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NO. 49

## Report On A System of Sanitary Sewers For The Town of Graham, N. C.

BY SOLOMON-NORCROSS CO., CONSULTING ENGINEERS  
ATLANTA, GA.

To THE HONORABLE MAYOR AND COMMISSIONERS OF THE CITY OF GRAHAM, N. C. Gentlemen:

In conformity with your instructions, we have made a survey of the City of Graham, and outlying section, for the purpose of determining the best manner for providing the City with adequate system of Sanitary Sewers. Attached hereto is our report, with estimates of cost, and such other information as you will need in presenting this matter to your citizens. The study of the sanitary and topographical features, both in the city and surrounding country, has been thorough, and we believe that a sewer system constructed as recommended in the accompanying plans and report will best serve the present need of the city and anticipate the probable needs of the future, as far as it is reasonably possible.

Very respectfully,  
SOLOMON-NORCROSS CO.

### PREAMBLE

Under authorization granted by the Honorable Mayor and Commissioners of the City of Graham, on September 12, 1919, Surveys and Investigations were made from which were prepared preliminary plans and estimates of cost for the construction of a Sanitary Sewerage System.

The result of these investigations, together with Preliminary Plans and Estimates, are submitted herewith:

### CITY OF GRAHAM, N. C.:

Graham is situated in the Haw River Drainage Basin on a ridge between Town Branch and Little Alamance Creek. The general elevation of the city is between 600 and 650 feet above sea level. It is suburban and residential in character, the principal industries consist of four cotton mills, widely separated, except for two, and these with their contiguous operatives home for three mill centers.

The corporate limits are for the most part south of the Southern Railroad and comprise an area of about 950 acres. About 60 per cent. of this has been developed by streets, and the remainder is in farmland. One principal thoroughfare, Main Street, runs from the railroad, in a southeasterly direction, to the center of the city, and thence southerly to the Court House Square and continues to the south corporate limits. Graham is the County Seat of Alamance County and aside from its cotton industries is the center of a well developed agricultural section.

Buildings as a rule are substantial and well kept. Streets are well maintained. Natural drainage conditions are excellent, but with the exception of a few individual cases, no attempt has been made to provide for the sanitary disposal of sewage.

### TOPOGRAPHY:

The City is for the most part situated on ridges dividing Town Branch from Dye Branch and Little Alamance Creek: Main Street is located along the crest of the main ridge, running North and South; another ridge leading to the West along College Street, and another to the East along Hardin Street, divides the city into four separate drainage districts.

The Northwest district (A) slopes rapidly to the Westward and drains into Little Alamance Creek, the Southwest district (B) slopes to the Southwest, and drains into Dye Branch, the Southeast district (C) slopes to the Southeast and is the source of Town Branch. In general the difference in elevation between the low points in these districts and the ridge is about fifty feet.

Four natural drainage districts are thus formed with Main Street as the approximate dividing line, North and South, and with East Hardin and College Streets as the dividing line running East and West, respectively.

Town Branch is seen, by referring to Plate No. 2, to discharge into Haw River, about three and one half miles from the city, whereas the waters of Little Alamance Creek flow about six miles before reaching the river.

### POPULATION:

The population of Graham in 1890 was 991, in 1900, 2052 and in 1910 2504: A very slow growth is shown: Improvements in sanitary conditions, together with the development of the textile industry, should, however, add materially to the population within the next few years.

Based upon census records, the population of the City in 1940 would be less than 4000, if past rates of increase were maintained. However, after consideration of the development of Graham in the past two years, and the recent general rapid increase in the Cities and Towns throughout the South, Chart No. 2 indicates that it is reasonable to expect that the City will develop approximately as shown.

In the design of the system, a growth along these lines was contemplated, and the City will be amply served by the construction of the system as shown upon the accompanying maps.

### SANITARY CONDITIONS:

Most of the sanitary sewage is at present disposed of by cesspools or vaults. In the business section, a sewer leading from the Court House Westward to Dye Branch, affords some relief to that locality, and a sewer discharging towards Town Branch, serves a few homes north of East Hardin Street. Two mills discharge their waste and sewage into Dye Branch, another into Little Alamance Creek, and another to Town Branch. The discharge of this sewage has always been a source of trouble and of some litigation.

The discharge of raw sewage practically within the city limits forms a menace to the health of the community, and is extremely objectionable and detrimental from the standpoint of the future growth and expansion of the City: Under certain atmospheric conditions the odors from cesspools and sewage are very noticeable and give rise to conditions no longer tolerated in progressive communities.

### WATER SUPPLY:

Water for Graham is furnished the City by a private corporation, The Graham Water and Electric Co. The supply is obtained from deep wells, pumped into an elevated steel tank, and distributed by gravity thru cast and galvanized iron mains: The Company reports at the present time a daily consumption of approximately 300,000 gallons.

The consumption will probably increase after the installation of sewers, but the water should be able to meet any anticipated demand of the near future by drilling one or more additional wells, and also adding one new deep well pumping head. The addition of this new pumping head, and one or more deep wells, properly equipped, would provide sufficient water for some time.

Graham, N. C. is one of the few American municipalities that can boast of a fully metered water system. Proper maintenance will prevent excessive waste of water, with its consequent load on the sewers. We have assumed in our calculations an average per capita per day consumption of 100 gallons. Experience has shown that this figure is higher where water meters are in use.

### BASIS FOR DESIGN:

With a present population of about 3000, and an estimated population of 10,000 in 1940, we have designed for a maximum consumption of 100 gallons per capita daily. Records of American municipalities of this character indicate that only about 75 per cent. of the total water used reaches the Sewerage System. This would mean, with the entire City sewered, that at its present the daily volume of sewage would be 225,000 gallons, and 750,000 gallons daily in 1940.

### GENERAL PLAN:

Because of the natural division of the city by ridges, practically at right angles with each other, the collection of all sewage into one outfall by gravity was considered too costly to be undertaken.

The general schemes were investigated which will be called Plan A and Plan B. Plan B contemplates the collection of all sewage from the East side of the City, that is from Districts "C" and "D" into one outfall, as shown on Plate No. 2, this outfall to run along Town Branch to Haw River. The sewage from the West side, Districts "A" and "B", would discharge into outfalls leading into Little Alamance Creek, and Dye Branch, respectively. These two outfalls would meet at a Sewage Disposal Plant to be located near the mouth of Dye Branch. Here the sewage, after being treated by Settling Tanks, Filters and Chlorine, would be discharged into Little Alamance Creek.

Under this scheme the shortening of the outfall along Little Alamance Creek, by using a cut off, as shown on Plate No. 2, was considered. The Sewage Disposal Plant in this case would be located about one half mile north of the mouth of Dye Branch, and on Little Alamance Creek.

Under Plan "A" the sewage from the East side is collected as in Plan "B", the sewage from District "A" is intercepted by a collecting well at Whitsett and North Sts and pumped by automatic controlled electric pumps thru a four (4) inch cast iron main to a point on Whitsett St. east of the railroad Spur. Here it would be discharged into the Collecting system, and flow to the Town Creek Outfall. District "B" would be intercepted by a collecting well at Elm St. near Dye Branch, and pumped by automatically controlled electric driven pumps, thru a six (6) inch cast iron main to the corner of Maple and Elm Streets, where it would, like District "A", be discharged into the Town Branch Outfall.

Because of the large volume of water in Haw River, the discharge of Graham sewage would not constitute a nuisance. The dilution would be so great that this volume of sewage would not be objectionable.

From the standpoint of initial cost, and operation, the discharge of all sewage along Town Branch into Haw River was considered best, and plans for the proposed System were developed accordingly.

### COLLECTING SYSTEM:

The system as designed will permit all of the developed sections of the City being sewered immediately, and extensions to the undeveloped areas may be made as conditions warrant.

Should it not be deemed expedient to construct all of the proposed system at this time, certain laterals in the sparsely settled sections may be omitted without impairment of the system.

As a rule the mains will be laid along the center of the streets, so as to afford equal service to all property. In order to avoid the tearing up of pavement, however, on improved streets the sewer will be placed along the side of the road main, and service laterals will extend to the opposite side, so that all buildings will have easy access.

In Main Street, between Hardin and Pine Streets, and around the Court House Square, the conduits can be laid between the curb and sidewalk.

The minimum size of pipe to be used is 8" and will range from this to 12". Flush tanks to insure the flushing and cleaning of sewers will be placed at the head of all lines. Manholes will be constructed at all intersections, changes in line and grade, and at frequent intervals on long lines.

As previously stated the topography divides the city into four drainage districts: The Northeast District "C" (Plate No. 2) will discharge its sewage from Albright St. and a point between Hill and Travora St. to the Outfall along Town Branch; District "D", or the Southeast district, will discharge along Melville St. to a point midway between McAden and Pine, and thence Northeast and East of the cemetery, to the Town Branch Outfall. District "A" or the Northwest District, will drain to Whitsett and North Street, where the sewage will be pumped to the Collecting System on Whitsett St. East of the Railroad Spur. District "B", the Southwest district, will drain to the Dye Branch, at Elm Street, where the sewage will be pumped to the Collecting System at Maple and Elm Streets.

The sewage from the entire city will, therefore, be discharged thru one Outfall along Town Branch and into Haw River.

### PUMPING STATIONS:

The Whitsett St. Pumping Station would be called upon to pump not in excess of 50,000 gallons per day. The total head that the pumps would be required to operate against would be 40 feet: The sewers would empty into a Collecting well and when this well became filled to a certain elevation an automatically controlled electrically driven pump would be thrown into operation and force the sewage thru a four (4) inch cast iron main to the Collecting System. Pumps and motors would be installed in duplicate, to insure certain operation. It is estimated that 12 K.W. hours would constitute the power consumption per day for this plant: As the city grows the pumps would be required to operate for longer periods and in proportion to the amount of sewage received.

The Pumping Station at Elm Street and Dye Branch would receive about 110,000 gallons per day: The general arrangement of the plant would be the same as the Whitsett St. station except that pumps would be of greater capacity and would be required to operate a 63' head. About 40 K.W. Hours would constitute the daily power consumption of this plant.

The total power consumption for both plants, therefore, would be about 52 K. W. Hours.

These plants would not require an operator in constant attendance: A visit once a day by some official or employee of the city to oil and inspect equipment would be about all the attendance required.

### HAW RIVER OUTFALL:

The most direct route from the City permitting the construction of a sewer outfall capable of intercepting the city's sewage at a minimum cost lies along Town Branch. From its source in the city, in District "C" (Plate No. 2), it flows in a general southeasterly direction to the Haw River, and discharges into it about two thousand (2000) feet north of the Graham and Hillsboro Road.

Practically all of the city's drainage west of Main St. and a small area to the east of it, finds its way to this stream.

The elevation of Haw River at the mouth of Town Branch is 480 feet above sea level: The elevation of Town Branch at Melville St. is 587 above sea level. A fall of 107 feet is therefore available for sewer grades between the city and the river.

The land along the stream presents no unusual difficulties for sewer work. The major portion of it has been cleared and is easy of access from the main highways. Most of the land along the stream has not been brought to a high state of cultivation and very little damage would result to crops during construction. After the sewer is in place crops may again be planted over it.

Considerable rock is evident along the stream, but by crossing the Creek at several points most of it may be avoided.

The length of the line from Melville St. will be about Seventeen Thousand Seven Hundred (17,700) feet. The average grade will be about six feet per thousand. Pipe will be 12 inches and 15 inches in diameter.

Manholes will be placed at frequent intervals along the line to permit of inspection, and cleaning when necessary.

The point of discharge will be just south of the mouth of Town Branch and will be protected by a concrete bulkhead.

The general alignment of the sewer is shown on Plate No. 2.

### RECOMMENDATIONS:

Under the plan contemplating the use of two pumping stations, the initial cost of the system is less than under the plan which includes a Sewage Disposal Plant on Little Alamance Creek. The operation of the pumping station is automatic and aside from occasional inspections and cleanings will require very little attention. The Sewage Disposal Plant would, however, require considerable attention and would have to be carefully and rigidly maintained to the highest point of efficiency to obtain satisfactory results.

Because of the large amount of dye stuffs being discharged into the sewers a perfectly clear effluent could not be hoped for at all times, and this might constitute a possible source of dissatisfaction to the property owners along Little Alamance and Great Alamance Creeks. The discharge, however, of all sewage thru one Outfall direct to the Haw River would eliminate all future controversy.

It is therefore recommended that, first, because of lesser cost, second, because of easier maintenance, and third, because of elimination of dissatisfaction among property owners along above mentioned creeks, that all sewage be discharged directly into Haw River, and that the pumping stations be installed instead of a Disposal Plant and that the System be constructed as outlined under Plan "A".

### ESTIMATES:

The prices on all materials entering into the construction of a sewer system, as well as that of labor, have increased greatly during the past three years: There are no apparent indications of an early decrease in the cost of labor and materials.

All prices upon which estimates are based are for the best materials and workmanship of their respective classes. Vitrified pipe will be used in sewer lines, except at creek crossings, here cast iron pipe is contemplated. Manholes and flush tanks will be built of concrete and brick. The most efficient type of centrifugal pumps and motors will be installed in concrete and brick pumping stations.

The estimates included in this report are based upon current prices. Unless there is a material change in prices before the contract for construction is let, the estimate submitted should be reasonably close to the actual ultimate cost.

### PLATES:

The drawings accompanying this report are three in number. Plate No. 1 is a chart showing the population of the city from 1890 to the present with an estimate for the next twenty years. Plate No. 2 is a map, showing the location of the proposed Outfall Sewers and the limits of the four drainage districts. Plate No. 3 is a General Plan of the proposed collecting system in the city and shows the location of Pumping Stations and Drainage Districts, in detail.

NOTE—See maps at Mayor's office

### Plan A.

#### ESTIMATES OF COST

#### SEWER SYSTEM FOR THE CITY OF GRAHAM, N. C. COLLECTING SYSTEM

Cut	Length	Price per ft.	Cost.
0-4	25211	\$0.80	\$20,168.80
4-6	25211	\$0.80	16,368.65
6-8	9373'	1.15	10,778.95
8-10	4373'	1.50	6,559.50
10-12	2188'	2.00	4,376.00
12-14	220'	2.50	550.00

\$58,741.90  
10" Vitrified Pipe

Cut	Length	Price per ft.	Cost.
0-4	970'	\$1.05	\$1,018.50
4-6	1185'	1.20	1,422.00
6-8	400'	1.40	560.00
8-10	180'	1.75	315.00
10-12	210'	2.25	472.50

\$3,788.00

Depth	Number	Price Each	Cost
0-4	55	\$60.00	\$3,300.00
4-6	26	75.00	1,950.00
6-8	23	85.00	1,955.00
8-10	13	100.00	1,300.00
10-12	9	115.00	1,035.00
12-14	1	130.00	130.00

\$9,670.00

FLUSH TANKS \$7,020.00

PUMPING STATIONS WITH DISCHARGE MAINS.  
Station at Whitsett St. and North St. \$6,000.00  
Station at Elm St. and Dye Branch, 10,500.00  
Total for Pumping Stations \$16,500.00

Total for Collecting System: \$95,719.00

#### OUTFALL FROM DISTRICT "D" TO TOWN BRANCH OUTFALL

Cut	Length	Price per ft.	Cost.
0-4	940'	\$0.80	\$752.00
4-6	340'	0.95	\$323.00

1280' 10" Vitrified Pipe \$1,075.00

Cut	Length	Price per ft.	Cost.
0-4	500'	\$1.05	\$525.00
4-6	240'	1.20	288.00
6-8	1010'	1.40	1,414.00
8-10	120'	1.75	210.00
10-12	120'	2.25	265.00
12-14	110'	3.00	330.00
14-16	190'	4.00	760.00
16-18	140'	5.00	700.00

\$4,492.00

Concrete Piers. \$500.00  
20 cu. yds. concrete \$25.00 per cu. yd.  
Cast Iron Pipe \$360.00  
6 Tons \$60.00 per ton.

Depth	Number	Price Each	Cost
0-4	5	\$60.00	\$300.00
4-6	1	70.00	70.00
6-8	1	85.00	85.00
10-12	1	\$115.00	115.00

\$570.00

Total Cost Outfall, District "D", \$6,597.00

#### HAW RIVER OUTFALL SEWER

Cut	Length	Price per ft.	Cost
0-4	650'	\$0.80	\$520.00

\$520.00

Cut	Length	Price per ft.	Cost
0-4	13,040'	\$1.20	\$15,648.00
4-6	90'	1.35	121.50
6-8	30'	1.75	52.50

\$15,822.00

Cut	Length	Price per ft.	Cost
0-4	3,750'	\$1.70	\$6,375.00
4-6	670'	1.85	1,249.50

\$7,624.50

Depth	Number	Price Each	Cost
0-4	16	\$60.00	\$960.00
4-6	16	75.00	1,200.00
6-8	26	85.00	2,210.00
8-10	2	100.00	200.00
10-12	1	115.00	115.00

\$3,735.00

MANHOLES. \$2,250.00  
ROCK EXCAVATION \$200.00  
450 cu. yds. \$5.00 per cu. yd. Creek Crossings \$200.00  
10 \$20.00 \$200.00

CONCRETE BULKHEAD WALL AT HAW RIVER \$90.00  
3 cu. yds. of Concrete @ \$30.00 per cu. yd.  
5 cu yds of earth excavation @ \$20.00 per yd \$100.00

\$100.00

RIGHT OF WAY \$1,100.00  
Estimated, \$1.00 per rod, \$1,100.00  
Total Cost of Haw River Outfall, \$30,944.50

#### MISCELLANEOUS LINES

Outfall from corner Whitsett St and North St to Whitsett at Pumping Station, \$450.00

Outfall from Albright St to Haw River Outfall, \$1,136.00

Outfall to Pumping Station on Elm Street, \$1,500.00

Engineering, Legal and Incidentals, 10 per cent \$13,675.00  
Total Cost of System, \$150,422.00

#### ALTERNATE

PLAN "B" Collecting System, same as in Estimate No 1, omitting pumping station, \$79,219.90

Outfall from District D, same as in Estimate No 1, \$6,997.00

Haw River Outfall, same as in Estimate No 1, \$30,944.50

Outfall from corner Whitsett & North Sts to Little Alamance Creek, Outfall, \$230.00

Allbright St Outfall to Haw River Outfall, same as in Estimate 1, \$1,136.00

Sewage Disposal Plant, \$18,000.00

Outfall along Dye Branch from District B to Disposal Plant, \$2,268.00

Outfall along Little Alamance Creek from District A to Disposal Plant, \$7,129.00

Contingencies, legal and engineering, \$15,252.00

Grand Total, Cost of System, Plan B, \$167,770.00  
NOTE: See maps at Mayor's office

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OFFICE IN SIMMONS BUILDING

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LONG & LONG,  
Attorneys and Counsellors at Law  
GRAHAM, N. C.

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"The Key to Relief"

I am improving in health since I have been taking your medicine. It has helped me much. I can tell you how thankful I am. I do not think I could get along without it. I have recommended it to many since it has done me so much good.

Trustee's Re-Sale.

Under and by virtue of the power of sale contained in a certain deed of trust executed to the undersigned trustee on January 26th, 1918, by Mrs. Sallie Summers Harrison and husband, R. J. Harrison, for the purpose of securing the payment of four certain bonds of even date therewith, which deed of trust is recorded in the Public Registry of Alamance county in Book of Mortgages and Deeds of Trust No. 73, at page 264, default having been made in the payment of said bonds and the interest thereon, the undersigned trustee will, on

MONDAY, FEB. 2, 1920, at twelve o'clock, noon, offer for sale at public auction to the highest bidder, for cash, at the court house door of Alamance county, in Graham, N. C., a certain tract or parcel of land lying in Boon Station township, Alamance county, North Carolina, on the southwest side of Haw river, and bounded as follows:

Beginning at a locust tree at or near Haw river at the bridge, a corner between Peter and George Summers, and running thence north 67 1/2 deg W 9 chs to a stone; thence N 87 deg W 35 chs to a cherry tree; thence in a direct line to a white oak; thence N 57 1/2 deg E 13 chs and 7 links to a stake in the big road; thence S 1 deg E 11 chs and 40 links to a stake; thence 87 1/2 deg E 22 chs to a gum on Haw river, a corner on Mary Walker's (formerly Abner James' corner); thence up said river as it meanders to the beginning, making by estimate one hundred acres, more or less.

Under the advanced bid placed upon said land as allowed by law since the last sale, bidding will begin thereon at \$47.25 per acre; said land having been previously sold December 1st, 1919. The trustee reserves the right to sell only a part of said land sufficient to satisfy said deed of trust.

This 1st day of Jan., 1920, Alamance Ins. & Real Estate Co., Trustee.

E. S. W. Dameron, Atty.

LIVES OF CHRISTIAN MINISTERS