City of Norman

Water Conservation Plan 2016

(As Amended 5/10/16)

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1.0 HISTORY OF THE CITY OF NORMAN WATER SYSTEM

Settlement of public lands near the Little River and the South Canadian River in central Oklahoma progressed rapidly once the area was opened to entry in the late 1800's. In this area, the once known settlement called Camp Norman was incorporated into the City of Norman on May 13, 1891. Since its incorporation, the City of Norman has continually expanded. About this same time, the State of Oklahoma established the University of Oklahoma in Norman. Since then, our histories have traveled together.

For the first 65 years of our history, Norman's water supply was from wells drilled into the Garber Wellington Aquifer located beneath central Oklahoma. The aquifer is sometimes referred to as the Central Oklahoma Aquifer. The aquifer ranges South to North from Norman to Guthrie. The aquifer ranges west to east from I-35 to Shawnee. In the 1940's, city officials began to realize the need for additional water resources which led to discussions with the Bureau of Reclamation and the ultimate reconnaissance study for a reservoir in 1949.

A Feasibility Study followed in 1954, a Reappraisal Report in 1959, and a Definite Plan Report in 1961. These all led the Federal Government to the conclusion that a surface reservoir was needed to serve area communities. The reservoir was named The Norman Project, eventually to become Lake Thunderbird and was authorized by Congress on June 27, 1960. The Norman Project considered serving Oklahoma City, Tinker Air Force Base, Norman, Midwest City and Del City. Oklahoma City realized the quantity was too small for their efforts. Tinker decided to stay with their wells which left the supply for Norman, Midwest City, and Del City. Three members from Norman, 3 members from Midwest City, and 1 member from Del City were appointed to form the Central Oklahoma Master Conservancy District (COMCD) in 1961. Their purpose was to manage the needs of all project participants. The lake was designed to yield a reliable water supply at 21,600 acre feet per year or approximately 7 billion gallons per year. The contract stated that Norman would receive 43.8%, MWC 40.4%, and Del City 15.8%. The population for Norman was 33,412 in 1960.

Throughout this time the lake and the water wells were continually used to supply its citizens as needed. In the 1970's increased peak day water demand was stressing the system. In 1982 the water treatment plant was expanded from 7 MGD to 14 MGD. Though this did not expand our annual allocation of water from Lake Thunderbird, it allowed the plant to replenish the water used after peak day demands experienced in the summertime. The population for Norman had grown to 68,020 in 1980. As the population and associated water demands expanded over time, this led to water shortages and rationing in the 1990's for Norman. Additional water wells began to be constructed and in 1999, 31 wells along with a 14 MGD water treatment plant were being utilized to meet Norman's demand. The population for Norman was 95,694 in 2000.

In 2000, Norman completed a connection to the treated water supply system of Oklahoma City. This connection served and continues to serve as an emergency reserve supply and is only operated during times of extreme demand or system emergency. Norman produces its own water from the lake and wells at a much lower cost than purchasing water from Oklahoma City so it is more economical for Norman to purchase the additional water needed using Oklahoma City's Peak Rate.

In January of 2006, the arsenic rule became in effect which lowered the arsenic limits from 50 micrograms per liter to 10 micrograms per liter. This lower limit forced the City to turn off several wells and Norman's water supply was reduced to 15 active wells along with the water from Lake Thunderbird. This same year, the citizens of Norman voted to significantly raise their water rates in order to address the impacts of the lowering of the arsenic limits. With the rate increase, new wells were drilled within Northeast Norman. Also, large irrigation users were reviewed in an effort to replace their potable water needs with irrigation quality water. Norman began encouraging citizens to practice conservation every day. Currently in 2016, the City of Norman is operating with the same amount of water that it had in 2006 (21,600 acre feet annually from Lake Thunderbird and 31 water wells). The City of Norman has begun purchasing 1 MGD from Oklahoma City to help with the water quantity situation. The population for Norman as of July 2015 is 118,294.

2.0 WATER SYSTEM INVENTORY

2.1 Water Wells Today, Norman utilizes Lake Thunderbird, 31 water wells drilled into the Garber Wellington Aquifer, and purchases 1 million gallons per day from OKC to meet everyday water needs. Ground water is pumped from the Garber Wellington Aquifer directly into Norman's water distribution system with the exception of a few wells. Of the few considered treated, some are blended with other water sources to meet the arsenic rule. One well has an arsenic removal system set up with chloramination. The remaining wells meet current water quality standards with out additional treatment. Feasibility data is being collected to possibly combine several wells that are not active and establish a combined treatment system to reduce arsenic levels and potentially address future rule changes possibly for chromium, vanadium, etc. City staff continues to monitor updates to the ground water rule and unregulated contaminants that might be added in the future.

Currently, 10-12 new water wells are under design and will be constructed and online within the next three years. This is in accordance with our 2060 Strategic Water Supply Plan which is available for review on the City of Norman website.

http://www.normanok.gov/utilities/wt/water-treatment-strategic-water-plan

Figure 1 graphically shows the general distribution of the water wells, including those recently closed due to high arsenic, and their physical relation to Lake Thunderbird.

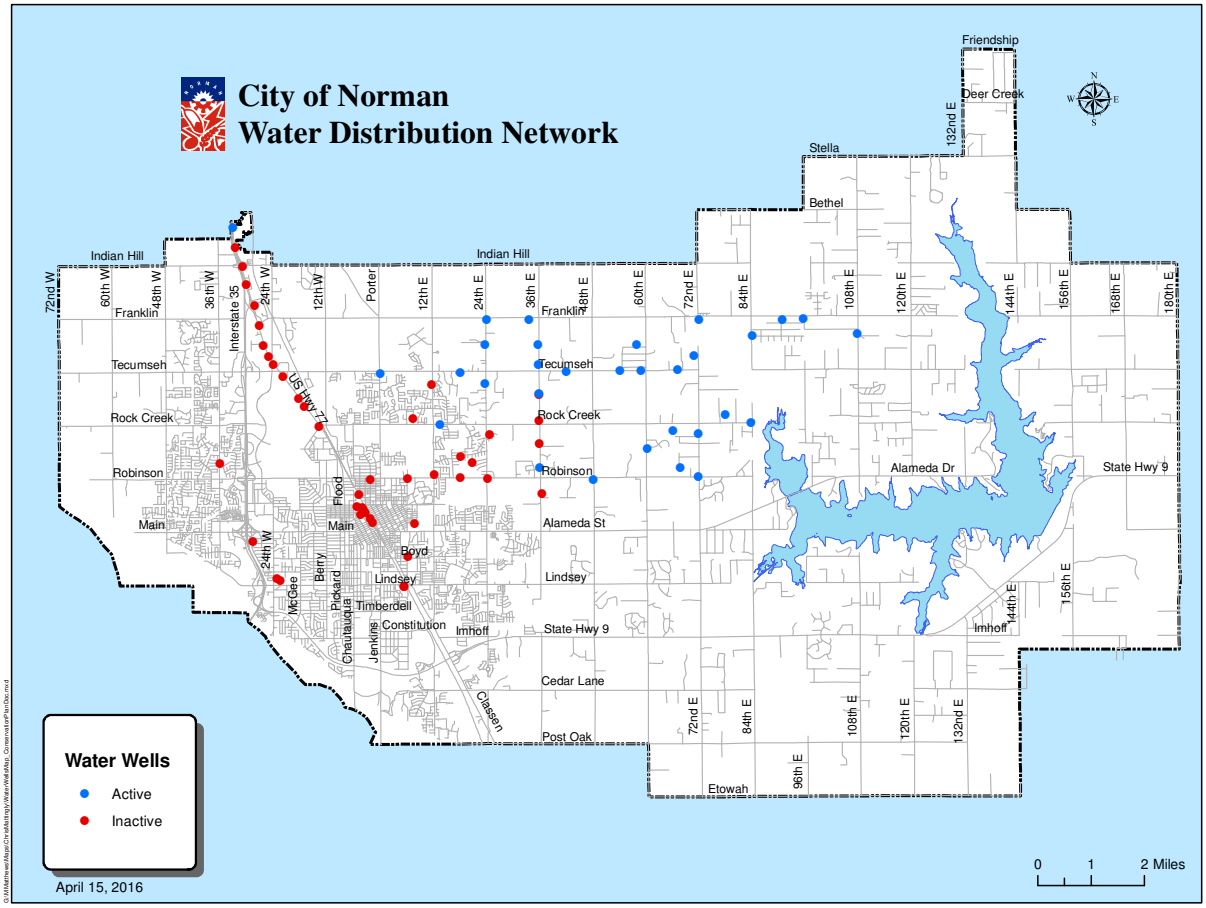
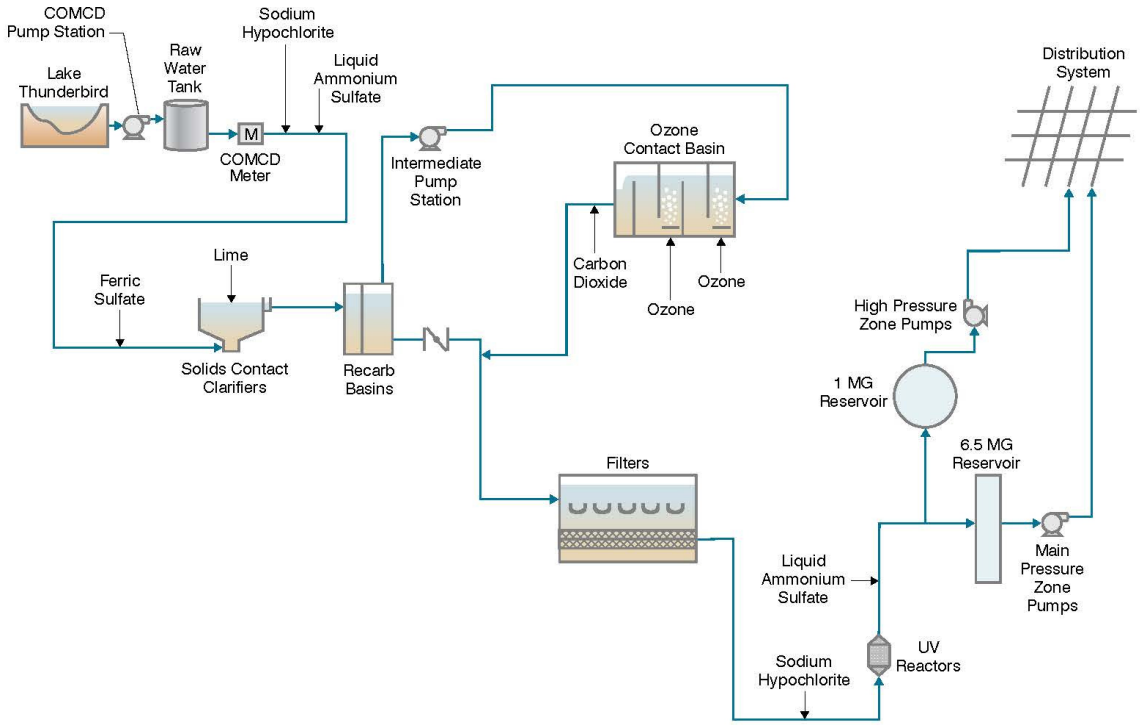


Figure 1.

2.2 Water Treatment Plant Raw water is delivered by the COMCD to Norman's water treatment plant. Plant design is conventional softening and it was constructed in the mid 1960's. The plant was expanded in 1982 and again in 2010 Phase I. The water plant is currently undergoing additional water treatment improvements (Phase II) that will address taste and odor, algal toxins, pharmaceuticals and personal care products that might be found in the raw water supply. Ozone and UV will be added as part of the Phase II improvements. Figure 2 is the future treatment process for Norman's water treatment plant.

Figure 2.



2.3 OKC Emergency Connection The supply line connecting Norman to Oklahoma City provides an emergency supply source. Maximum delivery rate can vary from 6.5 to 9 MGD depending on season and ultimately the pressure differential between Oklahoma City and Norman. OKC discontinued the peak purchase contract and Norman signed a new contract to purchase 1 million gallons per day for the next five plus years. This contract quantity can be increased moving forward and staff will continue to monitor. The vault connection is located at the northwest boundary of Norman's city limits.

3.0 WATER RIGHTS vs PRODUCTION

3.1 Water Supply Permitted Rights- Wells A majority of Norman's ground water right permits are temporary permits which allow withdrawal of 2 acre-ft of water per acre per year. Norman is permitted for approximately 28,600 acre-ft of ground water which equates to roughly 9.3 billion gallons per year. The Garber-Wellington aquifer is currently being studied by the Oklahoma Water Resources Board and the Association of Central Oklahoma Governments (ACOG). Preliminary data suggests that the sustainable yield is much less than the current water rights issued under temporary permits. ACOG indicates the recharge rate is approximately 2 inches per year which suggests that the sustainable yield will probably be between 0.25 and 0.5 acre-ft of water per year. If the decision is made to reduce the yield to 0.5 acre-ft of water per year, the NUA's water rights will be 2.33 billion gallons per year or an average of 6.4 Million Gallons per Day (MGD). This reduced yield would only allow for 36 wells operating 70% of the time throughout the year. Therefore, if the temporary permits are reduced before becoming final

permits, additional ground water rights will be necessary. Staff has hired a consultant to review Norman's water rights and possibly add to them as it pertains to Norman drilling 10-12 more water wells.

3.2 Water Supply Permitted Rights-Surface Water Norman's surface water comes from Lake Thunderbird which is controlled by the Central Oklahoma Master Conservancy District. Norman is permitted to use an allotment of 3.083 billion gallons per year. This equates to an average of 8.4 MGD. The Norman water treatment plant and raw water supply line had a maximum daily capacity of 14 MGD until 2011 when it was expanded to 17 MGD. However, since the annual average must remain at 8.4 MGD or less, Norman must use less surface water in the winter months to allow for the additional demand in the summer months. Norman has executed a contract with Del City and Midwest City to utilize their unused portion of water rights each year at a specified cost and as stipulated by contract. These agreements will potentially aid during years if and when Norman is over its annual lake allocation.

3.3 Water Production Daily records are kept on the operations of each source of supply. Figure 3 represents the annual water usage from the three sources available to Norman. The Oklahoma City supply connection became available in Summer 2000 and was an important part of our summer peak supply through 2016. Norman and OKC signed a new contract in 2016 in which Norman will purchase 1 MGD and no longer have the ability to peak from OKC.

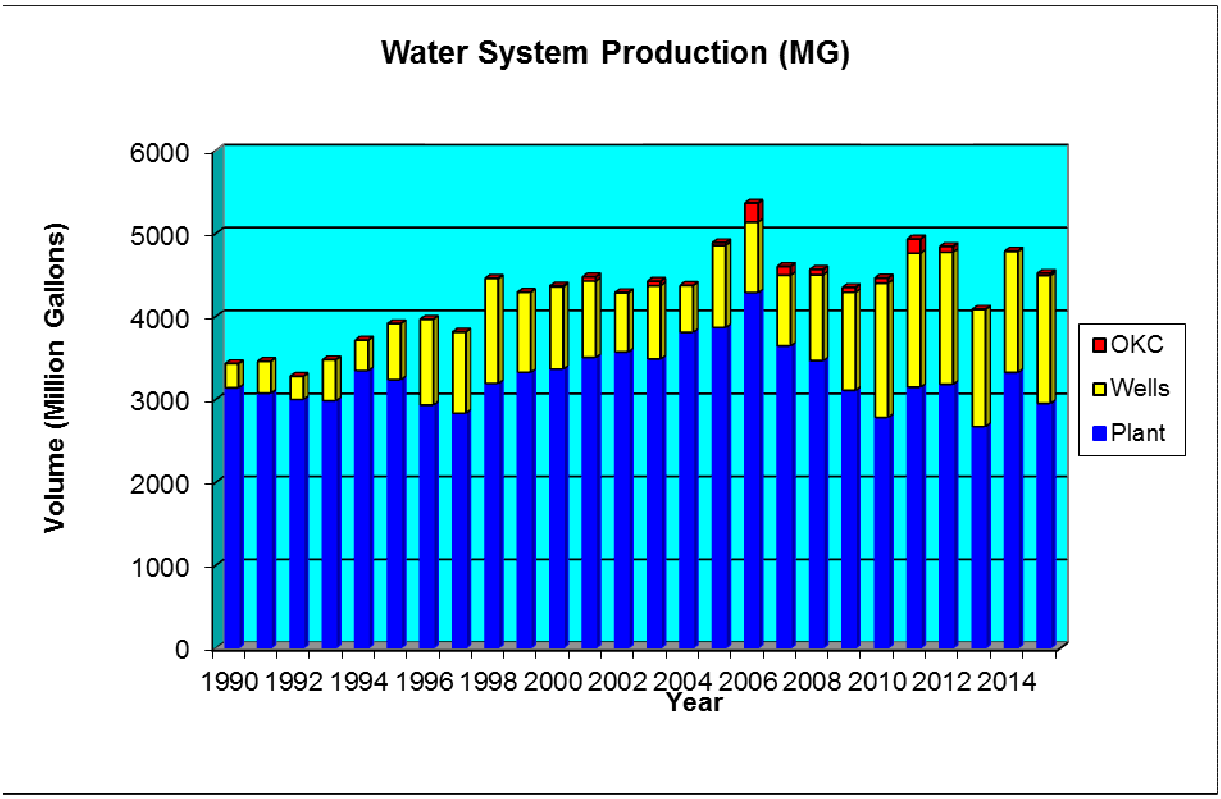


Figure 3.

4.0 WATER CUSTOMER PROFILE

Norman is not a heavily industrialized community. Residential customers consume the majority of the water produced. Within Norman are four purchase water systems operating individually. The University of Oklahoma is the largest followed by Griffin Memorial Hospital followed by two mobile home parks.

Water demand is influenced by the population served, per capita water use, weather conditions and conservation measures, while the water supply capability is largely a matter of the resources available. To assess Norman's ability to meet future needs, the 2040 Strategic Water Supply Plan was developed to address water system improvements and expansion needs based on projected trends in usage. These efforts were based on historical data collected from Norman's operational and growth records. The Water Supply Plan projected continued gallon per capita day (gpcd) increases. The more recent 2060 Strategic Water Supply Plan has refined earlier projections and tapered forecasts down from original projections. These tapered forecasts are warranted since older household fixtures are continually replaced with newer water conserving devices, and education continues regarding water conservation within the community.

4.1 Population Norman's continual growth since 1890 is reflected in Table 1. The data provided in Table 1 originated from the United States Census Bureau.

Table 1 – City of Norman, Historic Total Population

Year	Total Population
1890	787
1900	2,225
1910	3,724
1920	5,004
1930	9,603
1940	11,429
1950	27,006
1960	33,412
1970	52,117
1980	68,020
1990	80,071
2000	96,065
2005	101,930
2010	110,925
2015	118,294

4.2 Customer Distribution The City of Norman delivers water to retail customers inside the City Limits. Table 2 provides a customer summary for the City of Norman in 2016. It is worth noting the City of Norman, unlike most cities, does not have a reserve water supply to meet future industrial ventures should a company want to relocate their business to Norman.

Table 2 – City of Norman, Water Use Customer Summary in 2016

Category	# of Accounts
Residential	34,922
Commercial	1,981
Industrial	17
Institutional	51
City of Norman	98
Irrigation Only	873
OU	31
Total Customers	***37,973***

5.0 WATER USE PROFILE / RATES

Water customers in Norman exhibit distinctive use patterns. Each category of user described below illustrates the nature of each customer category use pattern.

5.1 Per Capita Consumption Data Per capita consumption is determined by dividing the total water produced in a given year, divided by the population served, then divided by 365 days per year. Table 3 provides the calculated per capita information available from 1960 to 2015.

Table 3 – City of Norman, Historical Capita Consumption of Water

Year	Per Capita Consumption (gpcd)
1960	74
1970	81
1980	100
1985	121
1990	133
1995	139
2000	142
2001	142
2002	133
2003	134
2004	130
2005	142
2006	155
2007	132
2008	130
2009	122
2010	125
2011	140
2012	132
2013	110
2014	127
2015	118

Values presented in Table 3 represent experienced demands. Though data from 1960 forward shows an increasing trend, data since 1990 indicates somewhat of a downward trend. Figure 4 below illustrates these trends.

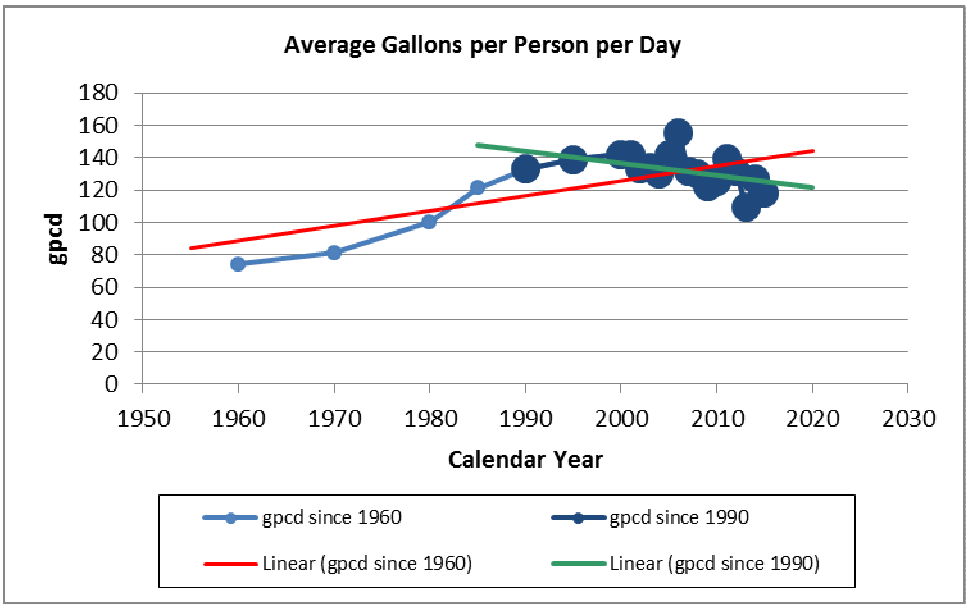


Figure 4.

It is expected that per capita consumption will increase with climate / weather. Data from the Oklahoma Climatological Survey is presented in Figure 5 below. It shows that Oklahoma has been in a period of above average rainfall since about 1983, which may account for the flattening of the water use trend. The state average water use is near 180 gpcd, indicating that Norman has already achieved significant water conservation. Further water conservation will probably be more difficult, and if Oklahoma enters a dry weather trend the increase may outweigh the savings that may be achieved.

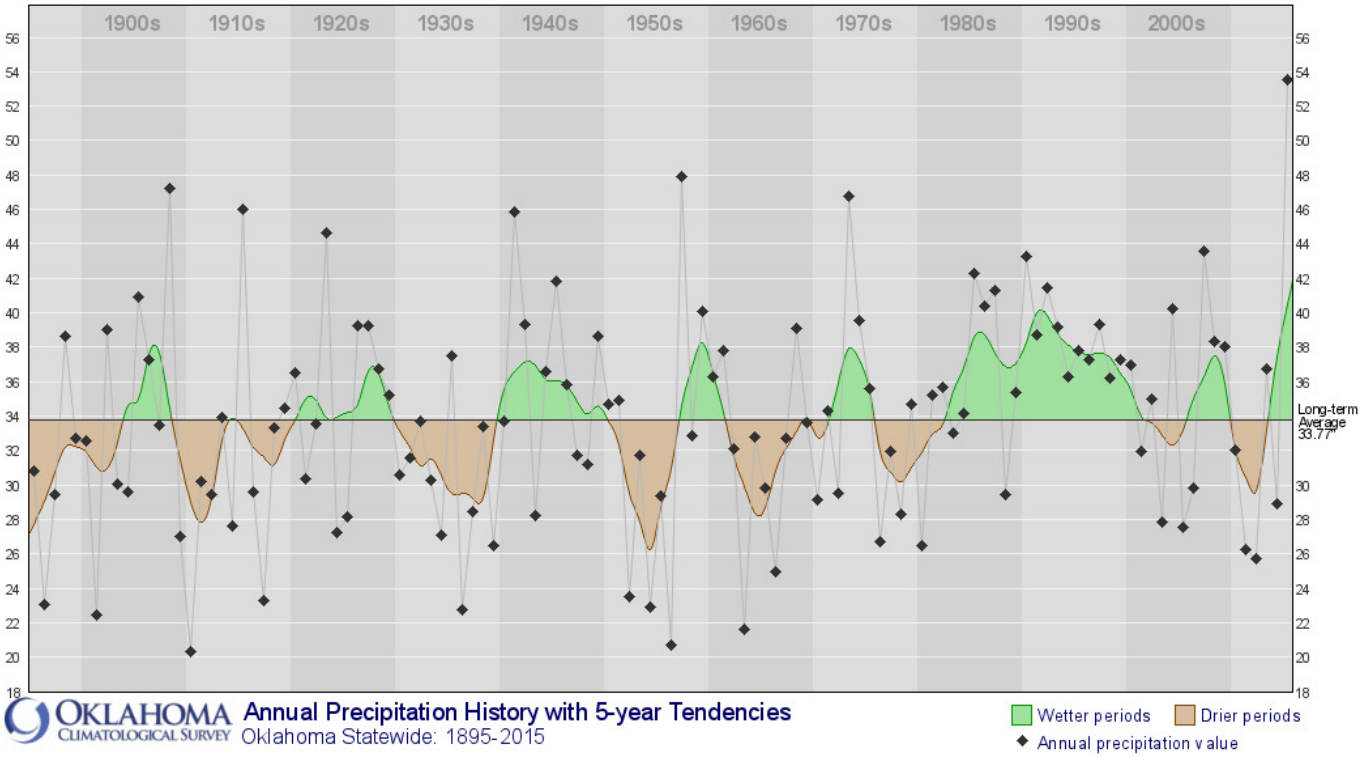


Figure 5.

5.2 Water Pricing Structure The water rate structure in Norman is established by a majority vote of the public. The city charter prohibits increasing water rates by administrative action. The voters passed a water rate increase January 2015 by a 67% to 33% vote. The rate increase allowed the NUA to pay for $50 million worth of improvements involving both water quality and quantity. Norman's current water rates can be found on the City's website:

http://www.normanok.gov/finance/utility-service-rates

6.0 SYSTEM LOSS PROFILE

Utilities staff continually monitors percent loss within the water distribution system. Utilizing a 12 month running average, Norman's unaccounted water ranges from 5 – 7%.

6.1 Water Treatment System Loss Raw water is delivered to Norman's water treatment plant by the Central Oklahoma Master Conservancy District. Line losses in their delivery system are unknown. Losses within the boundaries of the treatment plant are thought to be minimal. Recent flow meters have been installed with the plant rehabilitation that will better track water inventories. Losses are usually attributed to the evaporation of filter backwash process water as it is held for extended periods in the residual ponds.

6.2 Distribution System Loss As mentioned earlier, system losses are believed to be in the order of 5-7%. To minimize this value, line maintenance personnel are available 24 hours a day to address system failures as they occur. Upon being notified of a failure, crews respond with quick corrective action.

Another known source of water loss within the distribution system is from old and or fatigued water meters. The older meters have propellers that spin and account for the water used. The propellers deteriorate over time and are not able to register all of the water delivered to the customers. Line maintenance crews routinely test, remove and replace meters in an effort to improve water accountability. Approximately 700 meters are replaced annually of the 38,800 total meters. This equates to a replacement cycle of once every 55 years. American Water Works Association recommends a replacement cycle of small meters once per 10 years and suggest annually checking large meters accuracy since these usually register larger amounts of water used in the water system.

7.0 WATER MANAGEMENT

Water Management for the City of Norman is very important, considering the historic increases in customer usage along with a growing population. The combination of growth, a slight increase of customer usage and most importantly a limited local water supply lead to significant water supply problems in the very near future. Recent conservation efforts have resulted in a decrease in per meter usage while the population has increased. However, additional supply is necessary in addition to continue conservation efforts.

7.1 Water Use Issues Norman utilizes Lake Thunderbird as its source for surface water supply. In addition to this, water wells into the Garber Wellington aquifer provide the other component of water supply. Each source is currently experiencing problems with either quantity capability or quality.

Since the 1960's, Lake Thunderbird has historically served the majority of Norman's water demand needs. The annual allotment from Lake Thunderbird is 9,460 acre-feet (3.082 billion gallons). In 1988 Norman exceeded the allotment for the first time. Since then, the water treatment plant use has exceeded the allowed allocation fifteen times. The demands on Lake Thunderbird have increased to the point that it cannot provide the City's supply requirements on a continual basis. Figure 6 depicts Norman continually increasing demand placed on Lake Thunderbird. Recent efforts were made to operate the well field at a maximum yield to reduce the annual demand from Lake Thunderbird and bring Norman's usage within the permitted allocation.

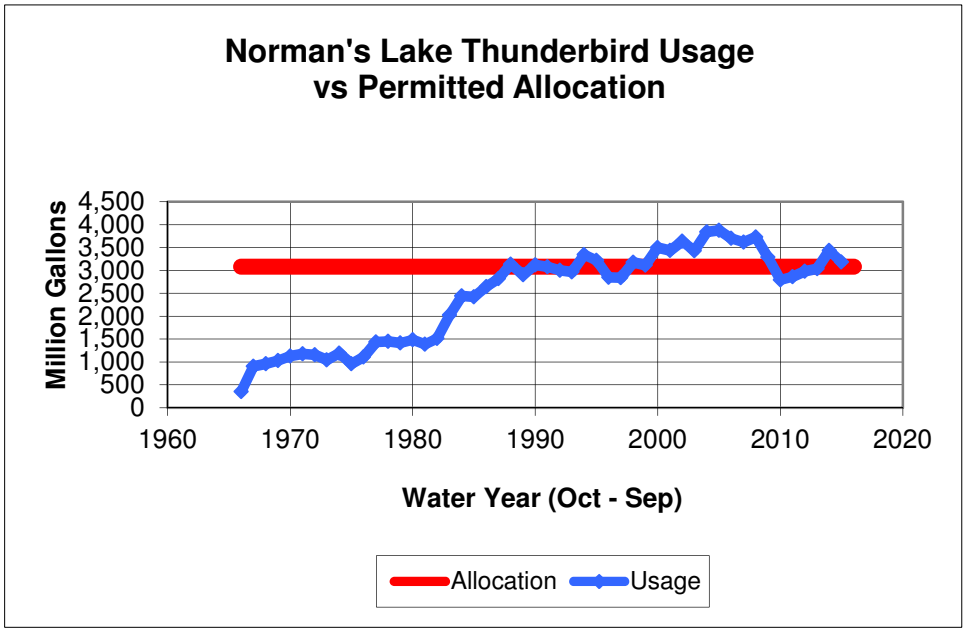


Figure 6.

To reduce the demands on Lake Thunderbird, Norman began to rely heavily on water production from ground water wells to meet demands. This practice allows Norman to limit the extent of exceeding the Lake Thunderbird allotment annually. It is uncertain at this time if the well field can withstand this increased pumping strategy over time. Additionally, Norman must continue to address increased regulations regarding groundwater. The most impacting rule change was the one establishing new limits in the amount of naturally occurring arsenic. This rule change resulted in the loss of fourteen wells from service. In addition, another well failed fluoride testing and one structurally failed. By January of 2006, the loss of these wells reduced Norman's total ability to supply water to a peak rate of 18.4 million gallons per day.

Currently, EPA is reviewing the existing regulatory limits for Chromium. If the current 100 parts per billion (ppb) regulation is reduced to a limit of 10 ppb or less, it will require most of the well field to be shutdown and/or costly treatment added to continue use. EPA has also recently released candidates for future contaminants of concern which include vanadium. Similar to the other metals, the Garber Wellington well field has levels of vanadium prevalent as well.

7.2 Water Use Goal Conserving and reusing water will ultimately save Norman citizens money and decrease the demands placed upon the environment in the form of additional supplies. Norman's conservation efforts have accomplished a reduction in the growth of the per capita usage. To further reduce per capita water usage, a combined effort of public education and water pricing will be necessary to achieve further reductions. In all cases, Norman will still need additional supplies of water for the future.

Indirect Potable Reuse (IPR) was recommended in the 2060 Strategic Water Supply Plan. The idea is based on treating water from the water reclamation facility to such a high quality; it could

be placed back into Lake Thunderbird to augment the lake water supply. DEQ is currently drafting rules to allow for the possibility of such a reuse scenario. If the IPR rules become too stringent, the City of Norman will look at Direct Potable Reuse as a potential water source. This would entail piping the highly treated water (treated to drinking water quality) from the water reclamation facility directly back to the water treatment plant. Several "fail safes" would be installed to assure all water quality parameters are met or the treatment process would automatically shut down when not sufficient. More research into the feasibility of this concept will be undertaken before it becomes a reality.

7.3 Indoor Use and Ideas for Reduction Current indoor use patters are shown in the attached Figure 7.

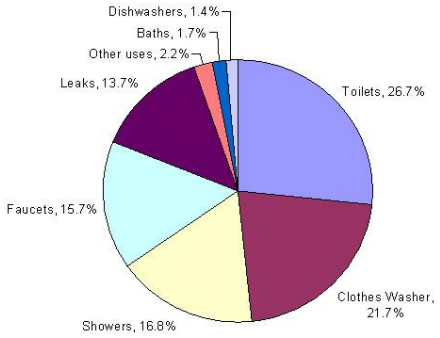


Figure 7.

(Source: American Water Works Association. (1999). Residential End Uses of Water)

Customers can do their part by conserving water and using water wisely. The City has material available on water conservation tips available at the City Hall and on the City website. Some are included here:

*Take brief showers and/or open faucets only half or three-quarters open to minimize the total water use per shower. Installing a simple restrictor in the shower head or installing a low water use shower head can reduce water use by 25 to 35 percent. However, only opening the faucets part way will accomplish the same thing with no cost or installation required.

*Place plastic bottles or bags filled with water and a few stones in the toilet tank to reduce the volume of water used with each flush. There are also alternatives of toilet dams or low water use toilets available. These may reduce the total water used by 5 to 20 gallons per day. However, be aware a newer model is probably already a low water use model, and reducing the volume of water per flush may cause improper flushing.

*Encourage the use of faucet aerators on all kitchen and bathroom faucets, as these reduce the water flow while enhancing the rinsing action of the faucet stream.

*Use automatic dishwashers sparingly and only for full loads. Most dishwashers use 20 to 30 gallons per wash, and most or all of it is hot water. By washing only full loads or hand washing

small amounts, saves in both water and energy. When cleaning dishes for the dishwasher, wipe them off with a paper towel or napkin rather than rinsing; this will save from 3 to 5 gallons.

*Wash only full loads of clothes, or match the water setting of the washer to the size of the load.

*Keep a bottle of water in the refrigerator for a cool drink. Do not run the faucet to chill the water.

7.4 Outdoor Use and Ideas for Reduction There are several ways to reduce outdoor water usage. In the summer months, Norman citizens more than double their indoor water usage recorded in the winter months. Outdoor ideas include:

*Use a nozzle with a cutoff feature on your garden hose when washing the car or other outdoor items. This will cut off the water flow when not needed.

*Sweep driveways or patios rather than hosing them off, unless they border a flower bed or garden. If so, wash so the water will run to the garden or flower bed. Get double duty from the water used.

*Plant trees, shrubs and ornamentals that are adapted to dry conditions. Use mulch around plants and shrubs to help limit evaporation and retain water. Use sprinklers sparingly and water after the sun goes down to limit evaporation. Where possible, use soaker hoses instead of sprinklers, as they are more efficient. Don't over fertilize your lawn, since this will make it require more water than normal.

*If you have a swimming pool, cover it when not in use to control evaporation.

Plumbing and Landscaping Ordinances

The City of Norman Code of Ordinances requires the 2009 International Plumbing Code for non-residential construction and 2009 International Residential Code be observed. Each requires low flow fixtures in new construction.

In 2005 the City of Norman began to require that all new automatic irrigation systems have a rain sensor and freeze gauges installed to promote water conservation. This measure will help to reduce the overall water usage of Norman.

Landscape Programs

The City of Norman carefully monitors its own use of water utilized in public landscape improvements. Irrigation activities only occur when soil conditions require. Attention is given to weather conditions and forcasts in deciding upon irrigation times for public spaces. Many areas have been switched from spray watering to ground level drip irrigation.

As for private landscape programs, Norman encourages watering early in the morning before 9:00 AM. Current practice is to provide public reminders through the local press and as billing

inserts about wasteful activities commonly occurring during irrigation. Through public media contact, self guided direction for landscape practices occur.

How much should I water my lawn?

This question is received from citizens often and the answer is dependent on several variables. Local universities maintain a website that monitors soil conditions and with the expertise in agronomy, it suggests watering quantities for various lawns. Customers are encouraged to visit this website provided by Oklahoma and Oklahoma State Universities team partnership.

The web site is named SIP, an acronym for 'Simple Irrigation Plan'. http://sip.mesonet.org/

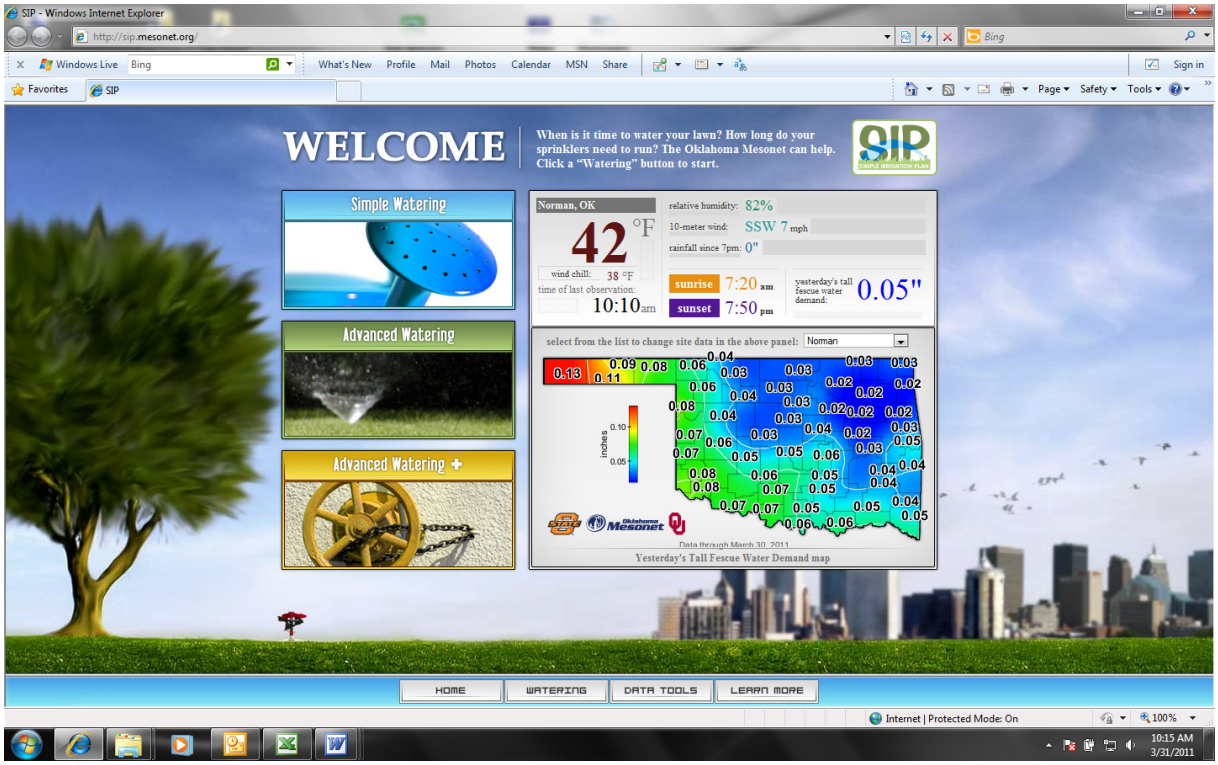


Figure 8.

Figure 8 above is and example of the SIP website.

7.5 City of Norman Water Conservation Measures Treated wastewater as irrigation reuse occurs in Norman. The University of Oklahoma uses an average of 500,000 gallons of effluent per day in the summer to irrigate the golf course. The University installed pumps and piping to connect the golf course to the discharge line leaving the treatment facility. Norman desires to utilize this resource further in the future. Figure 9 shows a typical effluent application at the University of Oklahoma Golf Course. At this time, local state regulations limit the irrigation application of effluent to controlled access areas only.

Figure 9 – City of Norman
Treated Effluent Application

Since 2004, Norman has implemented a few notable water conservation measures worth mentioning.

1. Westwood Golf Course utilized potable water for irrigation since it was built in 1967. During summer time peak demands, the golf course would use the equivalent of 1 municipal water well or 300,000 gallons per day. During the 2004 remodel project, new large ponds were constructed to capture and hold storm water. In addition, the water utility fund aided in drilling a new non-potable irrigation well for use on the golf course. The irrigation well was purchased for approximately $300,000 less than the cost of a fully designed, DEQ approved drinking water well.

2. At a cost of $15,000, a water well not suitable for drinking water was re-purposed for irrigation only to serve the Griffin park complex. This complex too was dependent on Norman's treated water drinking for irrigation purposes. The existing usage was not fully metered so it is estimated that peak summer irrigation days were over 300,000 gallons per day or the equivalent of one well during peak summer demands. Now Griffin park complex has a new irrigation pond and a well that can be used to help supply irrigation water.

3. Wastewater Treatment Plant constructed a non-potable water system to discontinue using potable water for all of the maintenance activities, such as washing clarifier weirs, foam suppression, pump seals, etc.. This is estimated at a savings of 480,000 gallons per day or the equivalent of 1 and 1/2 wells.

4. During the summer months, potable water is utilized by the composting operation to maintain a continual moist environment during processing. The potable water is used in this operation currently to control dust and limit compost drying during warmer periods. Conversion to use treated wastewater effluent will effectively reduce demands placed on treated water supplies. Staff is working with DEQ to allow the non-potable water to be used for the composting operation.

8.0 SELECTED MEASURES AND PROJECTED RESULTS

Conservation efforts undertaken in the last several years have provided a noted reduction in the growth of the per capita usage of water in Norman. Through knowledge and understanding, the citizens of Norman can continue to reduce their annual per person water demands. In addition to continuing existing programs, new efforts will be introduced to further conservation by the citizens of Norman.

8.1 Continuance of Current Fundamental Water Conservation Measures Efforts underway in Norman to conserve water will continue into the future. All existing programs will be continued as long as funding allows. Efforts to gain citizen's support of water conserving practices will be pursued through all existing measures.

8.2 Projected Results of Conservation Efforts Figure 20 shows the actual per capita increases in potable water consumption since 1960 yet data since 1990 indicates somewhat of a downward trend. Staff is uncertain as to how much can be attributed to conservation efforts and or the effects of recent climate patterns but will continue to monitor the data. If a growth in demand through adding industry and or extended drought patterns develops along with the expanding population, sustainability cannot be achieved with current water resources.

With additional rate increases of the conservation based water rates along with the water conservation and reuse programs listed within this document, it is projected that water consumption can be curtailed. Achieving this goal will affect the timeline of implementing water resource projects. It will not eliminate the future need for additional supplies, but will allow time for detailed consideration to be given to options available.

9.0 EDUCATIONAL INFORMATION

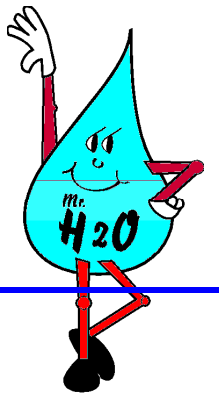
Norman promotes water conservation along with pesticide reduction activities as part of their efforts to promote a cleaner environment. More information regarding this can be found on our website:

http://www.normanok.gov/content/green-norman

Annually, the City of Norman provides the Consumer Confidence Report (CCR) to all customers and dwelling units served by Norman water. Within each CCR, the past year water quality data is made available along with all required water consumption information. In addition, extensive conservation tips are given for water use in and around households. These reports can be found with the following URL:

www.normanwater.com

9.1 Media Campaign To reduce summertime periods of high water usage the City of Norman, along with the local newspaper, publishes daily the previous days overall per capita usage along with a conservation tip. This promotes



awareness of what demands the citizens' place on the system when temperatures are high. In addition, with the help of local news agencies, water use awareness media releases occur to notify citizens of the need to be responsible for their usage of water. Publications have included recommendations to our customers.

9.2 School Programs The water treatment plant is toured approximately 15-20 times per year. The tours are from various schools and range from elementary to college students. Our staff on occasion attends elementary school functions, boy scout functions, or rotary club functions to talk about water treatment.

9.3 Information and Education Program
The items listed in Section 4.0 outline the basis of the information and education program in effect today in Norman. Funds for these actions are provided by the water utility system revenues. Future efforts will continue to expand the public's knowledge of voluntary water conservation practices.

Part of information and education is using the 'drought monitor' web site sponsored by several state and federal organizations. This information is posted weekly at the Water Treatment Plant to keep track of weather patterns, especially related to drought. The web site is; http://droughtmonitor.unl.edu/

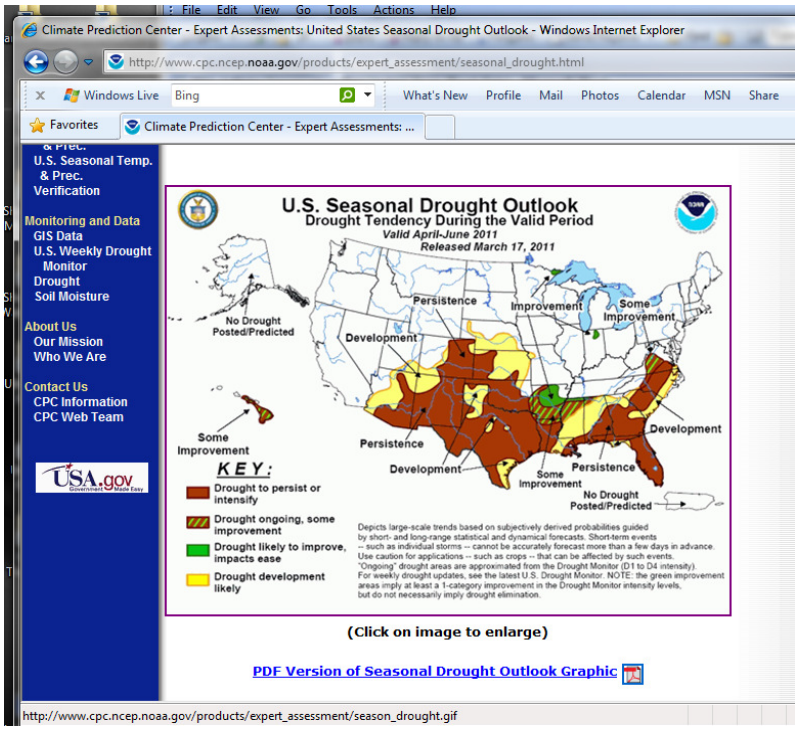


Figure 10.

Figure 10 above is the screen sample of one of the pages from the drought web site.

9.4 Water Conservation Coordinator The City of Norman has assigned water conservation information distribution and the direction of public programs to the Environmental Services Coordinator. The responsibilities include coordinating compliance monitoring of industrial customers, coordinating water pollution educational programs, and water conservation education. The mailing address to the City of Environmental Services Coordinator follows:

City of Norman
Environmental Services Coordinator
P.O. Box 370
Norman, OK 73070

10.0 MANDATORY WATER CONSERVATION MEASURES

The Strategic Water Supply Plan anticipates reductions of water use per capita by our community as we map out our water needs through the year 2060. Outdoor irrigation is a component of water use that looks promising when looking at ways to reduce water usage. Summer peak days are approximately double the daily average of our community. Our community used an average of 12.5 million gallons per day for FYE15 and experienced a peak day usage of 24.8 million gallons per day July 23, 2012.

Customers are encouraged to irrigate sprinklers between 4AM and 9AM. On a hot and windy day, the amount of water that never reaches your grass can be substantial. Citizens are asked to maintain and review irrigation sprinkler operation to repair broken sprinkler heads and prevent watering of sidewalks and streets.

Hand watering landscape and gardens with a hand held hose with a positive shut off nozzle is allowed any time. Also, soaker hoses are allowed any time throughout all stages listed below.

During periods of water conservation, the Water Conservation Plan enables the City Manager to implement conservation stages when certain criteria are met. The City is in Stage 1, Everyday Conservation at all times unless a subsequent conservation stage is implemented. With the implementation of each subsequent conservation stage, the City Manager will sign a proclamation and publish notice of the implentation of such conservation stage in the local newspaper. City ordinances allow for the police enforcement of the limits set by each conservation stage (City of Norman Code of Ordinances; Section 21-501) should efforts to educate the public be ineffective to ensure the City maintains necessary water supplies to its citizens.

10.1 Drought Contingency Plan
Stage 1, Everyday Conservation. The City of Norman will be in Stage 1 water conservation year round. This means the citizens of Norman will practice Odd/Even watering all year round. This

strategy reduces the peak water usage and will delay the need for larger infrastructure required to deliver everyone's total water need on a per-day basis.

Odd/Even is better explained:

- **Last number of the building address – 1, 3, 5, 7, 9 – water odd number calendar days**
- **Last number of the building address – 0, 2, 4, 6, 8 – water even number calendar days**

Additional water conservation measures are utilized when drought patterns begin. The City Manager begins with Stage 2 Conservation and elevates the restrictions up to Stage 5 Conservation if drought conditions persist, and or extreme conditions dictate such.

Triggers for Stage 2, Moderate Conservation. The City Manager may implement Stage 2 when one or more of the following criteria are met:

1. The City water demand exceeds the NUA's supply capacity by greater than 3 mgd for two consecutive days and there is no weather related relief in the immediate forecast. The following link is used for forecasting extensiveness of drought:

   http://droughtmonitor.unl.edu/

2. There is a reduction in the long term source of water supply (i.e. supply shortage, pumps down, break or extensive damage to raw water line, contamination to water supply), or Central Oklahoma Master Conservancy District requests a 10% reduction in allocation from Lake Thunderbird.

3. Lake Thunderbird water level drops to a water level of 1033.0 or 69% full. The following link is used for instantaneous lake level readings:

   http://waterdata.usgs.gov/ok/nwis/uv?07229900

4. A large portion of NUA's water distribution system is out of service due to failure or damage of major water distribution components.

Goals for Use Reduction and Actions Available Under Stage 2. The goal for water use reduction in Stage 2 is a significant reduction in the water demand to more closely match the supply capability of NUA. Water use restrictions shall apply to all customers connected to the NUA water system.

1. **Continue with water conservation actions and programs provided under Stage 1, unless they are amended or replaced by the restrictions provided in Stage 2.**

2. **All Outdoor irrigation will reduced to 2 days per week.**
   - **Single-family resident address ends in odd number – Saturdays & Wednesdays**
   - **Single-family resident address ends in even number – Sundays & Thursdays**
   - **All others – Tuesdays & Fridays (Duplexes, Triplexes, home owner association properties, commercial, industrial, government)**
3. **All outdoor watering or irrigation is prohibited between the hours of 9AM and 6PM.**
4. Washing of cars, trucks, trailers or other vehicles is allowed on your designated landscape watering day as described above.
5. Recommend the public, developers and commercial enterprises to wait until the current drought or water emergency has passed before establishing new landscaping. New landscaping installed during any drought stage will be subject to all water use restrictions implemented. Financial loss will not constitute justification for a variance.
6. Eliminate non-essential City water use (e.g. street cleaning, vehicle washing, flushing of water lines, fire hydrant testing, etc.).
7. City to reduce splash pad operation hours by 2 hours per day.
8. Washing or hosing down of buildings, sidewalks, driveways, patios, porches, parking areas or any other paved surfaces is prohibited.
9. Excessive water run-off from any landscaped area onto streets, alleys or parking lots or other paved surfaces is prohibited. Water run-off is excessive when it extends for a distance greater than ten feet from the property's boundary lines or ten feet past the targeted irrigation area.

Triggers for Stage 3, Severe Conservation. The City Manager may implement Stage 3 when one or more of the following criteria are met:

1. The City water demand exceeds the NUA's supply capacity by greater than 6 mgd for two consecutive days and there is no weather related relief in the immediate forecast.
2. Areas of the water distribution system have reduced water pressures less than 25 psi for 24 hours or more.
3. There is a reduction in the long term source of water supply (i.e. supply shortage, pumps down, break or extensive damage to raw water line, contamination to water supply), or

Central Oklahoma Master Conservancy District requests more than a 10% reduction in allocation from Lake Thunderbird.

4. Lake Thunderbird water level drops to a water level of 1031.0 or 60% full. The following link is used for instantaneous lake level readings:

http://waterdata.usgs.gov/ok/nwis/uv?07229900

5. Stage 2 Moderate Conservation was implemented based on a reduction in allocation from Lake Thunderbird of 10% and demand for water in Norman has not decreased by 10% during Stage 2 and the drought is not forecast to end in the near future. The following link is used to forecast the extensiveness of the drought:

http://droughtmonitor.unl.edu/

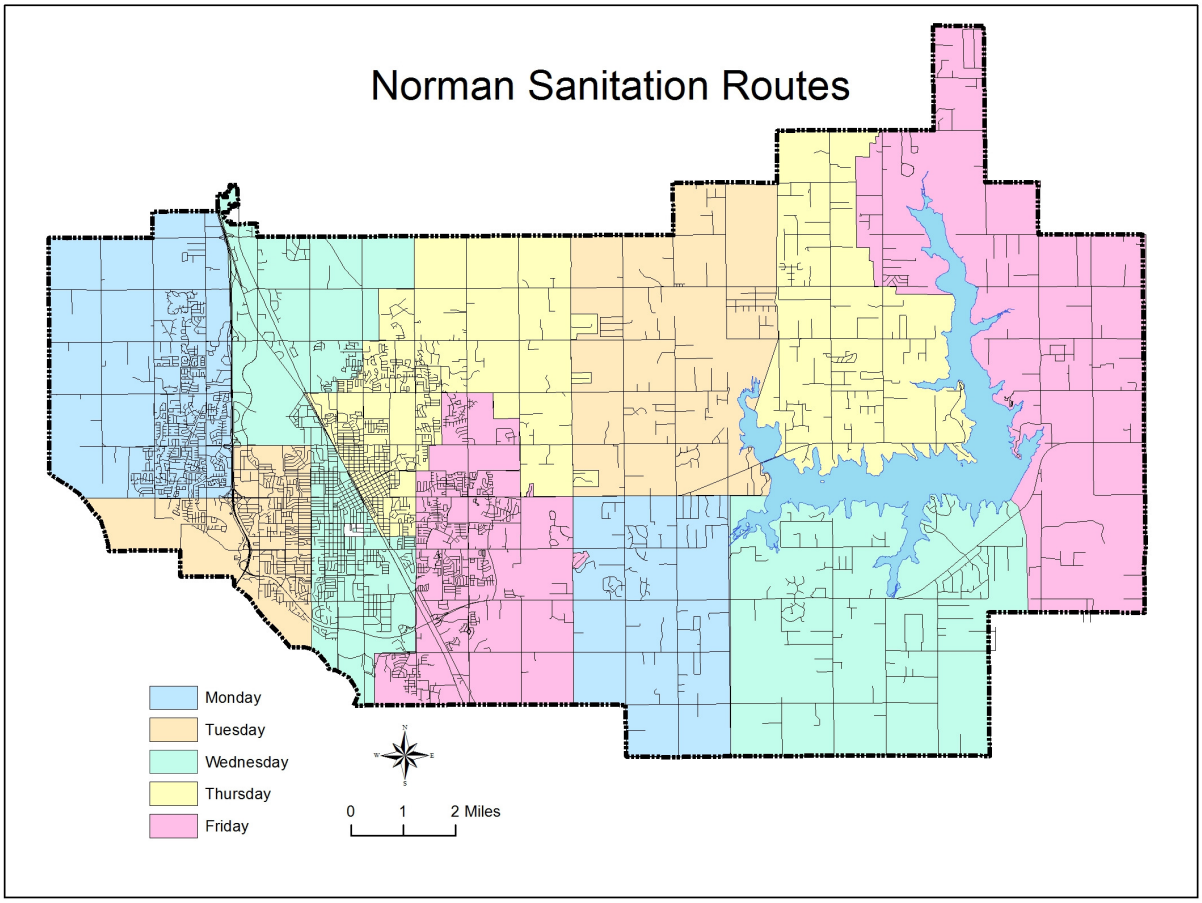
6. A large portion of NUA's water distribution system is out of service due to failure or damage of major water distribution components.

Goals for Use Reduction and Actions Available Under Stage 3. The goal for water use reduction in Stage 3 is an immediate and drastic reduction in the water demand to more closely match the supply capability of NUA. Water use restrictions shall apply to all customers connected to the NUA water system.

1. **All of the water use restrictions implemented under Stage 1 and 2 shall continue in force except as amended or replaced by the restrictions set out in Stage 3.**

2. **Landscape watering is limited to one assigned day per week. Outdoor watering or irrigation is prohibited between the hours of 9AM and 6PM.**

   a. Customers with once a week garbage pickup (including all residential) may only water their landscaping on the same day as garbage is collected, as shown on the map below:



b. Customers with more than one day per week garbage pick-up are limited to watering landscape according to the following schedule:

Area	**Allowed Landscape Water Day**
North Norman	**Monday**
South Norman	**Tuesday**
East Norman	**Wednesday**
West Norman	**Thursday**
Central Norman	**Friday**

3. Except as otherwise provided herein, landscape watering is prohibited on weekends.

4. Landscape beds may be watered on any day by using a hand operated hose equipped with a positive shut off nozzle. Soaker hoses for foundation maintenance are authorized as necessary. In all instances, run-off is prohibited.

5. Watering of City property, medians, parks, and athletic complexes will be allowed one day per week, following the North, South, East, West, Central schedule, and only before 9 am or after 6 pm. Golf course watering and irrigation using potable water shall be limited to greens and tee boxes only.

6. City splash pads will be shut off.

7. Pools may use water to maintain operational levels. Use of potable water to refill ponds and lakes is prohibited.

8. Use of potable water at construction sites for dust control, compaction or wash-downs is prohibited.

9. Bulk water usage under a bulk water permit is prohibited unless an exception is granted by the City Manager on the basis of substantial and unnecessary hardship caused by the prohibition to the property owner. Any exception granted must be limited in time and only allow the minimum amount of water usage necessary to alleviate the substantial and unnecessary hardship caused to the property owner.

10. Washing of cars, trucks, trailers or other vehicles is prohibited, unless these items are taken to a commercial carwash.

Triggers for Stage 4, Emergency Conservation. The City Manager may implement Stage 4 when one or more of the following criteria are met:

1. Lake Thunderbird water level drops to a water level of 1028.56 or 50% full. The following link is used for instantaneous lake level readings:

http://waterdata.usgs.gov/ok/nwis/uv?07229900

Goals for Use Reduction and Actions Available Under Stage 4. The goal for water use reduction in Stage 4 is a further immediate and drastic reduction in the water demand to more closely match the supply capability of NUA. Water use restrictions shall apply to all customers connected to the NUA water system.

1. Hand watering gardens & flower beds only.
2. Commercial car wash with water recycling operations only.

All of the water use restrictions implemented under Stage 1, 2, and 3 shall continue in force except as amended or replaced by the restrictions set out in Stage 4.

Triggers for Stage 5, Emergency Conservation. The City Manager may implement Stage 5 when one or more of the following criteria are met:

1. Lake Thunderbird water level drops to a water level of 1025.0 or 37% full. The following link is used for instantaneous lake level readings:

http://waterdata.usgs.gov/ok/nwis/uv?07229900

Goals for Use Reduction and Actions Available Under Stage 5. The goal for water use reduction in Stage 5 is to **Ban all outdoor watering and washing of vehicles, including commercial car washing operations**. Implementation of Stage 5, will require public notification by the City Manager. Water use restrictions shall apply to all customers connected to the NUA water system.
All of the water use restrictions implemented under Stage 1, 2, 3, and 4 shall continue in force except as amended or replaced by the restrictions set out in Stage 5.

11.0 ENVIRONMENTAL REVIEW

Currently the State of Oklahoma does not allow the irrigation of common spaces, such as parks and lawns, with effluent. Irrigation of controlled access Golf Courses is allowed, but common grounds are not. At this time, the State of Oklahoma Department of Environmental Quality is beginning to consider new applications of effluent. If it is approved for use of effluent in common public spaces then the Expanded Wastewater Reclamation Efforts, discribed in Section 7.2 are expected to occur. If delay in approval of this type of applications occur, then reuse efforts will be limited to current practices.

12.0 ADOPTION AND IMPLEMENTATION

Appendix A

City of Norman Resolution R-1011-123

Adopting the Water Conservation Plan

Resolution

R-1011-123

A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING THE CITY OF NORMAN WATER CONSERVATION PLAN 2011 WHICH INCLUDES THE DROUGHT CONTINGENCY PLAN.

§ 1. WHEREAS, the Norman City Council believes it is important to plan for Norman's future and water needs; and

§ 2. WHEREAS, the Norman City Council also believes that the conservation of our water helps save our resources as well as the cost associated with providing to all citizens; and

§ 3. WHEREAS, the City of Norman Water Conservation Plan is a starting point for community minded water conservation activities through public education and programs to conserve and reuse our water; and

§ 4. WHEREAS, the City of Norman, the State of Oklahoma, and the Central Plain States are in a drought and proper planning dictates the implementation of a staged drought contingency plan.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

§ 5. That the Council of the City of Norman, Oklahoma, adopts the City of Norman Water Conservation Plan 2011 which includes the Drought Contingency Plan attached hereto and made a part hereof.

PASSED and ADOPTED this ~~24th~~ 31st day of May, 2011.

Cindy S Rosenthal
Mayor

CITY OF NORMAN CORPORATE SEAL OKLAHOMA

ATTEST:

Brenda Hall
City Clerk

Appendix B

City of Norman Resolution R-1213-103

Adopting the Water Conservation Plan as amended

Resolution

R-1213-103

A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING THE CITY OF NORMAN WATER CONSERVATION PLAN 2011, AS AMENDED.

§ 1. WHEREAS, the Norman City Council believes it is important to plan for Norman's future water needs; and

§ 2. WHEREAS, the Norman City Council believes that the conservation of our water helps save our resources as well as the cost associated with providing water to our citizens; and

§ 3. WHEREAS, the Norman City Council adopted the City of Norman Water Conservation Plan 2011, including the Drought Contingency Plan on May 31, 2011 (the "Plan"); and

§ 4. WHEREAS, the Plan provided a starting point for community minded water conservation activities through public education and programs to conserve and reuse our water; and

§ 5. WHEREAS, the City of Norman, the State of Oklahoma, and the Central Plain States continue to be in a prolonged drought stage and the continuing drought has necessitated amendments to the Plan.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

§ 6. That the Council of the City of Norman, Oklahoma adopts the City of Norman Water Conservation Plan 2011, including the Drought Contingency Plan, as amended.

PASSED and ADOPTED THIS 26th DAY OF February, 2013.

Cindy Rosenthal
Mayor

ATTEST:

Brenda Hall
City Clerk

CITY OF NORMAN CORPORATE SEAL OKLAHOMA

THE CITY OF NORMAN OKLAHOMA RECREATION EDUCATION INDUSTRY HEALTH RESEARCH

Appendix C

City of Norman Ordinance O-1314-26

Amending Section 21-405 of Chapter 21

Ordinance No. O-1314-26

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 21-405 OF CHAPTER 21 OF THE CODE OF THE CITY OF NORMAN TO REQUIRE YEAR ROUND CONSERVATION RESTRICTIONS AND PROVIDE FOR ADDITIONAL CONSERVATION STAGES IN ACCORDANCE WITH THE CITY OF NORMAN WATER CONSERVATION, AND SET FORTH THE REQUIREMENTS FOR VARIANCES THEREFROM; AND PROVIDING FOR THE SEVERABILITY THEREOF.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

§ 1. That Section 21-405 of Chapter 21 of the Code of the City of Norman shall be amended to read as follows:

Sec. 21-405. Water conservation.

(a) The City Manager has full authority to impose and enforce water conservation stages in accordance with the City of Norman Water Conservation Plan, as may be amended from time to time.

(b) Unless a subsequent conservation stage of the Water Conservation Plan is implemented requiring more limited water use, all users of the City water system shall limit landscape watering year round in accordance with Stage 1, Normal Conservation of the City of Norman Conservation Plan as follows:

(1) Users shall water landscaping on odd or even days depending on address, meaning even numbered addresses shall only water landscape on even numbered dates and odd numbered addresses shall only water landscape on odd numbered dates.
(2) Hand watering landscaping is allowed at all times.

(c) Temporary variances from the requirements of any stage of the Water Conservation Plan may be requested by any accountholder of the water system for consideration by the City Manager or his or her designee who shall decide whether or not to grant the variance in accordance with the following provisions:
(1) Variances will not be considered for inconvenience.
(2) The variance will only apply to the property specifically listed in the variance.
(3) The variance will only apply to the accountholder applying for and granted variance.
(4) The variance may be terminated or suspended at any time and for any reason by the City Manager or his designee.
(5) No person or entity has any property or personal right or interest in the continuance or the continuing operation of the variance.

1

Ordinance No. O-1314-26

(6) All variances will be automatically suspended should Stage 5 Emergency Conservation be implemented.

(7) Applicants do not have any right to the issuance of a variance.

(8) The City may adopt a fee for the application, review, issuance, and regulation of variances.

(9) Variances will be considered for the following circumstances:

i. Existing in-ground water irrigation system is determined to make compliance physically impossible.

ii. Newly-installed landscapes may be approved for a variance to allow additional watering days following installation of the landscape for a reasonable time period.

iii. Special circumstances as long as the applicant can demonstrate special circumstances and extreme hardship to the satisfaction of the City Manager or his designee and the granting of the variance will not cause an immediate significant reduction in the City's water supply.

(d) Failure to comply with the provisions of this section and any variance granted thereunder shall be punishable in accordance with Section 21-501 of this Code.

§ 2. Severability. If any section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance, except that the effective date provision shall not be severable from the operative provisions of the ordinance.

ADOPTED this 14th day of January, 2014.

Cindy Rosenthal
Mayor

ATTEST:

Brenda Hall
City Clerk

CITY OF NORMAN CORPORATE SEAL OKLAHOMA

NOT ADOPTED this _____ day of _____, 2013.

_____
Mayor

2

Resolution

R-1516-115

A RESOLUTION OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING THE CITY OF NORMAN WATER CONSERVATION PLAN 2016.

§ 1. WHEREAS, the Norman City Council believes it is important to plan for Norman's future water needs; and

§ 2. WHEREAS, the Norman City Council believes that the conservation of our water helps save our resources as well as the cost associated with providing water to our citizens; and

§ 3. WHEREAS, the Norman City Council adopted the City of Norman Water Conservation Plan 2011, including the Drought Contingency Plan on May 31, 2011 (the "2011 Plan"), and adopted minor amendments to the 2011 Plan via Resolution No. R-1213-103 on February 26, 2013; and

§ 4. WHEREAS, the Norman City Council undertook a comprehensive review of the 2011 Plan, resulting in adoption of the City of Norman Water Conservation Plan 2014 on January 28, 2014 (the "2014 Plan"); and

§ 5. WHEREAS, the water rates, population data, and other data used for long term planning purposes are outdated and need to be revised;

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

§ 6. That the Council of the City of Norman, Oklahoma adopts the City of Norman Water Conservation Plan 2016.

PASSED AND ADOPTED THIS 10th DAY OF May, 2016.

CITY OF NORMAN CORPORATE SEAL OKLAHOMA

Cindy Rosenthal
Mayor

ATTEST:

Brenda Hall
City Clerk

RECREATION EDUCATION RESEARCH HEALTH INDUSTRY THE CITY OF NORMAN OKLAHOMA