



December 23, 2014

Technical Memorandum

To: Mr. Vic Knight
Knight Strategies

From: Jeffrey T. Brown, PE

Cc: file

Re: **Town of Lake Lure**
NC 9 Corridor Master Plan
Utility Demands



12-23-14

Brown Consultants, PA was asked to provide existing capacities and future demands for the Hwy 9 Corridor based upon Master Planning, and to comment on the existing Town water and sewer system capacities in the Hwy 9 Corridor.

Existing Capacity:

The Town owns and maintains a well water system and a sewer collection system. The existing system runs along Hwy 9, on both the western and eastern edge of the road, and runs from Hwy 64, south to Island Creek Road. The existing demands were based upon actual usage. (See Attached Exhibits).

The total existing demand on the water and sewer are an actual 3,700 gallons per day.

Sewer: The existing sewer line is an 8-inch line; based upon the minimum slope of the existing line, the line at half-full has a capacity of 1.1 million gallons a day.

Water: The Island Creek pressure zone serves the Hwy 9 corridor. The Island Creek zone is served from four (4) wells:

L22 – Vess	80 gpm
L14- Woody	50 gpm
<u>L12 & L13</u>	<u>35 gpm</u>
Total yield	165 gpm or 118,800 gpd

Note: Conversion from gpm to gpd is based upon a twelve (12) hours of pump run time per NCDENR.

Current Water Demand – Island Creek Zone

Water consumed for calendar year 2012 (from billing records) 11,710,000 GAL or 32,000 GPD

Recommended values to use for this study

Water consumed for May/June 2013	2,320,000 Gal or 38,000 GPD
Allowance for system water loss – (15% - the AWWA Standard)	5,800 GPD
Allowance for New Charter School (based upon Build Out)	12,500 GPD
Total Current Demand	56,300 GPD

Ten (10) year projected growth based upon 2010 US Census Bureau Projection of 25% 64,000 GPD

Projected Demand Hwy 9 Corridor

Current Lake Lure Demand - 2014	64,000 GPD
Projected Demand	194,505 GPD
Total Projected Demand	258,505 GPD
Current System Capacity	118,800 GPD
Excess Required Over Existing Capacity	139,705 GPD

Note: When excess capacity reaches 20%, NCDENR requires a plan on file as to how additional capacity can be developed. When excess capacity reaches 10%, NCDENR requires the plan for additional capacity to be placed into action.

Conclusion

Currently and for the Ten (10) year projection, **Lake Lure has sufficient capacity to supply the Hwy 9 corridor with sewer service.**

Lake Lure does not have the water capacity to service the planned growth for the Hwy 9 corridor. The Town of Lake Lure will have to increase water production for the Island Creek Zone by a minimum of 75% in order to meet demand and meet NCDENR requirements.

The existing 8-inch pipework/infrastructure along Hwy 9 is sufficient in size to meet the projected demands.

The existing Island Creek Tank (200,000 gallons) is sufficient to meet projected demands, but is near capacity.



BROWN CONSULTANTS, PA

30 Ben Lippen School Rd.
Asheville, NC 28806
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f: 828.350.7684

SHEET _____ OF _____ WORK BY: _____ CHK'D BY: _____
PROJECT: _____ PROJECT #: _____
SUBJECT: _____ DATE: _____

LAKE LURE - HWY 9

CAPACITY CALCULATIONS

NOV 12, 2014

PP 1-7 CALCULATIONS

EXHIBIT 1 LOCATION MAP

EXHIBIT 2 EXIST. CONDITIONS

EXHIBIT 3 NCDENR RULES

EXHIBIT 4 PLANNING MAP



NOV 12, 2014

REVISED 12/23/14



12/23/14



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SHEET 1 OF 7 WORK BY: JB CHK'D BY: _____
PROJECT: LAKE LURE HWY 9 PROJECT #: _____
SUBJECT: WSS CAPACITY DATE: Nov 2014

1) EXISTING

• MAHER = NCDEM (CALCULATED)

$$5 \text{ employee} \times 25 \text{ gpd} = 125 \text{ gpd}$$

= ACTUAL = L.L. has NOT completed a billing cycle.

• HWY 9 : NCDEM UNITS 32 X 240 gpd = 7680 gpd
APTS

$$\begin{aligned} \text{ACTUAL} & \frac{67,940}{25 \text{ units}} = 2717 \text{ gal/unit} \\ & \frac{2717 \text{ gal/unit}}{60 \text{ days}} = 45 \text{ gal/day/unit} \end{aligned}$$

$$\therefore 45 \times 32 = \underline{1440 \text{ gal/day}}$$

• INGRES : ACTUAL *Lake Lure USAGE 2320 gpd

• CHURCH : WATER ONLY

$$< 1000 \text{ gal} / 2 \text{ mo} = 13 \text{ gpd}$$

$$\text{NCDEM} = 100 \times 5 = 500 \text{ gpd}$$



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SHEET 2 OF 7 WORK BY: JB CHK'D BY: _____
PROJECT: LL HWY 9 PROJECT #: _____
SUBJECT: W & S Capacities DATE: NOV 2018

1. Assisted living ~~85~~ 120 gal/hd
2. Proffers
75,000 50,000 sq ft.
e 175 sq ft/person * 280 people
428 people 25 gal/person
- 2A. COMMERCIAL/SPECIAL RETAIL 15,000 sq ft. e 86 people
3. Multifamily
res 128 units 280 gal/unit
96 UNITS
4. Mixed Use
Commercial 400 units } 200 RES e 280 gal
200,000 sq ft. } 100,000 sq ft
120 gal / 1000 sq ft } 120 gal / 1000 sq ft.
- ✓ 5. HOTEL 80 120 gal/room
- ✓ 6. SINGLE FAMILY 30 400 gal/dw
- ✓ 7. SINGLE FAMILY 100 ± 50 units
- ✓ 8. Neighborhood Mixed 130,000 sq ft 50,000
120 gal / 1000 sq ft



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SHEET 3 OF 7 WORK BY: JB CHK'D BY: _____
PROJECT: HL-HW 99 PROJECT #: _____
SUBJECT: WES Capacity DATE: NOV 2018

~~9~~ ~~8~~. ~~conced~~ 10,000 S.F.
120 /¹⁰⁰S.F.

~~10~~ ~~9~~. Civic (Library) 2440 gpd

~~11~~ ~~10~~. Sports Center 300 people day x 5gal 1320 gpd

~~12~~ ~~11~~. Resort Hotel 125 rooms 175 gal/room.

~~13~~ ~~12~~. H.H. Academy 850 students
x 15 gpd $\frac{12750 \text{ gpd}}{1440} \times 2.5 = 22.13 \text{ gpm}$
or
31875 gpd

~~14~~ ~~13~~. Convenience store w/ GAS 250 gal / water closet

8 H₂O closets → 8 x 250 gpd

~~15~~ ~~14~~. Office Park 50,000 sqft. / 175 = 286 people



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SHEET 4 OF 7 WORK BY: JB CHK'D BY: _____
PROJECT: LL HWY 9 PROJECT #: _____
SUBJECT: W.S. Improvements DATE: 10/24/2014

SEWER

EXISTING 8-INCH

CALCULATION OF SEWER LINE FLOW AT ANY DEPTH

PIPE DIAMETER = 8 INCHES = 0.67 FEET
FLOW DEPTH = 5 INCHES = 0.42 FEET 0.6 DEPTH RATIO
MANNING'S n = 0.013
PIPE GRADE = 8.51 FEET PER 100 FEET
THETA (FLOW ANGLE) = 3.65 RADIANS
FLOW AREA = 0.23 SQ. FEET
HYDRAULIC RADIUS = 0.19 FEET
PIPE FLOW = 2.52 CU. FT. PER SEC.
1,130.4 GAL. PER MIN.
1,627,786 GAL. PER DAY
VELOCITY = 10.97 FT. PER SEC.

PIPE SIZE (In.) =		
PIPE GRADE (FT. / 100 FT.) =		
DEPTH RATIO	DEPTH (INCHES)	FLOW (GPD)
0.1	0.8	47,568
0.2	1.6	199,520
0.3	2.4	446,177
0.4	3.2	767,785
0.5	4.0	1,139,188
0.6	4.8	1,530,705
0.7	5.6	1,907,542
0.8	6.4	2,227,037
0.9	7.2	2,428,287
1.0	8.0	2,278,376

MINIMUM PIPE GRADES	
PIPE SIZE (In.)	MINIMUM GRADE
6	0.50
8	0.34
10	0.24
12	0.20
15	0.14
>15"	0.10

• NCDENR DESIGN REQ'D 1/2 FULL
AVERAGE DAILY FLOWS.

**Lake Lure
Hwy 9
Water and Sewer Demands
REVISED December 22, 2014**

Existing		NCDENR		
		No.	demand	Total
	Unit	units	gal/unit	gpd
1	Mahec	5	25	125
2	Hwy 9 Apts	32	240	7680
3	Ingles	1		2300
4	Church	100	5	500
TOTAL				10605

	Proposed	No.	demand	Total
	Unit	units	gal/unit	gpd
1	assisted living	85	120	10200
2	Professional Office	286	25	7150
2a	special retail	86	25	2150
3	multi-family	96	280	26880
4	mixed use commercial			
4a	commercial space	100000	120	12000
4b	residential (APTS)	200	280	56000
5	hotel	80	120	9600
6	single family	30	400	12000
7	single family	50	400	20000
8	neighborhood commercial	50000	120	6000
9	commercial	0	120	0
10	civic	0	2640	0
11	sports center	300	5	1500
12	Resort Hotel	125	175	21875
13	LL Academy	850	15	12750
14	convenience store/gas	8	250	2000
15	office park	286	25	7150
TOTAL				207255

total combined 217860

NC 9 Corridor Study
Lake Lure, North Carolina
Future Trip Generation Analysis

Land Use Code	Land Use	Method	Unit and Size				Weekday						Weekend			
			Units	Square Feet	Students	Staff	Beds	ADT	%	In	Out	In	Out	SAT ADT	In	Out
Beginning at Northwest corner of Highway 9 and NC 64/74A																
64	A Assisted Living	Weighted					85	233	1.41%	10	4	13	12	187	15	15
750	B Office Park	Equation		50,000				795	4.83%	202	25	26	161			
626	C Specialty Retail	Equation		15,000				679	4.12%	-	-	25	32		-	-
220	D Multi Family Apartments	Equation	96				80	705	4.28%	10	41	46	25	497		
710	E Hotel	Equation						343	2.08%	19	12			475	33	26
Mixed Use Commercial Center																
220	F Apartments	Equation	100					730	0.00%	11	42	47	25	529		
220	G Second Level Apartments	Equation	-					-	0.00%	20	81	83	45	1,314		
224	H Town Home-Residential-Owner Occupied	Equation	100					643	3.90%	9	43	40	20	790	39	33
820	I Shopping Center	Equation		-				-	0.00%	141	90	496	516	14,299	699	645
826	N Specialty Retail (Neighborhood Commercial)	Equation		100,000				4,316	26.21%							
210	J Single Family Residential	Equation	30					343	2.08%	8	23	22	13	337	19	17
Beginning at Northeast corner of Highway 9 and NC 64/74A																
330	K Resort Hotel	Equation					125	587	3.56%	34	13	26	35	1,679		
536	L Private School (K-12)	MSTA School			1,500	165		2,489	15.11%	1,088	845	513	546			
853	M Conv. Market with Gas Pump	Weighted		2 pumps				1,085	6.59%	220	220	299	299	14,483	234	225
826	N Specialty Retail (Neighborhood Commercial)	Equation		50,000				2,177	13.22%			149	189			
750	O Office Park	Equation		50,000				795								
210	O Single Family Residential Detached Housing	Equation	50					550	3.34%	20	60	66	39	1,059	52	48
On US 64/74A with impact on Hwy 9 Corridor																
488	P Soccer Complex	Local Data														
TOTAL								16,470	100.00%							

SA/7

Cast Iron and New Steel Pipe (Continued)

Extra strong steel sch 80			Schedule 160—steel		
5.761" inside dia			5.187" inside dia		
Velocity ft per sec	Head loss ft per 100 ft	Head loss ft per 100 ft	Velocity ft per sec	Head loss ft per 100 ft	Head loss ft per 100 ft
.62	.01	.032	.759	.009	.053
.74	.01	.044	.911	.013	.073
.86	.01	.058	1.06	.018	.096
.98	.01	.074	1.22	.023	.123
1.1	.02	.091	1.37	.029	.152
23	.02	.110	1.52	.036	.184
48	.03	.154	1.82	.052	.256
72	.05	.203	2.13	.070	.340
97	.06	.260	2.43	.092	.435
122	.08	.323	2.73	.116	.522
46	.09	.392	3.04	.143	.635
71	.11	.451	3.34	.173	.760
96	.14	.530	3.64	.206	.895
120	.16	.616	3.95	.242	1.04
145	.19	.708	4.25	.281	1.20
39	.21	.807	4.56	.322	1.36
64	.24	.911	4.86	.366	1.54
89	.27	1.02	5.16	.414	1.73
113	.31	1.14	5.47	.464	1.93
138	.34	1.26	5.77	.517	2.14
3	.38	1.39	6.07	.572	2.36
4	.48	1.74	6.82	.725	2.95
6	.59	2.13	7.59	.894	3.61
7	.71	2.55	8.35	1.08	4.34
9	.85	3.02	9.11	1.29	5.13
0	.99	3.52	9.87	1.51	5.99
3	1.16	4.06	10.63	1.75	6.92
4	1.33	4.64	11.39	2.01	7.91
5	1.51	5.25	12.15	2.29	8.96
5	1.7	5.90	12.91	2.59	10.1
1	1.9	6.60	13.67	2.90	11.3
2	2.1	7.33	14.42	3.23	12.5
3	2.4	8.09	15.18	3.58	13.8
4	2.8	9.74	16.71	4.33	16.7
5	3.4	11.5	18.22	5.15	19.8
4	4.0	13.5	19.74	6.05	23.1
6	4.6	15.6	21.26	7.01	26.7
8	5.3	17.8	22.78	8.05	30.6
10	6.0	20.3	24.29	9.16	34.7
12	6.8	22.8	25.81	10.34	39.1
14	7.7	25.5	27.33	11.59	43.8
16	8.4	28.4	28.85	12.92	48.7
18	9.4	31.4	30.37	14.31	53.9
20	11.4	37.9	33.40	17.32	65.0
22	13.6	44.9	36.44	20.61	77.2

eter, or any abnormal condition of interior
conditions and the requirements of each
ial design purposes a safety factor of 15 to

Friction of Water

Asphalt-dipped Cast Iron and New Steel Pipe (Based on Darcy's Formula)

8 Inch

Flow U S gal per min	Asphalt-dipped cast iron			Std wt steel sch 40			Extra strong steel sch 80			Schedule 160—steel		
	8.0" inside dia			7.981" inside dia			7.625" inside dia			6.813" inside dia		
	Velocity ft per sec	Head loss ft per 100 ft	Head loss ft per 100 ft	Velocity ft per sec	Head loss ft per 100 ft	Head loss ft per 100 ft	Velocity ft per sec	Head loss ft per 100 ft	Head loss ft per 100 ft	Velocity ft per sec	Head loss ft per 100 ft	Head loss ft per 100 ft
130	.83	.011	.037	.83	.011	.036	.91	.01	.046	1.14	.020	.079
140	.89	.012	.042	.90	.013	.042	.98	.01	.052	1.23	.024	.090
150	.96	.014	.048	.96	.014	.047	1.05	.02	.059	1.32	.027	.102
160	1.02	.016	.054	1.03	.016	.053	1.12	.02	.066	1.41	.031	.115
170	1.08	.018	.060	1.09	.018	.059	1.19	.02	.074	1.50	.035	.128
180	1.15	.021	.067	1.15	.021	.066	1.26	.02	.082	1.58	.039	.142
190	1.21	.023	.074	1.22	.023	.073	1.33	.03	.091	1.67	.043	.157
200	1.28	.025	.082	1.28	.026	.080	1.41	.03	.099	1.76	.048	.172
220	1.40	.031	.098	1.41	.031	.095	1.55	.04	.118	1.94	.058	.205
240	1.53	.037	.115	1.54	.037	.111	1.69	.04	.139	2.11	.069	.241
260	1.66	.043	.134	1.67	.043	.128	1.83	.05	.161	2.29	.081	.279
280	1.79	.050	.154	1.80	.050	.147	1.97	.06	.184	2.46	.094	.320
300	1.91	.057	.175	1.92	.058	.167	2.11	.07	.209	2.64	.108	.350
350	2.23	.077	.235	2.24	.089	.222	2.46	.09	.278	3.08	.147	.467
400	2.55	.101	.303	2.57	.102	.284	2.81	.12	.343	3.52	.192	.601
450	2.87	.128	.380	2.89	.129	.341	3.16	.15	.428	3.96	.243	.750
500	3.19	.158	.465	3.21	.160	.416	3.51	.19	.522	4.40	.301	.916
550	3.51	.191	.559	3.53	.193	.497	3.86	.23	.625	4.84	.364	1.10
600	3.83	.228	.661	3.85	.230	.586	4.22	.28	.736	5.28	.433	1.30
650	4.15	.267	.772	4.17	.271	.682	4.57	.32	.857	5.72	.508	1.51
700	4.47	.310	.891	4.49	.313	.785	4.92	.38	.986	6.16	.589	1.74
750	4.79	.356	1.02	4.81	.360	.895	5.27	.43	1.13	6.60	.676	1.98
800	5.11	.405	1.16	5.13	.409	1.01	5.62	.49	1.27	7.04	.769	2.24
850	5.42	.457	1.30	5.45	.462	1.14	5.97	.55	1.43	7.48	.869	2.52
900	5.74	.513	1.45	5.77	.518	1.27	6.32	.62	1.59	7.92	.974	2.81
950	6.06	.571	1.61	6.09	.577	1.40	6.67	.69	1.77	8.36	1.09	3.12
1000	6.38	.633	1.78	6.41	.639	1.55	7.03	.77	1.95	8.80	1.20	3.45
1100	7.02	.766	2.15	7.05	.773	1.86	7.83	.95	2.34	9.68	1.46	4.14
1200	7.66	.911	2.55	7.70	.920	2.20	8.43	1.10	2.77	10.56	1.73	4.91
1300	8.30	1.07	2.98	8.34	1.08	2.56	9.13	1.30	3.23	11.44	2.03	5.73
1400	8.93	1.24	3.45	8.98	1.25	2.96	9.83	1.5	3.73	12.32	2.36	6.62
1500	9.57	1.42	3.95	9.62	1.44	3.38	10.5	1.7	4.26	13.20	2.71	7.57
1600	10.2	1.62	4.48	10.3	1.64	3.83	11.2	2.0	4.83	14.08	3.08	8.58
1800	11.5	2.05	5.65	11.5	2.07	4.81	12.6	2.5	6.07	15.84	3.90	10.8
2000	12.8	2.53	6.96	12.8	2.56	5.91	14.1	3.1	7.46	17.60	4.81	13.3
2200	14.0	3.06	8.40	14.1	3.09	7.11	15.5	3.7	8.98	19.36	5.82	16.0
2400	15.3	3.65	9.98	15.4	3.68	8.43	16.9	4.4	10.6	21.12	6.92	19.0
2600	16.6	4.28	11.7	16.7	4.32	9.85	18.3	5.2	12.4	22.88	8.13	22.2
2800	17.9	4.96	13.5	18.0	5.01	11.4	19.7	6.0	14.4	24.64	9.43	25.7
3000	19.1	5.70	15.5	19.2	5.75	13.0	21.1	6.9	16.5	26.40	10.82	29.4
3500	22.3	7.70	21.1	22.4	8.9	17.6	24.6	9.4	22.3	30.80	14.73	39.8
4000	25.5	10.1	27.4	25.7	10.2	22.9	28.1	12.3	29.0	35.20	19.23	51.8
4500	28.7	12.8	34.7	28.9	12.9	28.9	31.6	15.5	36.6	39.60	24.34	65.4
5000	31.9	15.8	42.7	32.1	16.0	35.6	35.1	19.1	45.0	44.00	30.05	80.6
5500	35.1	19.1	51.7	35.3	19.3	43.0	38.6	23.2	54.4	48.40	36.36	97.3

Note: No allowance has been made for age, difference in diameter, or any abnormal condition of interior surface. Any factor of safety must be estimated from the local conditions and the requirements of each particular installation. It is recommended that for most commercial design purposes a safety factor of 15 to 20% be added to the values in the tables—see page 3-5.

6/7



BROWN CONSULTANTS, PA

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SHEET 7 OF 7 WORK BY: JB

PROJECT: hh HWY 9

SUBJECT: W-S capacity

CHK'D BY: _____

PROJECT #: _____

DATE: Nov 2014

- EXISTING W.L.

: H_L on 8-inch w/h @ 150 gpm = .021 ft/100 ft

$\therefore @ \frac{3500}{100} \text{ i.f.} \times .021 \text{ ft} = .735 \text{ ft } H_L$

\therefore 8-INCH W/H IS O.K.

- EXISTING TANK - Island Creek

o PER ACDENR 15A: 18C .0800 / .0805

- TANK shall provide $\frac{1}{2}$ average daily demand +
fire flow

= $260,800 / 2 + 60,000 = 190,400$ GALLONS

o \therefore Island Creek is O.K. \Rightarrow BUT
AT CAPACITY.



EX. GRAVITY SEWER

EX. 8" WATERLINE

ISLAND CREEK
WATER TANK

500

Feet

LOCATION MAP



EXHIBIT No 1



INGLES
APTS
MAHEC

WATER TANK

CHURCH

EXISTING CONDITIONS - 2014
N.T.S.

EXHIBIT 2

TITLE 15A - DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES

CHAPTER 18 - ENVIRONMENTAL HEALTH

SUBCHAPTER 18A - SANITATION

SECTION .1900 - SEWAGE TREATMENT AND DISPOSAL SYSTEMS

Rules .1901 - .1968 of Title 15A Subchapter 18A of the North Carolina Administrative Code (T15A.18A .1901 - .1968); has been transferred and recodified from Rules .1901 - .1968 of Title 10 Subchapter 10A of the North Carolina Administrative Code (T10.10A .1901 - .1968), effective April 4, 1990.

15A NCAC 18A .1901	PURPOSE
15A NCAC 18A .1902	PROPER DISPOSAL
15A NCAC 18A .1903	DEFINITIONS
15A NCAC 18A .1904	SEWAGE DISPOSAL REQUIREMENTS
15A NCAC 18A .1905	PRIVY AND SEPTIC TANK CONSTRUCTION
15A NCAC 18A .1906	PREFABRICATED TANKS
15A NCAC 18A .1907	MINIMUM STANDARDS FOR PREFABRICATED SEPTIC TANKS
15A NCAC 18A .1908	SITE EVALUATION
15A NCAC 18A .1909	APPLICATION RATES
15A NCAC 18A .1910	SITE CLASSIFICATION
15A NCAC 18A .1911	SPACE REQUIREMENTS
15A NCAC 18A .1912	LOCATION OF SEPTIC TANK SYSTEMS AND PRIVIES
15A NCAC 18A .1913	MAINTENANCE OF PRIVIES
15A NCAC 18A .1914	MAINTENANCE OF SEPTIC TANK SYSTEMS
15A NCAC 18A .1915	PERMITS
15A NCAC 18A .1916	RESPONSIBILITIES
15A NCAC 18A .1917	TECHNICAL GUIDE
15A NCAC 18A .1918	SITE FACTORS
15A NCAC 18A .1919	TOPOGRAPHY
15A NCAC 18A .1920	SOIL CHARACTERISTICS
15A NCAC 18A .1921	PERCOLATION TESTS
15A NCAC 18A .1922	DETERMINATION OF SOIL SUITABILITY
15A NCAC 18A .1923	AVAILABLE SPACE
15A NCAC 18A .1924	OTHER APPLICABLE FACTORS
15A NCAC 18A .1925	ESTIMATES OF SEWAGE QUANTITIES
15A NCAC 18A .1926	POSSIBLE MODIFICATIONS OF INITIAL CLASSIFICATIONS
15A NCAC 18A .1927	INTERPRETATION AND TECHNICAL ASSISTANCE
15A NCAC 18A .1928	APPLICABILITY OF RULES
15A NCAC 18A .1929	EXEMPTION
15A NCAC 18A .1930	DISUSE OF SEWAGE SYSTEM
15A NCAC 18A .1931	VIOLATIONS
15A NCAC 18A .1932	CONFLICTING RULES REPEALED
15A NCAC 18A .1933	SEVERABILITY

History Note: Authority G.S. 130-160; 166.23 through 166.28;
Eff. July 1, 1977;
Readopted Eff. December 5, 1977;
Amended Eff. July 1, 1982; March 31, 1981; June 30, 1980;
Repealed Eff. July 1, 1982.

15A NCAC 18A .1934 SCOPE

The rules contained in this Section shall govern the treatment and disposal of domestic type sewage from septic tank systems, privies, incinerating toilets, mechanical toilets, composting toilets, recycling toilets, or other such systems serving single or

considered a bedroom for design purposes. When the occupancy of a dwelling unit exceeds two persons per bedroom, the volume of sewage shall be determined by the maximum occupancy at a rate of 60 gallons per person per day.

(b) Table No. I shall be used to determine the minimum design daily flow of sewage required in calculating the design volume of sanitary sewage systems to serve selected types of establishments. The minimum design volume of sewage from any establishment shall be 100 gallons per day. Design of sewage treatment and disposal systems for establishments not identified in this Rule shall be determined using available flow data, water-using fixtures, occupancy or operation patterns, and other measured data.

TABLE NO. I

TYPE OF ESTABLISHMENT	DAILY FLOW FOR DESIGN
Airports (Also R.R. stations, bus terminals --not including food service facilities)	5 gal/passenger
Barber Shops	50 gal/chair
Bars, Cocktail Lounges (Not including food service)	20 gal/seat
Beauty Shops (Style Shops)	125 gal/chair
Bowling Lanes	50 gal/lane
Businesses (other than those listed elsewhere in this table)	25 gal/employee
Camps	
Construction or Work Camps	60 gal/person
	40 gal/person (with chemical toilets)
Summer Camps	60 gal/person
Campgrounds -- With Comfort Station (Without water and sewer hookups)	100 gal/campsite
Travel Trailer/Recreational Vehicle Park (With water and sewer hookups)	120 gal/space
Churches (Not including a Kitchen, Food Service Facility, Day Care or Camp)	3 gal/seat
Churches (With a Kitchen but, not including a Food Service Facility, Day Care, or Camp)	5 gal/seat
Country Clubs	20 gal/member
Day Care Facilities	15 gal/person
Factories (Exclusive of industrial waste)	25 gal/person/shift
Add for showers	10 gal/person/shift
Food Service Facilities	
Restaurants	40 gal/seat or 40 gal/15 ft ² of dining area, whichever is greater
24-hour Restaurant	75 gal/seat
Food Stands	
(1) Per 100 square feet of food stand floor space	50 gal
(2) Add per food employee	25 gal
Other Food Service Facilities	5 gal/meal
Hospitals	300 gal/bed
Marinas	10 gal/boat slip
With bathhouse	30 gal/boat slip
Meat Markets	
(1) Per 100 square feet of market floor space	50 gal
(2) Add per market employee	25 gal
Motels/Hotels	120 gal/room
With cooking facilities	175 gal/room
Offices (per shift)	25 gal/person

Residential Care Facilities	60 gal/person
Rest Homes and Nursing Homes	
With laundry	120 gal/bed
Without laundry	60 gal/bed
Schools	
Day Schools	
With cafeteria, gym, and showers	15 gal/student
With cafeteria only	12 gal/student
With neither cafeteria nor showers	10 gal/student
Boarding Schools	60 gal/person
Service Stations	250 gal/water closet or urinal
24-hour Service Stations	325 gal/water closet
Stores, Shopping Centers, and Malls	
(Exclusive of food service and meat markets)	120 gal/1000 ft ² of retail sales area
Stadium, Auditorium, Theater, Drive-in	5 gal/seat or space
Swimming Pools, Spas, and Bathhouses	10 gal/person

(c) An adjusted design daily sewage flow may be granted by the local health department upon a showing as specified in Subparagraphs (c)(1) through (c)(2) that a sewage system is adequate to meet actual daily water consumption from a facility included in Paragraph (b) of this Rule.

- (1) Documented data from that facility or a comparable facility justifying a flow rate reduction shall be submitted to the local health department and the State. The submitted data shall consist of at least 12 previous consecutive monthly total water consumption readings and at least 30 consecutive daily water consumption readings. The daily readings shall be taken during a projected normal or above normal sewage flow month. A peaking factor shall be derived by dividing the highest monthly flow as indicated from the 12 monthly readings by the sum of the 30 consecutive daily water consumption readings. The adjusted design daily sewage flow shall be determined by taking the numerical average of the greatest ten percent of the daily readings and multiplying by the peaking factor. Further adjustments shall be made in design sewage flow rate used for sizing nitrification fields and pretreatment systems when the sampled or projected wastewater characteristics exceed those of domestic sewage, such as wastewater from restaurants or meat markets.
- (2) An adjusted daily sewage flow rate may be granted contingent upon use of extreme water-conserving fixtures, such as toilets which use 1.6 gallons per flush or less, spring-loaded faucets with flow rates of one gallon per minute or less, and showerheads with flow rates of two gallons per minute or less. The amount of sewage flow rate reduction shall be determined by the local health department and the State based upon the type of fixtures and documentation of the amount of flow reduction to be expected from the proposed facility. Adjusted daily flow rates based upon use of water-conserving fixtures shall apply only to design capacity requirements of dosing and distribution systems and nitrification fields. Minimum pretreatment capacities shall be determined by the design flow rate of Table I of this Rule.

History Note: Authority G.S. 130A-335(e);
Eff. July 1, 1982;
Amended Eff. January 1, 1990; January 1, 1984.

15A NCAC 18A .1950 LOCATION OF SANITARY SEWAGE SYSTEMS

(a) Every sanitary sewage treatment and disposal system shall be located at least the minimum horizontal distance from the following:

- (1) Any private water supply source, including any well or spring 100 feet;
- (2) Any public water supply source 100 feet;
- (3) Streams classified as WS-I 100 feet;
- (4) Waters classified as S.A. 100 feet, from mean high water mark;
- (5) Other coastal waters 50 feet, from



5. COMPREHENSIVE DEVELOPMENT REPORT (CDR)

This report provides a detailed, integrated analysis of the Plank County area, including a review of the existing conditions, a description of the proposed development, and a summary of the findings and recommendations. The report is organized into five main sections: Introduction, Existing Conditions, Proposed Development, Findings, and Recommendations. The following table provides a summary of the key findings and recommendations from the report.

Section	Findings	Recommendations
Introduction	The Plank County area is a rapidly growing region with a diverse mix of land uses and a strong economic base. The proposed development is a key component of the county's long-term growth strategy.	Continue to support the proposed development and ensure that it is integrated with the county's overall growth plan.
Existing Conditions	The existing conditions in the Plank County area include a mix of residential, commercial, and industrial land uses. The area is characterized by a high density of development and a strong infrastructure base.	Continue to support the existing development and ensure that it is integrated with the county's overall growth plan.
Proposed Development	The proposed development is a large-scale, multi-phase project that will include a mix of residential, commercial, and industrial land uses. The project is designed to be integrated with the county's overall growth plan and to provide a high-quality development experience.	Continue to support the proposed development and ensure that it is integrated with the county's overall growth plan.
Findings	The findings of the report indicate that the proposed development is a key component of the county's long-term growth strategy and that it is integrated with the county's overall growth plan. The report also identifies a number of key findings and recommendations that will help to ensure the success of the project.	Continue to support the proposed development and ensure that it is integrated with the county's overall growth plan.
Recommendations	The recommendations of the report are designed to help ensure the success of the proposed development and to provide a high-quality development experience. The recommendations include a number of key findings and recommendations that will help to ensure the success of the project.	Continue to support the proposed development and ensure that it is integrated with the county's overall growth plan.

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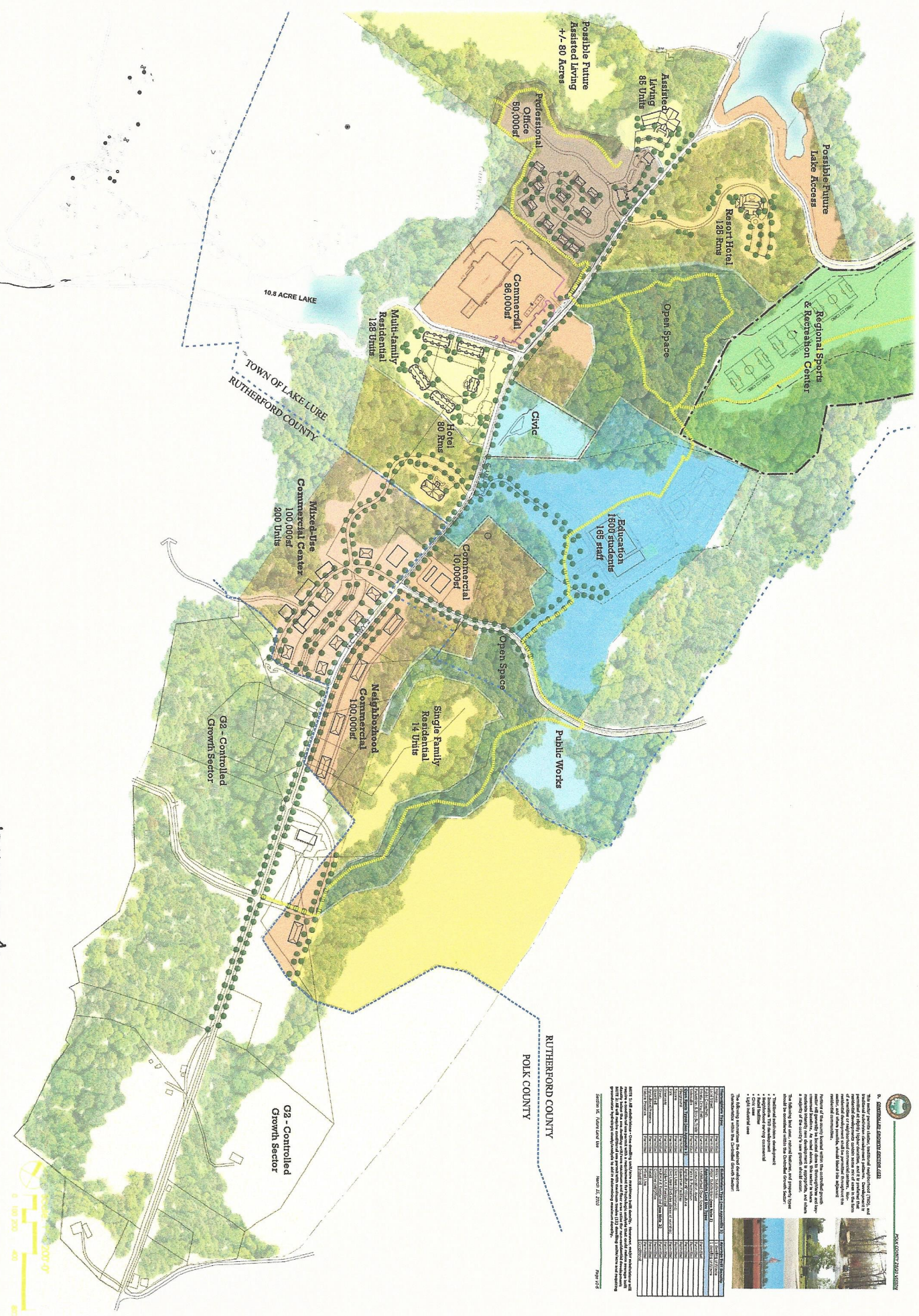


EXHIBIT 4
HWY 9 Commercial Corridor Study
SMALL AREA PLAN