

# Comparing Cary's Water Resourcing to the Future Development of Pittsboro's Water Resourcing

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## **PART I: Introduction**

The words water, H<sub>2</sub>O, Agua, are names that some people are all too familiar with when it comes to one of the most crucial elements for human survival. We see it in everywhere from rainfall, water bottles, waterparks, faucets, etc. It is an element that is used in everyday life. How abundant is water? “Water makes up about 71% of the Earth’s surface, while the other 29% consists of continents and islands” (26). Out of the 71% of water on Earth however, “less than 1 percent of the water on the planet is fresh and available for human use” (28). With the earth’s population of roughly 7.1 billion people, this appears to be a grim statistic, and in many cases around the world, it is. Emphasis needs to be placed on how important water is to our daily lives. In the United States, we have an abundance of quality water. We have strict federal and state laws that implement what we discharge into our water. The National Pollution Discharge Elimination System (NPDES), “Clean Water Act” (CWA), and Wetland Protection Act, etc., are all just a few regulations that govern how we utilize the water within the US. Though the regulations mentioned above are all federal, each state has its own regulations. However, the point to be made is that each state must adhere to the federal rules, and may add on additional requirements as they see fit.

Another concept that is linked to water but possibly not quite understood is development. Development brings jobs and people to urban and rural areas. In one such area, Cary, NC, the population was increased by development. “The population of Cary doubled in the 1960’s aided by the construction of the Research Triangle Park and the arrival of such companies as IBM and Chemstrand Corporation” (23). What does this have to do with water? In order to sustain a

growing population, a village, town, city, etc., must have infrastructure to sustain that population and have the means to expand the infrastructure in the future.

In 2010 economic experts from around the world met at the Annual World Economic Forum. Infrastructure was one of the topics that was discussed. What they stated in their report was “Infrastructure is fundamental to both economic development and plays a crucial role in determining the quality of life of individuals and societies” (30). So infrastructure is important but what does that look like numbers wise? Regarding water the Environmental Protection Agency (EPA) estimates “The average American family of four uses 400 gallons of water per day. On average, approximately 70 percent of that water is used indoors, with the bathroom being the largest part of the consumption. (A toilet alone can use 27 percent!)” (4). One person needs 100 gallons, so a population of 30,000 would need 3,000,000 gallons daily. This is of course a rough estimate. What this shows, is that while development, jobs, and people go together, one of the most critical pieces to development there needs to be the infrastructure must exist to sustain the population.

The consumption and use of water is parallel to both urban and rural development. How do they work together? In this paper, I will be looking into two cities. One is Cary, NC which is a city continuing to grow in population, that has a robust economy and a solid water quality program. The other is Pittsboro, NC which is much smaller with regards to population; however, a new development “Chatham Park” could increase its size and make it part of the thriving economy called “Research Triangle”. This paper will compare and contrast the two cities. The focus will be on water in general but will include information on water quality, runoff, wetlands and wastewater treatment. The main idea of this paper is to focus on the implications of water consumption and how it pertains to development and infrastructure.

In researching this topic I was hoping to find scholarly articles, or research conducted by NCSU on the development of Cary, Chatham Park, etc. I was not able to find articles or research that has been conducted. This is not to say that it does not exist I was just not able to find it. This surprised me because Cary, Pittsboro, and Chatham Park are relatively close to North Carolina State University (NCSU). In April of 2015 my committee chair Dr. Blank and I sat down and discussed possible research topics that I would be interested but also that NCSU had not seen yet. Since my next job will be with United States Army Corp of Engineers (USACE) I wanted to do a project that involved municipalities, state agencies, federal agencies, regulations, policies, and development. Since Chatham Park was a fairly new project and involved all of the previously mentioned subjects both Dr. Blank and I felt it was an excellent subject that has not been researched and would fit my future job needed experience. The next question I had for myself was how to conduct the research or more importantly what would be the method that I would go through to complete my research?

## **PART II: Methods of Research**

The first issue I ran into was finding information on Chatham Park, Pittsboro, and Cary. Since the concept of this paper came first from the development of Chatham Park I started there. In researching the information for this paper I came across a grass roots movement called Pittsboro Matters that is not fully for the development of Chatham Park. I visited their website with the hopes of conducting an interview with a member of the group. I emailed Pittsboro Matters and was contacted by Amanda Robertson a co-founder of the movement.

Name	Date of Interview	Duration and location of interview	Number of phone calls	Number of emails	Information from Interview
Amanda Robertson	26-MAY-2015	2.5 Hours Jordan Hall NR Library	3 phone calls,	3 emails	Was informed that the Mayor of Pittsboro Billy Terry would be a good person to talk to. Informed of current lawsuits that are against Pittsboro and Preston Development.

I conducted the interview and found more information that helped me further with the research and the final paper. Further contact between us was conducted via email and phone conversations.

Bill Terry who is the current mayor of Pittsboro was the next person that I interviewed.

Name	Date of Interview	Duration and location of Interview	Number of phone calls	Number of emails	Information from Interview
Bill Terry	05-June-2015	4 hrs/ Pittsboro Town Hall, Pittsboro NC	4 phone calls	5 emails	Extra-Territorial Jurisdiction (ETJ), Information on community's thoughts on the development. Preston Development involvement within the city council. Preston Developments Master Plan

After the interview Bill Terry and I visited downtown Pittsboro and also went out to the Chatham Park Development. Through this interview I was able to see the town for what it is now and also make observations on future impacts that the development could have on the surrounding the area. Further contact was conducted via email and phone conversations. Through emails I was able to clarify my notes and make sure what I wrote was accurate. While I was visiting downtown Pittsboro I found out that Preston Development has an outreach building where citizens could come in and see Preston's vision of the future of Chatham Park. One of my concerns for this paper was avoiding bias. At this point of my research I had only really received information on groups that were either against the development or partially against it. Visiting

Preston Development outreach center I was informed that the best one to talk to for information outside of the outreach center was Vanessa Jenkins the Executive Vice President for Preston Development. I was not able to conduct an actual one on one interview due to timing constraints and legal issues. However I was able to conduct a phone conversation with Vanessa Jenkins.

Name	Date of Interview	Duration and location of Interview	Number of phone calls	Number of emails	Information from Interview
Vanessa Jenkins	10-June-2015	30 minutes, Phone conversation	3 phone calls	6 emails	Preston Development Master plans

Through the phone conversation I was able to find information on their master plan which produced more questions. Further contact between us was conducted via email and phone conversations. The questions that came from my interview with Vanessa Jenkins were dealing with what other agencies thought about the development but also what Pittsboro’s Water Treatment Plant (WTP) and Waste Water Treatment Plant (WWTP) thought about the development.

After the interview with Preston Development the most logical place to continue with the research was with state and federal agencies. The two continuous agencies that came up were North Carolina Department of Environmental Natural Resources (NCDENR) and United States Army Corp of Engineers (USACE). The reasons for NCDENR were based on that they monitor and enforce regulations such as National Pollution Discharge Elimination System (NPDES), Clean Water Act (CWA), etc. Additionally talking to NCDENR I was able to compare and contrast issues with Cary and Pittsboro’s Water Resource Department from NCDENR standpoint. With NCDENR I talked to Rich Bolich RRO APS Supervisor at the NCDENR, Raleigh Regional Office.

Name	Date of Interview	Duration and location of interview	Number of phone calls	Number of emails	Information from interview
Rich Bolich	16-June-2015	2 hrs/NCDENR regional office Raleigh, NC	3 phone calls	4 emails	Thoughts about Cary's development, Chatham Park development. Past, Present, Future issues with Cary and Pittsboro's WTP, WWTP

NCDENR was not the only agency that was interviewed for this paper. Knowing that both Cary and Pittsboro depend on Jordan Lake for their water supply I looked into who currently managed Jordan Lake. Through research it was revealed that USACE managed Jordan Lake. An interview was conducted with Francis Ferrel who is a park manager for USACE at Jordan Lake.

Name	Date of Interview	Duration and location of Interview	Number of phone class	Number of emails	Information from interview
Francis Ferrell	22-June-2015	1.5 hours/ USACE bldg Jordan Lake, NC	1 phone call	2 emails	Jordan Lake Partnership (JLP), History of Jordan Lake

Francis Ferrell gave me information on the History of Jordan Lake as well as the JLP, and the relationship between USACE in surrounding municipalities and NCDENR. Further contact between us was conducted via email and phone conversations.

At this point of the research I needed to understand how both Cary and Pittsboro's WTP, WWTP, and reuse systems worked. I decided to start with Cary's WTP. Cary has several WTP, WWTP, etc. Instead of going to every single WW one I decided to visit one to get a general understanding of the whole. Dr. Gary Blank introduced me to Kelvin Kreech who is the

superintendent at the Cary/Apex WTP. I visited the WTP and conducted an interview. Further contact between us was conducted via email and phone conversations.

Name	Date of interview	Duration and location of interview	Number of phone calls	Number of emails	Information from Interview
Kelvin Kreech	19-June-2015	1.5 hrs/ Cary/Apex WTP, Cary NC	3 phone calls	7 emails	Long Range Water Resource Plan (LRWRP), Contacts for Cary's Water Resource Department, Capacity for WTP

Next I decided to look into Pittsboro WTP and WWTP. Working with the mayor of Pittsboro Bill Terry he introduced me to Adam Pickett the plant superintendent at Pittsboro's WTP and Randy Heard superintendent at the WWTP. With these introductions I was able to conduct interviews, make observations and understand how both plants worked. Further contact between us was conducted via email and phone conversations.

Name	Date of Interview	Duration and location of Interview	Number of phone calls	Number of emails	Information from interview
Adam Pickett	01-August-2015	2hrs/ Pittsboro WTP, Pittsboro, NC	2 phone calls	2 emails	History of WTP, current and past capacity, issues, professional thoughts on Chatham Park, Preliminary Engineering Report (PER)
Randy Heard	01-August-2015	2hrs Pittsboro WWTP, Pittsboro, NC	2 phone calls	2 emails	History of WWTP, current and past capacity, issues, professional thoughts on Chatham Park, Reuse issues and capacity, PER

The last interview to discuss that was conducted was with the town of Cary Water Resource Department. I was not able to conduct an interview with Pittsboro's Water Resource Department, because they do not currently have one. Before the interview with Cary's Water

Resource Department I spoke over the phone with Leila Goodwin, PE. Leila Goodwin is one of the Water Resource Manager's in Cary's Water Resource Department. She explained before the interview that I should read up on Cary's LRWRP and email her questions before hand.

Additionally to Leila, I spoke with Billy Lee, PE Storm Water Engineering Manager; and Sydney Miller, Water Resource Engineer. This was instrumental in understanding how Cary plans for both the present and future regarding water.

Name	Date of Interview	Duration and location of Interview	Number of phone calls	Number of emails	Information from Interview
Leila Goodwin, Billy Lee, Sydney Miller	24-June-2015	2 hrs/ Cary Town Center, Water Resource Department, Cary, NC	3 phone calls	3 emails	LRWRP, JLP, Issues with Cary's WWTP, WTP, Thoughts on Pittsboro/ Chatham Park

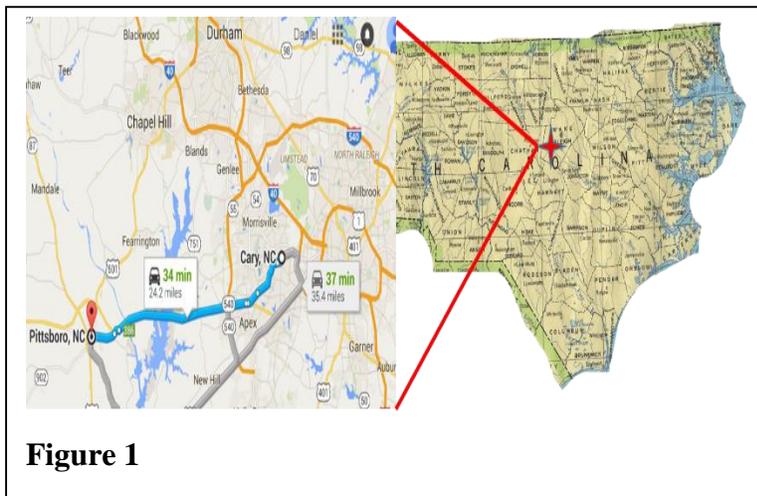
After the interview all conversations and information shared was conducted through emails and phone conversations.

The research for this paper started on the 13-May-2015 and ended on the 14-August-2015. In total it took 94 days to conduct all the research, verify interviews and notes, read all the material/ articles that I found and were proposed to me to read. Additionally with the research I interviewed 11 individuals for a total of 19 hours, corresponded via email 34 times, and verified my notes through 25 phone conversations. The phone conversation on the phone were what I believed to be a necessity because of a couple of reason. The first accuracy, I wanted to present the information with accuracy but also with clarity. By calling the individuals after the interview it allowed me the opportunity to insure that the information that I presented was accurate. The other reasons was to show appreciation to the individual who took the time to answer my questions. Lastly I felt that interviews were the best way to accomplish the research for this

paper. Sometimes when research is conducted it can be performed in a bubble. Whether it's reading or video coverage a person may not get on site experience and this could result in a lack of full understanding about the subject that is being researched.

### **PART III: History of Cary, NC**

The Cary, NC population as of 2013 (151,088) is located in north Central North Carolina (See Fig 1) and is roughly 24 miles east of Pittsboro NC. Cary was founded in 1749 by Francis Jones who “received a 640-acre land grant along Crabtree Creek in what is now Cary” (5).



**Figure 1**

However, it was not incorporated into a town until April 3, 1871 (5). Cary had its initial population boom as far back as the 1870's when Frank Page, Adolphus Jones, and Rufus Jones established a private school for their children

called the Cary Academy. This was due to the overall collapse of the area school system during the Civil War. Looking forward to 2015, Cary continues to grow both in population as well as new development. It appears that everywhere you go within the City of Cary, some type of housing project or new business is being built. A website called Market Watch ranked Cary, NC as the 8<sup>th</sup> most popular city to move to in the US stating that “Cary has attracted high numbers of new businesses and young entrepreneurs. With the unemployment rate at less than 5% last year, the local economy is doing well” (14). Time Magazine stated that “In the heart of North Carolina's Triangle region, Cary is sitting pretty. Raleigh, the state capital, and high-tech hub Research Triangle Park are just a few minutes of commute time away. Cary itself is headquarters

to mega software maker SAS Institute” (22). Cary is a city that is growing as exemplified by its close proximity to the state capital, access to main highways, and business headquarters. The popular headquarters include, IBM, Quintiles, SAS, etc. It is apparent that with the development and all that follows, Cary has needed to maintain its infrastructure regarding water and expand it to meet the demands of the growing population.

## **PART IV: Cary’s Water Resource Department**

The city of Cary’s Water Resources Department is quite robust. The department is divided into five departments: Administrative Staff, Field Services, Storm Water, Utility Design & Construction Services, and Water Resources Planning. Within these five departments the city of Cary employs 37 individuals. The credentials of these 37 employees consist of fifteen professional engineers (PE), one professional land surveyor (PLS), one certified insurance counselor (CIC), and one person certified in clinical laboratory improvement amendment (CLIA). This is mentioned because when individuals seeking employment have more certifications, they should be paid more. This is largely due to the fact that these certifications allow more flexibility to a government agency or the private sector regarding projects. If you are paying an individual a salary that means that they will get a certain amount per paid period for the work they do. If there was a project that needed a surveyor, then the water resource department could just use the one individual already working for them. This can reduce overall overhead cost by not having to pay a different person to do the same job. The certifications are important because this illustrates one difference between the City of Cary’s Water Resource Department and the City of Pittsboro’s Water Resource Department.

The difference is that with population increase, tax base will increase. When this happens a city like Cary can afford due to revenues attained from their residents to hire more specialized professionals such as PE's, PLS, etc. This can allow a city to have an overall better Water Resource Department because of the specialized individuals on their staff. This does not mean that Pittsboro's Water Resource Department is not as good as Cary's just that Cary can afford more specialized staff.

Cary's ability to have a fairly large Water Resource Department is due mainly to its

Population of Cary		
Year	Popula- tion	Annual growth rate
1980	21,958	4.8
1981	24,507	11.6
1982	26,775	9.3
1983	27,205	1.6
1984	31,308	15.1
1985	35,688	14.0
1986	37,455	5.0
1987	39,387	5.2
1988	40,810	3.6
1989	42,681	4.6
1990	44,276	3.7
1991	48,130	8.7
1992	52,403	8.9
1993	57,187	9.1
1994	61,439	7.4
1995	69,500	13.1
1996	76,800	10.5
1997	82,700	7.7
1998	86,783	4.9
1999	88,354	1.8
2000	95,949	8.6
2001	99,798	4.0
2002	103,260	3.5
2003	106,715	3.3
2004	108,152	1.3
2005	111,039	2.7
2006	115,854	4.3
2007	122,643	5.9
2008	130,716	6.6
2009	135,955	9.6

**Figure 2**

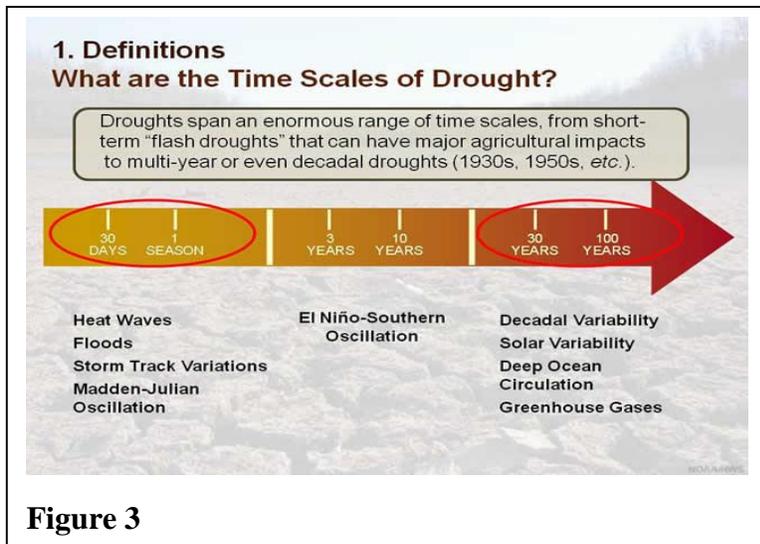
population growth which allows for a larger tax base which pays for the larger department. This paper will not cover in depth tax analysis but, rather a portrayal of how the utilities are paid for. As a way to visualize Cary's growth, we can look at **(Figure 2)**. In the diagram we can see that the growth rate spans thirty years with an annual average growth rate of 6.68%. With the increasing population growth, Cary had to develop plans that could sustain the city's growing population and provide it with an adequate water supply. During my research, I was able to interview individuals from Cary's Water Resource Department: Leila Goodwin, PE Water Resource Manager; Billy Lee, PE Storm Water Engineering Manager; and Sydney Miller, Water Resource Engineer. These interviews gave me a

firsthand account on how Cary's Water Resource Department works, their own personal/professional beliefs, and in general their plans for Cary's future.

In 2000 Cary developed one of its first long range plans called Long Range Water Supply Plan (CH2M HILL, 2000) followed up by the Integrated Water Resources Management Plan (CH2M HILL, 2007). With continuing growth in the city of Cary, the Water Resource Department developed the Long Range Water Resource Plan (LRWRP, 2010) which is the resource plan that will be explained in this paper. It should also be mentioned that CH2M HILL 2000, CH2M HILL 2007, and LRWRP 2010 do not replace each other. However they update the previous plan as new questions, incidents, and technologies develop. The LRWRP primary objective is to forecast the water requirements from 2010 to 2060. One of the questions that I asked was concerning the significance of the year 2060. The year 2060 is a significant year in that it signifies a 50 year drought. Lelia Goodwin stated "Cary's Jordan Lake Water Allocation is for only thirty years at a time. However, Cary has documentation and permits that extend to 50 years in the event of a drought" (3). I have concluded that in the event of a drought the City of Cary is prepared and has the means to deal with a drought. This does not mean that the City of Cary is predicting one, but a contingency plan that addresses droughts is crucial to a city's

current growth as well as its future growth. Droughts are not as common in NC as in the Western and Southwestern parts of the US. However they do happen to some degree.

In the book *On the Grid* by Scott Huler he stated “During a recent drought, things started looking extremely scary. Our reservoirs had diminished to about 30 percent of capacity. We talked about restrictions and rationing and gallons per person per day” (7). This occurrence happened in Raleigh in 2007-2008. Raleigh borders Cary so it is safe to say that Cary could have problems regarding water supply. In (Figure 3) we can see a visual depiction of droughts. Raleigh experienced in between a 1 season and a 3 years type of drought. What we can also see is that droughts can span a time frame from 1 month to 1 Century. Cary’s Water Resource Department has made it a priority to have a plan set in place to ensure they are prepared in the event of a drought. Imagine if Raleigh was in a drought the things people may take for granted (i.e. more than enough running water) may need to be rationed. Scott Huler’s pointed this out by



saying “So when the people managing the water suddenly stop using words like “shortage and “conservation” and start saying “mandatory water restrictions,” you sit up and take notice.”(7). If a city did not plan for droughts, it

would be disastrous for not only the way of life, but the economy and future growth.

## **PART V: Cary's Long Range Water Resource Plan (LRWRP)**

A part of Cary's LRWRP is its Jordan Lake Partnership (JLP). This partnership is between the city of Cary and 13 other local governments which will be discussed later in this paper. Out of the 13 local governments that Cary is involved with in the JLP only two local governments share actual treatment plants with the City of Cary. Cary has currently three Water Reclamation Facilities (WRF), North Cary WRF that has a daily yield of 12 million gallons a day (mgd), South Cary WRF 12.8 (mgd), and a new WRF that is currently under construction Western Wake Regional 18 (mgd). Additionally, Cary has two Waste Water Treatment Plants WWTP which are the Middle Creek WWTP 3.6 mgd and the Durham Triangle WWTP 4.6 mgd. These plants are not all owned and operated by the City of Cary. North Cary WRF is operated by the City of Cary and the City of Morrisville. Western Wake Regional WRF will be operated by both the City of Cary and the City of Apex. Finally the Durham Triangle WWTP is operated by the City of Cary, City of Durham, and the Research Triangle Park (RTP).

In 2001, the City of Cary was granted a storage allocation nominal yield of 39 mgd from Jordan Lake water supply. The figures did not add up because of all of Cary's WTP, WRF, and WWTP mgd yields added up to 46.4, which exceeds the 39 mgd that the state of NC granted to Cary. Billy Lee explained that "we are granted 39 mgd by the state of NC. However that does not mean we use 39 mgd daily or that we take more than we are allotted. What it means is that we have the extra storage space available for future population growth" (3). This is part of Cary's LRWRP to build and forecast for the future. Instead of building just for the minimal 39 mgd, Cary's LRWRP plan builds bigger structures with more capacity to fit the possibility of

future needs. The two big reason for this, are due to the time it takes to build the infrastructure and the regulatory process. In the LRWRP it states “Forecasting is critical to a town in planning, designing, and constructing capital-intensive infrastructure, which can take upwards of a decade before major water supply and treatment facilities can be placed online. The towns are also subjected to regulatory processes that can span an additional 3 to 10 years, including Inter Basin Transfer (IBT) certification” **(30)**. This type of planning has been crucial to the City of Cary’s success with their LRWRP as well as an excellent way to plan future needs of Cary’s population and water needs.

The LRWRP process looks at different scenarios and phases them accordingly. The phasing process contains two phases each with their own strategies to look at the water needs of Cary. In Phase I the two most critical findings were 1) fulfilling the National Environmental Policy Act (NEPA) policy of community involvement, and 2) Producing an extensive list of possible water resources that have been used or could be used in the future. One of NEPA’s polices Sec. 1500.2 part D states “Encourage and facilitate public involvement in decisions which affect the quality of the human environment” **(11)**.

In Cary’s LRWRP Phase I it states “Developing the project purpose and establishing the community values to guide the project”(15). This illustrates that one of Cary’s main goals is to

ensure that the community is involved in the process as well as adhering to the rules and regulations set forth by NEPA.

In Phase I, the LRWRP also looks at possible water resources by developing a long list of those resources. In Phase II the LRWRP takes the opinions of the community and other experts to make a smaller list of strategies to make decisions based on those strategies. In (Figure 4), we can see Phase I and II for the LRWRP in a visual depiction. Cary not only envisions their water resource plan but, actually implements it. As stated before, the LRWRP collects information from both the local community and all types of water experts in Phase

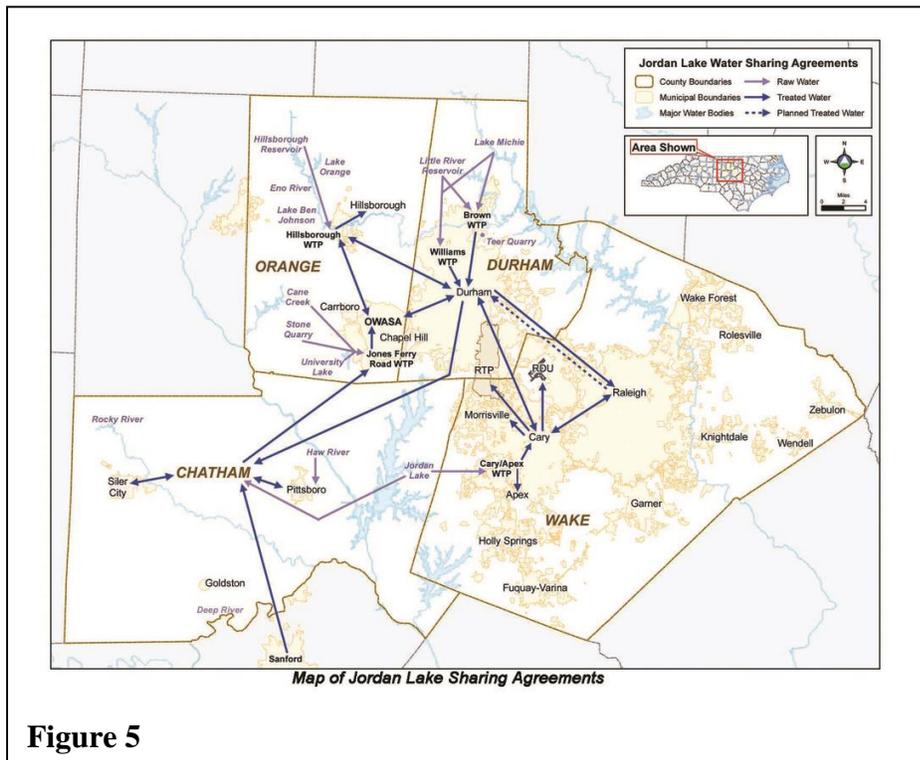


I. This allows the city of Cary to look at all options and decide which strategies are best for Cary in the future. This action leads to Phase II where the LRWRP decides what strategies are best.

It is crucial to note that not all strategies share the same amount of weight or importance. Some strategies are not practical due to various reasons such as cost or time constraints. These are filtered out in Phase I and the best options are presented in Phase II. I have mentioned how the LRWRP filters out the impractical strategies which leaves the most practical for Cary's future water needs. Strategy 1 "Increase Water Supply via Jordan Lake Allocation" (15) the main concept from this strategy is to request more than the 39 mgd from Jordan Lake that currently Cary has approved from the state of NC. As mentioned before Cary's current storage

capacity exceeds the 39 mgd. This strategy could work for Cary because Cary already has the storage capacity and the necessary permits filled out in the event that this happens. The other strategy (strategy 3) “Increase Water Supply and/or Storage via Interconnections” (15) looks at acquiring more water capacity through purchase agreements through other municipalities. Other strategies are in the LRWRP as well as other important topics such as historic water demand, needs of the future, and more of the planning process.

## PART VI: Cary, Pittsboro and the Jordan Lake Partnership (JLP)



**Figure 5**

In Cary’s LRWRP, it was mentioned that Cary is involved with other counties and municipalities regarding its water needs from Jordan Lake. The partnership is called the Jordan Lake Partnership

(JLP). The JLP was formed in 2009 by jurisdictions and water systems that surround the Triangle region. The thirteen municipalities and counties include Apex, Cary, Chatham County, Durham, Hillsborough, Holly Springs, Morrisville, Orange County, Orange Water and Sewage Authority (OWASA), Pittsboro, Raleigh, Sanford, and Wake County. In (Figure 5) we can see a visual depiction of the JLP. The JLP was created due to several factors and needs for the area.

The three most important factors regarding this paper are referenced in the JLP Memorandum of Understanding. Where the first factor mentions “the Research Triangle Region of North Carolina has experienced three significant droughts within the past six years” (15). It was mentioned briefly that sometimes uncommon droughts can happen. The JLP was created because there were three droughts in a six year time frame before 2009. This is important because the 13 municipalities that were mentioned all share Jordan Lake as a source of water. If a more severe drought occurred, such as the 10 year drought in California, all 13 municipalities could be affected.

Cary and Apex WTP is an example of a joint venture that shares resources. It is impossible to prevent a drought but, the impact can be less of a burden on areas affected if a plan is already in place. Cary and Pittsboro have both been cities that have been affected in the past by droughts and could be affected by drought in the future. The main difference is the cities current and future populations. Cary currently has a population of (151,088) with an allocation from Jordan Lake of 39 mgd. Pittsboro’s population is (3,743) with an allocation from Jordan Lake of 6 mgd. It was previously mentioned that Cary is continuing to grow and that based on Cary’s LRWRP, they have already planned for future growth and requires more water from Jordan Lake. The key point here is Pittsboro’s future growth (i.e. Chatham Park). The growth of Pittsboro is estimated to increase to 65,000 in the next thirty years. Pittsboro currently receives 6 mgd for a population of nearly 4,000 which will clearly increase due to the projected population boom. I asked Lelia Goodwin that exact question and she explained in a very simple way “That is the point of the JLP, we know about Chatham Park and Pittsboro’s possible future growth and have planned accordingly with Pittsboro’s as well as the other municipalities” (3). Pittsboro and Chatham

Park will be discussed later in the paper but, it is important to show the future development relationship between Cary and Pittsboro.

The second factor states “The B. Everett Jordan Reservoir (Jordan Lake) has proven to be a reliable source of water supply” **(15)**. The B. Everett Jordan Reservoir or more commonly called Jordan Lake was developed by the United States Army Corp of Engineers (USACE) built from 1973 to 1983. It was created by damming the Haw River and New Hope River and flooding the area. Its primary inflows are the Haw River, New Hope River, Morgan Creek, and Little Creek. Its primary outflow is Haw River. Its original purpose was flood control due to a tropical storm in September of 1945 that damaged the surrounding area downstream. At the present time, Jordan Lake has more than served its purpose as a flood control mechanism. It has now and the past become a primary water resource for the surrounding areas. The memorandum states that Jordan Lake is reliable. In 2008 an article was written by WRAL. The article wrote “Unlike Falls Lake north of Raleigh or parched reservoirs in Durham, Jordan Lake is filled to capacity, and several counties and municipalities are looking for ways to lap up the lake's water to quench their growing thirst” **(32)**. During the droughts that happened in the area around Jordan Lake, most reservoirs were affected however, Jordan Lake prospered WRAL stated “Experts say Jordan Lake is almost a foot higher than what it is when technically full. Meanwhile, Falls Lake, Raleigh's primary reservoir, is about 8 feet below normal levels, and Lake Michie and the Little River Reservoir, Durham's main sources of drinking water, are about 3½ and 20 feet below normal, respectively” **(32)**. Jordan Lake became a reliable water resource because it wasn't affected like the surrounding areas. Both Cary and Pittsboro use Jordan Lake as a primary source of water. Jordan Lake took approximately 10 years to build. If the surrounding cities continue to grow as projected, can Jordan Lake sustain the area it supports given the worst case

scenario (i.e. drought)? That will not be answered in this paper but, it is definitely a concern for the region's water resources as well as future development.

Finally third factor the memorandum of understanding for the JLP states “The Research Triangle Region continues to grow and serve as the premier economic engine for our State” (7). This paper has mentioned that Cary is part of the Research Triangle Park (RTP) which provides jobs to cities like Cary, Raleigh, Chapel Hill, Durham, etc. As the memorandum states, RTP is an economic engine for the area. RTP has attracted people to move here for the job opportunities. The function of JLP sheds light on how RTP cities in the area continue to grow. In the end this will put a greater focus on how the area utilizes Jordan Lake as a water source. Planning and developing innovative methods to utilize Jordan Lake will ensure that it will last as a suitable water resource for the area. The JLP is interesting in that it shows how the surrounding communities banded together to preserve a natural resource and work together for future growth. It has allowed collaborations such as the North Cary WRF in which Cary and Morrisville share the cost and space for water reclamation. It needs to be mentioned however, that as Sydney Miller from the city of Cary's stated “We all work together and share resources and expertise however, though we share some of the same plants and facilities, each city is responsible for its own water resource plan” (3). The JLP is a partnership however, all 13 members provide water resources for their own municipalities. Finally, the JLP has become a platform which the thirteen members meet annually in which the 13 member discuss current and future topics such as the Chatham Park development in Pittsboro. These annually meetings allow the JLP to plan for future development between the 13 members and discuss/plan/solve any current or future issues that may arise.

## **PART VII: Cary's Issues**

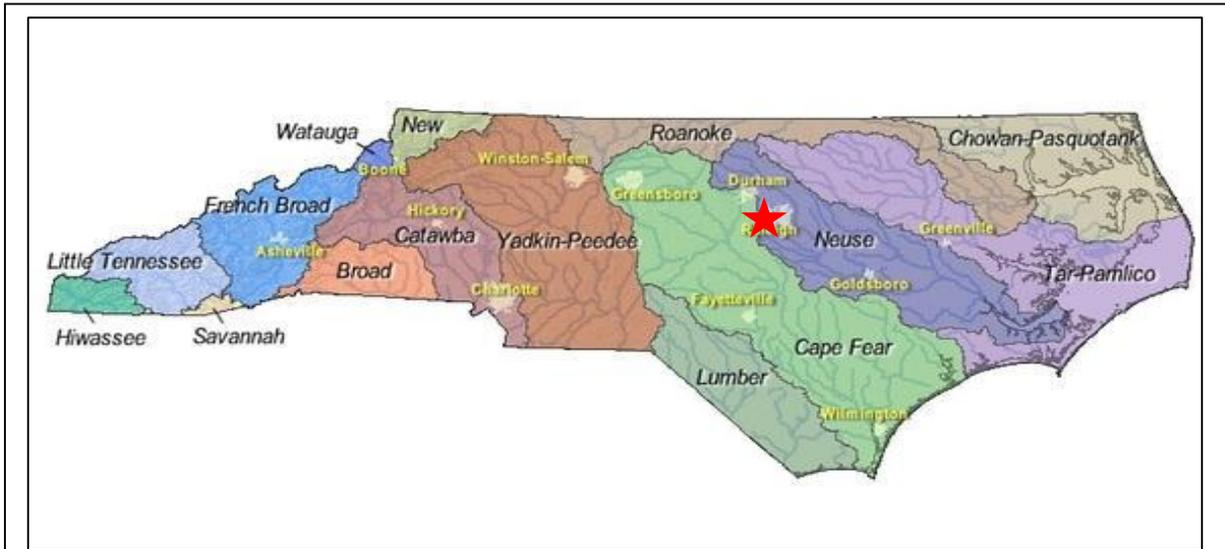
As the City of Cary continues to grow, issues will present themselves as part of development and the utilization of water as a natural resource. With these issues, agencies both federal and state work with local municipalities to ensure that regulations are upheld. In NC one of the main regulatory agencies that works with Cary is North Carolina Department of Environment and Natural Resources (NCDENR).

In an interview with NCDENR Water Quality Program Supervisor Rich Bolich, we discussed some of the issues dealing with Cary's Water Resource Department. Bolich explained "NCDENR has not had any real issues with the City of Cary. Cary in and of itself, has the largest and one of the state's best reuse permit programs for waste water and any issues that NCDENR has with Cary are quickly resolved" (17). Rich Bolich also added that he believes that one of the reasons Cary has done so well with their water program is their size. Bolich stated "Cities with a bigger tax base tend to do better with compliance because they in the end can afford it" (17). As mentioned before, with a bigger population comes the added advantage of a bigger tax base which equals more revenue for city improvements. There are more agencies both state, federal, and nonprofit that work with the city of Cary to bring up issues and work with them to resolve them. It is safe to say that Cary has grown and prospered but that was not always the case.

Back in the early 2000s the previous leadership for the city of Cary was anti-development. Lelila Goodwin stated "The previous mayor and city leadership wanted to curtail the city's growth and development by preventing the building of WTP, WRF, roads, utilities etc." (17). By doing this, it would have limited the amount of people the city could have

supported with the current infrastructure. Though this idea was tried, it was in the end defeated by a new mayor and city leadership being voted in.

One of the biggest issues that Cary faces and is dealing with internally is inter basin



**Figure 6**

transfer. Inter basin transfer is a man-made conveyance scheme which moves water from one river basin where it is available, to another basin where water is less available or could be utilized better for human development. The purpose of such designed schemes can be to alleviate water shortages in the receiving basin. This has become an issue with Cary recently. In an article from WRAL they stated that Cary wanted to “take 9 million gallons of water a day out of the Cape Fear River basin, but they don’t want to put it back. Easier and cheaper, they say, to treat it and put it into the Neuse Basin instead” (10). There are several issues with this proposal. One of them is where they are taking the water from. The city of Cary is located in the Neuse River Basin (See Figure 6 Red Star) which is a water resource for both discharged and treated water. The problem is, that taking the water from one river basin (Cape Fear) and not replacing it leads to a shortage. Currently Cary already withdraws “24 million gallons a day out of the Haw River,

one of the sources of the Cape Fear” (10). If Cary were allowed to take 24 million from the Haw River and an additional 9 million from the Cape Fear River Basin that would mean that Cary is taking 33 million gallons of water daily from the Cape Fear Basin without putting any of it back. This could affect not only the environment, but the people who need it as well. The Cape Fear Basin “is already ranked by the Department of Environment and Natural Resources as one of the most endangered in the state” (10). The fact that the Cape Fear is not one of the healthiest basins is not the only issue here.

Cary needs the water due to its growing population. However, one thing that needs to be pointed out is that if Cary is allowed to do this, it would affect other cities that are growing too. Municipalities such as Pittsboro, Chatham County, Fayetteville, and Wilmington are cities that need that water too, and could affect an already taxed basin to the extent that it could diminish the ability for other cities to prosper. As of this writing, Cary’s request has not been approved. Inter transfer basin is the main hot topic and issue for the City of Cary’s Water Resource Department. As the city grows, it remains to be seen on how they deal with acquiring more water and working with other municipalities.

One thing that needs to be discussed that was not mentioned in Cary’s LRWRP is their issues with wetlands. Cary began seeing its first population and development increase back in the 60’s. However protection of wetlands did not become a real priority until the 1972 Federal Water Pollution Control Act or more commonly known as the Clean Water Act (CWA) was passed. Through the CWA Section 404 was created as the backbone for protection of wetlands. What is unknown or more importantly I was not able to find out was the past condition of the wetlands in Cary and compare it to the current condition. This is important because it can show several things that are important to development in wetlands. One it can show how our

understanding of wetlands has increased from a historical perspective. Two it can show how engineering technology has changed and better mitigation practices have been implemented. Lastly having this information could show the true effects development can have on wetlands. I was not able to find the information on wetlands which would allow me to make a comparison to Pittsboro's/Chatham Parks relationship to wetlands. In my conclusion I will address what I think the future could hold for North Carolina State University (NCSU), regarding wetlands in both Cary in Pittsboro from an academic research stand point.

## PART VIII : Brief History of Pittsboro, NC



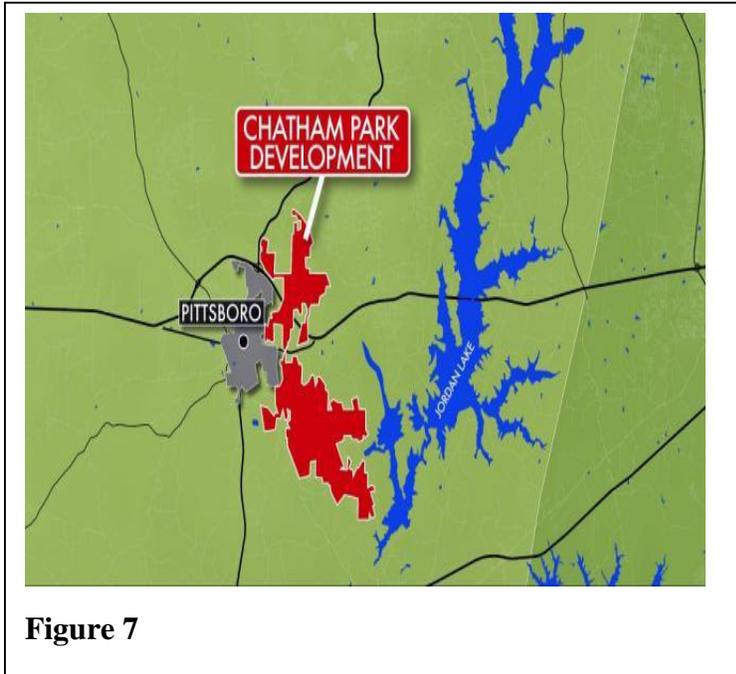
The city of Pittsboro, NC population as of 2013 (3,962) is located in North Central North Carolina (See Fig 1) and is roughly 24 miles west of Cary, NC. Pittsboro was established as a town in 1787 and named after the Earl of Chatham's son, William Pitt the

Younger. Potential development has always been a part of Pittsboro's history. Pittsboro was in fact at one time considered "as a potential site for both the University of North Carolina and the state capital" (10). Instead, the University of North Carolina was established in Chapel Hill, NC and the capital was established in Raleigh, NC. "In 1971, the town proper held 1,447 residents, and only 174 more were added between then and 1990, a 12% increase. However, between 1990

and 1999, the population of the town grew from 1,621 to 2,237, a 38% increase” (10). Pittsboro is a historic city which has preserved its history and seen mild growth in population compared to Cary, NC and other towns of the Triangle Region. Unlike Cary, Pittsboro has not seen such development to the same extent. With Pittsboro not seeing the development that Cary has, the residents in Pittsboro have had to look outside of the town for job opportunities. Bill Terry, the Mayor of Pittsboro stated that “Residents that live in Pittsboro tend to work and find jobs outside of Pittsboro such as Cary, Raleigh, Durham, and Chapel Hill. Pittsboro does not have the jobs available that attracts people to work within or move here in large numbers for jobs” (24). At the present time, Pittsboro does not have a population boom like Cary. However, residents still steadily move there and still work in the larger cities. Continuing the conversation with Bill Terry, he stated “I believe people move here because land is more available and cheaper, life is not as fast paced, and generally less stress” (24). In an article written by Trent Hamm, he stated “Rural living is becoming more popular because the cost of living is stunningly low, the ability to focus is much higher, and day to day life lacks urgency” (5). It has been established that Pittsboro is opposite to Cary in population growth and there are more differences yet to be discussed, yet people still move to Pittsboro for various reasons. A rather large development that is currently in construction in Pittsboro has in the making of a city like Cary.

In 2004 Chatham Park Investor Limited Liability Company (LLC) was formed.

According to the web site legal zoom an LLC is “a type of business structure where the owners or partners -- called members -- have only a limited liability for the debts and liabilities of the company. An LLC is generally formed by filing a document, called the Articles of Organization, with your state's tax office or Secretary of State. Limited liability companies are popular because they can offer tax advantages, and a high degree of ownership and management flexibility” (13).



**Figure 7**

Chatham Park investors between 2006 and 2008 bought 7,500 acres east of Pittsboro see **(Figure 7)**. Their plan is to build roughly 20,000+ new homes/ corporate campuses which they estimate will bring Pittsboro’s population to 60,000 in the next 30 years. The developer of Chatham Park a Cary, NC based company

called Preston Development has already started construction on a “25,000-square-foot medical office that will be occupied by UNC Health Care specialists” **(31)**. Preston Development will develop Chatham Park with a phased construction plan over the next thirty years.

## **PART IX: Pittsboro Water Resource Department**

This part of the paper will look into Pittsboro’s current Water Resource Department, what they can currently manage, and issues they deal with. Additionally, I will discuss the issues with Preston’s development of Chatham Park and compare them to Cary’s development. Pittsboro’s Water Resource Department equivalent is much smaller than Cary’s Water Resource Department. The Water Resource Department is located under the public utilities department which consists of the water plant, wastewater department, utilities, and solid waste services. Pittsboro’s only water plant which is located on Hwy 15-501 was built in 1964. The plant itself is over fifty years old, but has seen several improvements over the years. Adam Pickett the plant superintendent stated “Pittsboro’s water plant has had three upgrades in the last 50 years, though

the plant building may be considered old, the equipment, methods, and processes that we use are not out of date” (6). The water plant has the capacity of producing 2 mgd which according to Pickett, is only one quarter of its production capacity. Pickett stated “the reason we don’t make our full capacity is that we do not have the people in the city of Pittsboro that could actually utilize that amount” (6). The concept was to build larger storage tanks than required. Pittsboro has one water plant that includes four storage tanks. The tank details are included in this citation: “including gallon ground storage tank, the Chatham Forest Standpipe with a 500,000 gallon capacity, the Horton Tank with a 200,000 gallon capacity and a clear well tank at the water plant that holds 450,000 gallons” (21).

Pittsboro currently is in the planning process with the Chatham Park developer Preston Development to build a 300 million gallon elevated storage tank. This storage tank will be built during the 1<sup>st</sup> phase of construction of Chatham Park and there is a plan for the actual water plant to be upgraded in Chatham Parks 2<sup>nd</sup> phase of construction. When speaking to Adam Pickett about his thoughts on Preston development of Chatham Park, he said “Personally I do not have a problem with the development of Chatham Park. The water plant has a great working relationship with Preston Development Engineers. Preston Engineers have come to the plant conducted assessments, informed us on their thoughts, and brought us in on the planning process” (6).

Pittsboro’s waste water plant was originally built in 1977 and has been upgraded in 1989, 2010, and 2011. Currently, the waste water plant is designed to treat and discharge 750,000 gallons or 0.75 mgd of waste water per day (16). The average in 2014 was 433,000 gallons of waste water per day (16). It was previously stated that with this type of infrastructure,

municipalities build larger than what they need. This is done for potential growth but, also to handle excess weather related events such as floods.

## **PART X: Pittsboro's Issues and Preliminary Engineering Report (PER)**

NCDENRs Rich Bolich stated that the biggest issue with Pittsboro's waste water treatment plant is inflow and infiltration. Both inflow and infiltration are issues that had large impacts on waste water treatment plants in smaller communities. Infiltration occurs when excess water seeps or trickles into mainline pipelines, joints, etc. Normally the excess water enters through damaged or collapsed parts of the utilities which lead to the wastewater plant. Inflow is where excess water enters through leaky manhole covers or enters through wastewater treatment plant infrastructure. All this excess water overloads the waste water plant which in the end releases partially treated waste water back into Robinson Creek which in turn discharges into Jordan Lake. The partially treated waste water discharging into Robinson Creek/ Jordan Lake has brought Pittsboro main issues with their waste water plant because it violates NPDES regulation on point discharge. The problem with partially treated water entering the water systems brings up several issues. The two biggest issues are to human health and also the environment. The human health issue is something most people may not think of. Imagine this heavy rain over taxes Pittsboro's waste water treatment plant. There the water is treated through chemicals, bacteria, UV lights, regular sun light, etc. Once this happens the waste water is released back into Robinson Creek which leads to Jordan Lake. With the heavy rain the waste water does not go through the entire process. The partially treated waste water can be filled with diseases that are harmful to individual's health. If an individual decided to swim in Jordan Lake

after a heavy rain fall they could have a chance to be in direct contact with the partially treated waste water.

Regarding the environment the partially treated water can be full of nutrients such as nitrogen and phosphorus. This can cause eutrophication which allows certain plants to thrive and algae to grow which can kill native plant species and suffocate fish populations due to lack of oxygen (27). When the WWTP overflows with more than what the plant can handle, agencies such as NCDENR fines the city of Pittsboro for violating NPDES.

Though NCDENR or Pittsboro would not divulge the amount of times that Pittsboro has been fined, it was shared that they have in the past. Rich Bolich of NCDENR wanted to make it clear that NCDENR is not a policing agency that fines everybody. They have worked with Pittsboro in the past to correct this issue and Pittsboro has been receptive to fixing it. Pittsboro's waste water plant has had some issues due to out of date equipment. How does this relate to Preston's development of Chatham Park? This is a question that was addressed in an interview with Randy Heard. Randy Heard, the Superintendent of the wastewater treatment plant stated "Personally, I like the thought of the development if it is done right. Currently the waste water plant can only manage the population that we currently have. If the population increases to the way the developers think it will the plant will have to expand" (16). The wastewater plant is out of date and is in need of repair. When inquiring as to why Pittsboro hasn't built a new plant, the mayor of Pittsboro, Bill Terry responded "the issue with building a wastewater plant is not the desire to build one because the city wants to build it, it is actually on the top of our list, but the cost. Currently, we have three bids to build a new one, with the cheapest being 35 million. The problem is that our annual budget for the city is only 3 million" (24). This is the problem with a lot of rural towns. This issue is shared nationwide. Rich Bolich stated that NCDENR sees this a

lot in the rural areas of NC where smaller towns do not have the tax base income to afford to build the most up to date wastewater or water plants. Instead, they are forced to make smaller upgrades to improve their current infrastructure. With the upcoming development of Chatham Park, how will Pittsboro deal with these issues and implement new infrastructure without the funds to pay for the new infrastructure?

Unlike Cary, Pittsboro does not have a LRWRP because they don't have the population that would warrant that type of planning. However, eventually Pittsboro will need to start to plan for the future. In March of 2015, the Town of Pittsboro contacted the Wooten Company an Engineering firm based out of Raleigh, NC to develop a Preliminary Engineering Report (PER). The purpose of the PER will be to "Develop an overall plan for the waste water plant and water plant expansion. This will meet NCDENR standards for permitting and for a revolving loan fund application (if warranted). Additionally, the PER will develop 5 different plans for both the wastewater and water plant possible expansion" (21). The PER will give Pittsboro 5 different choices on how to proceed with each expansion, how much it will cost, and when should they start. Each plan that the PER will give is an equivalent to the United States Army planning process called Course of Action (COA). With each COA, the person making the decision is allowed to see each pro and con on that particular choice. Since the development of Chatham Park is already in the construction process, Pittsboro needs to start planning for the future. The PER is part of a loan process that Pittsboro can use to receive the funds in the form of a loan for a future expansion of the wastewater and water treatment plant. Pittsboro's Water Resource Department is not as robust as Cary's. The current and future development of Chatham Park is directly linked to Pittsboro's Water Resource Department. Without the future expansion of both

the water plant and the wastewater plant, Pittsboro as well as Chatham Park can't achieve the population boom that they are expecting.

To quote the movie *Field of Dreams* "if you build it they will come" though this is a movie, it explains how infrastructure and development work together. If a city has the ability to expand the infrastructure (i.e. availability of water) and can manage the removal of wastewater then with that expansion more people will be able to live in those areas. An article called *Positive Infrastructure A Framework for Revitalizing the Global Economy* stated "Infrastructure is fundamental to both economic development and plays a crucial role in determining the quality of life for individuals and societies. Additionally the ability to expand, and improve a municipalities water supply and sewage create positive public health and welfare effects through their contribution to sanitation"(30). This quote shows the positive effects that infrastructure can have on the local population. Currently Pittsboro water resource infrastructure is out of date and can only manage the population that they currently have. Add to the fact that they also can't afford to expand the infrastructure how will Pittsboro manage this and what role will Preston Development play on expanding the infrastructure?

## **PART XI: Preston Development**

As mentioned before, Preston Development has already started developing Chatham Park when they began construction on a 25,000-square-foot medical office that will be occupied by UNC Health Care specialist (31). In this part of the paper we will look into Preston

Developments master plan and share the observations that I found relative to my research and this paper. It is important to note that I didn't have the opportunity to conduct an extensive interview any Preston Development employees. The main reason for this is because the company is involved in legal matters regarding a grass roots movement in Pittsboro called "Pittsboro Matters" over the Chatham Park Development. The Preston Development employees could not participate in any type of interview due to legal reasons. The legal issues will be discussed later in this paper from my perspective. One thing that needs to be pointed out before we continue is that Chatham Park LLC is not Preston Development. Chatham Park LLC is the group that bought Chatham Park. Preston Development is the developer that Chatham Park LLC hired to develop the land. There may be more connections to the LLC and Preston Development, but for this paper it was not looked into. I was not able to find who is part of Chatham Park LLC, however I was able to find information on Preston Development.

Preston Development is a civilian developer more importantly it is not a state or federal agency. All federal and state agencies must follow NEPA by federal regulation. NEPA "establishes a public, interdisciplinary framework for Federal decision-making and ensures that agencies (BLM and all other agencies) take environmental factors into account when considering federal actions"**(16)**. The NEPA policy also laid the groundwork for states to establish their own policies like North Carolina State Environmental Policy Act (SEPA). Policies like NEPA and SEPA have established rules on how federal or state agencies will conduct themselves before beginning a project: "publish a notice of intent in the federal register, develop a preparation plan, develop a strategy for public involvement and interagency/intergovernmental coordination and consultation, hold public meetings/hearings, publish an NOA regarding the availability of the record of decision" **(11)**. The information provided came from the NEPA Handbook (H-1790-

1). The biggest difference here is that Preston Development is not a federal or state agency, it is a civilian company that does not get its funding from tax payers, but rather from its investors and owners. Actions like “publish a notice of intent in the federal register, develop a strategy for public involvement and interagency/intergovernmental coordination and consultation, and hold public meetings/hearings (11) are requirements that Preston Development does not have to comply with. However, as NCDENRs Rich Bolich pointed out “No, Preston Development does not need to hold town meeting, inform the public, etc. If they choose to do that it can be a good thing, because it can get valuable feedback from the community that could be affected. However, it is not a requirement. Preston Development has complied with acts such as the CWA and wetlands act. Preston Development has to inform the federal and state agencies and receive feedback from them” (17).

So what does this mean? First Preston Development does need to acquire information on Chatham Park regarding wetlands, endangered species, national heritage, etc regarding if the development will affect any of the previously mentioned natural resources. Second they still need to contact both state and federal agencies such as Environmental Protection Agency (EPA), United States Fish Wildlife Services (USFWS), NCDENR, USACE, etc and get feedback to ensure that the development will not affect any of the natural resources. If the development does in fact affect for instance wetlands they need to propose how they will mitigate the impact to the monitoring agency’s approval or standard. Third Preston Development still needs to comply with regulations such as wetland protection act, CWA, NPDES, etc. Lastly if all this is done they are in compliance with the state or federal agencies regulations protecting the environment. Preston Development is allowed to proceed with the development. Since Chatham Park was bought by a private organization they do not have to follow parts of NEPA regarding informing

the public on what they are doing. With that said the company has established an outreach building in downtown Pittsboro. The purpose of this building is to share Preston's vision of Chatham Park. This is a good start however, the building itself resembles the Chatham Park website. I was hoping to find more information at the outreach building but, I didn't find the information I was looking for. The website didn't address the pertinent information such as "what is your plan for potable water, sewer, reclaimed water, and wetlands?" I was told that all my questions could be answered by reading the Chatham Park Planned Development District Master Plan- Submitted May 2015-Approved August 10, 2015.

## **PART XII: Preston Developments Master Plan (Riparian buffer, NPDES, and Wetlands)**

Preston Development had three master plans submitted and approved by the Pittsboro's city council dated (June 9, 2014), (December 8, 2014) and (August 10, 2015). The focus for this paper will be on the latest master plan dated August 10, 2015. A master plan also known as a comprehensive plan can identify "suitable locations for commercial, housing and mixed-use development, strategies from increasing economic development; environmental, historic and cultural resources that need conservation" (18). A master plan looks at a project from different angles and shows how certain issues will and can be dealt with. Cary's LRWRP is their equivalent master plan as well as Pittsboro's PER follows the same concept. Preston Development's master plan covers many topics but, we will focus on water related issues. In February 2011, the city of Pittsboro adopted the Riparian Buffer Protection Ordinance. The purpose and intent is "in order to maintain their nutrient removal and stream protection

functions. Additionally, this ordinance will help protect the water supply uses of Jordan Lake Reservoir, Jordan Water Shed, and provide additional watershed protection throughout Pittsboro's planning jurisdiction”(18). Riparian buffers is a term used to describe the area where land borders streams or rivers and a distinct line of vegetation exists. This line of vegetation can contain flowers, grasses, trees, and shrubs that are native to that area. Riparian buffers are important because they provide valuable habitat for wildlife, provide erosion control, flood control, sediment control, etc. Preston Development acknowledges the importance of stream buffer and according to the master plan, will follow Pittsboro's Riparian Buffer Protection Ordinance.

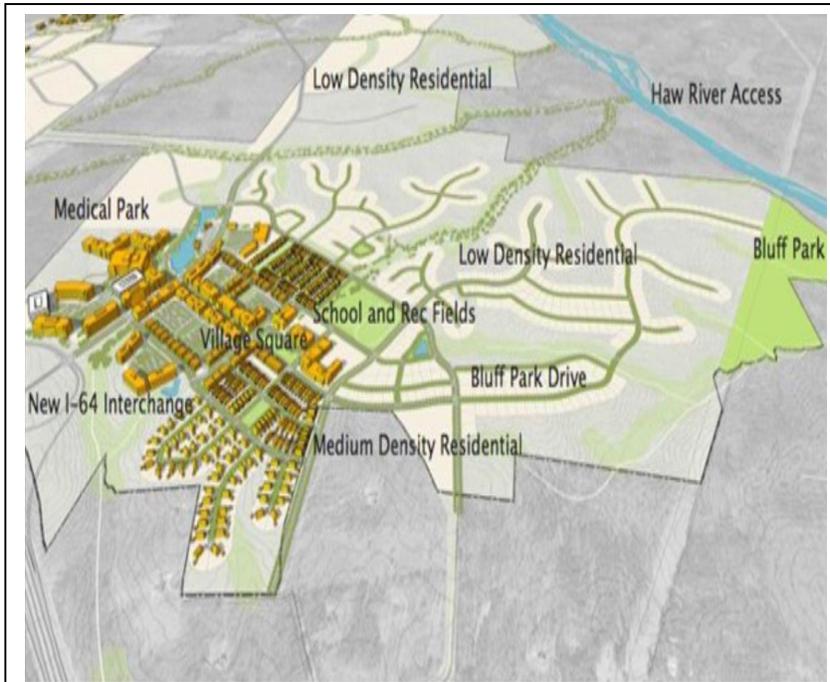
The master plan states that their buffer protection will consist of “riparian buffers on one hundred (100) feet for perennial streams and fifty (50) feet for intermittent streams will be protected and preserved” (18). Perennial streams have water flowing yearly through the entirety of the stream during normal rain fall compared to intermittent streams that have regular flow in parts, but tends to pool or dissipate in certain areas. The buffer means that development can occur relatively close to streams but they have to be 100 or 50 feet away from the stream. Additionally, not all streams whether they are perennial or intermittent will be considered for protection under the Riparian Buffer Protection Ordinance. This will be determined by the City of Pittsboro, NCDENR and USACE. The master plan will also establish two buffers by the Haw River. The first buffer will be 300 feet which will be located at the most northern part of Chatham Park development, and the other will be a 500 feet buffer. The purpose of these two buffers will add additional protection for the river and create linkages to other state owned parks by the river. The master plan also provides buffers for areas where endangered species have been recognized to inhabit stating “Federally listed species currently inhabit this portion of the

river and would be protected by the Endangered Species Act of 1973, perennial streams shall have two hundred foot (200') buffers and intermittent streams shall have one hundred foot (100') buffers" (18). Preston Development is incorporating the protection of riparian buffers and the protection of endangered species in their master plan. At the present time, there are no issues with the riparian buffer that Preston will utilize. This is due to the fact that development is fairly new and it will take 30 years for the entire development to be completed. It can't be said with 100% certainty what effect could occur. It is possible to estimate the possible outcomes of the development regarding the riparian buffer.

The NPDES regulates point and nonpoint pollution discharge into the US water ways. Point discharge into waterways are easy to define because in general, they can be compared to a storm drain, Duke Energy/ Dan River ash spill, and BP oil spill in the gulf. The incidents listed can be clearly defined and can be pinpointed as to where the source came from. Nonpoint discharge on the other hand is more difficult to determine. It is difficult to decipher where pollution is coming from because it could be coming from multiple sources. An example might be a farm and/or a carwash. Both of these examples point to different pollutants that can eventually make its way to the river. With Preston Development's Chatham Park, there will be increased urbanization of the area.

Urban nonpoint pollutions in the US are becoming more of a problem the EPA states

“The most recent National Water Quality Inventory reports that runoff from urbanized areas is



**Figure 8**

the leading source of water quality impairments to surveyed estuaries and the third-largest source of impairments to surveyed lakes” (27). In Figure 8 we can see Preston Development North Village concept which will be the first part of the development. The North

Village concept will have a medical park, village square, medium/low density residential, etc.

The North Village part of Chatham Park will have the majority part of its natural ground turned

into impervious surface such as asphalt and concrete. Issues that can develop from urban

nonpoint pollutants are increased run-off and increased pollutants loads. Increased run-off

occurs when the surface of the developed area becomes impervious or nonporous. The

impervious surface such as a road or sidewalk prevents water from being absorbed into the

ground. This leads to water in the form of runoff to move more rapidly to streams or rivers.

This over burdens the water system and can cause damage to the stream or river through erosion.

The other issues, such as increased pollutants loads present an issue because of the variety of

pollutants such as sediment, oil, road salts, pet waste, viruses, etc. The pollutants listed could enter the water systems around the area.

Another issue that could arise from urban development is excess nutrients in the water or eutrophication. Excess nutrients occur when chemicals such as nitrogen or phosphorus enter the waterways. The chemicals can have both positive and negative effects on the environment. The EPA states “Too much nitrogen and phosphorus in the water causes algae to grow faster than ecosystems can handle. Significant increases in algae harm water quality, food resources and habitats, and decrease the oxygen that fish and other aquatic life need to survive” (27). Within the next thirty years, Preston Development will develop Chatham Park. Preston Development will have to follow regulations such as NPDES and Riparian Buffer Ordinance that Pittsboro has established. The master plan did not mention how it will manage the urban runoff nor did it mention if they completed an environmental assessment.

Wetlands is another issue that was not addressed very well in the Master Plan. In (Figure 9) we can see Chatham Park with its current wetland inventory. If the picture is a little unclear wetlands within Chatham Park are illustrated as red, purple illustrates suitable mitigation

### Existing Wetlands and Future Mitigation Sites in Chatham Park Area

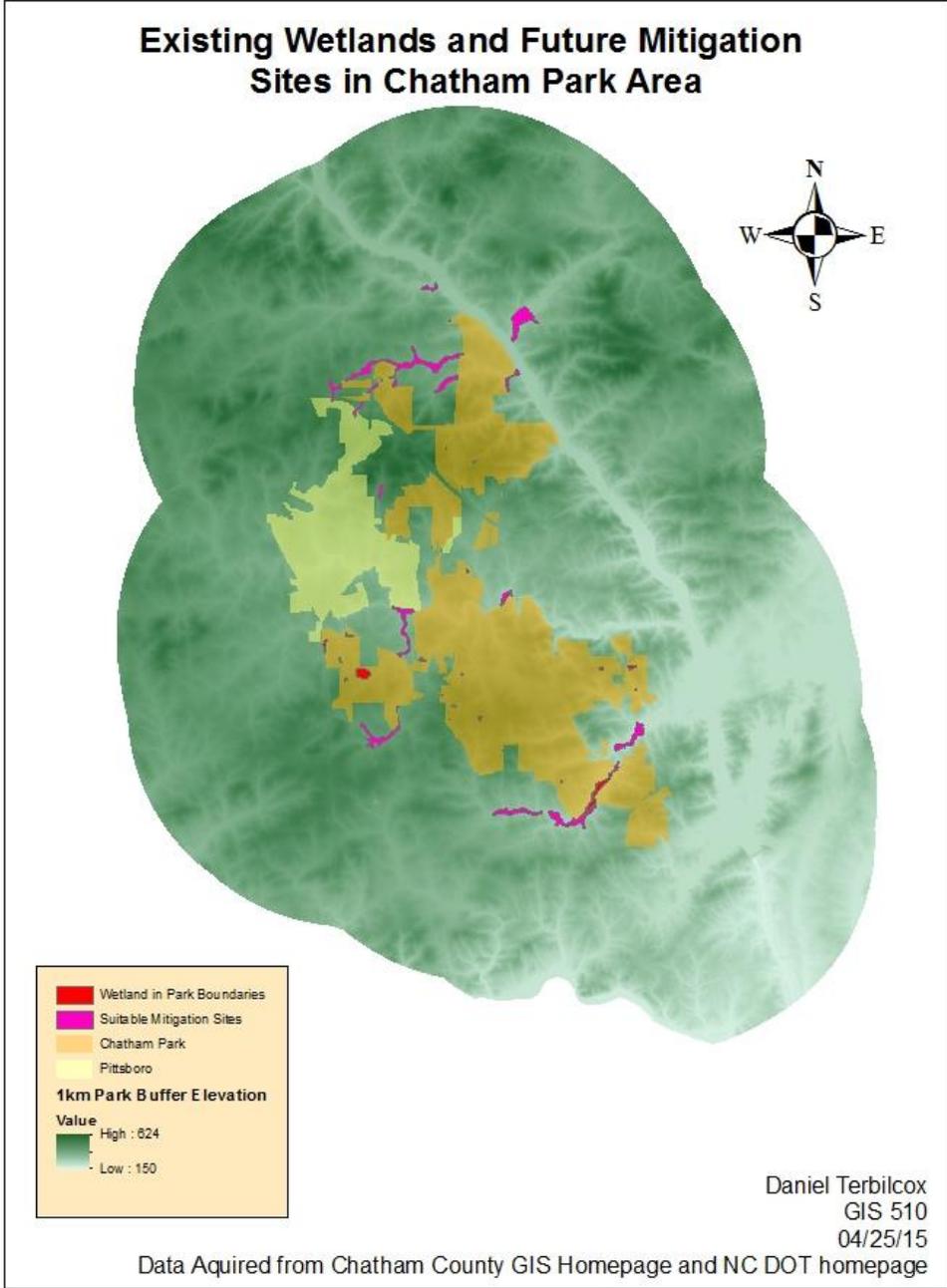


Figure 9

site areas within and 1 kilometer outside the park, orange is Chatham Park itself, yellow illustrates the city of Pittsboro boundary. Currently there are 59.8 acres of wetlands in Chatham Park. More precisely if the entire park was developed there would be 59.8 acres that would need to be restored or mitigated either within the park or outside the development. The two most prevalent soil types in Chatham Park wetland boundary are ChA also called Chewacla with 25.4 acres and M-W also called Miami Silt with 15.3 acres. These two soil types are the most prevalent where the wetland reside. I was able to accomplish this map for my final project in GIS 510. The data acquired that allowed to find this information was retrieved from Chatham County GIS homepage and North Carolina Department of Transportation (NCDOT) GIS Home page. Through this information my conclusion was that there is 358.4 acres of ChA or Chewacla within a 1 kilometer buffer from Chatham Park that would be suited for wetland mitigation or establishing new wetlands. The ChA or Chewacla is illustrated as purple in Figure 9. This in the end means that that Preston Development has the opportunity to restore or establish new wetlands within a short distance from Chatham Park. So when reading the master plan I tried to find out more about Preston Development plans for the wetland within Chatham Park. Clearly there are wetlands there so what is Preston Development Plan? In the master plan there is little to no mention on how wetlands will be dealt with regarding mitigation or restoration.

Wetlands are in essence areas that are saturated or inundated by either ground water or surface water frequently enough to support vegetation that is accustomed to live in that environment. Wetland are protected by regulations like Section 404 of the CWA. In section 404 it calls for no net loss of wetlands. Therefore developers that destroy or alter wetlands must either establish a new wetland, repair the existing one, or set land aside for wetlands. This is not

a choice; all developers must abide by this regulation. The advantages to the developer can be tax breaks, mitigation credits, etc. Regardless of how Preston Development does it they will have to have a plan to mitigate the loss or damaged wetlands.

The Master Plan is at times vague and does not get in depth on some issues or in case of wetlands not at all. Based on the Master Plan an Environmental Impact Statement (EIS) was completed for Chatham Park but there is no access to it. Within the EIS more questions could be answered such as excess nutrients in the water, wetlands, direct impacts, indirect impacts, cumulative impacts, etc. It will remain to be seen on the environmental impacts that happen to Chatham Park due to the development.

### **PART XIII: Preston Development (Water Treatment Plant (WTP))**

Previously in this paper, we talked about Cary's LRWRP, their WTP, WWTP as well as Pittsboro's PER current WTP, WWTP, and Reuse Water systems. Preston's Developments master plan discusses utility plans for water, wastewater and reuse water. In the Master Plan it states "Such plans will, by necessity, become more specific as development progresses and the installation of utility infrastructure shall not be required before it is needed" (17). We will now look into Pittsboro's Water Resource Department and how it relates to Preston Development. Currently the city of Pittsboro doesn't provide water utilities to Chatham Park Planned Development District (PDD). Additionally, Pittsboro does not have any capital improvement projects for water systems that are programmed or funded. Capital Improvement Plan/Program (CIP) is in essence a municipalities plan to fund a project regarding infrastructure, which

includes the cost of building, maintenance, etc during the entirety of the projects life cycle.

Pittsboro does not have a CIP for the WTP because it can't for financial reasons and because the need is not there due to the current population. As the development continues and people eventually move to Chatham Park the demands for water will increase.

In 2011, a planning report from Preston Development stated that “due to equipment age and tighter water quality standards, it is doubtful the existing plant can operate at current full rated capacity for an extended period. Additionally the water treatment plant will need to be upgraded and expanded as development in *Chatham Park* PDD and properties occurs.” (18). The Master Plan further explains that during “buildout conditions” the projected daily need will be at 4.4 mgd which also does not include any peaking factors which is 2.4 mgd more than what currently the city of Pittsboro can manage. Finally, the Master Plan states “The town is a member of the Jordan Lake Regional Water Supply Partnership, which will request water allocation from Jordan Lake. It is expected that the Town of Pittsboro and Chatham County can obtain the additional capacity needed to supply the future growth demands through these sources. Even so, there are possibilities – if both warranted and feasible – for interconnections with adjoining public water systems in Durham, Wake, and Lee Counties” (18). There are issues that arise from the previously mentioned quotes. First the Master Plan notes that the current water plant is outdated and will need to operate 2.4 mgd beyond its capacity. The Master Plan does not explain who will pay for the upgrade or expansion nor when the buildout will begin. This is critical because the water plants can take around a decade to be built and be online (29). Also, the regulatory criteria can take 3- 10 years (29). The Master Plan does not mention these issues nor does it explain what phase this would happen in. It is necessary to explain that it is not feasible

to estimate when individuals will move to an area. This is understandable however, there should be at least a mention or broad overview of this timeline with trigger moments such as population growth or phase completion. Second Pittsboro is a member of the JLP and as said before the JLP is aware and has planned for the Chatham Park Development. However, the master plan does not state when they will request for more water than what Pittsboro is allotted. The Master Plan does not indicate when they will request water from Durham, Wake and Lee County. It is understandable that like population growth, it's hard to predict when the request would happen. The problem is that the regulatory process and needs of other municipalities could hinder the water supply which may lead to more problems.

## **PART XIV (Waste Water Treatment Plant (WWTP) and Reuse Water)**

The wastewater system is similar to the water system in that the town of Pittsboro does not provide the services to Chatham Park and that there isn't a CIP programmed or funded. Previously it was mentioned, that Pittsboro WWTP can treat and discharge 750,000 gallons or 0.75 mgd a day **(16)**. It has been discovered that Pittsboro WWTP didn't utilize that amount. In 2014, the average was 450,000 or 0.45 mgd **(16)**. In July of 2011, the town of Pittsboro was a granted a new NPDES which allowed them to treat and discharge 2.47 mgd into the Haw River which is an addition to the 0.75 mgd that they are allowed to treat and discharge into Robinson Creek. Per Preston Developments Master Plan, the new NPDES states "As of the date of this report, this discharge permit is not being utilized by the town" **(18)**.

Water storage tanks, and wastewater plants are designed to hold and treat more than what the municipality can actually utilize. The positive side to all of this is that Pittsboro can actually treat and discharge 3.22 mgd from their WWTP which should help the development at the beginning of the project. The Master Plan predicts that during build out conditions and initial sustainment of 4.8 mgd which 1.58 mgd more than what Pittsboro can currently handle. Preston Development plans on addressing this issue regarding the WWTP, by building six smaller WWTP facilities. Instead of building one new wastewater plant, Preston will build six smaller plants within Chatham Park which the Master Plan states “The decentralized approach provided flexibility to adapt and be compatible with the character of Chatham Park PDD’s neighborhood development, minimize initial capital investment, and reduces future operations & maintenance costs associated with maintaining larger, underutilized infrastructure” **(18)**. Preston Development believes that smaller plants can be better utilized because they are cheaper to maintain, are more environmentally friendly and will overall use the plants to the max capacity. Additionally, by constructing the six smaller plants it will be “phased to minimize or eliminate the need to utilize the towns existing treatment capacity, infrastructure, and accommodate growth in Chatham Park PDD as needed” **(18)**. The decentralized plants are what Preston Development has proposed and planned, but will it work? When speaking with Rich Bolich from NCDENR, he said “NCDENR prefers the single wastewater plant because it makes it easier to manage from our standpoint. However, what Preston is doing is legal and as long as they follow all the rules and regulations, we do not have problem with it” **(17)**. In the end it will be up to Preston Development as to how they tackle the problem regarding the wastewater plant. Given the facts, a wastewater plant will need to be built to support population growth.

Regarding reuse water the town of Pittsboro provides reuse water to 3M for cooling water. 3M uses a 500,000 gallon storage tank. This reuse water does not meet the effluent standards that NCDENR regulates. NCDENR issued Pittsboro a special permit to allow this but, the reuse water is not part of the discharge allowed into Robinson Creek. As discussed before, Preston Development proposed a decentralized wastewater treatment facility with six in total. Preston Development predicts that they will need 2.0 mgd during buildout conditions. Reuse water is the wastewater that has been treated through the plant and meets the requirements established by the CWA, NEPA and NCDENR so that it can be discharged into the water system. The purpose of the reuse water in Chatham Park will be used for such things as cooling towers, irrigation for commercial, irrigation for residential landscaping, fountains and ponds. This is beneficial to the environment because, it reduces the amount of water taken from sources like Jordan Lake. In the end, Preston Development plans on using part of Pittsboro's new NPDES permit. Since Chatham Park borders portions of the Haw River, this will allow closer proximity to the discharge points which will minimize size, cost, and scope of the infrastructure needed.

## **PART XV (Preston Development who pays?)**

This paper has talked briefly about what Preston Development will do for water, wastewater and reuse water. The question is who will pay for this? Pittsboro can't pay for all of these upgrades or new infrastructure due to the cost. The Master Plan states that the answer to each one of these systems is different. For water, the plan is for Pittsboro to sell water to the

businesses and residents moving to Chatham Park. They will also collect revenue from connecting water services. This as Preston states “should be able to secure enough funds to pay for needed expansions” (18). The problem with this are words like “should”. It “should” is not a good way to plan for infrastructure. What if the city of Pittsboro does not acquire the funds in time? What if a sudden need for water exceeds what Pittsboro can handle? The master plan does not answer these questions. It is understandable that not everything can be predicted, but a plan should still be put in place to address these issues.

With the six new wastewater plants the master plan proposes that the developer pay for construction. The developer could either maintain ownership, operation or maintenance through a third party to construct the system and receive credits from Pittsboro for fees equal to the cost of construction. Either way, the construction or initial cost would be the responsibility of the developer and not Pittsboro. This is beneficial for Pittsboro because it can't afford these upgrades as of now and addresses the question of how Pittsboro will provide the wastewater utility to Chatham Park. The reuse water system will depend on who builds, operates, and maintains the wastewater plant.

The master plan doesn't answer who will manage the plants but, stresses the importance of a decentralized system and not a centralized system. So why is this important or worth discussing in this paper? For starters infrastructure cost money. I can say with 100% certainty that everybody complains about one of the following: traffic, not enough schools, not enough hospitals, not enough police, housing etc. The development of some of these reside on the municipality some on the developer. The important thing is who will pay. Schools, Police stations, traffic improvement reside on the municipality or state, where housing and hospitals

reside on the developer. What this means is that traffic improvement is paid by the tax payers while a developments connection to a HWY, Interstate, Parkway is paid for by the developer but then handed over to the municipality to manage. This is clearly defined, but what is not defined is who will pay for Preston Developments WTP, WWTP, and Reuse Water systems. In order for Preston Development and Pittsboro to see the growth potential that is proposed the payment of this infrastructure must be resolved and clearly defined. If not Chatham Park may not reach its full growth potential.

## **PART XVI: (Preston Development and Issues outside of the Company)**

There are issues with Preston Developments Master Plan and they have briefly been examined at the time of writing this paper. What will be discussed now is the issues beyond Preston Development. There are issues with any development that is a certainty. Cary has had their own internal issues but there is a big difference between Cary and Pittsboro. Cary's development has been within Cary's own boundaries. This is due to the relationship between development and planning for increased infrastructure. Leila Goodwin from Cary's Water Resource Department said it best "the difference between Cary and Pittsboro is where Cary was developed within the city limits of Cary where the Water Resource Department was directly involved in the current and future planning of the developments infrastructure. Pittsboro is being developed by an outside developer and not within the city limits" (3). Chatham Park is not within the City of Pittsboro's city limits. Chatham Park lies within what is called Extra-

Territorial Jurisdiction or ETJ. ETJ means that the City of Pittsboro has zoning powers over the area, but can't collect taxes from the residents that live there. Zoning powers allow municipalities to dictate and enforce what can be built. For instance, a liquor store must be 500 feet from a school or a stream buffer. Though ETJ residents do not have to pay taxes to the city of Pittsboro, there are some drawbacks. One such drawback is having a voice in city politics within Pittsboro.

ETJ residents are not part of the city of Pittsboro therefore, do not get to vote on regulations, ordinances, city council members, and Chatham Park. When Chatham Park was proposed, residents both within the City of Pittsboro and Pittsboro's ETJ voiced their opposition. The problem was that where the residents of Pittsboro vote could count, the ETJ residents who will have the most direct impact were not counted. Bryan Gruesbeck Pittsboro's Town Manger explained that the ETJ does have a voice "Pittsboro's six-member planning board has three members from the ETJ, so there is representation. Additionally, the town will work with all residents and continue to listen to anyone who wishes to give us input" (2). Issues such as everyday living, noise and effects on the water were considered but, in the end ETJ residents could not impact the city council's vote to allow Chatham Park to be developed. Chatham Park was not always part of Pittsboro's ETJ. The current mayor of Pittsboro Bill Terry explained "Around 2013-2014 lobbyist from Preston Development inserted themselves into Pittsboro's planning board. By doing this they steered the committee to include Chatham Park as part of Pittsboro's ETJ" (24). This type of involvement from Developers is not as uncommon as one may think. Thomas E. Marano wrote "Urban sprawl continues its march into many small towns. But with small budgets and limited staff, these town have limited financial resources and little

training in methods to manage development pressures”(9). I am unaware if what Preston Development did was legal or not though I do believe there are ethical questions that may need to be addressed. Regardless Preston Development was able to get Chatham Park to be part of Pittsboro ETJ. In interviewing Bill Terry, he explained what he felt about the development and what he believed the residents of Pittsboro thought about the development. Bill Terry is pro development, he believes that Chatham Park could benefit the city if it’s done right. His issues address the fact that Preston Development has inserted itself within the city council and they are vague and not transparent enough. In the interview he personally believed that the issue of Chatham Park is very polarizing with the residents of Pittsboro. If it came to a vote it would be 50/50 or a coin toss. He further explained that Pittsboro lacks the jobs to support future growth. As he explained, most people of working age work in areas like RTP, Cary, Raleigh, Durham, and Chapel Hill. Finally his environmental concerns with the development regarding water were centered on issues such as runoff, stream buffers, and excess nutrients in the water ways that Pittsboro depends on.

The mayor of Pittsboro issues are not the only ones that have problems with how Chatham Park is being developed. A grassroots movement called Pittsboro Matters has currently sued the Town of Pittsboro twice regarding how the town managed the zoning and approval process. Pittsboro Matters claims that “Pittsboro Board of Commissioners violated state and local zoning rules, including a lack of proper meetings notices, and wants a judge to overturn Chatham Park’s rezoning and master plans and block town leaders from issuing development permits”(2). Pittsboro Matters is talking about the fact that when Preston Development inserted itself into the planning process, they were able to convince the town council to give them a wide

berth on zoning. This means that Preston Development would have the flexibility to build what they want. This is something that Bill Terry agreed with explaining “The old administration in Pittsboro did this to allow Preston Development greater flexibility in zoning and construction” (24).

It was previously mentioned that Preston Development is not a state or federal agency, because of this they do not have to follow parts of NEPA such as public involvement. However where Preston Development is private the City of Pittsboro is a state entity and therefore must follow NEPA mandates such as informing the public. Pittsboro Matters has also attempted to involve Chatham County in the overall planning process due to the fact that ETJ is controlled by Pittsboro. The individuals living there technically are residents of Chatham County. Chatham County Manager Charlie Horne said “There are no immediate plans to combine forces and currently there is not enough planning employees to add Chatham Park to the existing work load” (2).

Pittsboro’s problems with the development are not solely zoning reasons. They have issues with the potential negative impacts that the development will have on the water shed that Pittsboro and residents depend on. In an interview with Pittsboro Matters co-founder Amanda Robertson she stated “Jordan Lake has been on the impaired list, which means polluted water list, for the EPA since 2002. It’s hard to see how this won’t just increase pollution rather than reduce it due to the fact that parts of Chatham Park will eventually drain into the Haw river which drains into Jordan Lake” (20). Issues such as these have been brought up previously in this paper by multiple sources and interviews. The lawsuit is still ongoing, which is part of the reason Preston Development can’t provide any rebuttal or an explanation as to what Bill Terry

has claimed or Pittsboro Matters has claimed. It should also be mentioned that part of the deal between Preston Development and Pittsboro was that in the event of a lawsuit, Preston Development would provide the legal defense for the town.

Issues will always arise when development is planned, proposed, and executed. The difference here as previously mentioned, is that the development is happening outside of the city limits of Pittsboro. Adding to the fact that there may or may not have been some questionable activity from the developer raises questions on the process. One of the problems is transparency from Preston Development which I could not find due to the legal issues currently being addressed. The issues that were addressed are valid ones and should be addressed. At the present time, it is uncertain as to what will happen to the development. My opinion is that the development will happen regardless. One such reason is that the land was bought by Chatham Park LLC. It is their property and as long as they follow the rules and regulations they will be able to continue. This is not just my opinion, the Mayor of Pittsboro Bill Terry has the same opinion “in the end the land that is Chatham Park was bought and sold legally. If individuals that have issue with that then they should have bought the land which they did not” (24). I agree with this but, believe that Preston Development could alleviate some of these issues with transparency and simply asking the people both in Pittsboro in the ETJ what they think. John W Keller professor at Kansas State University said it best “For a new development to be successful, efforts to rejuvenate the rural countryside must rest on genuine local preference. Underlying these preferences is some understanding of what rural individuals, consider simply as citizens of a country, are thought to deserve” (9). I feel that what Keller means is that by involving more people into the planning process and informing the public it would create less conflict.

Regardless if you have to involve or inform, by allowing the involvement of the local rural community they can feel that they are part of the new prosperity from the beginning. In essence they automatically have a stake in the success of the development for their wellbeing.

## **PART XVII: Future Research Opportunities**

This paper has mentioned briefly that there are more opportunities with research regarding Chatham Park. This part of the paper will focus on what I think is an excellent opportunity for North Carolina State University (NCSU) to utilize Chatham Park for more master and doctoral research. I am an Engineer Captain in the Army. The Army sent me to NCSU for 18 months to receive my masters in Natural Resource Management with a focus in Assessment and Analysis. Though this is not a lot of time to complete all the research that I wanted, I was still able to conduct research and accomplish finishing a research paper. There will more than likely be more questions on what could have been looked into, studied, commented on, etc. This I believe is true however with the time constraint, I was not able to get everything I wanted to complete for this paper.

With that said I based this part of the paper on master classes I took at NCSU as well as my own background. Back in 2008, Preston Development asked the Triangle Land Conservancy (TLC) to conduct an Environmental Assessment on Chatham Park. Preston Development was prepared to pay the TLC for their time and results of their findings. The TLC declined this payment due to conflict of interest that they believed would exist. Instead they applied and received grants from the State of NC to conduct the assessment. The TLC along with the Center for Sustainable Community Design, Institute for the Environment, University of North Carolina-

Chapel Hill produced the *Southwest Shore Conservation Assessment Chatham County, NC*.

Upon completion of this assessment it was presented to Preston Development. Upon learning about this assessment I asked Bill Terry Mayor of Pittsboro what happened to the assessment. He stated “Preston Development reviewed it and decided to do nothing with it. Whatever it proposed clearly Preston did not agree with” (24). One of the classes I took was Environmental Assessment. A research opportunity exists by comparing both Preston Development assessment and TLC assessment. By looking at both assessments and seeing how they differ more questions could be answered. Questions like why did Preston Development decline to use the TLC assessment could be answered? Additionally since the project is thirty years in length how has Preston Development tackled issues with the assessment regarding direct, indirect, and cumulative impacts? I feel that there is opportunity for further research on this topic and should be looked into.

At NCSU I was able to take classes in Wetland Delineation and GIS. It has been established that there are wetlands in Chatham Park. The question is what is the current status of the wetlands as well as what effect will the development have on wetlands? Here is an opportunity for research using not only wetland delineation but also GIS. Through wetland delineation further research could establish what type of wetlands exists, what species both plant and animal occupy the wetlands of Chatham Park, what is the current condition of the wetlands health wise, etc. This is not a complete list but shows that understanding what the actual wetlands look like will benefit our overall understanding of them. Through GIS I was able to establish in acres what not just Chatham Park stand to lose but the Water Basin and the State of NC could lose. Further research using GIS mapping can show what the past conditions of the

wetlands have been in Chatham Park but also past/ present conditions of Cary's wetlands. Through GIS mapping research could look at Cary's wetlands and see what effects Cary's development has had on their wetlands. One could then take this information and make assumptions on what could happen to wetlands not only within Chatham Park but also outside. Further research through GIS could also let us see occurrences through time like excess sediment, excess nutrients, point discharge, non-point discharge and their effects on Jordan Lake.

During this paper it has been discussed briefly on regulations, rules, laws, ordinances, policies, etc. An important opportunity regarding Chatham Park is Natural Resource Policy. Regulations and Agencies such as CWA, NPDES, NEPA, NCDENR, USACE have been mentioned in this paper, but a further look into how these regulations and agencies intertwine with development could be researched. Questions like how do small town manage population growth, ETJ, ethics, city and county obligations to their residents, etc are just a few topics that can be furthered studied. Natural Resource Policy is a subject that is deeply involved in all the previously mentioned examples, because it gets to the root of the problems with development. The root of the problem from my stand point is that people not directly involved with natural resources or development, may not fully grasp what all goes into developing land. Before writing this paper I had no idea of the problems that are both for development and against it. Problems such as taxes, growth, anti-growth, grassroots movements, ETJ, ordinances, regulations, policies, etc the list goes on. The important thing is that my understanding of development before and after writing this paper has drastically changed. Natural Resource Policy is directly linked to development, because Natural Resource Policy is how development is completed.

This is not a complete list by any means more of some ideas that I could think of. There are more opportunities such as research on environmental engineering, civil engineering, forestry, plant biology, animal biology, etc the list goes on but they do exist. Chatham Park also has the benefit of being relatively close to Raleigh being that it's roughly 30-40 minutes away which could allow more in-depth research and more frequent trips. Lastly the development of Chatham Park is a project that will take 30 years to complete. NCSU has the opportunity to see the project from start to finish, research and document the changes both good and bad that occur. I was not able to get all the answers or accomplish everything that I felt I wanted to I have presented my findings in the hope that further research is conducted because the opportunities are there.

## **PART XVIII: Conclusion**

Before I wrote this paper, my Committee Chair, Dr Blank asked one of the most important questions to me "Ask yourself this why are you doing this research". It was important question one I did not fully think of at first. However as I was thinking it through it came to me my answer "because of my job". Since I am an active duty Army Engineer Officer my next job will be with USACE or more commonly known as the Corps. I will be a project manager in the Omaha District headquarters located in Omaha, NE. There I will work on projects that will affect not only local municipalities, but states, and the regional area. Writing this paper allowed me to see a more in-depth look at effects that occur from projects or developments and how they can affect the environment and people. What I have learned at NCSU in the classes that I took will be instrumental on navigating the political realm that is before me.

So I have answered why I wrote this paper and what I feel can be accomplished from more research regarding Chatham Park, but what are my opinions on Chatham Park, Pittsboro, and what are the comparisons to Cary? When the idea came to start this paper I was originally just going to write about Chatham Park and Pittsboro. Driving through the city of Cary, where I currently live I was amazed about how much new development was popping up what seemed like every day. Since Cary's population currently is roughly 145,000 larger than that of Pittsboro's and add the fact that Pittsboro has the opportunity to grow to 60,000 in the next thirty years I felt it was a good comparison. Additionally with Cary's population I found that they have a very robust Water Resource Department. Knowing this I felt it was important to show what a population like Cary's Water Resource Department looks like. I believe Pittsboro's future success in the Chatham Park Development will rely on how they build/ expand their Water Resource Department. There are other similarities between the two cities such as planning (i.e. LRWRP, PER), both are part of the JLP, both have WTP, WWTP, Reuse Water systems, both work with NCDENR, both follow CWA/ NPDES, etc. These are similarities and there are probably more. However where there are similarities there are bound to be differences.

The big difference between the two cities is when the development has happened regarding time. Cary has seen development since the 1960's and has steadily increased since then. Pittsboro on the other hand has grown significantly slower and has not seen as much development. Within Pittsboro's Water Resource Department they lack the staff members with certification credentials that Cary has. Pittsboro does have one PE, but that individual works in the planning department within the city. This comparison is not to say that Cary is better or that Pittsboro is worse off. More importantly it shows that towns or cities with larger population tend

to have larger departments and can afford to hire people with more specialized certifications. It is possible to presume that as Pittsboro grows with the Chatham Park development their Water Resource Department will grow, not only with who they hire and their certifications, but also will enhance Pittsboro's ability to manage and plan for water related expansions. With the development of Chatham Park, Pittsboro could grow to a population that compares to the city of Cary. I say could because no guarantee exists in development that people will move to those areas that are developed. This paper has mentioned the popularity of RTP the reason that this area of NC is becoming the place to move for jobs. This paper has also said that rural areas are becoming more popular to move to because of the peace and quiet. These two points are contradictory. Rural areas are becoming more popular because the peace and quiet draws people there. So if the area is developed why would people move there? Is that not what people are trying to get away from? This I believe is a subject that should be pointed out. It should be pointed out because it could affect the amount of people moving there. As cities grow people tend to work in the cities but live in the suburbs. If Pittsboro becomes another large city there is a chance that people will move away from the city to seek more rural living.

Lastly, natural resources in regards to water is an important topic and the basis of this paper. Both cities need it to thrive not just now but also for their future prosperity. Both Cary and Pittsboro have had their issues with how they deal with the need for water and how they manage what they currently have. The important point is knowing what effects can occur from development. Chatham Park was bought legally and though there might have been some ethical things that Preston Development accomplished regarding Pittsboro city council they are not criminals from my stand point. The effects that Chatham Park could have on the surrounding

water systems can be assumed by using other historical facts. It remains to be seen what actual effect the development will have on the environment. I believe with further research and time our understanding of those effects will be better understood. Development and water are intertwined. Development needs water, because of construction, life, sanitation, etc. If development did not happen water would still be there. Where water needs development comes due to the fact that development will happen regardless. Water needs development to protect it, make sure that mitigation is implemented, that steps are taken regarding regulations, ordinances to safeguard it from human mistakes. This paper looked at a historical and current examination of how two cities manage their relationship with one of the most precious resources that we have. It remains to be seen how Pittsboro and Preston Development relationship changes through time and how they manage and work with water as a natural resource.

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