0.29	0.42	0.47	0.53
30	1,049	0.20	0.22	0.24	0.26
31	1,252	0.24	0.26	0.29	0.31
32	306	0.08	0.09	0.10	0.11
33	197	0.04	0.05	0.06	0.09
38	1,696	0.08	0.08	0.09	0.10
39	283	0.02	0.02	0.02	0.02
41	618	0.11	0.14	0.18	0.21
42	2,922	0.04	0.05	0.05	0.06
45	1,179	0.03	0.04	0.04	0.04
57	312	0.01	0.01	0.01	0.01
70	852	0.05	0.25	0.35	0.38
71	2,003	0.05	0.25	0.35	0.38
	20,289	1.94	2.80	3.43	3.98

West Brunswick Service Area Phase 2

SA ID	SA AREA	Permanent Flow Projections			
		2005	2010	2015	2020
7	2,200	0.14	0.14	0.14	0.14
10	1,193	0.05	0.08	0.10	0.20
11	424	0.00	0.00	0.00	0.00
12	556	0.00	0.04	0.04	0.05
13	1,060	0.06	0.07	0.08	0.08
14	1,038	0.01	0.01	0.01	0.01
17	677	0.01	0.01	0.02	0.02
18	930	0.01	0.01	0.01	0.01
19	2,193	0.08	0.10	0.11	0.11
25	913	0.02	0.02	0.03	0.04
26	3,168	0.10	0.13	0.14	0.16
27	1,208	0.06	0.07	0.07	0.08
28	395	0.01	0.01	0.01	0.01
29	1,027	0.08	0.09	0.10	0.10
30	1,049	0.08	0.08	0.09	0.10
31	1,252	0.09	0.09	0.10	0.11
32	306	0.04	0.04	0.05	0.05
33	197	0.02	0.02	0.04	0.05
37	2,392	0.04	0.04	0.05	0.05
38	1,696	0.05	0.06	0.07	0.07
39	283	0.01	0.01	0.01	0.01
40	3,702	0.04	0.05	0.07	0.09
41	618	0.09	0.11	0.14	0.16
42	2,922	0.03	0.03	0.04	0.04
43	6,175	0.04	0.05	0.05	0.06
44	4,617	0.02	0.03	0.03	0.03
45	1,179	0.02	0.02	0.03	0.03
46	826	0.01	0.01	0.01	0.01
47	1,097	0.01	0.03	0.04	0.04
48	3,940	0.02	0.08	0.25	0.40
51	6,352	0.03	0.03	0.03	0.03
53	691	0.00	0.00	0.01	0.01
54	1,042	0.01	0.01	0.01	0.01
55	452	0.01	0.01	0.02	0.02
56	961	0.01	0.01	0.01	0.01
57	312	0.01	0.01	0.01	0.01
59	1,129	0.03	0.04	0.04	0.04
60	2,176	0.01	0.02	0.02	0.02
61	2,254	0.02	0.02	0.04	0.05
62	2,117	0.01	0.01	0.01	0.01
64	3,569	0.01	0.01	0.01	0.01
66	3,461	0.04	0.09	0.17	0.24
67	2,492	0.02	0.02	0.02	0.02
68	1,115	0.01	0.02	0.02	0.02
69	1,547	0.01	0.03	0.04	0.06
70	852	0.03	0.20	0.25	0.30
71	2,003	0.03	0.20	0.25	0.30
72	599	0.02	0.02	0.02	0.03
73	1,766	0.06	0.06	0.07	0.08
	84,124	1.59	2.35	2.94	3.60

West Brunswick Service Area Phase 2

SA ID	SA AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
7	2,200	0.60	0.80	1.00	1.20
10	1,193	0.08	0.10	0.15	0.25
11	424	0.00	0.00	0.00	0.00
12	556	0.00	0.04	0.05	0.05
13	1,060	0.18	0.20	0.22	0.24
14	1,038	0.01	0.01	0.01	0.01
17	677	0.01	0.02	0.02	0.02
18	930	0.01	0.01	0.01	0.01
19	2,193	0.29	0.42	0.47	0.53
25	913	0.03	0.04	0.05	0.06
26	3,168	0.34	0.45	0.48	0.54
27	1,208	0.09	0.10	0.11	0.12
28	395	0.02	0.02	0.03	0.03
29	1,027	0.21	0.23	0.26	0.28
30	1,049	0.20	0.22	0.24	0.26
31	1,252	0.24	0.26	0.29	0.31
32	306	0.08	0.09	0.10	0.11
33	197	0.04	0.05	0.06	0.09
37	2,392	0.06	0.06	0.07	0.08
38	1,696	0.08	0.08	0.09	0.10
39	283	0.02	0.02	0.02	0.02
40	3,702	0.05	0.07	0.09	0.12
41	618	0.11	0.14	0.18	0.21
42	2,922	0.04	0.05	0.05	0.06
43	6,175	0.06	0.06	0.07	0.08
44	4,617	0.03	0.04	0.04	0.04
45	1,179	0.03	0.04	0.04	0.04
46	826	0.04	0.04	0.05	0.05
47	1,097	0.03	0.05	0.05	0.06
48	3,940	0.03	0.10	0.30	0.50
51	6,352	0.04	0.04	0.04	0.05
53	691	0.01	0.01	0.01	0.01
54	1,042	0.01	0.01	0.01	0.02
55	452	0.02	0.02	0.03	0.03
56	961	0.01	0.01	0.01	0.01
57	312	0.01	0.01	0.01	0.01
59	1,129	0.08	0.09	0.10	0.11
60	2,176	0.02	0.03	0.03	0.03
61	2,254	0.03	0.05	0.06	0.09
62	2,117	0.01	0.01	0.01	0.02
64	3,569	0.01	0.02	0.02	0.02
66	3,461	0.05	0.10	0.20	0.30
67	2,492	0.02	0.02	0.03	0.03
68	1,115	0.02	0.02	0.02	0.02
69	1,547	0.02	0.04	0.06	0.08
70	852	0.05	0.25	0.35	0.38
71	2,003	0.05	0.25	0.35	0.38
72	599	0.03	0.04	0.04	0.05
73	1,766	0.13	0.14	0.16	0.17
	84,124	3.64	4.94	6.12	7.28

West Brunswick Service Area - Phase 3

SA ID	SA AREA	Permanent Flow Projections			
		2005	2010	2015	2020
7	2,200	0.14	0.14	0.14	0.14
10	1,193	0.05	0.08	0.10	0.20
11	424	0.00	0.00	0.00	0.00
12	556	0.00	0.04	0.04	0.05
13	1,060	0.06	0.07	0.08	0.08
14	1,038	0.01	0.01	0.01	0.01
17	677	0.01	0.01	0.02	0.02
18	930	0.01	0.01	0.01	0.01
19	2,193	0.08	0.10	0.11	0.11
25	913	0.02	0.02	0.03	0.04
26	3,168	0.10	0.13	0.14	0.16
27	1,208	0.06	0.07	0.07	0.08
28	395	0.01	0.01	0.01	0.01
29	1,027	0.08	0.09	0.10	0.10
30	1,049	0.08	0.08	0.09	0.10
31	1,252	0.09	0.09	0.10	0.11
32	306	0.04	0.04	0.05	0.05
33	197	0.02	0.02	0.04	0.05
37	2,392	0.04	0.04	0.05	0.05
38	1,696	0.05	0.06	0.07	0.07
39	283	0.01	0.01	0.01	0.01
40	3,702	0.04	0.05	0.07	0.09
41	618	0.09	0.11	0.14	0.16
42	2,922	0.03	0.03	0.04	0.04
43	6,175	0.04	0.05	0.05	0.06
44	4,617	0.02	0.03	0.03	0.03
45	1,179	0.02	0.02	0.03	0.03
46	826	0.01	0.01	0.01	0.01
47	1,097	0.01	0.03	0.04	0.04
48	3,940	0.02	0.08	0.25	0.40
51	6,352	0.03	0.03	0.03	0.03
53	691	0.00	0.00	0.01	0.01
54	1,042	0.01	0.01	0.01	0.01
55	452	0.01	0.01	0.02	0.02
56	961	0.01	0.01	0.01	0.01
57	312	0.01	0.01	0.01	0.01
59	1,129	0.03	0.04	0.04	0.04
60	2,176	0.01	0.02	0.02	0.02
61	2,254	0.02	0.02	0.04	0.05
62	2,117	0.01	0.01	0.01	0.01
64	3,569	0.01	0.01	0.01	0.01
66	3,461	0.04	0.09	0.17	0.24
67	2,492	0.02	0.02	0.02	0.02
68	1,115	0.01	0.02	0.02	0.02
69	1,547	0.01	0.03	0.04	0.06
70	852	0.03	0.20	0.25	0.30
71	2,003	0.03	0.20	0.25	0.30
72	599	0.02	0.02	0.02	0.03
73	1,766	0.06	0.06	0.07	0.08
92	11,886	0.10	0.12	0.13	0.15
94	7,186	0.04	0.04	0.04	0.05
96	8,578	0.04	0.04	0.04	0.05
	111,775	1.77	2.54	3.17	3.85

West Brunswick Service Area - Phase 3

SA ID	SA AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
7	2,200	0.60	0.80	1.00	1.20
10	1,193	0.08	0.10	0.15	0.25
11	424	0.00	0.00	0.00	0.00
12	556	0.00	0.04	0.05	0.05
13	1,060	0.18	0.20	0.22	0.24
14	1,038	0.01	0.01	0.01	0.01
17	677	0.01	0.02	0.02	0.02
18	930	0.01	0.01	0.01	0.01
19	2,193	0.29	0.42	0.47	0.53
25	913	0.03	0.04	0.05	0.06
26	3,168	0.34	0.45	0.48	0.54
27	1,208	0.09	0.10	0.11	0.12
28	395	0.02	0.02	0.03	0.03
29	1,027	0.21	0.23	0.26	0.28
30	1,049	0.20	0.22	0.24	0.26
31	1,252	0.24	0.26	0.29	0.31
32	306	0.08	0.09	0.10	0.11
33	197	0.04	0.05	0.06	0.09
37	2,392	0.06	0.06	0.07	0.08
38	1,696	0.08	0.08	0.09	0.10
39	283	0.02	0.02	0.02	0.02
40	3,702	0.05	0.07	0.09	0.12
41	618	0.11	0.14	0.18	0.21
42	2,922	0.04	0.05	0.05	0.06
43	6,175	0.06	0.06	0.07	0.08
44	4,617	0.03	0.04	0.04	0.04
45	1,179	0.03	0.04	0.04	0.04
46	826	0.04	0.04	0.05	0.05
47	1,097	0.03	0.05	0.05	0.06
48	3,940	0.03	0.10	0.30	0.50
51	6,352	0.04	0.04	0.04	0.05
53	691	0.01	0.01	0.01	0.01
54	1,042	0.01	0.01	0.01	0.02
55	452	0.02	0.02	0.03	0.03
56	961	0.01	0.01	0.01	0.01
57	312	0.01	0.01	0.01	0.01
59	1,129	0.08	0.09	0.10	0.11
60	2,176	0.02	0.03	0.03	0.03
61	2,254	0.03	0.05	0.06	0.09
62	2,117	0.01	0.01	0.01	0.02
64	3,569	0.01	0.02	0.02	0.02
66	3,461	0.05	0.10	0.20	0.30
67	2,492	0.02	0.02	0.03	0.03
68	1,115	0.02	0.02	0.02	0.02
69	1,547	0.02	0.04	0.06	0.08
70	852	0.05	0.25	0.35	0.38
71	2,003	0.05	0.25	0.35	0.38
72	599	0.03	0.04	0.04	0.05
73	1,766	0.13	0.14	0.16	0.17
92	11,886	0.13	0.15	0.17	0.20
94	7,186	0.05	0.06	0.06	0.07
96	8,578	0.05	0.06	0.06	0.07
	111,775	3.87	5.21	6.42	7.61

West Brunswick Service Area Phase 4

SA ID	SA AREA	Permanent Flow Projections			
		2005	2010	2015	2020
7	2,200	0.14	0.14	0.14	0.14
10	1,193	0.05	0.08	0.10	0.20
11	424	0.00	0.00	0.00	0.00
12	556	0.00	0.04	0.04	0.05
13	1,060	0.06	0.07	0.08	0.08
14	1,038	0.01	0.01	0.01	0.01
17	677	0.01	0.01	0.02	0.02
18	930	0.01	0.01	0.01	0.01
19	2,193	0.08	0.10	0.11	0.11
25	913	0.02	0.02	0.03	0.04
26	3,168	0.10	0.13	0.14	0.16
27	1,208	0.06	0.07	0.07	0.08
28	395	0.01	0.01	0.01	0.01
29	1,027	0.08	0.09	0.10	0.10
30	1,049	0.08	0.08	0.09	0.10
31	1,252	0.09	0.09	0.10	0.11
32	306	0.04	0.04	0.05	0.05
33	197	0.02	0.02	0.04	0.05
37	2,392	0.04	0.04	0.05	0.05
38	1,696	0.05	0.06	0.07	0.07
39	283	0.01	0.01	0.01	0.01
40	3,702	0.04	0.05	0.07	0.09
41	618	0.09	0.11	0.14	0.16
42	2,922	0.03	0.03	0.04	0.04
43	6,175	0.04	0.05	0.05	0.06
44	4,617	0.02	0.03	0.03	0.03
45	1,179	0.02	0.02	0.03	0.03
46	826	0.01	0.01	0.01	0.01
47	1,097	0.01	0.03	0.04	0.04
48	3,940	0.02	0.08	0.25	0.40
51	6,352	0.03	0.03	0.03	0.03
53	691	0.00	0.00	0.01	0.01
54	1,042	0.01	0.01	0.01	0.01
55	452	0.01	0.01	0.02	0.02
56	961	0.01	0.01	0.01	0.01
57	312	0.01	0.01	0.01	0.01
59	1,129	0.03	0.04	0.04	0.04
60	2,176	0.01	0.02	0.02	0.02
61	2,254	0.02	0.02	0.04	0.05
62	2,117	0.01	0.01	0.01	0.01
64	3,569	0.01	0.01	0.01	0.01
66	3,461	0.04	0.09	0.17	0.24
67	2,492	0.02	0.02	0.02	0.02
68	1,115	0.01	0.02	0.02	0.02
69	1,547	0.01	0.03	0.04	0.06
70	852	0.03	0.20	0.25	0.30
71	2,003	0.03	0.20	0.25	0.30
72	599	0.02	0.02	0.02	0.03
73	1,766	0.06	0.06	0.07	0.08
92	11,886	0.10	0.12	0.13	0.15
94	7,186	0.04	0.04	0.04	0.05
95	65,336	0.09	0.10	0.11	0.12
96	8,578	0.04	0.04	0.04	0.05
97	14,935	0.06	0.07	0.08	0.08
192,047		1.92	2.71	3.35	4.05

West Brunswick Service Area Phase 4

SA ID	SA AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
7	2,200	0.60	0.80	1.00	1.20
10	1,193	0.08	0.10	0.15	0.25
11	424	0.00	0.00	0.00	0.00
12	556	0.00	0.04	0.05	0.05
13	1,060	0.18	0.20	0.22	0.24
14	1,038	0.01	0.01	0.01	0.01
17	677	0.01	0.02	0.02	0.02
18	930	0.01	0.01	0.01	0.01
19	2,193	0.29	0.42	0.47	0.53
25	913	0.03	0.04	0.05	0.06
26	3,168	0.34	0.45	0.48	0.54
27	1,208	0.09	0.10	0.11	0.12
28	395	0.02	0.02	0.03	0.03
29	1,027	0.21	0.23	0.26	0.28
30	1,049	0.20	0.22	0.24	0.26
31	1,252	0.24	0.26	0.29	0.31
32	306	0.08	0.09	0.10	0.11
33	197	0.04	0.05	0.06	0.09
37	2,392	0.06	0.06	0.07	0.08
38	1,696	0.08	0.08	0.09	0.10
39	283	0.02	0.02	0.02	0.02
40	3,702	0.05	0.07	0.09	0.12
41	618	0.11	0.14	0.18	0.21
42	2,922	0.04	0.05	0.05	0.06
43	6,175	0.06	0.06	0.07	0.08
44	4,617	0.03	0.04	0.04	0.04
45	1,179	0.03	0.04	0.04	0.04
46	826	0.04	0.04	0.05	0.05
47	1,097	0.03	0.05	0.05	0.06
48	3,940	0.03	0.10	0.30	0.50
51	6,352	0.04	0.04	0.04	0.05
54	1,042	0.01	0.01	0.01	0.02
55	452	0.02	0.02	0.03	0.03
56	961	0.01	0.01	0.01	0.01
57	312	0.01	0.01	0.01	0.01
59	1,129	0.08	0.09	0.10	0.11
60	2,176	0.02	0.03	0.03	0.03
61	2,254	0.03	0.05	0.06	0.09
62	2,117	0.01	0.01	0.01	0.02
64	3,569	0.01	0.02	0.02	0.02
66	3,461	0.05	0.10	0.20	0.30
67	2,492	0.02	0.02	0.03	0.03
68	1,115	0.02	0.02	0.02	0.02
69	1,547	0.02	0.04	0.06	0.08
70	852	0.05	0.25	0.35	0.38
71	2,003	0.05	0.25	0.35	0.38
72	599	0.03	0.04	0.04	0.05
73	1,766	0.13	0.14	0.16	0.17
92	11,886	0.13	0.15	0.17	0.20
94	7,186	0.05	0.06	0.06	0.07
95	65,336	0.12	0.14	0.15	0.16
96	8,578	0.05	0.06	0.06	0.07
97	14,935	0.09	0.10	0.11	0.12
	192,047	4.08	5.44	6.67	7.89

**Southwest Brunswick Service Area
Phase 1**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
2	3,321	0.04	0.04	0.05	0.06
3	9,887	0.29	0.31	0.34	0.36
4	9,368	0.25	0.27	0.28	0.30
5	16,894	0.21	0.23	0.25	0.26
21	422	0.01	0.01	0.01	0.02
22	1,301	0.04	0.04	0.04	0.05
24	428	0.02	0.02	0.03	0.03
85	2,248	0.17	0.21	0.26	0.32
43,870		1.02	1.14	1.26	1.40

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
2	3,321	0.41	0.47	0.48	0.50
3	9,887	0.61	0.66	0.72	0.78
4	9,368	1.14	1.20	1.26	1.32
5	16,894	0.72	0.84	0.96	1.08
21	422	0.04	0.05	0.05	0.05
22	1,301	0.04	0.04	0.04	0.05
24	428	0.02	0.02	0.03	0.03
85	2,248	0.20	0.25	0.30	0.37
43,870		3.18	3.53	3.85	4.19

**Southwest Brunswick Service Area
Phase 2**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
1	2,557	0.14	0.15	0.16	0.17
2	3,321	0.04	0.04	0.05	0.06
3	9,887	0.29	0.31	0.34	0.36
4	9,368	0.25	0.27	0.28	0.30
5	16,894	0.21	0.23	0.25	0.26
20	1,490	0.02	0.02	0.02	0.03
21	422	0.01	0.01	0.01	0.02
22	1,301	0.04	0.04	0.04	0.05
23	3,432	0.10	0.11	0.13	0.14
24	428	0.02	0.02	0.03	0.03
83	3,479	0.10	0.14	0.21	0.27
84	2,400	0.09	0.10	0.12	0.15
85	2,248	0.17	0.21	0.26	0.32
57,228		1.47	1.67	1.91	2.16

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
1	2,557	0.63	0.66	0.69	0.73
2	3,321	0.41	0.47	0.48	0.50
3	9,887	0.61	0.66	0.72	0.78
4	9,368	1.14	1.20	1.26	1.32
5	16,894	0.72	0.84	0.96	1.08
20	1,490	0.03	0.04	0.04	0.04
21	422	0.04	0.05	0.05	0.05
22	1,301	0.11	0.13	0.14	0.15
23	3,432	0.15	0.18	0.20	0.22
24	428	0.02	0.03	0.03	0.04
83	3,479	0.14	0.20	0.30	0.38
84	2,400	0.10	0.12	0.14	0.17
85	2,248	0.20	0.25	0.30	0.37
57,228		4.31	4.80	5.31	5.84

**Southwest Brunswick Service Area
Phase 3**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
1	2,557	0.14	0.15	0.16	0.17
2	3,321	0.04	0.04	0.05	0.06
3	9,887	0.29	0.31	0.34	0.36
4	9,368	0.25	0.27	0.28	0.30
5	16,894	0.21	0.23	0.25	0.26
20	1,490	0.02	0.02	0.02	0.03
21	422	0.01	0.01	0.01	0.02
22	1,301	0.04	0.04	0.04	0.05
23	3,432	0.10	0.11	0.13	0.14
24	428	0.02	0.02	0.03	0.03
83	3,479	0.10	0.14	0.21	0.27
84	2,400	0.09	0.10	0.12	0.15
85	2,248	0.17	0.21	0.26	0.32
86	10,857	0.01	0.01	0.02	0.02
87	11,951	0.12	0.13	0.14	0.15
88	7,694	0.03	0.03	0.03	0.03
87,729		1.62	1.84	2.09	2.36

SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
1	2,557	0.63	0.66	0.69	0.73
2	3,321	0.41	0.47	0.48	0.50
3	9,887	0.61	0.66	0.72	0.78
4	9,368	1.14	1.20	1.26	1.32
5	16,894	0.72	0.84	0.96	1.08
20	1,490	0.03	0.04	0.04	0.04
21	422	0.04	0.05	0.05	0.05
22	1,301	0.11	0.13	0.14	0.15
23	3,432	0.15	0.18	0.20	0.22
24	428	0.02	0.03	0.03	0.04
83	3,479	0.14	0.20	0.30	0.38
84	2,400	0.10	0.12	0.14	0.17
85	2,248	0.20	0.25	0.30	0.37
86	10,857	0.02	0.02	0.02	0.02
87	11,951	0.17	0.18	0.20	0.21
88	7,694	0.04	0.04	0.05	0.05
87,729		4.54	5.05	5.58	6.12

**Southwest Brunswick Service Area
Phase 4**

SA_ID	SA_AREA	Permanent Flow Projections			
		2005	2010	2015	2020
1	2,557	0.14	0.15	0.16	0.17
2	3,321	0.04	0.04	0.05	0.06
3	9,887	0.29	0.31	0.34	0.36
4	9,368	0.25	0.27	0.28	0.30
5	16,894	0.21	0.23	0.25	0.26
20	1,490	0.02	0.02	0.02	0.03
21	422	0.01	0.01	0.01	0.02
22	1,301	0.04	0.04	0.04	0.05
23	3,432	0.10	0.11	0.13	0.14
24	428	0.02	0.02	0.03	0.03
83	3,479	0.10	0.14	0.21	0.27
84	2,400	0.09	0.10	0.12	0.15
85	2,248	0.17	0.21	0.26	0.32
86	10,857	0.01	0.01	0.02	0.02
87	11,951	0.12	0.13	0.14	0.15
88	7,694	0.03	0.03	0.03	0.03
89	9,577	0.05	0.05	0.06	0.06
90	18,819	0.06	0.06	0.07	0.08
91	13,244	0.03	0.04	0.04	0.04
93	31,461	0.07	0.08	0.10	0.11
	160,830	1.84	2.08	2.36	2.65

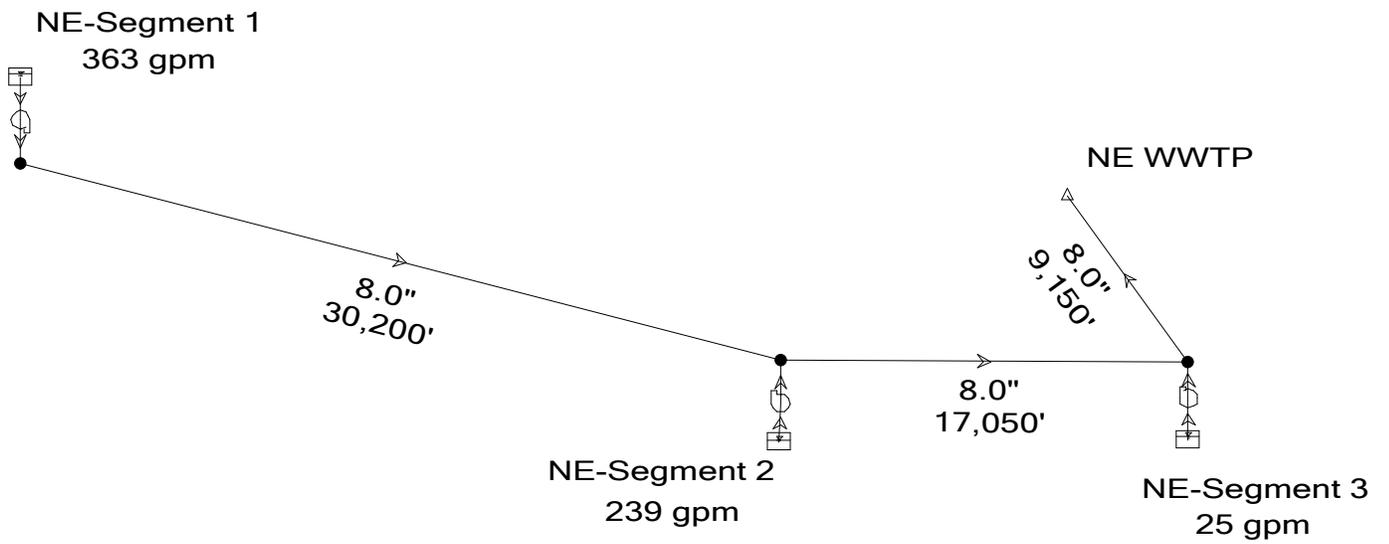
SA_ID	SA_AREA	Seasonal Flow Projections			
		2005	2010	2015	2020
1	2,557	0.63	0.66	0.69	0.73
2	3,321	0.41	0.47	0.48	0.50
3	9,887	0.61	0.66	0.72	0.78
4	9,368	1.14	1.20	1.26	1.32
5	16,894	0.72	0.84	0.96	1.08
20	1,490	0.03	0.04	0.04	0.04
21	422	0.04	0.05	0.05	0.05
22	1,301	0.11	0.13	0.14	0.15
23	3,432	0.15	0.18	0.20	0.22
24	428	0.02	0.03	0.03	0.04
83	3,479	0.14	0.20	0.30	0.38
84	2,400	0.10	0.12	0.14	0.17
85	2,248	0.20	0.25	0.30	0.37
86	10,857	0.02	0.02	0.02	0.02
87	11,951	0.17	0.18	0.20	0.21
88	7,694	0.04	0.04	0.05	0.05
89	9,577	0.07	0.07	0.08	0.09
90	18,819	0.08	0.09	0.10	0.11
91	13,244	0.05	0.05	0.06	0.06
93	31,461	0.09	0.11	0.12	0.14
	160,830	4.83	5.37	5.94	6.52

APPENDIX G

Regional Service Area Sewer System Models and Respective Pumping Station and Line Sizes

Northeast Regional Planning Area Model
Pumping Station and Line Sizes

Scenario: All Stations On



Scenario: All Stations On

NE Pump Report

Label	Design Head (ft)	Design Discharge (gpm)
NE-Seg 1	290	363
NE-Seg 2	210	239
NE-Seg 3	90	25

Scenario: All Stations On

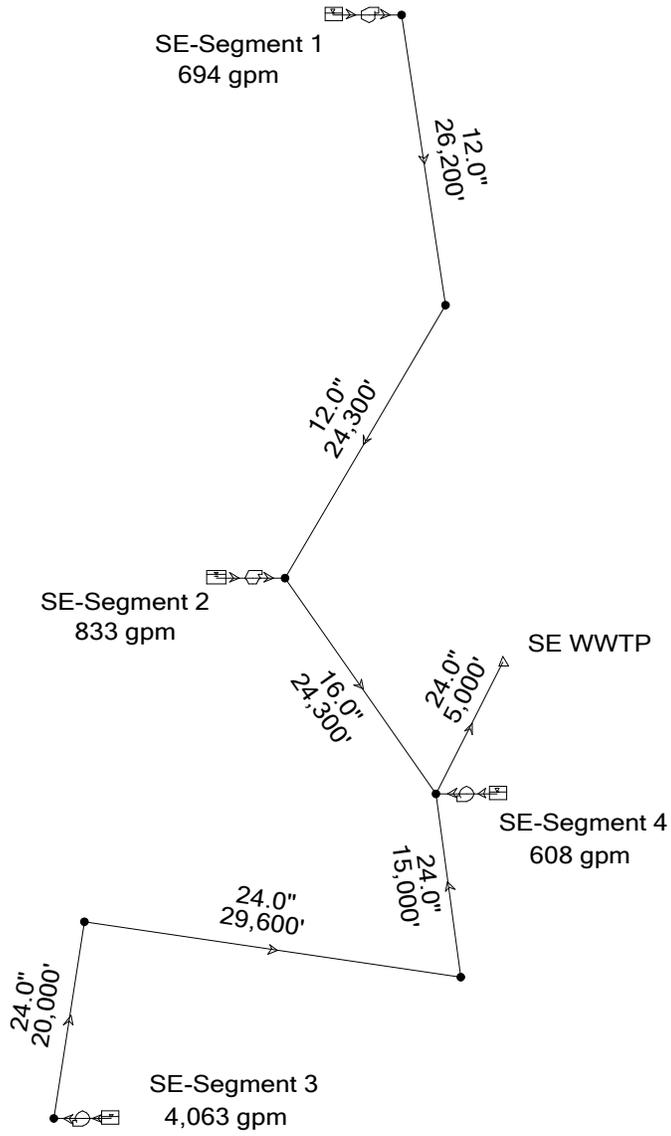
NE Pressure Pipe Report

Label	Length (ft)	Diameter (in)	Current Time Step Flow Rate (gpm)	Current Time Step Velocity (ft/s)	Hazen-Williams C
NE-Seg 1-1	30,200	8.0	360	2.30	130.0
NE-Seg 2-1	17,050	8.0	597	3.81	130.0
NE-Seg 3-1	9,150	8.0	623	3.98	130.0

Southeast Regional Planning Area Model
Pumping Station and Line Sizes

Scenario: All Stations On

16)



Scenario: All Stations On

SE Pump Report

Label	Design Head (ft)	Design Discharge (gpm)
SE-Seg 1	165	694
SE-Seg 2	95	833
SE-Seg 3	140	4,063
SE-Seg 4	50	608

Scenario: All Stations On

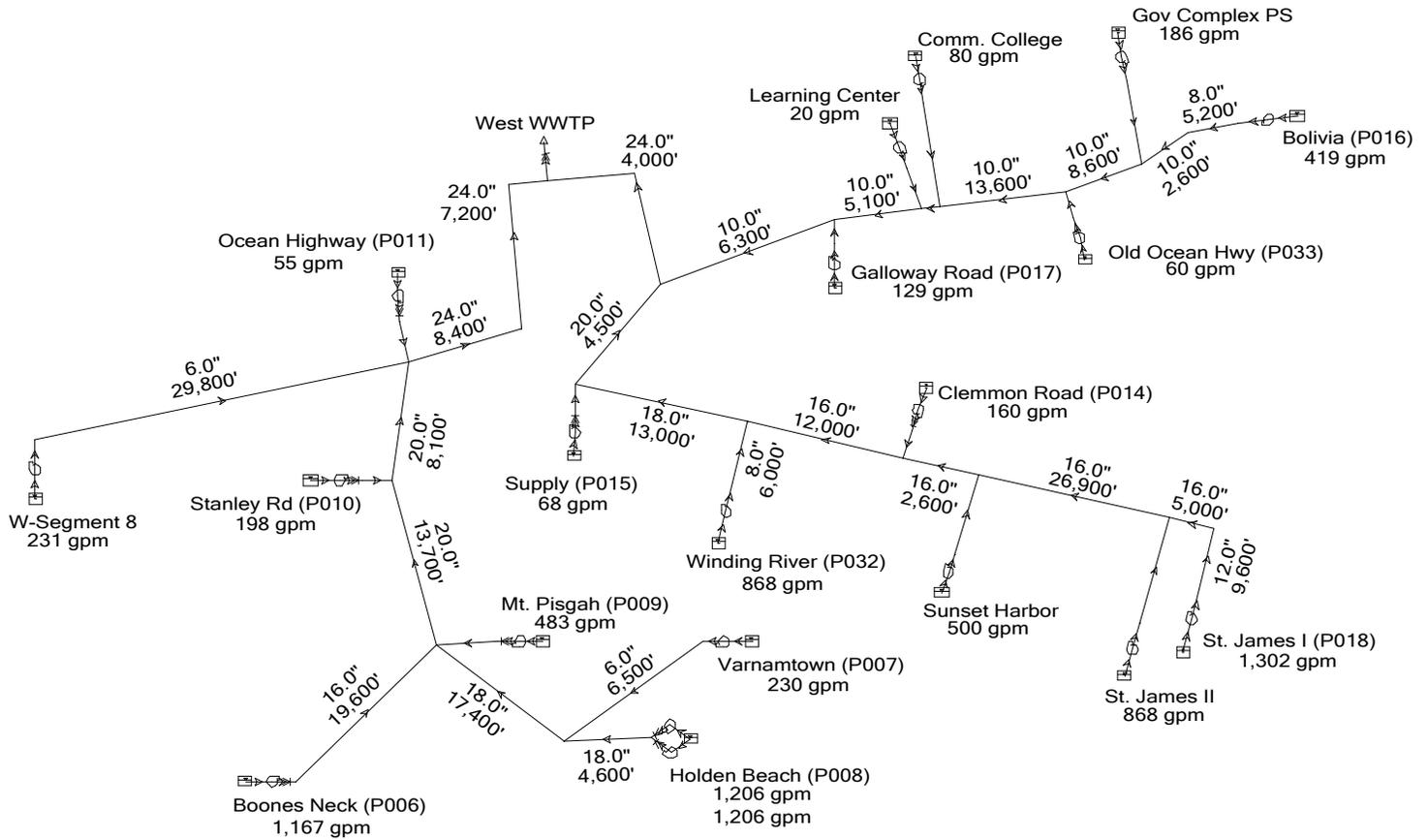
SE Pressure Pipe Report

Label	Length (ft)	Diameter (in)	Current Time Step Flow Rate (gpm)	Current Time Step Velocity (ft/s)	Hazen-Williams C
SE-Seg-3-3	15,000	24.0	4,157	2.95	130.0
SE-Seg 1-1	26,200	12.0	714	2.03	130.0
SE-Seg 1-2	24,300	12.0	714	2.03	130.0
SE-Seg 2-1	24,300	16.0	1,549	2.47	130.0
SE-Seg 3-1	20,000	24.0	4,157	2.95	130.0
SE-Seg 3-2	29,600	24.0	4,157	2.95	130.0
SE-Seg 4-1	5,000	24.0	6,348	4.50	130.0

West Regional Planning Area Model

Pumping Station and Line Sizes

Scenario: All Stations On



Scenario: All Stations On

W Pump Report

Label	Design Head (ft)	Design Discharge (gpm)
W-PMP-006-1	182	1,167
W-PMP-007-1	213	230
W-PMP-008-1	223	1,206
W-PMP-008-2	223	1,206
W-PMP-009-1	151	483
W-PMP-010-1	87	198
W-PMP-011-1	62	55
W-PMP-014-1	150	160
W-PMP-015-1	71	68
W-PMP-016-1	185	419
W-PMP-017-1	67	129
W-PMP-018-1	275	1,302
W-PMP-032-1	187	868
W-PMP-033-1	145	60
W-PMP-CC-1	100	80
W-PMP-GOV-1	170	186
W-PMP-LC-1	90	20
W-PMP-Seg 8	240	231
W-PMP-SH-1	167	500
W-PMP-SJII	280	868

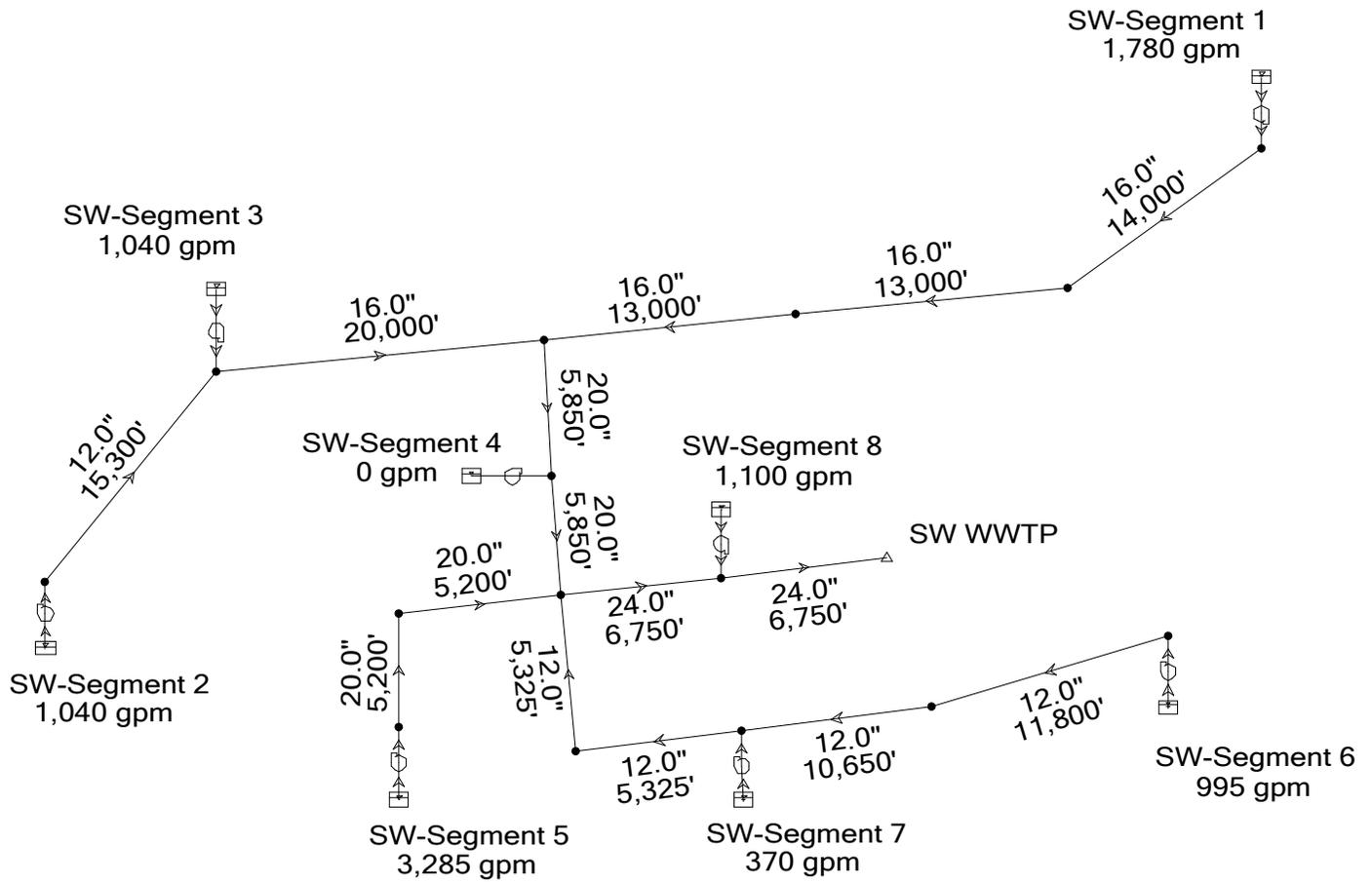
Scenario: All Stations On

W Pressure Pipe Report

Label	Length (ft)	Diameter (in)	Current Time Step Flow Rate (gpm)	Current Time Step Velocity (ft/s)	Hazen-Williams C
W-FM-6-1	19,600	16.0	1,156	1.85	130.0
W-FM-7-1	6,500	6.0	-232	2.63	130.0
W-FM-008-1	4,600	18.0	2,447	3.09	130.0
W-FM-8-2	17,400	18.0	2,680	3.38	130.0
W-FM-8-3	13,700	20.0	4,320	4.41	130.0
W-FM-8-4	8,100	20.0	4,523	4.62	130.0
W-FM-8-5	8,400	24.0	4,814	3.41	130.0
W-FM-8-6	7,200	24.0	4,814	3.41	130.0
W-FM-8-7	50	24.0	9,491	6.73	130.0
W-FM-9-1	100	10.0	484	1.98	130.0
W-FM-10-1	100	6.0	203	2.30	130.0
W-FM-11-1	100	3.0	56	2.54	130.0
W-FM-014-1	100	4.0	163	4.17	130.0
W-FM-015-1	100	3.0	68	3.09	130.0
W-FM-16-1	5,200	8.0	423	2.70	130.0
W-FM-16-2	2,600	10.0	423	1.73	130.0
W-FM-16-3	8,600	10.0	614	2.51	130.0
W-FM-16-4	13,600	10.0	675	2.76	130.0
W-FM-16-5	600	10.0	756	3.09	130.0
W-FM-16-6	5,100	10.0	776	3.17	130.0
W-FM-16-7	6,300	10.0	906	3.70	130.0
W-FM-16-8	4,000	24.0	4,677	3.32	130.0
W-FM-017-1	100	4.0	130	3.31	130.0
W-FM-18-1	9,600	12.0	1,305	3.70	130.0
W-FM-18-2	5,000	16.0	1,305	2.08	130.0
W-FM-18-3	26,900	16.0	2,172	3.47	130.0
W-FM-18-4	2,600	16.0	2,674	4.27	130.0
W-FM-18-5	12,000	16.0	2,837	4.53	130.0
W-FM-18-6	13,000	18.0	3,703	4.67	130.0
W-FM-18-7	4,500	20.0	-3,771	3.85	130.0
W-FM-032-1	6,000	8.0	866	5.53	130.0
W-FM-033-1	100	3.0	61	2.77	130.0
W-FM-CC-1	800	4.0	81	2.07	130.0
W-FM-GC-1	2,000	6.0	191	2.17	130.0
W-FM-LC-1	700	2.0	20	2.03	130.0
W-FM-Seg 8-1	29,800	6.0	235	2.66	130.0
W-FM-SH-1	100	12.0	502	1.42	130.0
W-FM-SJII-1	1,000	8.0	867	5.54	130.0

Southwest Regional Planning Area Model
Pumping Station and Line Sizes

Scenario: All Stations On



Scenario: All Stations On

SW Pump Report

Label	Design Head (ft)	Design Discharge (gpm)
PMP-SW-Seg-1	205	1,780
PMP-SW-Seg-2	215	1,040
PMP-SW-Seg-3	185	1,040
PMP-SW-Seg-4	0	0
PMP-SW-Seg-5	130	3,285
PMP-SW-Seg-6	220	995
PMP-SW-Seg-7	145	370
PMP-SW-Seg-8	60	1,100

Scenario: All Stations On

SW Pressure Pipe Report

Label	Length (ft)	Diameter (in)	Current Time Step Flow Rate (gpm)	Current Time Step Velocity (ft/s)	Hazen-Williams C
SW-Seg 1-1	14,000	16.0	1,781	2.84	130.0
SW-Seg 1-2	13,000	16.0	1,781	2.84	130.0
SW-Seg 1-3	13,000	16.0	1,781	2.84	130.0
SW-Seg 1-4	5,850	20.0	3,877	3.96	130.0
SW-Seg 2-1	15,300	12.0	1,041	2.95	130.0
SW-Seg 3-1	20,000	16.0	2,096	3.34	130.0
SW-Seg 4-1	5,850	20.0	3,877	3.96	130.0
SW-Seg 4-2	6,750	24.0	8,514	6.04	130.0
SW-Seg 5-1	5,200	20.0	3,262	3.33	130.0
SW-Seg 5-2	5,200	20.0	3,262	3.33	130.0
SW-Seg 6-1	11,800	12.0	1,005	2.85	130.0
SW-Seg 6-2	10,650	12.0	1,005	2.85	130.0
SW-Seg 7-1	5,325	12.0	1,375	3.90	130.0
SW-Seg 7-2	5,325	12.0	1,375	3.90	130.0
SW-Seg 8-1	6,750	24.0	9,654	6.85	130.0