City of Social Circle, Georgia

Water Distribution System Model and Master Plan

January 2018

Prepared by

Precision Planning, Inc.

802 East Spring Street

Monroe, Georgia 30655

770.267.8800

TABLE OF CONTENTS

City of Social Circle Water Distribution System Modeling and Master Plan

EXECUTIVE SUMMARY

The City of Social Circle commissioned Precision Planning, Inc. (PPI) to prepare a Water Distribution System Hydraulic Model and Master Plan to guide future infrastructure improvements within the City's system. The overall goal of the Water System Master Plan is to assess the current operations and functionality of the City's existing water system, identify deficiencies, and prioritize recommendations for future water system improvements to address both current operational issues and plan for future residential, commercial and industrial growth within the City's water service territory.

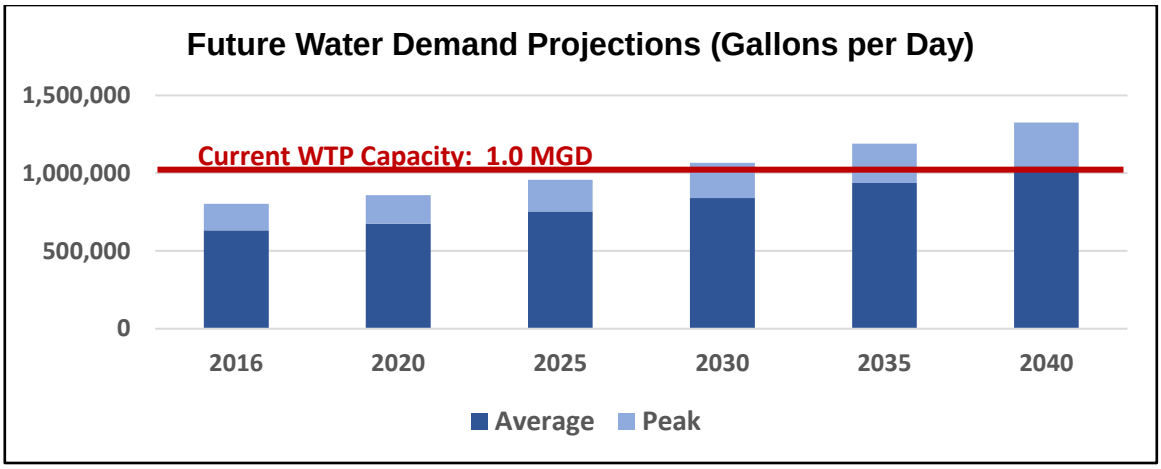
The water distribution system hydraulic model is a critical tool in the development of an effective water system master plan. The hydraulic model will allow the City to continuously evaluate the efficiency of current system operations, and accurately assess the potential impacts of future growth and development. The development and continued maintenance of the City of Social Circle Water System Hydraulic Model will provide City staff with access to real-time information regarding system operations including updated water system maps, fire flow availability, system pressure and flow rates, water age, and other key data at any point within the City's water system.

Based on model results, PPI has prepared the City of Social Circle Water System Master Plan including recommended and prioritized water system infrastructure improvements to improve current system operations and efficiency. The Master Plan also includes recommended future system improvements to accommodate projected demand increases due to anticipated residential, commercial and industrial growth with the City's water service area.

PPI's evaluation of the Social Circle water system is focused on the following primary service criteria:

Water Supply and Demand:

Based on projected population growth and future water demands, the City of Social Circle's current 1.0 MGD water withdrawal permit from the Alcovy River should be sufficient to meet projected peak day water demands through the year 2025.



The City of Social Circle currently has interconnections with both Walton and Newton County, and has the ability to purchase supplemental wholesale water supply from both entities. Given current water demands within the Alcovy River basin, it is unlikely that Georgia EPD would grant a significant increase in the City's existing water withdrawal permit. Therefore, PPI recommends that the City of Social Circle evaluate other regional water supply alternatives with adjacent utility systems including Walton County, Newton County or the City of Monroe.

Planning for future water supply capacity should begin as early as 2018.

Water Distribution System Infrastructure:

The existing Social Circle Water Distribution System includes approximately 329,000 linear feet (54 miles) of 2" through 12" diameter water mains. Approximately two-thirds (62%) of the existing distribution system is 6" diameter or smaller pipe. A breakdown of water main length by pipe diameter is provided below:

Pipe Diameter (Inches)	Length (Feet)	Percentage of Total System
2 to 4	28,000	8.5%
6	176,000	53.5%
8	45,000	13.7%
10	55,000	16.7%
12	25,000	7.6%
Total System:	**329,000**	**100%**

Much of the original water system infrastructure in downtown Social Circle is comprised of 6-inch diameter cast iron water mains, as well as several 2-inch and 4-inch galvanized water mains. While these pipe materials were commonly used during the period of initial water system development, excessive corrosion and tuberculation are typical problems observed with older cast iron and galvanized pipe materials (see example images below).

Typical Cast Iron Pipe Tuberculation

Typical Galvanized Steel Pipe Corrosion

Although these smaller diameter water mains were likely more than adequate to provide water supply to the City in the early years of water system development; pipe corrosion, population, and water demand growth have exceeded the operational capacity of many of these water mains presenting service pressure and fire flow concerns in the “Heart” of the City’s downtown area.

Therefore, the primary focus of the 10-Year Water System Capital Improvement Program is to provide a strategic approach for the replacement and/or upgrade of primary water mains along North Cherokee Street, East Hightower Trail, South Cherokee Street, Spring Street and Oak Drive which serve as the backbone of the Social Circle Water System. The recommended improvements should serve to significantly improve water system service pressures, increase available fire flow, and enhance water quality.

Water System Flow and Pressure:

Due to higher elevations, areas along North Cherokee Street/SR 11 are the most likely to experience low service pressures during periods of high water demand. As stated previously, residential and commercial areas served by older 2-inch and 4-inch galvanized water mains also frequently experience low service pressures due to corrosion and the reduced capacity of these older mains. PPI recommends implementation of the following projects to resolve low system pressure issues.

Highway 11/North Cherokee Road Pressure Reducing Valve (PRV): A PRV installed near Highway 11 and Bateman Drive would maintain normal system operations, but would also allow additional water supply from Walton County to feed the Social Circle system during periods of high demand and/or fire flow conditions. This is an economical solution to provide additional water supply redundancy during high demand or emergency conditions.

Annual Galvanized Water Main Replacement Program: Existing galvanized water pipe within the Social Circle water system increases annual maintenance costs, decreases system service pressures, and likely degrades water quality due to internal corrosion. PPI recommends implementation of annual program for the replacement of at least 1,000 LF of 2-inch and 4-inch galvanized and/or older 6-inch water mains for at least the next ten years to improve water system pressures, flow and capacity.

Water Quality Compliance:

Hydraulic model analyses indicate that outlying areas of the Social Circle water system likely experience diminished water quality due to water age and low chlorine residual. PPI recommends the following projects be implemented to address water quality issues.

Continue/Implement Systematic Flushing Program: Many of the outlying areas could be most economically addressed though the continuation/implementation of a scheduled flushing program including the I-20 Rest Area, South Cherokee Road, Barbara Trail, Laurel Lane and Lakewood Drive.

East Hightower Trail – US 278 Loop: The existing 6" diameter water main along Hwy 278 north of Hancock Road is a long dead-end line that currently experiences issues with both water quality and low fire flow availability. One option to improve water system operations in this area is to install approximately 5,500 linear feet of new 12-inch and 8-inch diameter water main along Highway 278 and East Hightower Trail to improve system connectivity and essentially "loop" the water system.

Water Storage Tank Operations:

Based on an evaluation of existing water system operating data, the following recommendations should be considered by the City of Social Circle to improve water storage tank operations and efficiency.

Repair or replace problematic altitude valves at tank sites – Given the varying overflow elevations of the City's four elevated water storage tanks (+/- 8 feet), proper operation of the altitude valves at each tank site is critical for optimal utilization of available storage capacity and management of system pressures. PPI recommends repair and/or replacement of control valves at each tank site.

Automated Operation of WTP High Service Pumps – PPI recommends SCADA upgrades to allow for the automated operation of the Water Treatment Plant high service pumps based on water tank levels. This improvement would optimize the efficiency of water system storage, reduce pumping costs, stabilize system pressures, and automate the system to better respond to spikes in water demands.

Future Water Storage Facilities – It is anticipated that replacement of the Tower Lane storage tank should be included in long range planning efforts (10+ years). The capacity of the Tower Lane elevated storage tank should be increased, and constructed at an overflow elevation of 990' MSL to match the Alcova Tank elevations.

PPI also anticipates that the required future construction of a new elevated storage tank will likely be required in the Gateway Interchange Character Area to meet required fire flows resulting from anticipated large scale industrial development in this area.

Industrial/Commercial Water Service:

Social Circle is a rapidly emerging industrial area given the City's proximity to I-20 and the metro area. In fact, Social Circle is the current primary target area for industrial development east of Atlanta, and remains in constant competition for potential manufacturing, distribution and other industrial prospects. Anticipated future industrial development will also drive residual residential and commercial growth, thereby increasing water system demand.

In order to improve and/or expand water service to emerging industrial/commercial areas, PPI recommends inclusion of the following projects in the Social Circle Water System Long Range Master Plan.

- **Fairplay Drive**
- **Industrial Blvd**
- **Roy Malcom Road**
- **Social Circle Pkwy - North**
- **Social Circle Pkwy - South**
- **Malcom Road**
- **Thurman Baccus Road**
- **East Atlanta Mega Site**
- **Social Circle-Fairplay Rd**

The resulting Water System Capital Improvement Plan presented herein identifies short-term capital projects (0-5 years), mid-term capital projects (6-10 years), and long range capital projects anticipated to occur beyond the defined 10-year planning horizon. Since any effective Master Plan must be a fluid document, it is recommended that the plan be reevaluated and updated on a 2-3 year basis to address system operational issues, future industrial projects, and changing development trends.

EXISTING WATER SYSTEM ANALYSIS

A. Previous Studies

Based on our discussion with City staff, no previous comprehensive hydraulic analysis of the City of Social Circle Water System has been completed. No other reports were referenced in production of the water system model or master plan.

B. Existing Water System

An existing water system map is included with this report as Map 1. The map is based on a water system information provided by G. Ben Turnipseed (GBT) Engineers.

Water Supply: The City currently withdraws raw water from the Alcovy River for treatment at the Social Circle Water Treatment Plant (WTP) located on Jersey-Social Circle Road. The City also maintains an interconnection (Highway 11 north) and wholesale water purchase agreement with the Walton County Water Department. The 2016 AWWA Water Audit reported at total system input of 0.62 MGD. A monthly breakdown provided by the City included a more detailed description of water produced or purchased in 2016 as follows:

	Average	Peak
Water Produced	0.588 MGD	0.751 MGD (July 2016)
Water Purchased	0.045 MGD	0.051 MGD (June 2016)
Total Water Supplied	**0.633 MGD**	**0.802 MGD**

Treated water from the Water Treatment Plant is conveyed into the distribution system by high service pumps located at the plant site. Historic pumping rates could not be provided by the City due to a previous lack of metering equipment, but pump rates were approximated at 500-600 gallons per minute (gpm) based on production records. Water from Walton County is delivered at a higher operating pressure at the northern City Limits on S.R. 11.

Water System Demand: The 2016 Water Audit reported 0.46 MGD in authorized consumption and 0.15 MGD in water loss. This equates to approximately 25% non-revenue producing water (NRPW). For modeling purposes, water system demand will be based on the supply rates stated above.

The model also includes input for demand provided by the City for the four highest water users on the system as provided in the table below.

High User Demand Allocation (Average GPD)

Iso Nova	Standridge	Goodyear	Certainteed
1022 E. Hightower Trl	1196 E. Hightower Trl	1 Wingfoot Way	200 Ronthor Dr
62,400	35,800	12,400	8,300

Water Distribution Mains: The existing Social Circle Water Distribution System includes approximately 329,000 linear feet (54 miles) of 2" through 12" diameter water mains. Approximately two-thirds (62%) of the existing distribution system is 6" diameter or smaller pipe, which limits available flow and pressure due to increased friction losses. A breakdown of water main length by pipe diameter is provided below:

Pipe Diameter (Inches)	Length (Feet)	Percentage of Total System
2 to 4	28,000	8.5%
6	176,000	53.5%
8	45,000	13.7%
10	55,000	16.7%
12	25,000	7.6%
Total System:	**329,000**	**100%**

Water Storage Facilities: The City of Social Circle currently operates four existing elevated water storage tanks with a total capacity of 1.75 million gallons (MG). Elevated storage tanks pressurize and supply the water distribution system when the WTP high service pumps are inactive. The WTP pumps are activated to fill the elevated storage tanks. Tanks are prevented from overflowing by altitude valves located at each tank site which automatically close when the tanks reach a pre-set maximum elevation.

In order to operate efficiently, storage tanks are typically constructed with the same overflow elevation which allows all tanks to fill simultaneously and maximize available storage capacity. One observed anomaly in the Social Circle water system is that all four tanks have different overflow elevations, which greatly reduces system efficiency. For instance, the Alcova tank overflow elevation is at 989.8 feet mean sea level (MSL) while each of the other tanks are 5 to 8 feet lower in elevation.

Therefore, when the Alcova tank is full, all other storage tanks are prevented from cycling. If the system is pressurized to the lower tank elevations, then the City is unable to utilize the full storage capacity of the Alcova tank.

A summary of the existing tank's physical characteristics is provided in the table below.

Storage Tank Summary

Tank Name	Capacity	Dia.	Bottom Elevation (ft)	Height to Overflow (ft)	Overflow Elevation (ft)	Nominal O.F. elev. (ft)	Operating Level Range (ft)	Minimum Operating Grade (ft)
			(Note 1)	(Note 2)				
Tower Road	0.1 MG	30'	887.4	95	982.4	982	22	960
Standridge (Hightower)	0.5 MG	50'	820.3	161.5	981.8	982	37	945
Spring Street	0.15 MG	32'	890.9	94	985.2	985	28	957
Alcova	1.0 MG	70'	815.8	174	989.8	990	39	951

Notes:

1. Center column elev: PPI GPS Survey dated 10/19/2017
2. Base Plate Info: Spring St. tank plate: .15 MG, 66' to bottom
   Standridge tank plate: 0.5 MG, 161.5 to OF, head range 37'-1.75"
   Tower tank plate: 0.10 MG, 95' to OF
   Alcova tank plate: 1.0 MG, 135' to bottom, 174' to OF

Water System Operation: The northern area of the water system along Highway 11 is currently isolated from the rest of the Social Circle water system near Bateman Drive. Water supply for this area is provided through the existing interconnection with the Walton County Water Department. This area includes the highest elevations within the Social Circle water system and would likely experience low service pressures if served from the City's system due to lower hydraulic grades.

The WTP finished water pumps are operated periodically (as needed) to fill the elevated storage tanks. Tank levels are reported to the WTP site via an existing SCADA system that is still being calibrated. At present, pump operations are controlled manually by plant staff based on discharge pressure readings observed at the plant site. Normal discharge pressure at the WTP site is reported to be 110 – 130 psi. When the discharge pressure approaches the upper end of this range, the pumps are turned off manually. Future automation of the high service pumps based on tank elevation readings is recommended to improve system operational efficiency.

As stated previously, survey verification has confirmed the overflow elevations of the City's four existing elevated water storage tanks vary from 5 to 8 feet. In order to utilize the top eight feet of capacity in the Alcova tank, the other three tanks would require altitude valves to automatically close the lower tanks to prevent overflow. This scenario would also prevent the lower tanks from cycling, and possibly result in diminished water quality.

Based on staff reports, the City has experienced previous operational issues with existing altitude valves sticking open or closed. These occurrences can be verified by reviewing historic SCADA reports for tank levels. These altitude valve issues can result in excessive water loss due to tank overflow when stuck in the "open" position; or increased system pressures, possible main breaks, or reduced fire flow when stuck in the "closed" position.

C. Model Calculation Criteria

For hydraulic analysis, system pressures and flow rates were analyzed at steady state using extended period simulations. Fire flow analyses were performed at steady state based on average daily demands, and were utilized to identify areas of low flow within the City's water system.

Available fire flows are computed in the model by maximizing water demands at a specific location (target area), while insuring that preset minimum pressures are not compromised at any other location in the system. Minimum fire flow pressure constraints were set at 20 psi residual pressure.

The computer-generated results were calculated using the Hazen-Williams Formula and Bentley WaterCAD V8i (SELECTSeries 6).

For all results, unless otherwise stated, time (t) = 0 occurs at 12:00 AM (midnight).

D. Model Assumptions

- Water Supply – Current and future operating scenarios assume water supply is not limited from the Social Circle WTP or the Walton County interconnection.
- Fire Flow – Minimum required fire flow was established as 500 gallons per minute (gpm) at a residual pressure of 20 pounds per square inch (psi). Minimum desired fire flow was programmed at 750 gpm with a residual pressure of 20 psi. Higher fire flows may be required depending on type of development. Minimum fire flow for designated industrial areas was programmed at 1500 gpm with 20 psi residual pressure.
- Service Pressure – Ideally, the Social Circle water system would prefer to maintain a normal working pressure of approximately 60 psi. Minimum and maximum pressures should range between 35 and 100 psi. The lowest pressure at any point within the system should not drop below 20 psi for any normal system condition.
- Hazen-Williams friction factor "C" for new pipe is 130. Existing pipeline friction factors will vary as necessary for model calibration to field conditions.

HYDRAULIC MODEL DEVELOPMENT AND CALIBRATION

A. Hydraulic Model Development

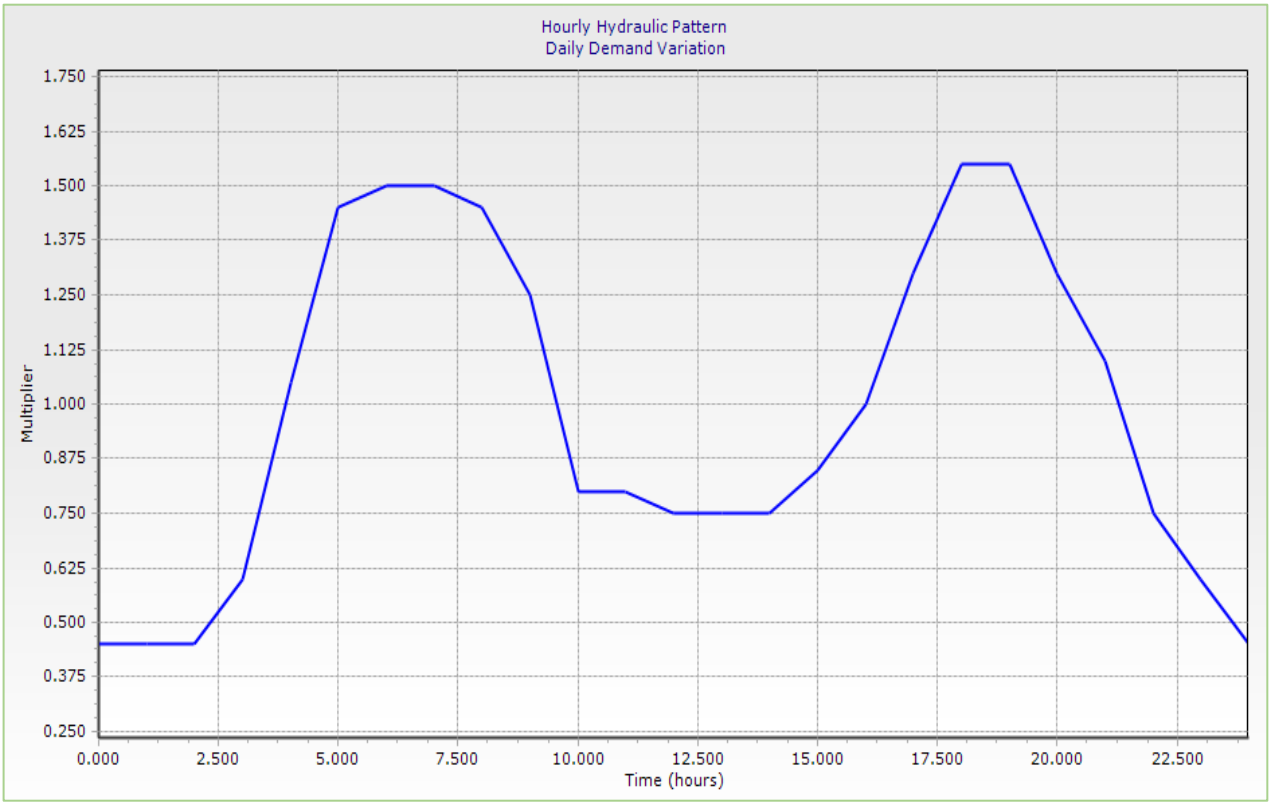
Water Infrastructure: Social Circle's existing water system infrastructure was modeled for this analysis by drawing system components in real world coordinates referencing the water system map provided by GBT Engineers. The initial maps provided included incorrect pipe diameters, which delayed overall model development until the map could be updated by the City. Pipe diameters were assigned per the GBT map and confirmed by City staff. Elevations were assigned to nodes using USGS quad maps and satellite imagery. Water sources and storage facilities are simulated in the model at their actual locations with known physical characteristics assigned appropriately.

Water Supply: The Water Treatment Plant high service pumps were modeled with a design operating point of 700 gpm at 340' TDH, based on the performance data referenced on the pump nameplates. Flow control valves located on the pump discharge will restrict flow, which has been simulated in the model to reflect actual projected flow rates.

The Walton County interconnection on Highway 11 north was programmed into the model using a hydraulic grade of 1120 feet MSL, based on Walton County delivery pressures. The isolated area of the City's water system north of Bateman Drive is simulated in the model based on current conditions.

Water Demand: Water system demands were initially distributed evenly throughout the model nodes with a current total demand of 0.64 MGD. Demands were then reallocated to reflect large users and industrial demands within the system. Peak seasonal water system demands were also programmed into the model to simulate high demand scenarios. Peak water usage increases demands at each node by a programmed multiplier to accurately distribute current peak water demands 0.80 MGD. A demand multiplier pattern was also developed and assigned to simulate high and low demand periods that occur over the course of a typical day as show below.

Figure 1. Typical Daily Water Demand Pattern



B. Hydraulic Model Calibration

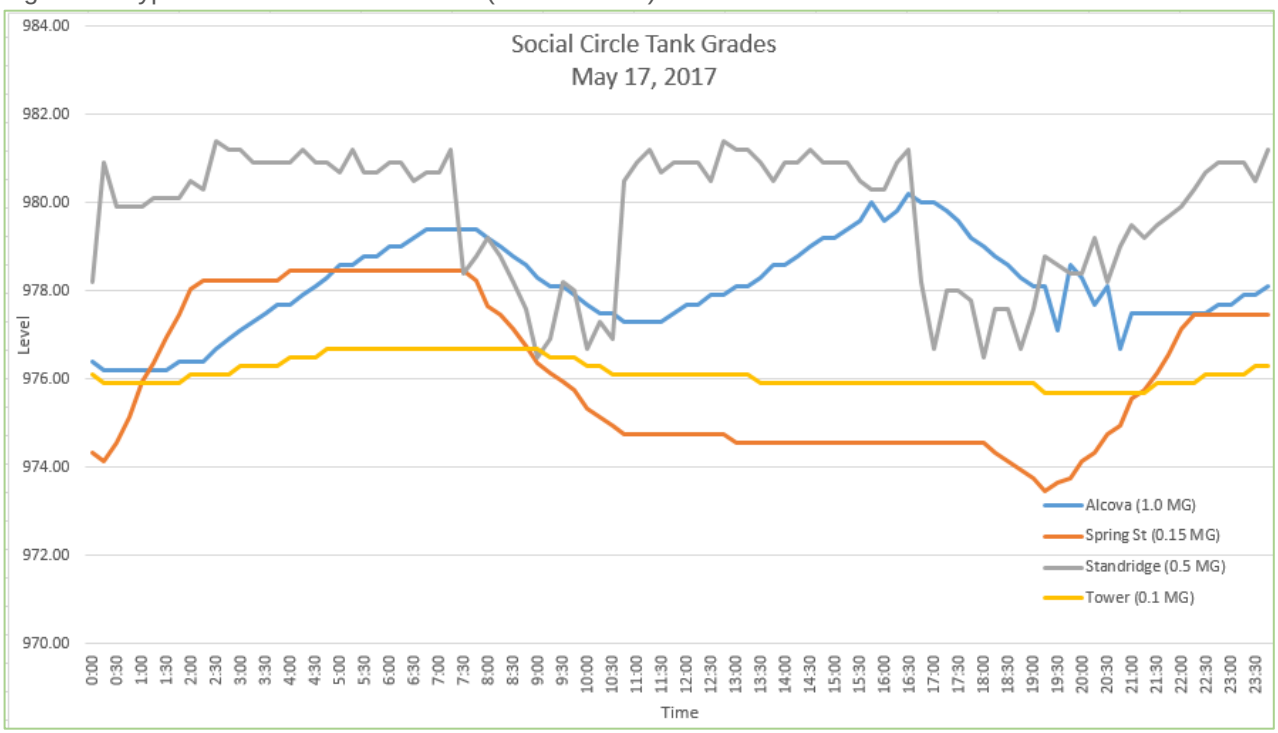
Tank Operation: Tank level and base pressure is monitored and recorded via an existing SCADA system. A review of this data over the last year identified highly variable tank level activity. The reported operational difficulties with the existing altitude valves was apparent based on observed tank level anomalies.

Existing SCADA outputs tank water level data reports. Using those reports to estimate water elevation in the tanks resulted in differences of 10-15 feet between the tanks. Data indicates, and model calculations support, that the tanks actually work together within a few feet in elevation. Therefore, the reported tank levels were adjusted in calculation results provided to better represent actual water system behavior.

Under normal operation, it appears from SCADA data that the tank water elevations typically vary from 974' to 982'. Therefore, it can be assumed that the typical water system operating grade is within the same range of 974' to 982' mean sea level (MSL).

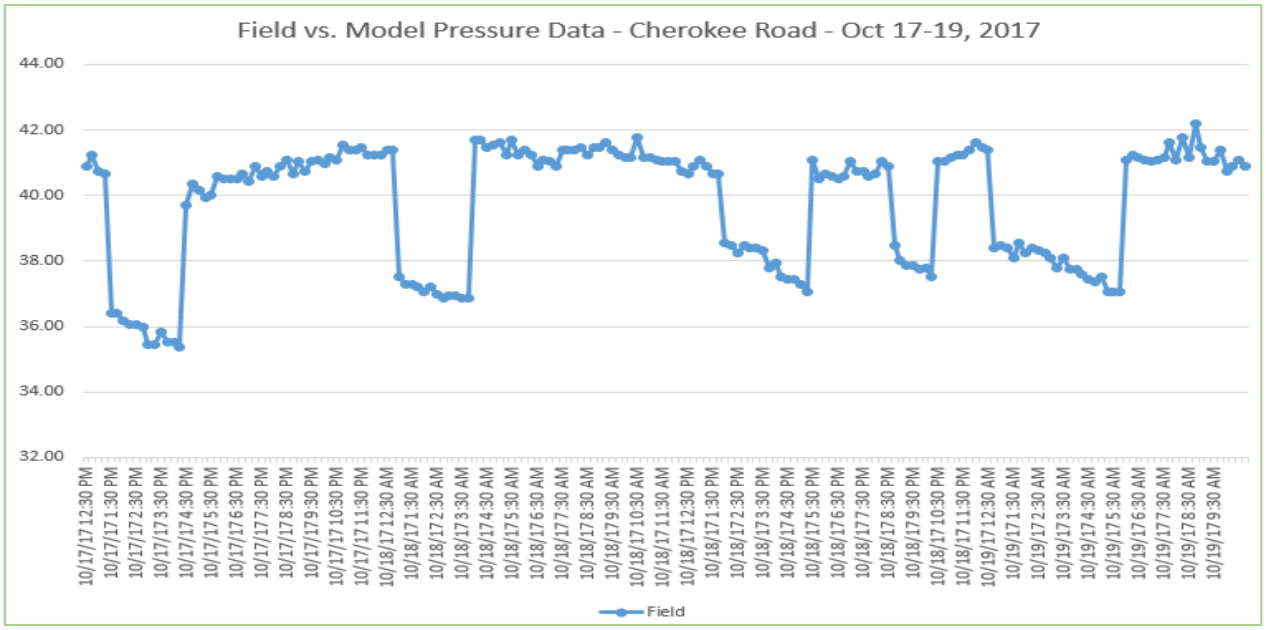
Figure 2 illustrates tank behavior and water elevation ranges on a typical day for each tank. The model was calibrated to match the typical water level range for each tank. Model calculations indicate the water elevations remain closer than SCADA data indicates, which can be attributed to current altitude valve behavior.

Figure 2. Typical Normal Tank Behavior (from SCADA)



24-hour Pressure Test: A system pressure data logger was installed on the existing fire hydrant at the intersection of Cherokee Road and Sycamore Street, and system pressure and tank levels were analyzed for during the period of October 17-19. The resulting data indicated that both the Spring and Tower tanks were closed and inactive for most of this period. These observations were then programmed in the model, which produced satisfactory calibration results to reflect actual system operations. The modeled pressure range approximately matches the observed data from the field.

Figure 3. Extended Period Pressure Test – Field Results



Fire Flow Availability: The City provided fire flow data at various locations throughout the water system. The location of fire flow testing was selected to provide sufficient coverage throughout the entire water system.

Hydraulic Model calibration was verified against field results by programming water demands to simulate actual recorded fire flow. Static and residual pressures were then verified (field versus model), and pipe roughness values were adjusted to reflect actual field conditions. Field and model results are shown in the following table.

City of Social Circle - Fire Flow Test Calibration Summary

			Field Tests				Model Results		
Flow test #	Hydrant City ID	Hydrant Date Tested	Hydrant Static (psi)	Hydrant Residual (psi)	Hydrant Flow (gpm)		Hydrant Static (psi)	Hydrant Residual (psi)	Hydrant Flow (gpm)
1	195	4/21/2017	110	94	1501		109	91	1501
6	130	4/24/2017	70	58	1187		63	50	1187
8	116	4/24/2017	62	52	1256		53	46	1256
9	414	5/31/2017	34	20	667		34	22	667
11	380	4/17/2017	40	34	671		41	36	671
14	72	4/17/2017	40	32	411		37	35	411
15	382	5/2/2017	42	35	805		44	37	801
16	86	4/18/2017	38	32	888		38	27	881
17	56	4/28/2017	35	23	888		36	25	888
20	15	4/25/2017	114	20	888		104	20	880

* Model results calculated by entering field flow as junction demand & recording calculated residual pressure. Pipe roughness was adjusted within reason to simulate field results.

C. Existing Water System Analyses

Fire Flow Availability: Model calculations indicate that a majority of the City water system is capable of providing an available fire flow of 750 gpm or higher. However, pressure and flow data provided by the Social Circle Fire Department indicate that many hydrants in the downtown area do not achieve model predictions. Further analyses of these areas were completed, and it was determined that older 6-inch cast iron pipe and smaller 2-inch and 4-inch galvanized water mains are likely contributing to reduced fire flows due to corrosion. It is also recommended that Social Circle Public Works establish a valve location and maintenance program focused to insure that valves are fully open and functioning properly. A major focus of the resulting 10-Year master plan includes a strategic approach to replace and/or upgrade water mains along North Cherokee Street, South Cherokee Street, East Hightower Trail, Spring Street and Oak Drive to resolve fire flow, system pressure and water quality issues in the downtown area. Map 2, located in Appendix A, illustrates current fire flow availability throughout the existing Social Circle water system.

Average Water System Pressure: Map 3, located in Appendix A, illustrates average water pressures throughout the existing Social Circle water system. This map indicates that areas of higher elevation along S.R. 11 (N. Cherokee, Cherokee Streets) experience the lowest observed system pressures under static conditions.

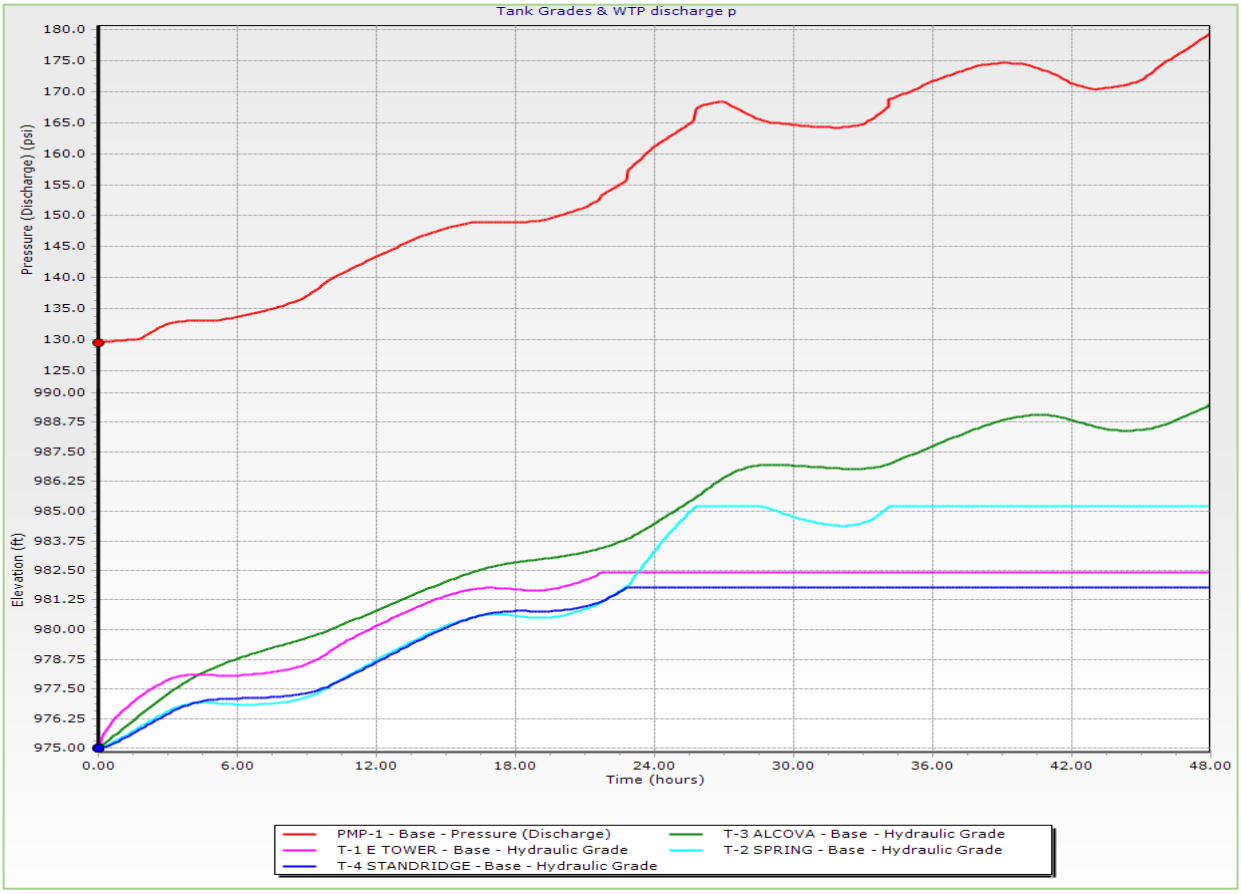
As noted previously, high elevation areas on Highway 11 north of Bateman Drive are currently isolated from the Social Circle water system and served through the Walton County interconnection. Since the Walton County water system operates at a higher hydraulic grade, this area of the City's system effectively operates at a higher pressure gradient.

Average Water Age: Map 4, included in Appendix A, illustrates average water age after a seven-day extended period model analysis. Chlorine residual levels in water typically decrease over time, so water age is a good indicator of potential water quality issues.

The hydraulic model indicates that only a couple of identified areas around the outer limits of the Social Circle water system may experience deteriorated water quality due to water age. Excessive water age in these areas can likely be resolved through the implementation of a systematic flushing program.

Tank Water Level Behavior: Hydraulic model evaluations were performed with all tanks programmed at a water elevation of 975', and WTP pumps operational for an analysis period of 48 hours. Results indicate that the Tower Road tank fills first, followed by the Standridge Tank, then the Spring Street Tank before the Alcova Drive Tank reaches overflow. Over this time period, discharge pressures at the WTP rose from 130 psi to 180 psi, spiking each time one of the tanks reached full capacity (assumed closed).

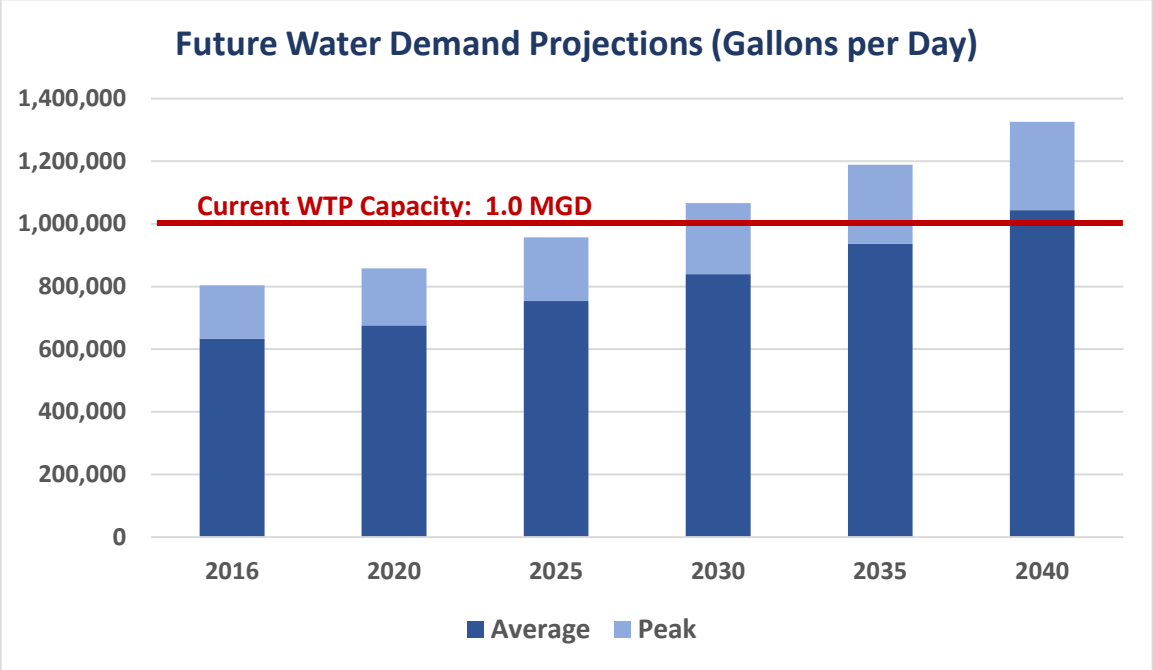
Figure 4. Tanks filling as WTP plant discharge pressure increases



D. Projected Future Water System Demands

City of Social Circle average day water demands were reported to be 633,000 GPD average day, and 802,000 GPD peak during calendar year 2016. When evaluating the State of Georgia Office of Planning and Budget (OPB) population projections for both Walton and Newton County, OPB predicts a 1.2% to 1.8% annual population growth in the Social Circle area. Given the high regard for the Social Circle School System, and available housing, PPI anticipates that the City of Social Circle's population growth rate will likely outpace adjacent unincorporated areas at a rate of approximately 2% per year.

When planning for future water system demands, it is also recommended to include a contingency factor of at least 10% to accommodate anticipated industrial and commercial development. Therefore, the future water demand projections presented below include an annual demand growth rate of 2.2%.



As shown above, project peak day water demands will likely exceed current water supply capacity by the year 2027. Planning for additional water supply capacity through additional wholesale water purchase agreements or expansion of the City's existing WTP should be initiated as early as 2018.

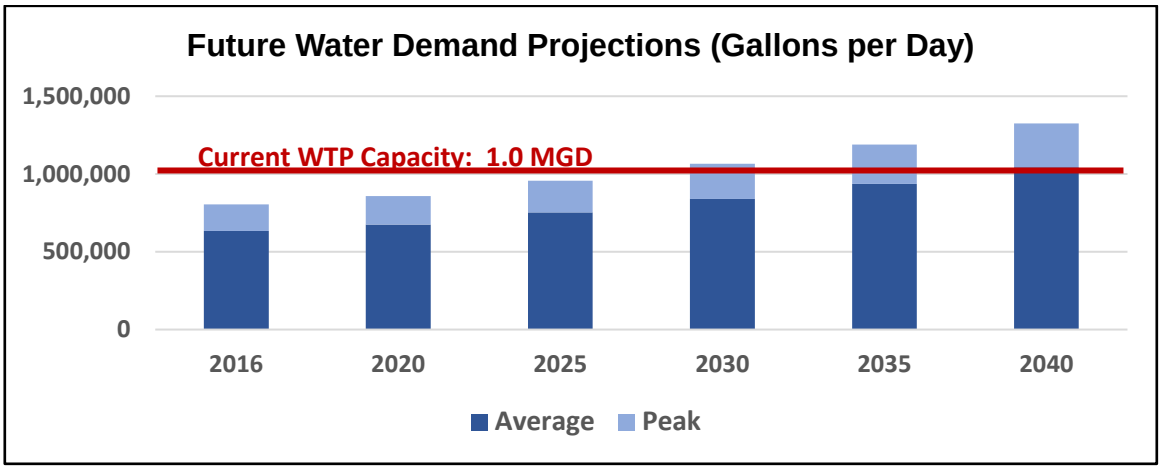
RECOMMENDED WATER SYSTEM CAPITAL IMPROVEMENTS

Based on model results, PPI has prepared the City of Social Circle Water System Master Plan including recommended and prioritized water system infrastructure improvements to improve current system operations and efficiency. The Master Plan also includes recommended future system improvements to accommodate projected demand increases due to anticipated residential, commercial and industrial growth with the City's water service area.

The following recommended Water System Capital Improvement projects were identified and prioritized to address current or projected water supply, service pressure, fire flow, and water quality compliance concerns within the Social Circle Water System.

Water Supply and Demand:

As outlined previously, the City of Social Circle's current Water Treatment Facility and 1.0 MGD permitted water withdrawal from the Alcovy River should be sufficient to meet projected peak day water demands through the year 2025.



Beyond 2025, the City of Social Circle will need to secure additional water supply to meet both peak and average day water demands in the future. As stated previously, given current water demands within the Alcovy River basin, it is unlikely that Georgia EPD would grant a significant increase in the City's existing water withdrawal permit.

Therefore, PPI recommends that the City of Social Circle evaluate other regional water supply alternatives with adjacent utility systems including Walton County, Newton County or the City of Monroe. The City may elect to secure additional water supply through the negotiation of favorable long term wholesale water purchase agreements with adjacent utility systems, or through the purchase and acquisition of an equity ownership in other water production facilities (Hard Labor Creek, Newton County or City of Monroe).

It is extremely critical that planning for future water supply capacity begin as early as 2018, as these negotiations and resulting infrastructure improvements may require a long implementation period.

Water Distribution System Improvements:

The existing Social Circle Water Distribution System includes approximately 329,000 linear feet (54 miles) of 2" through 12" diameter water mains. Approximately two-thirds (62%) of the current water distribution system is comprised of older 6-inch diameter cast iron water mains, as well as several 2-inch and 4-inch galvanized water mains. While these pipe materials were commonly used during the period of initial water system development, excessive corrosion and tuberculation are likely responsible for reduced fire flow and pressure in the downtown area.

Therefore, the primary focus of the 10-Year Water System Capital Improvement Program is to provide a strategic approach for the replacement and/or upgrade of primary water mains along North Cherokee Street, East Hightower Trail, South Cherokee Street, Spring Street and Oak Drive which serve as the backbone of the Social Circle Water System. The recommended improvements should serve to significantly improve water system service pressures, increase available fire flow, and enhance water quality.

A summary of these proposed water main replacement projects is presented below:

1. **Juniper Street and Clark Street**
2. **North Cherokee Road – Phase 1** *(West Hightower to Heritage Street)*
3. **South Cherokee Road – Phase 1** *(West Hightower to Hickory Street)*
4. **East Hightower Trail** *(Cherokee Road to Oak Drive)*
5. **Oak Drive** *(North Cherokee to Willow Drive)*
6. **Windsong/Park Place Water Main Looping**
7. **South Cherokee Road – Phase 2** *(Hickory Street to Spring Street)*
8. **Spring Street** *(Hightower to South Cherokee)*
9. **North Cherokee Road - Phase 2** *(Heritage Street to Ronthor Drive)*
10. **North Cherokee Road – Phase 3** *(Ronthor Drive to City Limits)*
11. **South Cherokee Road – Phase 3** *(Spring Street to City Limits)*
12. **Cannon Drive** *(Spring Street to Social Circle Parkway)*

Water System Flow and Pressure Improvements:

Due to higher elevations, areas along North Cherokee Street/SR 11 are the most likely to experience low service pressures during periods of high water demand. As stated previously, residential and commercial areas served by older 2-inch and 4-inch galvanized water mains also frequently experience low service pressures due to corrosion and the reduced capacity of these older mains. PPI recommends implementation of the following projects to resolve low system pressure issues.

Highway 11/North Cherokee Road Pressure Reducing Valve (PRV): A PRV installed near Highway 11 and Bateman Drive would maintain normal system operations, but would also allow additional water supply from Walton County to feed the Social Circle system during periods of high demand and/or fire flow conditions. This is an economical solution to provide additional water supply redundancy during high demand or emergency conditions.

Annual Galvanized Water Main Replacement Program: Existing galvanized water pipe within the Social Circle water system increases annual maintenance costs, decreases system service pressures, and likely degrades water quality due to internal corrosion. PPI recommends implementation of annual program for the replacement of at least 1,000 LF of 2-inch and 4-inch galvanized and/or older 6-inch water mains for at least the next ten years to improve water system pressures, flow and capacity.

Water Quality Compliance Improvements:

Hydraulic model analyses indicate that outlying areas of the Social Circle water system likely experience diminished water quality due to water age and low chlorine residual. PPI recommends the following projects be implemented to address water quality issues.

Continue/Implement Systematic Flushing Program: Many of the outlying areas could be most economically addressed though the continuation/implementation of a scheduled flushing program including the I-20 Rest Area, South Cherokee Road, Barbara Trail, Laurel Lane and Lakewood Drive.

East Hightower Trail – US 278 Loop: The existing 6" diameter water main along Hwy 278 north of Hancock Road is a long dead-end line that currently experiences issues with both water quality and low fire flow availability. One option to improve water system operations in this area is to install approximately 5,500 linear feet of new 12-inch and 8-inch diameter water main along Highway 278 and East Hightower Trail to improve system connectivity and essentially "loop" the water system.

Water Storage Tank Operational Improvements:

Based on an evaluation of existing water system operating data, the following recommendations should be considered by the City of Social Circle to improve water storage tank operations and efficiency.

Repair or replace problematic altitude valves at tank sites – Given the varying overflow elevations of the City's four elevated water storage tanks (+/- 8 feet), proper operation of the altitude valves at each tank site is critical for optimal utilization of available storage capacity and management of system pressures. PPI recommends repair and/or replacement of control valves at each tank site.

Automated Operation of WTP High Service Pumps – PPI recommends SCADA upgrades to allow for the automated operation of the Water Treatment Plant high service pumps based on water tank levels. This improvement would optimize the efficiency of water system storage, reduce pumping costs, stabilize system pressures, and automate the system to better respond to spikes in water demands.

The water system hydraulic model was utilized to evaluate tank level behavior under varying control scenarios. The results of this analysis are provided with Appendix C for reference. The following operation conditions were observed:

- All tanks operate within a few feet in elevation.
- With WTP pumping, Alcova fills first, followed by Tower.
- With WTP pumps off, all tanks equalize within 2' of each other.

Since the lowest tank overflow is 981.8' (Standridge), the analysis was run to cycle the tank water elevations from 977' to 981'. This approach would render the top 8' (~250,000 gallons) of the Alcova Tank unutilized, but could eliminate the need for altitude valves under normal operating conditions.

Findings from the model analyses indicate that operating the WTP high service pumps based on Tower or Alcova tank levels would improve the efficiency of overall water system operations. Operating the system based on the Alcova tank level would present an opportunity for the Tower Road tank to overflow due to its smaller capacity and lower overflow elevation. Therefore, an operational configuration based on Tower Road tank levels appears to be the best option. From an operations perspective, SCADA control systems should be configured to provide Operator's with the flexibility to control the WTP pumps based on a set level in any one of the existing tanks.

Figure 5. 72-Hour Tank Elevations using Tower Tank to Control WTP Pumping

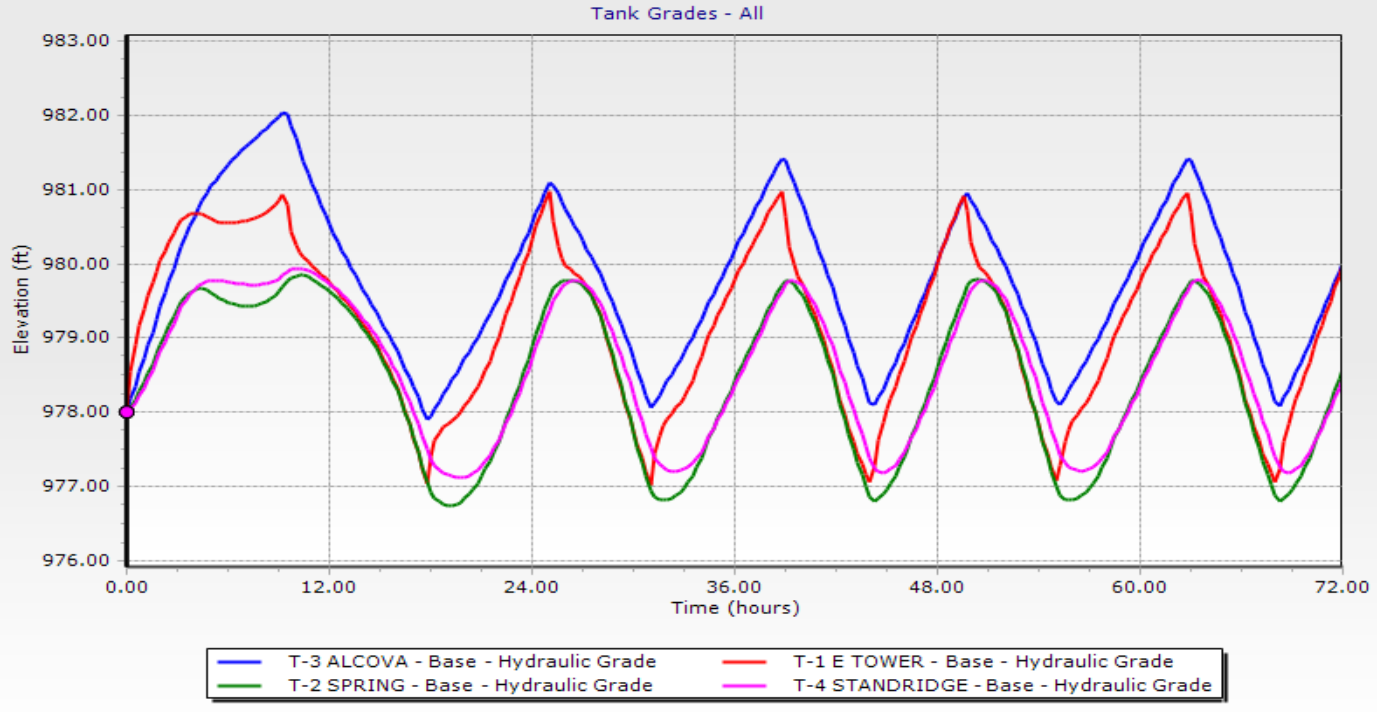
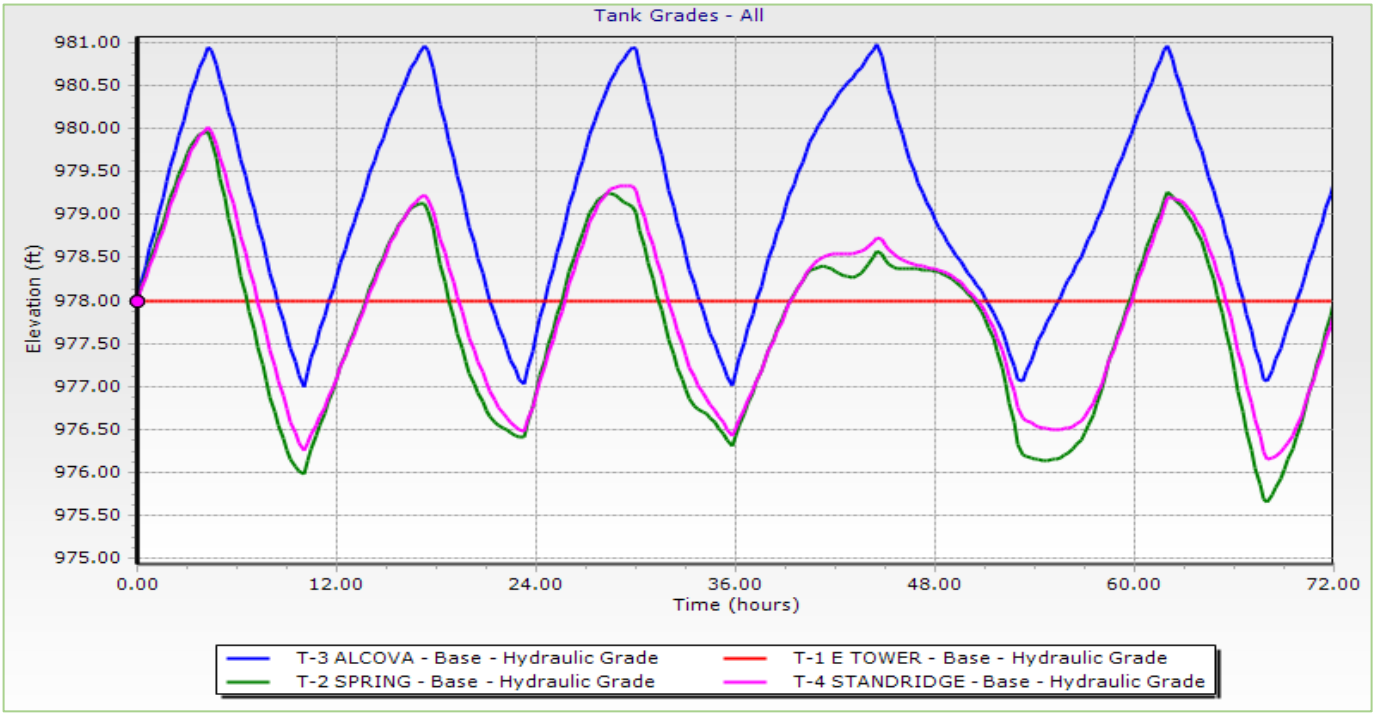


Figure 5 shows tank water level behavior when operating the WTP pumps based on the Tower tank level. The chart shows a collaborative relationship between the tanks as they collectively cycle their water volumes to feed the water system. Although the Tower tank fills faster due to its small volume, the Alcova tank is still able to recharge adequately.

Operating the Tower Road Tank – The Tower Road elevated water storage tank has the smallest capacity of all the City's existing tanks and has a low overflow elevation at 982' MSL; therefore its overall usefulness to system operations was initially in question. Model analyses were performed with and without the Tower Road tank in operation. Taking the tank offline resulted in no significant change in service pressure. Fire flow in some surrounding areas decreased only slightly. The model scenario with Tower offline and WTP pump control based on Alcova tank level revealed no issues with operation of the other tanks.

Figure 6 shows tank level behavior assuming the Tower tank is offline and WTP pumps are controlled to operate based on Alcova tank level. Model results estimate the tanks still work fairly close in hydraulic grade and effectively cycle their water volumes.

Figure 6. 72-Hour Tank Elevations, Pump Control by Alcova Tank, Tower offline



Utilizing the Tower Road elevated storage tank does not have a negative impact on water system operations. However, it does provide some water storage and appears to be useful for stabilizing system pressure and fire flow in the immediate vicinity. Based on model findings, the Tower tank appears to be a useful asset to the water system.

Future Water Storage Facilities – It is anticipated that replacement of the Tower Lane storage tank should be included in long range planning efforts (10+ years). The capacity of the Tower Lane elevated storage tank should be increased, and constructed at an overflow elevation of 990' MSL to match the Alcova Tank elevations.

PPI also anticipates that the required future construction of a new elevated storage tank will likely be required in the Gateway Interchange Character Area to meet required fire flows resulting from anticipated large scale industrial development in this area.

Industrial/Commercial Water Service Improvements:

Social Circle is a rapidly emerging industrial area given the City's proximity to I-20 and the metro area. In fact, Social Circle is the current primary target area for industrial development east of Atlanta, and remains in constant competition for potential manufacturing, distribution and other industrial prospects. Anticipated future industrial development will also drive residual residential and commercial growth, thereby increasing water system demand.

In order to improve and/or expand water service to existing and emerging industrial/commercial areas, PPI recommends inclusion of the following water main extension or replacement projects in the Social Circle Water System Long Range Master Plan.

1. **Malcom Road** *(North Cherokee Road to Fairplay Drive)*
2. **Industrial Boulevard** *(Ronthor Drive to Social Circle Parkway)*
3. **Fairplay Drive** *(Malcom Road to Social Circle Parkway)*
4. **North Parkway – Phase 1** *(Industrial Boulevard to Standridge)*
5. **North Parkway – Phase 2** *(Industrial Boulevard to SR 11)*
6. **South Parkway – Phase 1** *(E. Hightower to Thurman Baccus)*
7. **South Parkway – Phase 2** *Thurman Baccus to Cannon Drive)*
8. **Roy Malcom Road** *(Social Circle Parkway to City Limits)*
9. **Thurman Baccus Road** *(E. Hightower to Social Circle Parkway)*
10. **Gateway Interchange Character Area / EAMS** *(12-Inch Water Main Loop)*

The resulting Water System Capital Improvement Plan presented herein identifies short-term capital projects (0-5 years), mid-term capital projects (6-10 years), and long range capital projects anticipated to occur beyond the defined 10-year planning horizon. Since any effective Master Plan must be a fluid document, it is recommended that the plan be reevaluated and updated on a 2-3 year basis to address system operational issues, future industrial projects, and changing development trends.

Through hydraulic modeling analyses, discussions with City staff, and field observations; PPI has identified recommended water system capital improvement projects for inclusion in the Water System Master Plan. Project prioritization was based on water quality considerations, maintenance concerns, system operational efficiency, infrastructure life cycle, utility service goals, projected system/demand growth, and anticipated industrial and commercial development.

An effective and useful capital improvements program must realistically reflect the City of Social Circle's ability to fund the proposed improvements over the defined planning horizon. City staff may elect to revise the Master Plan based available funding; including utility reserves, SPLOST funds, and potential grant, loan or bonds funding. Project should be reprogrammed to accurately reflect available funding over the life of the plan.

The Water System Capital Improvement Plan presented on the following pages identifies short-term capital projects (0-5 years), mid-term capital projects (6-10 years), and long range capital projects anticipated to occur beyond the defined 10-year planning horizon. Capital cost escalation should be incorporated into each project budget based on scheduled implementation.

Proposed Water System Capital Improvements have been prioritized and programmed in the following Water System Master Plan. Since any effective Master Plan must be a fluid document, it is recommended that the plan be reevaluated and updated on a 2-3 year basis to address changing development trends and project priorities.

CITY OF SOCIAL CIRCLE

10-Year Water System Capital Improvements Program

			Short Term CIP (Years 1 thru 5)					Mid Term CIP (Years 6 thru 10)				
	PROJECT	**TOTAL**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
1.	**Repair/Replace Altitude Valves @ Alcova, Tower, Spring and Standridge Tanks**	**$80,000**	$80,000									
2.	**Juniper Street / Clark Street Water Main Improvements**	**$180,000**	$180,000									
3.	**North Cherokee - Phase 1** *(W Hightower to Heritage - 2,000 LF/12-inch)*	**$320,000**	$140,000	$180,000								
4.	**North Cherokee Road Pressure Control Valve** *(Walton Interconnection)*	**$35,000**		$35,000								
5.	**SCADA System Operational Improvements - WTP High Service Pumps**	**$70,000**		$70,000								
6.	**South Cherokee - Phase 1** *(W Hightower to Hickory - 1,300 LF/12-inch)*	**$208,000**		$95,000	$113,000							
7	**East Hightower Trail Water Main** *(Cherokee to Oak Dr. - 2,400 LF/12-Inch)*	**$384,000**			$272,000	$112,000						
8.	**Oak Drive Water Main** *(N Cherokee to Willow Dr - 2,800 LF/8-inch)*	**$378,000**				$278,000	$100,000					
9.	**Windsong/Park Place Water Main Looping** *(Routing TBD)*	**$154,000**					$154,000					
10.	**South Cherokee - Phase 2** *(Hickory to Spring St - 2,800 LF/12-inch)*	**$448,000**					$156,000	$292,000				
11.	**Spring Street Water Main** *(Hightower to South Cherokee - 4,600 LF/8-Inch)*	**$621,000**						$155,000	$466,000			
12.	**North Cherokee - Phase 2** *(Heritage to Ronthor Dr - 3,600 LF/12-Inch)*	**$576,000**								$478,000	$98,000	
13.	**North Cherokee - Phase 3** *(Ronthor Dr to City Limits - 5,600 LF/12-Inch)*	**$896,000**									$396,000	$500,000
14.	**Annual Water Main (Galvanized) Replacement Program** *(1,000 LF/Year)*	***Annual***	$100,000	$120,000	$125,000	$130,000	$130,000	$135,000	$135,000	$140,000	$140,000	$145,000
	TOTALS	**$5,650,000**	**$500,000**	**$500,000**	**$510,000**	**$520,000**	**$540,000**	**$582,000**	**$601,000**	**$618,000**	**$634,000**	**$645,000**

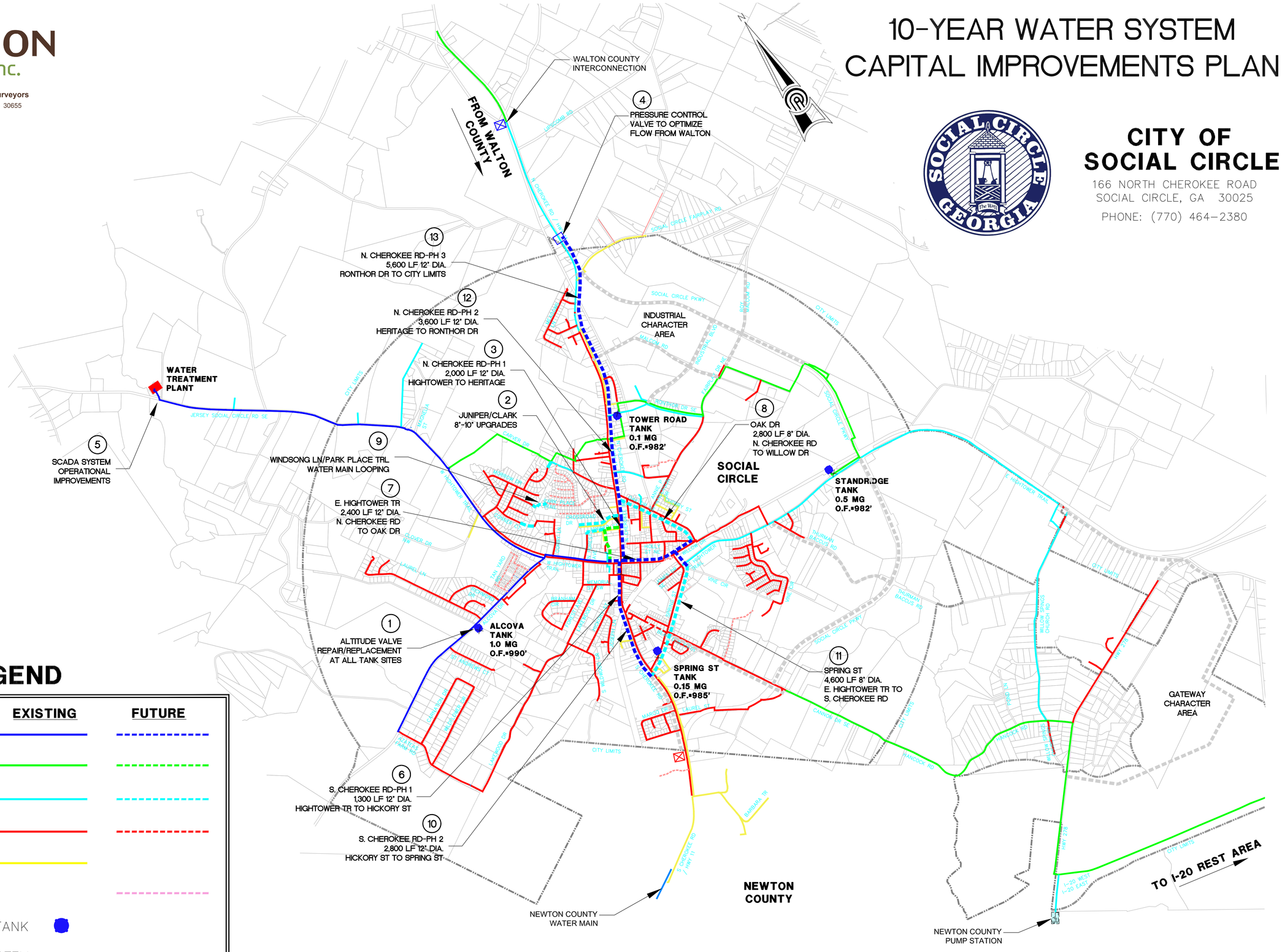
FUNDING SOURCES		
TYPE	**AMOUNT**	**% TOTAL**
Utility Reserve Funds		0.0%
SPLOST		0.0%
Private Investment		0.0%
Grant/Loans Funds		0.0%
TOTAL:	**$5,650,000**	**100.0%**

PRECISION Planning Inc.
planners • engineers • architects • surveyors
802 East Spring Street • Monroe • Georgia • 30655
770.267.8800 • www.ppi.us

10-YEAR WATER SYSTEM CAPITAL IMPROVEMENTS PLAN

CITY OF SOCIAL CIRCLE

166 NORTH CHEROKEE ROAD
SOCIAL CIRCLE, GA 30025
PHONE: (770) 464-2380



LEGEND

	EXISTING	FUTURE
12" WATER MAIN		
10" WATER MAIN		
8" WATER MAIN		
6" WATER MAIN		
2" OR 4" WATER MAIN		
LONG RANGE WATER		
ELEVATED STORAGE TANK		
WATER SYSTEM INTERCONNECTION/METER		

N.T.S.

MAP 5

CITY OF SOCIAL CIRCLE

Long Range Water System Capital Improvements

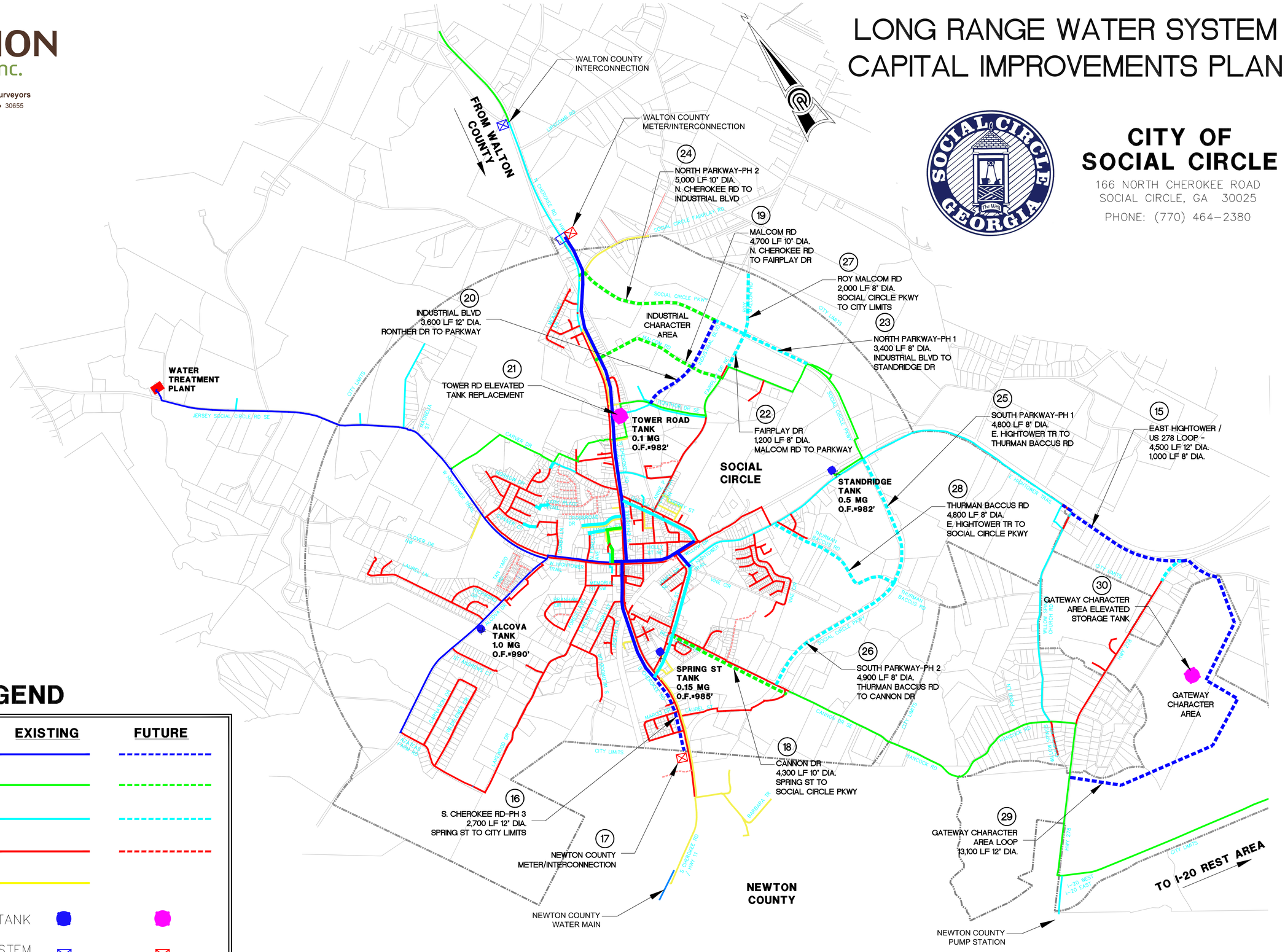
PROJECT	TOTAL
15. East Hightower Trail - US 278 Loop *(4,500 LF/12-Inch and 1,000 LF/8-Inch)*	**$855,000**
16. South Cherokee - Phase 3 *(Spring St to City Limits - 2,700 LF/12-Inch)*	**$432,000**
17. Newton County Meter / Interconnection *(@ City Limits)*	**$80,000**
18. Cannon Drive Water Main *(Spring to Social Circle Parkway - 4,300 LF/10-Inch)*	**$623,500**
19. Malcom Road Water Main Extension *(SR 11 to Fairplay Drive - 4,700 LF/10-Inch)*	**$681,500**
20. Industrial Blvd Water Main Extension *(Ronthor to Parkway - 3,600 LF/12-Inch)*	**$576,000**
21. Tower Road Elevated Storage Tank Replacement *(1,000,000 Gallon)*	**$1,950,000**
22. Fairplay Drive Water Main Extension *(Malcom Rd to Parkway - 1,200 LF/8-Inch)*	**$162,000**
23. North Parkway WM Extension Phase I *(Industrial Blvd-Standridge - 3,400LF/8-Inch)*	**$459,000**
24. North Parkway WM Extension Phase 2 *(Industrial Blvd to SR 11 - 5,000 LF/10-Inch)*	**$725,000**
25. South Parkway WM Ext - Phase 1 *(E. Hightower-Thurman Baccus 4,800 LF/8-Inch)*	**$648,000**
26. South Parkway WM Ext - Phase 2 *(Thurman Baccus to Cannon - 4,900 LF/8-Inch)*	**$661,500**
27. Roy Malcom Road Water Main *(SC Parkway to City Limits - 2,000 LF/8-Inch)*	**$270,000**
28. Thurman Baccus Road Water Main Extension *(4,800 LF/8-inch)*	**$648,000**
29. Gateway Character Area / EAMS Water Main Loop *(13,100 LF/12-Inch)*	**$2,100,000**
30. Gateway Character Area / EAMS Elevated Storage Tank	**$2,000,000**
TOTAL LONG RANGE PROJECT COSTS:	**$12,871,500**

PRECISION
Planning Inc.
planners • engineers • architects • surveyors
802 East Spring Street • Monroe • Georgia • 30655
770.267.8800 • www.ppi.us

LONG RANGE WATER SYSTEM CAPITAL IMPROVEMENTS PLAN

CITY OF SOCIAL CIRCLE

166 NORTH CHEROKEE ROAD
SOCIAL CIRCLE, GA 30025
PHONE: (770) 464-2380



LEGEND

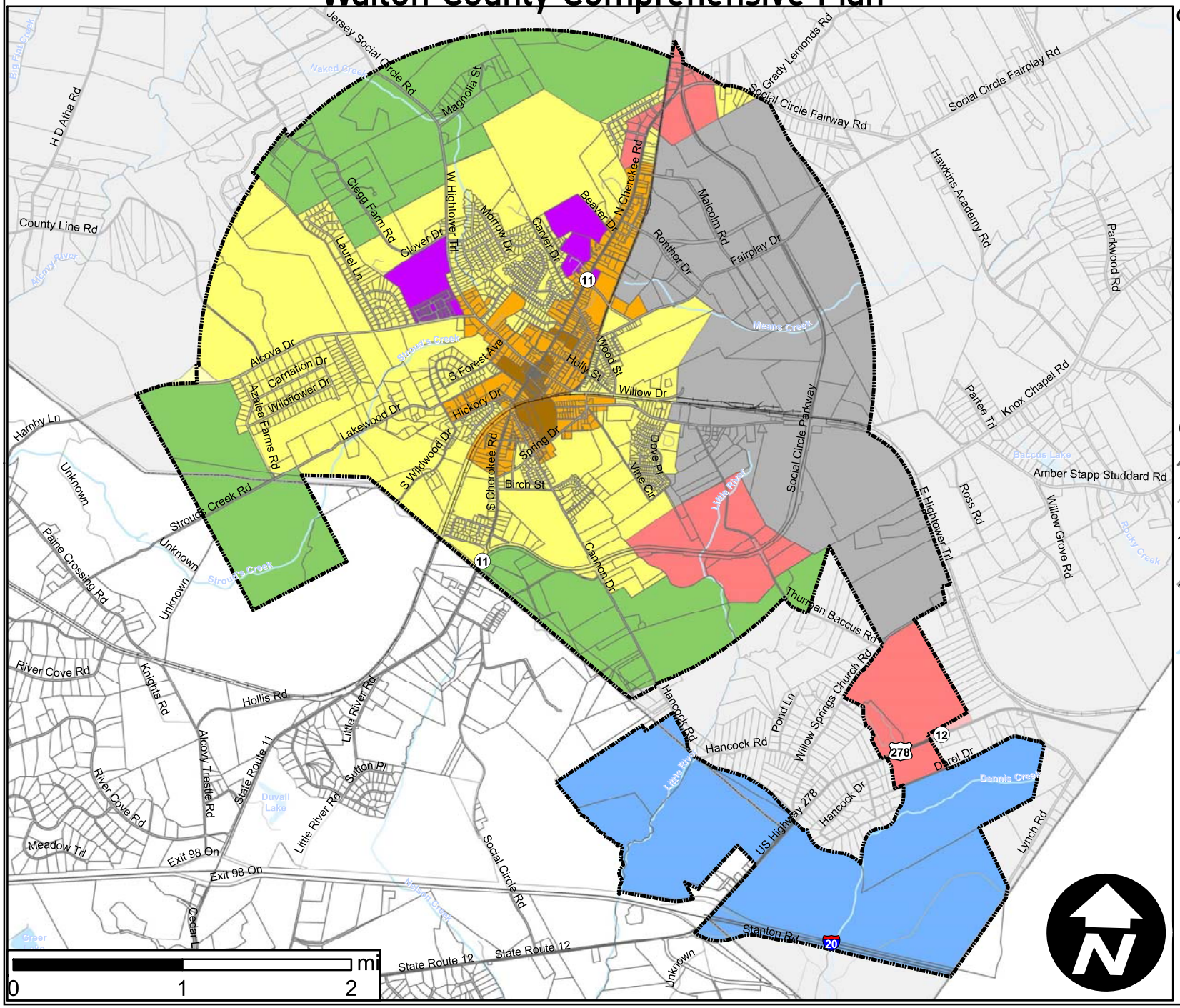
	EXISTING	FUTURE
12" WATER MAIN		
10" WATER MAIN		
8" WATER MAIN		
6" WATER MAIN		
2" OR 4" WATER MAIN		
ELEVATED STORAGE TANK		
WATER SYSTEM INTERCONNECTION/METER		

N.T.S.

MAP 6

Social Circle Future Development

Walton County Comprehensive Plan



Character Areas

- Agricultural and Large Lot Residential Character Area
- Commercial and Institutional Character Area
- Gateway Interchange Character Area
- Imagine Social Circle - Downtown Character Area
- Imagine Social Circle - Historic District Character Area
- Imagine Social Circle - Neighborhoods Character Area
- Industrial Character Area
- Urban Village Character Area

Other

- State Route
- Local Road
- Railroad
- County Boundary
- City Limits
- Rivers and Streams
- Lakes
- Parcels

This map is for planning purposes only.

NEGRC
Northeast Georgia Regional Commission

6/9/2017

PRECISION
Planning Inc.
planners • engineers • architects • surveyors
802 East Spring Street • Monroe • Georgia • 30655
770.267.8800 • www.ppi.us

EXISTING WATER SYSTEM MAP

- APPROXIMATE WATER SYSTEM HYDRAULIC GRADE = 980'
- WALTON COUNTY INTERCONNECTION SUPPLIES TO MEADOWS LANE
- AVERAGE DAILY DEMAND = 0.64 MGD (2016)

CITY OF
SOCIAL CIRCLE
166 NORTH CHEROKEE ROAD
SOCIAL CIRCLE, GA 30025
PHONE: (770) 464-2380

WALTON COUNTY INTERCONNECTION

FROM WALTON COUNTY

WATER TREATMENT PLANT

TOWER ROAD TANK
0.1 MG
O.F.=982'

STANDRIDGE TANK
0.5 MG
O.F.=982'

ALCOVA TANK
1.0 MG
O.F.=990'

SPRING ST TANK
0.15 MG
O.F.=955'

SOCIAL CIRCLE

NEWTON COUNTY

NEWTON COUNTY WATER MAIN

NEWTON COUNTY PUMP STATION

TO I-20 REST AREA

CITY LIMITS

LEGEND

- 12" WATER MAIN
- 10" WATER MAIN
- 8" WATER MAIN
- 6" WATER MAIN
- 2" WATER MAIN
- UNKNOWN SIZE
- ELEVATED STORAGE TANK
- WATER SYSTEM INTERCONNECTION/METER

N.T.S.

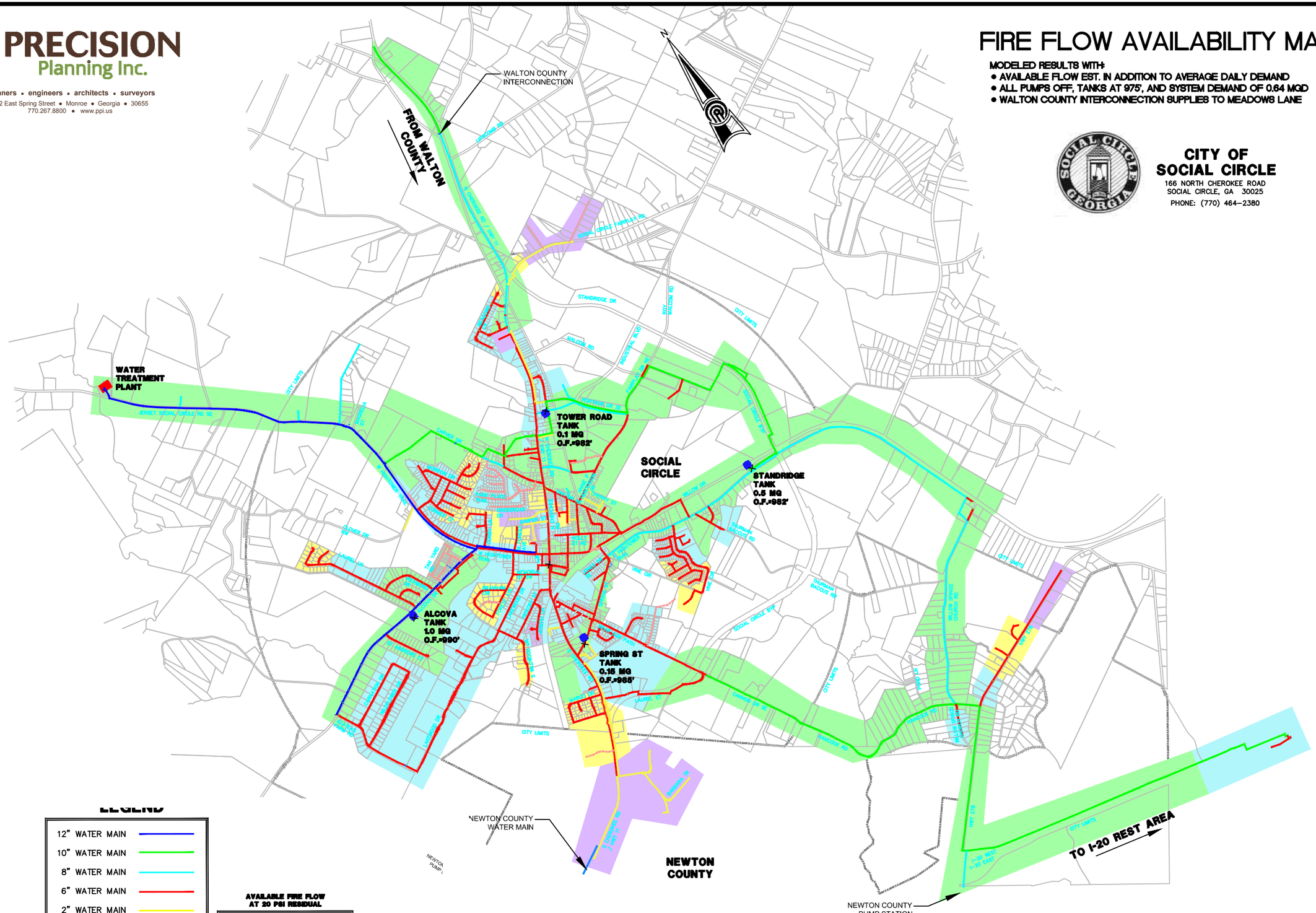
MAP 1

PRECISION
Planning Inc.
planners • engineers • architects • surveyors
802 East Spring Street • Monroe • Georgia • 30655
770.267.8800 • www.ppi.us

FIRE FLOW AVAILABILITY MAP

MODELED RESULTS WITH:
- AVAILABLE FLOW EST. IN ADDITION TO AVERAGE DAILY DEMAND
- ALL PUMPS OFF, TANKS AT 975', AND SYSTEM DEMAND OF 0.64 MGD
- WALTON COUNTY INTERCONNECTION SUPPLIES TO MEADOWS LANE

CITY OF SOCIAL CIRCLE
166 NORTH CHEROKEE ROAD
SOCIAL CIRCLE, GA 30025
PHONE: (770) 464-2380



N.T.S.

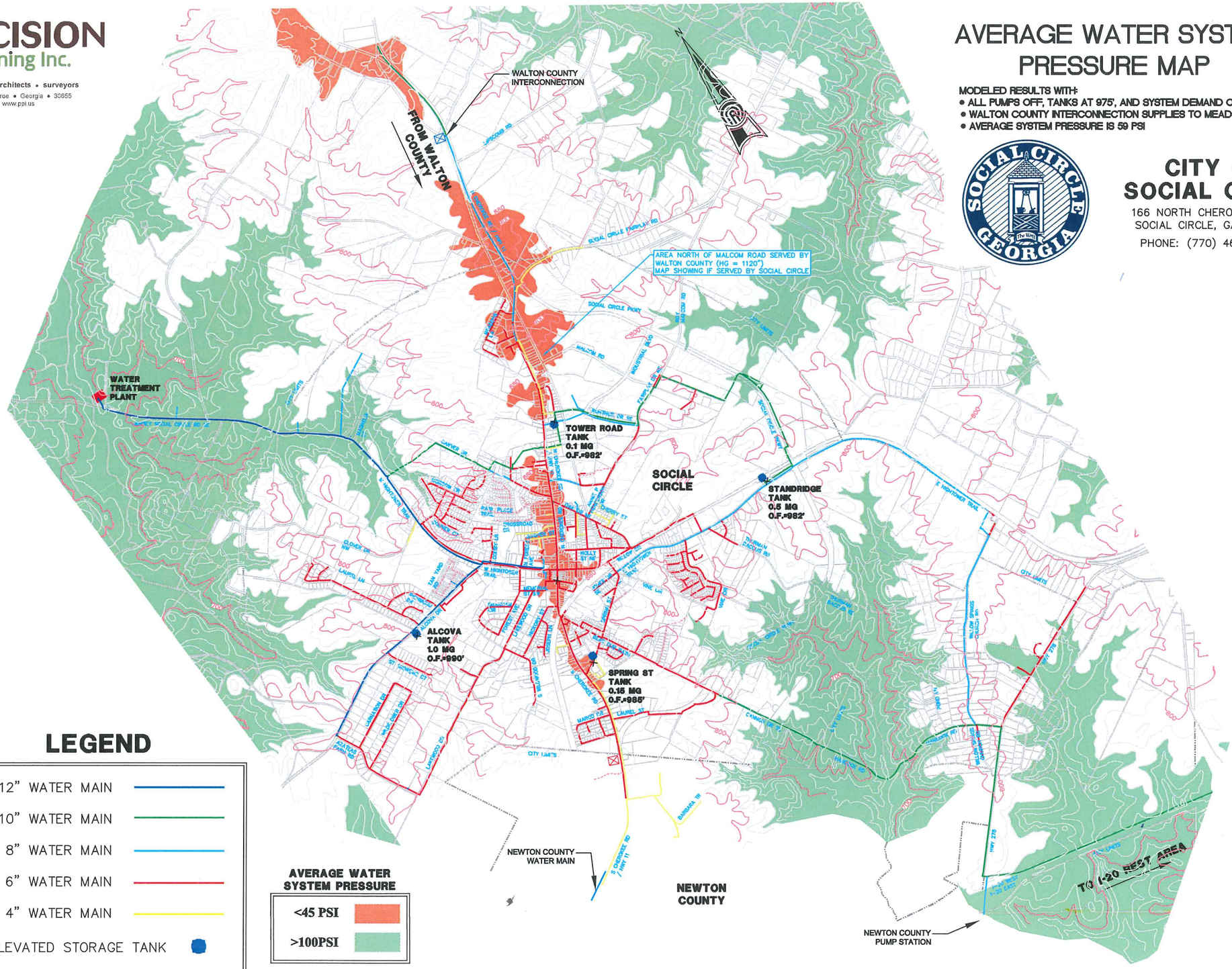
MAP 2

PRECISION
Planning Inc.
planners • engineers • architects • surveyors
802 East Spring Street • Monroe • Georgia • 30655
770.267.8800 • www.ppi.us

AVERAGE WATER SYSTEM PRESSURE MAP

MODELED RESULTS WITH:
- ALL PUMPS OFF, TANKS AT 975', AND SYSTEM DEMAND OF 0.64 MGD
- WALTON COUNTY INTERCONNECTION SUPPLIES TO MEADOWS LANE
- AVERAGE SYSTEM PRESSURE IS 59 PSI

CITY OF SOCIAL CIRCLE
166 NORTH CHEROKEE ROAD
SOCIAL CIRCLE, GA 30025
PHONE: (770) 464-2380



LEGEND

- 12" WATER MAIN
- 10" WATER MAIN
- 8" WATER MAIN
- 6" WATER MAIN
- 2" OR 4" WATER MAIN
- ELEVATED STORAGE TANK
- WATER SYSTEM INTERCONNECTION/METER

AVERAGE WATER SYSTEM PRESSURE

<45 PSI	
>100PSI	

N.T.S.

MAP 3

PRECISION
Planning Inc.
planners • engineers • architects • surveyors
802 East Spring Street • Monroe • Georgia • 30655
770.267.8800 • www.ppi.us

WATER AGE MAP

• AGE AFTER A 7-DAY EXTENDED PERIOD ANALYSIS

CITY OF
SOCIAL CIRCLE
166 NORTH CHEROKEE ROAD
SOCIAL CIRCLE, GA 30025
PHONE: (770) 464–2380

WALTON COUNTY
INTERCONNECTION

FROM WALTON COUNTY

WATER
TREATMENT
PLANT

TOWER ROAD
TANK
0.1 MG
O.F.=962'

SOCIAL
CIRCLE

STANDRIDGE
TANK
0.5 MG
O.F.=962'

ALCOVA
TANK
1.0 MG
O.F.=990'

SPRING ST
TANK
0.15 MG
O.F.=985'

NEWTON COUNTY
WATER MAIN

NEWTON
COUNTY

NEWTON COUNTY
PUMP STATION

TO I-20 REST AREA

N.T.S.

LEGEND

12" WATER MAIN	
10" WATER MAIN	
8" WATER MAIN	
6" WATER MAIN	
2" WATER MAIN	
ELEVATED STORAGE TANK	
WATER SYSTEM INTERCONNECTION/METER	

LEGEND

0–1 DAY OLD	
1–3 DAYS OLD	
4–5 DAYS OLD	
6+ DAYS OLD	

MAP 4