

Brunswick County Request for Interbasin Transfer Certificate

HEARING OFFICER'S REPORT

Environmental Management Commission

North Carolina

Department of the Environment and Natural Resources

November 2013

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HEARING OFFICERS' RECOMMENDATIONS

The Environmental Management Commission (Commission) held a Public Hearing on Brunswick County's Petition for an Interbasin Transfer Certificate (IBT) on September 9, 2013 at the Leland Town Hall, in Leland, North Carolina. The public record for that hearing closed on October 9, 2013. Thirteen people were in attendance for the Public Hearing on the IBT Petition, and one person gave an oral comment in favor of the proposal. One comment in writing was received during the 30-day period following the public hearing. The comment and associated response is included in Appendix A.

Brunswick County developed an Environmental Assessment (EA) to support their request for an interbasin transfer of water, which received a Finding of No Significant Impact (FONSI) from the Division of Water Resources after being reviewed through the State Environmental Review Clearinghouse.

According to G.S. 143-215.221(g), the Commission shall issue an Interbasin Transfer (IBT) Certificate only if the benefits of the proposed transfer outweigh the detriments of the proposed transfer, and the detriments have been or will be mitigated to a reasonable degree. The Commission may grant the Petition in whole or in part, or deny it, and may require mitigation measures to minimize detrimental effects. In making this determination, the Commission is required to specifically consider:

1. The necessity, reasonableness, and beneficial effects of the transfer.
2. Detrimental effects on the source river basin
 - 2a. The cumulative effect on the source major river basin of any water transfer or consumptive water use
3. Detrimental effects on the receiving basin
4. Reasonable alternatives to the proposed transfer
5. Use of impounded storage
6. Purposes and water storage allocations in a US Army Corps of Engineers multipurpose reservoir
7. Whether the service area of the applicant is located both the source river basin and the receiving river basin
8. Any other facts or circumstances necessary to carry out the law.

In addition, the Certificate must require a drought management plan describing the actions a Certificate Holder will take to protect the source basin during drought conditions.

The Commission Finds:

The members of the Commission reviewed and considered the complete record, which included the Hearing Officers' report, staff recommendations, the applicants' Petition, the Final Environmental Assessment (EA), the public comments relating to the proposed interbasin transfer, and all of the criteria specified above. Based on that record, the Commission makes the following findings of fact.

FINDINGS OF FACT

(1) NECESSITY, REASONABLENESS, AND BENEFITS OF THE REQUESTED TRANSFER AMOUNT

Brunswick County, through Brunswick County Public Utilities, provides water to more than 34,000 retail customers and 11 wholesale customers through its two water treatment plants (WTP). The Northwest WTP is located near the City of Northwest and is supplied by water from the Cape Fear River via the Lower Cape Fear Water and Sewer Authority (LCFWSA). The Highway 211 WTP, near the Town of St. James, is supplied by water from groundwater wells accessing the Castle Hayne Aquifer.

The Northwest WTP has a maximum capacity of 24 million gallons per day (MGD) while the 211 WTP's capacity is 6 MGD. Together Brunswick County is able to produce a maximum of 30 million gallons per day (MGD) of potable water. Previous water demand projections prepared for Brunswick County's recent Water Master Plan suggested that peak day demand was estimated to reach 80 percent of the water treatment capacity for the Northwest and 211 plants combined, in about 2007 (Hazen and Sawyer, 2006). Additionally, data from 2005 through 2007 suggested that the Northwest WTP was approaching capacity on peak days which typically occur mid-summer (Hazen and Sawyer, 2008). Since 2008, water use has fluctuated due to various factors (i.e. economic downturn, weather patterns, increased water efficiency and reuse, reduced industrial usage) resulting at times in somewhat diminished water use; nonetheless, the peak day demand has exceeded the 80 percent threshold in the past two years.

Even though Brunswick County is currently meeting its water needs, water use projections conducted by the county demonstrate a need for 42 MGD system-wide by 2042, with 36 MGD coming from a surface source. Approximately half of the surface water usage will be in the Cape Fear Basin, with the remainder transferred to the Shallotte and Waccamaw Basins, and not returned to the source basin. The growth is anticipated to be greatest in the Shallotte Basin, which would require an increase from the existing allowable IBT amount by 7.8 MGD. For the Waccamaw Basin, no additional IBT amount beyond the existing 0.81 MGD is requested due to the minor growth expected in this area coupled with a water purchase agreement with the Little River Water and Sewerage Company in South Carolina.

Brunswick County has undertaken significant programs to encourage reductions in per capita water use. As a result, per capita water use has been consistently lower than the per capita water use during the 2006 and 2007 calendar years. Brunswick County has undertaken many activities to encourage water conservation at various levels from system operations to residential customers:

- A water conservation ordinance, including voluntary and mandatory water use restriction conservation stages. To strengthen and improve the effectiveness of the ordinance, there have been two amendments since 2008.
- Pricing signals, including tiered water rates and separate irrigation metering and rates.
- A metering program, including advanced retail metering and irrigation metering.
- A leak detection program, including advanced metering infrastructure retrofit and distribution system leak detection and repair.
- Customer education and community outreach.
- Water reuse, including existing reuse facilities and a residential water reuse feasibility study.
- A planned aquifer storage and recovery (ASR) study at the 211 WTP.

This transfer request represents an estimated average-day transfer capacity through 2042; during the month with the highest demand (July). The EA and Petition documents include analyses of the amount of the request, including an evaluation of the peaking factors used by the Petitioners in support of their request.

Based on the record, the Commission finds a transfer amount not to exceed a maximum of 17 million gallons, calculated as a daily average of a calendar month (Appendix B), from the Cape Fear River Basin to the Shallotte and Waccamaw River Basins is necessary to provide a dependable water supply to the Petitioners. Surface water from the source basin is readily available from the LCFWSA. A FONSI was issued in August 2010 to the LCFWSA regarding a 106 MGD intake, which included Brunswick County's 36 MGD proposal; therefore, approval has been granted for the water withdrawal sufficient to supply the IBT water associated with this petition.

Based on the record, the Commission finds that the IBT Management Strategy will be an important factor in the ability of the Petitioners to meet demands while maintaining compliance with the conditions of this Certificate. Therefore, this Certificate will include a Compliance and Monitoring Plan to ensure that the daily average transfer amounts are not exceeded and the Petitioners' IBT Management Strategy is followed in the manner set forth in the Petition.

(2) DETRIMENTAL EFFECTS ON THE SOURCE BASIN

WATER QUANTITY

Cumulative withdrawals represent about 3 percent of mean river flow (5,063 cubic feet per second (cfs)), 6 percent of median river flow (2,540 cfs), and 17 percent of 10th percentile river flow (969 cfs) based on 2012 data from the USGS Water Data Report published in 2013. The cumulative withdrawals incorporate all LCFWSA customers including Brunswick just above the Lock and Dam and are 164 cfs for the 2050 planning horizon. Given the size of the withdrawals relative to the river's low flow regime and the tidal nature of the river below Lock and Dam #1, NCDWR deemed that a detailed field study of stream flow impacts on habitat and recreation downstream of the dam would not be necessary (July 17, 2009 letter from NCDWR to Tetra Tech).

NCDWR (2008) undertook a calibrated hydrology modeling investigation of surface water supplies in the Cape Fear, including increased withdrawals from behind Lock and Dam # 1. The Cape Fear Hydrologic Model or CFHM (HydroLogics, 2006) is an implementation of OASIS (HydroLogics, 2009), which is a generalized mass balance model designed to assess the impacts of different water allocation policies and facilities during the historic record of inflows.

The hydrologic analysis explores three general scenarios derived from the CFHM: the baseline condition for the OASIS application (2003), and future projected conditions; 2030 and 2050. The 2003 baseline scenario reflects the discharges and withdrawals (represented as monthly averages) that were reported for 2003 applied to the model's long-term simulation (1930–2005). Likewise, the 2030 and 2050 projected scenarios are the projected 2030 and 2050 withdrawals applied to the 76-year simulation. Since the previous CFHM analysis was conducted by NCDWR in the mid-2000s through about 2008, Brunswick County has revised its 2030 and 2050 water demand to a small degree.

Comparison of the incremental increase in the projected withdrawals with and without the additional withdrawal under the 2050 scenario was conducted. This investigation concluded that, the percent difference from the incremental increase at some of the lowest flows is 5 percent (for flows exceeded 95 percent of the time). The results of this analysis are included in the associated Petition document.

This revised flow analysis does not change NCDWR's (2008) conclusion that full demand for all withdrawals at Lock and Dam #1 and within the Cape Fear IBT River Basin would be met through 2050 because the revisions to Brunswick County's demand are minor and the maximum withdrawal scenario differs little from the average day scenario. In addition, predicted flows passing over the dam at the 95th percentile flow exceedance (i.e., a fairly low flow) in 2050 remain substantial at nearly 500 cfs. Accordingly, the direct impact of the Brunswick County withdrawal on water supply in the Cape Fear River would not be significant.

WATER QUALITY

A USGS observation station (02105769) and a North Carolina Ambient Monitoring System station (B8350000) were used to investigate possible relationships of flow or water temperature with response variables of dissolved oxygen and pH. Several statistical regressions were applied to the data by varying the independent and dependent variables, and predictive models for pH and dissolved oxygen were developed.

To evaluate dissolved oxygen and pH responses conservatively or under near “worst case” scenarios, the 7Q10¹ was used. For production of the EA document, the United States Geologic Survey (USGS) was contacted for an updated 7Q10, and provided a provisional value of 500 cfs (323 mgd) using data for 1982–2009 climatic years². This value has been reduced from the 2001 published value (Weaver and Pope, 2001) due to “a combination of the recent droughts on flows in the Cape Fear River and the regulated flow conditions from Jordan Lake during this period” (USGS personal communication).

Utilizing the provisional 7Q10 flow, two of the three modeling exercises predicted slightly increased dissolved oxygen as a result of the increased withdrawal; however, none of the changes are significant. The variability in observed dissolved oxygen is primarily due to factors other than flow and temperature; however, none of the changes are significant. Furthermore, the regression model for pH predicts an increase in pH from 7.519 to 7.644, which equal to a 1.66 percent change. In sum, both the dissolved oxygen and pH changes are predicted to be minimal and insignificant, and further modeling analysis is not warranted.

Regarding the potential increase in tidal influence from increased water withdrawals, studies by Bowen et al. (2009) and Hamrick et al. (2001) show that during low-flow summer conditions, hydrology and pollutant transport are dominated by tidal exchange with the ocean. The Environmental Fluid Dynamics Code (EFDC) model uses a historical period of flow at its upper boundary (Lock and Dam #1) that reflects flows above approximately 700 cfs. The withdrawal associated with the proposed flow transfer for Brunswick County corresponds to 60 cfs, which represents approximately 9 percent of the lowest model flows entering the Lower Cape Fear River Estuary (LCFRE). Tidal flow dominates pollutant fate and transport during the lowest flow periods and transfer of flow would remove pollutants from entering the LCFRE. Therefore, the IBT would not be expected to have a noticeable effect on water quality in the river below Lock & Dam #1 from tidal influences.

A Preliminary Engineering Report (PER) (Hazen and Sawyer, 2008) evaluated the expansion of the Northwest WTP in terms of operational water quality and quantity issues, as well as an economic analysis. Impacts associated with the proposed WTP expansion will be addressed in the environmental documentation, following the defined SEPA process, to be conducted after the approval of the IBT Petition.

Due to the above-mentioned factors, and the fact that modeling results indicate that the IBT will have minimal impact on the existing stream flow, as well as water quality upstream or downstream, no significant impacts to the source basin are anticipated. No direct or indirect impacts to aquatic or terrestrial habitats are expected to occur from the proposed interbasin transfer. Similarly, indirect impacts to state and federally protected species are expected to be insignificant. No direct or indirect impacts to hydroelectric power generation, navigation, or recreation are expected to occur within the Cape Fear River Basin will occur as a result of the proposed transfer.

Based on the record and the results of the hydrologic evaluations that were performed, the Commission finds that the interbasin transfer is not likely to have a significant impact on the source basin. The Commission finds that to protect the source basin during drought conditions and as authorized by G.S. §143-215.221(h), a drought

¹ 7Q10 is defined as the lowest 7-day average flow that occurs (on average) once every 10 years.

² The climatic year is the standard annual period used for low-flow analyses at continuous-record gaging stations and is from April 1 through March 31, designated by the year in which the period begins.

management plan is required. The drought management plan will describe the actions that the Petitioners will take to protect the Cape Fear River Basin during drought conditions.

2(A) CUMULATIVE EFFECT ON SOURCE BASIN OF ANY TRANSFERS OR CONSUMPTIVE WATER USE PROJECTED IN LOCAL WATER SUPPLY PLANS

Data from local water supply plans, including current and projected water use, was used to develop input data sets for the hydrologic accounting model. The model accounted for all existing and proposed water withdrawals and discharges to the Cape Fear River that exceeds 100,000 gallons per day. Based on the results of that model, there was no significant impact to the Cape Fear River under the modeled scenarios.

Based on the record and as stated in (2) the Commission finds that the interbasin transfer is not likely to have a significant impact to the source basin.

(3) DETRIMENTAL EFFECTS ON THE RECEIVING BASINS

DIRECT IMPACTS

There are no direct construction activities in the receiving basin proposed in association with this project. Therefore, no significant direct impacts to aquatic or terrestrial habitats within the receiving basins are expected to occur as a result of the proposed transfer. No direct impacts to navigation, recreation, or flooding are predicted to occur as a result of this proposed project based on the minimal effect on stream flows.

The projected Northwest WTP expansion would have no direct effects on the Waccamaw and Shallotte River Basins associated with the transfer of water. Any direct impacts associated with construction of the WTP improvements and transmission line upgrades would be reviewed under an environmental document prepared under SEPA specifically for these projects as required by statute and regulation.

INDIRECT AND CUMULATIVE IMPACTS

Secondary and cumulative impacts for the project are those that could be derived from potential growth inducement in the receiving river basin. The additional water supply is considered a factor in facilitating growth. If not managed properly, additional urbanization of the service area could degrade water resources, aquatic wildlife habitat and resources, and other environmental consequences because of increased stormwater runoff, erosion and sedimentation, and other consequences of land development. No indirect impacts to navigation, recreation, or flooding are predicted to occur as a result of this proposed project based on the minimal effect on stream flows.

The Environmental Assessment (EA) related to this Petition provides a summary of the potential secondary and cumulative impacts on environmental features of the Shallotte River Basin. Many of these potential impacts are associated with future growth projections described in Brunswick County's future land use plan. Growth is expected to primarily occur as low and medium density residential uses, with an increase of three to four times in area relative to existing land use. Within the Waccamaw River Basin, no additional water transfer is being proposed in the Petition; therefore, no indirect or cumulative impacts would occur as a result of the IBT approval.

Mitigation measures aimed at offsetting potential secondary and cumulative impacts include government policies and programs. These existing measures have been determined in the EA to adequately minimize and mitigate indirect and cumulative impacts from the proposed water transfer. A detailed list of these local, state, and federal regulations and programs related to development for the communities in the receiving basins that would be obtaining water through the proposed action is included in Appendix C. The EA provides an evaluation of the degree of protection that these policies and programs offer.

Based on the record and the evaluation of impacts discussed in the Environmental Assessment the Commission finds that the proposed IBT will not cause significant detrimental effects to the Shallotte or Waccamaw River Basins.

(4) ALTERNATIVES TO THE PROPOSED TRANSFER

The Petitioner evaluated several alternatives to the proposed interbasin transfer, including a no additional IBT or “no action” alternative. The “no action” alternative is not recommended because Brunswick County has demonstrated the need for an expansion of its water treatment system; not doing so would compromise its ability to provide reliable, high-quality potable water to its customers, particularly those in the Shallotte IBT River Basin. The alternatives to the requested additional IBT that were evaluated included five alternatives to integrating a new water supply source, and another four alternatives to utilizing the existing water supply.

1. Increase in IBT from Cape Fear River - Northwest WTP Expansion
2. Development of new surface water supply
3. Purchase of water from other suppliers in the basin
4. Development of additional groundwater facilities
5. Seawater desalination
6. Off-line storage reservoir of existing allotment of IBT water from Cape Fear
7. Development of an Aquifer Storage and Recovery (ASR) system
8. Further development of water conservation and reuse programs
9. Return of Wastewater to the source basin

The existing 24 MGD Northwest WTP provides the majority of Brunswick County’s potable water. The location of the surface water WTP is in the northern portion of the county’s service area utilizing water from the Cape Fear River; however, the growth is primarily occurring in the southern and southwestern areas. NCDWR has concluded that full demand for all withdrawals at Lock and Dam #1 would be met through 2050 (NCDWR, 2008). The existing WTP site was master planned in the 2008 Northwest WTP PER and is considered to have adequate room to support the expansion, so no additional land would need to be acquired. The expansion plans would allow the WTP to maintain its current operations with minimal disruption. An expansion would increase the reliability of the WTP, which is crucial because the WTP is the main potable water supply for the county. The reliability of the WTP has been discussed in the Preliminary Engineering Report prepared by HDR (1999a).

Development of a new freshwater surface water supply source would face steep challenges considering the location of the primary water use is near and along the coast in the Shallotte Basin. There are no substantial freshwater surface water sources in the Shallotte Basin. The Waccamaw River would be the only potential surface water supply source in the area, which would require an IBT certificate to transfer water from the Waccamaw River Basin to the Shallotte River Basin. Additionally, the Waccamaw River would only be able to sustainably provide a small fraction (193,923 gallons per day (GPD)) of the water needed without construction of an unrealistically large (>400 acre) reservoir. Similarly, the potential for an off-line storage reservoir of water from Cape Fear IBT was investigated; however, there is no feasible location for this type of device to be successful in the county.

Brunswick County has invested significant time and efforts into exploring and establishing water purchase agreements with existing neighboring water utilities. Currently, Brunswick County has an emergency interconnection contract with the Little River Water and Sewerage Company, Inc. (Little River) in South Carolina to supply 170,000 GPD. No additional capacity is expected to be provided by Little River; however, this agreed upon

volume will be utilized in a non-emergency fashion in the future within the Waccamaw Basin. This reduces the need for any additional IBT into the Waccamaw from what is currently allowed.

Two groundwater source/treatment options have been evaluated: expand the existing 211 WTP in the southeastern portion of the county's service area, or construct a new groundwater WTP in the western portion of the service area. Expansion of the existing 211 WTP would require adding an additional 30 wells onto the existing 15-well facility. These increased water withdrawals from the Castle Hayne aquifer could cause unacceptable effects on surface water quality, existing water users, and sensitive ecological systems. In addition, the cost is higher considering collection and distribution infrastructure, treatment of process water, and operations and maintenance. Similarly, the development of a new groundwater WTP in the western portion of Brunswick County would be a significantly greater expense than the proposed IBT/Northwest WTP expansion alternative and potentially result in unknown surface water, private well, and environmental issues.

Due to Brunswick County's location along the coast, desalination was an investigated alternative. It has been shown that seawater desalination is cost-prohibitive compared to treating other sources of raw water. A conceptual level cost evaluation was completed for the treatment facilities, intake structures and raw water mains, distribution mains and site work associated with a new desalination facility. The results confirmed that desalination would be cost-prohibitive for Brunswick County.

Development of an Aquifer Storage and Recovery (ASR) system, which allows for the injecting of treated water into an existing aquifer, is an option that holds potential promise in the future. The Greenville Utilities Commission and the Cape Fear Public Utility Authority (CFPUA) are currently conducting investigations into this technology, with varying degrees of success. Brunswick County has identified that the 211 WTP could serve as the location for a future ASR program. This location could potentially allow for a reduction in water withdrawal from the Cape Fear River to meet potable water demands during the dry season and during peak demand events, such as the July 4th holiday. However, there is not enough information at this time to pursue this as a viable alternative.

Brunswick County has instituted a strong water conservation program and maintains one of the most robust water reuse programs of any water system in the state. The county has committed to continued support and development of these programs. These conservation efforts have presumably reduced the per capita demand for potable water; however, conservation alone would not be sufficient to offset future water demands and alleviate the need for an IBT. Furthermore, any consumptive reuse (i.e. irrigation) in the Shallotte River Basin would still count toward the proposed IBT, since the water would still be originally sourced from the Cape Fear River.

Brunswick County investigated several options for returning wastewater from the Shallotte to the Cape Fear River Basins including:

- Pumping treated effluent from the West Regional plant to the Cape Fear River Basin for discharge, land application, or reuse. The West Regional Plant currently has a 6 MGD capacity, but is expandable to 12 MGD.
- Pumping raw sewage from the Shallotte River Basin to an expanded Northeast Regional Plant, or one of the other plants that discharges in the Cape Fear River Basin.
- Building a new wastewater treatment plant or multiple decentralized plants in or closer to the Cape Fear River Basin to treat wastewater from Shallotte River Basin for dispersal in the Cape Fear River Basin.

After reviewing the economics of these alternatives, the first option of moving the treated effluent from the expanded West Regional WWTP back into the Cape Fear Basin, was the least costly. Nonetheless, this option was still significantly more expensive than the IBT/Northwest WTP expansion alternative. Due to existing surface water discharge constraints, land application of the effluent is the only feasible solution. Estimations conducted by Brunswick County demonstrate that land application in the Cape Fear IBT River Basin, not including transmission

from the West Regional plant, was estimated to range between \$10,631,250 for 100 percent rapid infiltration to \$92,452,500 for 100 percent spray irrigation, with much of the cost difference attributable to land acquisition, site preparation and storage requirements. Another draw-back to this alternative is that Brunswick County has committed to providing reuse water to various industries, including golf courses across the Shallotte Basin. This alternative would require that the water be instead returned to the Cape Fear Basin, thereby potentially conflicting with existing agreements.

Combined with expansion of the Northwest WTP and associated increase in IBT, Brunswick County proposes to use a combination of alternatives to limit transfer of water. As indicated, water conservation and reuse are key elements of the county's current water management plan and their reduced demand and associated IBT. It is not known how changes to these programs would result in additional demand reduction and future water transfer. In addition, the county has reduced the need to transfer additional water by developing an interconnection and agreement to purchase water from the Little River Water and Sewerage Company for potable water service in the Waccamaw River Basin. Brunswick County is conducting a study to assess the feasibility of residential water reuse (costs, demand and public acceptance issues) at the Saint James Plantation and Winding River developments. The county estimates that these developments might have a seasonal reclaimed water demand of up to 1.3 MGD. Finally, the county is planning a study of ASR storage at the 211 plant to reduce withdrawal of surface water during peak demand periods. The technical viability of this option is unknown. The EA and Petition provide detailed impact and cost analysis for all of these alternatives.

Based on the record, the Commission finds that the selected alternative involving an increase in IBT from the Cape Fear River Basin to the Waccamaw and Shallotte River Basins is the least environmentally damaging, the most cost effective, and the most technically feasible alternative for Brunswick County.

(5) IMPOUNDMENT STORAGE

This criterion is not applicable, as the Petitioners do not have an impoundment.

(6) MULTIPURPOSE RESERVOIR CONSTRUCTED BY THE UNITED STATES ARMY CORPS OF ENGINEERS

This criterion is not applicable, as the Petitioners do not use a reservoir.

(7) WHETHER THE SERVICE AREA OF THE APPLICANT IS LOCATED BOTH THE SOURCE RIVER BASIN AND THE RECEIVING RIVER BASIN

The service area for Brunswick County Public Utilities includes significant portions of the Cape Fear River, Waccamaw River, and Shallotte River Basins. According to the 2012 LWSP, 52 percent of the service population is in the Cape Fear Basin, with 46 percent in the Shallotte Basin, and the remaining 2 percent in the Waccamaw Basin.

Brunswick Public Utilities contains significant portions of the service area population within both the source and receiving basins; thereby, avoiding the removal or receipt of water in a basin not contained within the existing service area.

(8) OTHER CONSIDERATIONS

Based on the record, there are no other considerations at this time.

RECOMMENDATION

Based upon the Findings of Fact stated above, the hearing officer has determined that (1) the benefits of the proposed modification outweigh the detriments of the proposed modification, and (2) the detriments of the proposed modification will be mitigated to a reasonable degree. Having reviewed and considered the information specific to the proposal, the comment received during the public review process, and the requirements set forth in the North Carolina General Statutes, the Hearing Officer recommends that the Commission grant the Petitioners a transfer amount not to exceed a maximum of 17 million gallons, calculated as a daily average of a calendar month, from the Cape Fear River Basin to the Shallotte and Waccamaw River Basins, from the Cape Fear River Basin to the Shallotte and Waccamaw River Basins, with the following conditions:

1. This Certificate does not exempt the Certificate Holder or any other entity from compliance with any other requirements of law.
2. If the Commission determines that the record on which this Certificate is based is substantially in error or if new information becomes available that clearly demonstrates that any Finding of Fact (including those regarding environmental, hydrologic, or water use impacts) pursuant to G.S. § 143-215.221(f) was not or is no longer supported or is materially incomplete, the Commission may reopen and modify this Certificate to ensure continued compliance with G.S. ch. 143, art. 21, part 2A.
3. The Certificate Holder shall implement drought management measures that become more stringent as drought conditions increase in severity. Prior to receiving any water under this Certificate, the Certificate Holder shall submit a Water Shortage Response Plan (“Plan”) to the Division, for the Division’s approval. The Certificate Holder shall receive approval of the Plan from the Division, and shall have and maintain adequate authority and resources to implement and enforce the Plan. In order to be approved, the Plan must meet or exceed the requirements set forth in 15A NCAC 2E .0607 and be no less stringent than the Plan in Appendix D, which is incorporated herein. Any subsequent modifications to the Plan will be reviewed and approved by the Division. Adoption of the measures in Attachment A does not imply compliance with G.S. 143-355(l) or 15A NCAC 2E .0607. The Certificate Holder shall not transfer any water to any other unit of local government unless that unit of local government agrees to be bound by this condition in full.
4. The Certificate Holder shall report annually to the Division. The report shall detail water use during the calendar year by providing the following information:
 - **Daily Average Water Transfer Amount Calculated over Each Calendar Month.** Brunswick County shall calculate daily average surface water interbasin transfers taking into account the Brunswick County Public Utilities’ own metered water use for each billing cycle from the Northwest Water Treatment Plant (WTP) with separate data provided for customers in the Shallotte Interbasin Transfer (IBT) River Basin and the Waccamaw IBT River Basin. The groundwater use from the 211 WTP and other groundwater sources shall be excluded from the daily average surface water transfer calculation. The daily average transfer calculation shall also take into account Brunswick County’s wastewater treatment facilities and water reclamation facilities average daily and maximum month flow as well as consumptive uses.
 - **Drought Management Activities.** In the event of public water supply shortages, the county shall report on any Stage 1, 2, and 3 water use restrictions implemented by municipalities in the Shallotte IBT River Basin, pursuant to regulations as stipulated in Section 1.4.1 of the Environmental Assessment Brunswick County Interbasin Transfer (June 2013), or pursuant to any amendments of such water use restriction regulations.
 - **Mitigation Measures.** In addition to existing measures to reduce water usage discussed in Section 1.4 of the Environmental Assessment Brunswick County Interbasin Transfer (June 2013), the county shall conduct a study of the potential for aquifer storage and recovery at 211 WTP, a feasibility study of

residential water reuse at the Town of Saint James, a customer leak detection program, and a distribution system leak detection and repair program as potential means to reduce withdrawal and transfer of surface water.

Compliance with other Certificate Conditions. Brunswick County shall also provide a status report of compliance efforts for any other conditions required by the IBT certificate.



Nat Wilson, Hearing Officer
North Carolina Division of Water Resources

ENVIRONMENTAL MANAGEMENT COMMISSION

CERTIFICATE AUTHORIZING BRUNSWICK COUNTY TO TRANSFER WATER FROM THE CAPE FEAR RIVER BASIN TO THE WACCAMAW AND SHALLOTTE RIVER BASINS UNDER THE PROVISIONS OF G.S. 143-215.22L AND SESSION LAW 2013-388

Based on the hearing record and the recommendation of the hearing officers, the Commission, on November 14, 2013 by duly made motions concludes that by a preponderance of the evidence based upon the Findings of Fact stated in the hearing officers report that (1) the benefits of the modification outweigh the detriments of the modification, and (2) the detriments of the modification will be mitigated to a reasonable degree. Therefore, and by duly made motions, the Commission grants Brunswick County's request to a transfer amount that shall not exceed a maximum of 17 million gallons, calculated as a daily average of a calendar month, from the Cape Fear River Basin to the Shallotte and Waccamaw River Basins, with the following conditions:

- 1) This Certificate does not exempt the Certificate Holder or any other entity from compliance with any other requirements of law.
- 2) If the Commission determines that the record on which this Certificate is based is substantially in error or if new information becomes available that clearly demonstrates that any Finding of Fact (including those regarding environmental, hydrologic, or water use impacts) pursuant to G.S. § 143-215.22(f) was not or is no longer supported or is materially incomplete, the Commission may reopen and modify this Certificate to ensure continued compliance with G.S. ch. 143, art. 21, part 2A.
- 3) The Certificate Holder shall implement drought management measures that become more stringent as drought conditions increase in severity. Prior to receiving any water under this Certificate, the Certificate Holder shall submit a Water Shortage Response Plan ("Plan") to the Division, for the Division's approval. The Certificate Holder shall receive approval of the Plan from the Division, and shall have and maintain adequate authority and resources to implement and enforce the Plan. In order to be approved, the Plan must meet or exceed the requirements set forth in 15A NCAC 2E .0607 and be no less stringent than the Plan in Appendix D, which is incorporated herein. Any subsequent modifications to the Plan will be reviewed and approved by the Division. Adoption of the measures in Attachment A does not imply compliance with G.S. 143-355(l) or 15A NCAC 2E .0607. The Certificate Holder shall not transfer any water to any other unit of local government unless that unit of local government agrees to be bound by this condition in full.
- 4) The Certificate Holder shall report annually to the Division. The report shall detail water use over the calendar year by providing the following information:
 - **Daily Average Water Transfer Amount Calculated over Each Calendar Month.** Brunswick County shall calculate daily average surface water interbasin transfers taking into account the Brunswick County Public Utilities' own metered water use for each billing cycle from the Northwest Water Treatment Plant (WTP) with separate data provided for customers in the Shallotte Interbasin Transfer (IBT) River Basin and the Waccamaw IBT River Basin. The groundwater use from the 211 WTP and other groundwater sources shall be excluded from the daily average surface water transfer calculation. The daily average transfer calculation shall also take into account Brunswick County's wastewater treatment facilities and water reclamation facilities average daily and maximum month flow as well as consumptive uses.

- **Drought Management Activities.** In the event of public water supply shortages, the County shall report on any Stage 1, 2, and 3 water use restrictions implemented by municipalities in the Shallotte IBT River Basin, pursuant to regulations as stipulated in Section 1.4.1 of the Environmental Assessment Brunswick County Interbasin Transfer (June 2013), or pursuant to any amendments of such water use restriction regulations.
- **Mitigation Measures.** In addition to existing measures to reduce water usage discussed in Section 1.4 of the Environmental Assessment Brunswick County Interbasin Transfer (June 2013), the county shall conduct a study of the potential for aquifer storage and recovery at 211 WTP, a feasibility study of residential water reuse at the Town of Saint James, a customer leak detection program, and a distribution system leak detection and repair program as potential means to reduce withdrawal and transfer of surface water.

This certificate is effective immediately. This is the 26th day of November 2013.



Benne C. Hutson, Chairman

**APPENDIX A:
PUBLIC COMMENTS REGARDING IBT PETITION**



North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E. Skvarla, III
Secretary

October 9, 2013

MEMORANDUM

SUBJECT: Response to Public Comments: Waccamaw Riverkeeper

During the 30-day comment period following the public hearing held on September 9, 2013, one comment was received. The comment from the Waccamaw River Keeper, Ms. Christine Ellis, is provided below, and the DENR response is included afterward.

Dear Mr. Brady,

Please accept the following comments on behalf of the Waccamaw RIVERKEEPER® Program of Winyah Rivers Foundation regarding the water transfer permit requested by Brunswick County Public Utilities requesting permission to transfer a maximum of 18.3 million gallons per day of water from the Cape Fear River Basin to the Shallotte and Waccamaw River Basins, and specifically a maximum transfer of 0.94 MGD to the Waccamaw River basin based on projections through 2040.

Response: Brunswick County has proposed an IBT of 0.81 MGD into the Waccamaw River Basin, not 0.94 MGD. That value of 0.81 MGD is the current basin transfer of water and is expected to be valid through 2050 through a water purchase agreement with the South Carolina based, Little River Water and Sewerage Company.

As the Waccamaw RIVERKEEPER®, advocating for the protection of the Waccamaw River watershed, my concerns include potential impacts to water quality, introduction of non-native species to the river basin and ensuring that ecological services are maintained within the Waccamaw River watershed.

According to available documents, the NC Division of Water Resources has concluded that the interbasin transfer would have no significant impact on the affected river basins; however, it is the opinion of the Waccamaw RIVERKEEPER® that adverse environmental impacts may occur and that these have not been adequately addressed in the EIS.

Response: It should be noted that this comment period is specifically related to the IBT Petition document. An Environmental Impact Statement (EIS) document was not conducted for this proposed transfer. The required environmental document, an Environmental

Assessment (EA), was issued a “Finding of No Significant Impact” (FONSI) in June 2013 after agency and public review through the State Environmental Policy Act (SEPA) process. The EA is a supporting document for the Petition. Nonetheless, the comments made are relevant to the determination criteria the Environmental Management Commission (EMC) is required to consider as set forth by GS 215-143.22L and Session Law 2013-388.

Other than what is presented in the EIS, I am not familiar with the water quality of the Cape Fear River Basin nor its threats. I am familiar with water quality in Lake Waccamaw and the Waccamaw River in part because of the Waccamaw RIVERKEEPER®’s Volunteer Water Quality Monitoring Program and other water quality monitoring projects in which we are engaged. My concern is that the physical, chemical and biological water quality aspects in the Waccamaw River not be impacted by those water quality aspects of the source basin, specifically that the pH levels remain unaffected by source water, that nutrient levels remain unaffected by source water and that bacteria levels remain unaffected by source water. In addition, since the Waccamaw River watershed in North Carolina is a freshwater system, source water must remain salinity free. Maintaining designation as Outstanding Resource Water at Lake Waccamaw and its headwaters is especially critical. Preventing degradation of water quality throughout the watershed is of utmost importance to maintain the characteristics of this unique black water system.

Response: Regarding the comment, “the physical, chemical and biological water quality aspects in the Waccamaw River not be impacted by those water quality aspects of the source basin”, has been reviewed and discussed in Chapter 6.2. Additionally, it is not expected to be an issue due to the unchanged water quality or quantity from what is currently transferred into the Waccamaw River Basin.

I appreciate the recognition of the significance of the Waccamaw River watershed in terms of its natural history, wetlands function and important natural areas; however, in my review of the EIS, I saw no discussion of impacts associated with the potential for introduction of invasive (non-native) species to this watershed. Given our growing concern in the Waccamaw watershed for the introduction and proliferation of non-native species and their impact on our important native species, a discussion of this needs to be included and addressed in the EIS.

Response: Regarding the comment, “I saw no discussion of impacts associated with the potential for introduction of invasive (non-native) species to this watershed”, this issue was not discussed in the EA document. Introduction of non-native or invasive species was not discussed because the proposal is strictly for treated potable water. No basin transfer of raw water has been proposed for this project. Therefore, since the water must go through an extensive treatment process for drinking water purposes, no direct introduction of invasive species would be anticipated from this proposed project.

One of the alternatives that should have been considered is the discussion of water conservation measures that would reduce the need for the interbasin transfer. The EIS discusses the education

and outreach related to water conservation but truly reducing the need for freshwater extraction from our rivers and aquifers requires regulations and incentives. The EIS should address the potential benefits associated with the regulation of greywater use, especially domestically, to reduce fresh water demand within the growing communities of Brunswick County. The potential ecological benefits of greywater recycling include lowering fresh water demand, reducing impacts on septic and treatment plant infrastructure, reduced energy use, improved groundwater recharge and protection of our existing surface and ground waters. The time has come for the implementation and regulation of greywater systems within communities that are outgrowing their freshwater sources.

Response: In both the EA and the Petition document, Brunswick County details their water conservation efforts through existing policies and incentives. These measures include (but are not limited to), water use restrictions, irrigation metering, conservation pricing structure, customer education initiatives, water reuse programs, and an aquifer storage and recovery (ASR) study. Regarding the usage of gray water, North Carolina currently only allows for indoor domestic gray water use on a very limited basis. This allows for little opportunity for a local water system to implement a gray water program system wide.

Lastly, as a RIVERKEEPER®, it is important that the integrity of our Waccamaw River basin be maintained and that we protect the ecological services that provide for the human and non-human communities that call it home.

Many thanks for your consideration.

Regards,
Christine

**Working together for
FISHABLE, SWIMMABLE, DRINKABLE WATER FOR OUR FAMILIES AND OUR
FUTURE.**

Find out more at:

Website: www.winyahrivers.org

Facebook: www.facebook.com/pages/Waccamaw-RIVERKEEPER-Program-of-Winyah-Rivers-Foundation

Twitter: <https://twitter.com/Waccamawkeeper>

Linked In: Waccamaw RIVERKEEPER® group

Your RIVERKEEPER®,

**Christine Ellis
Waccamaw RIVERKEEPER®
A Program of Winyah Rivers Foundation**

**c/o Coastal Carolina University
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www.winyahrivers.org
A proud member of WATERKEEPER® ALLIANCE.**

APPENDIX B:
TRANSLATION OF MAX DAY IBT TO PEAK MONTH MEMORANDUM

Memorandum

To: Harold Brady, NC Division of Water Resources **Date:** October 11, 2013
From: J Todd Kennedy, Tetra Tech **Subject:** Translation of Max Day IBT to Peak Month
cc: Jerry Pierce, Brunswick County **Proj. No.** 100-RTP-T23440
 Trevor Clements, Tetra Tech

Brunswick County has prepared a petition to the Environmental Management Commission for an Interbasin Transfer Certificate. The June 2013 petition requests a certificate to transfer up to a daily maximum of 18.3 MGD from the Cape Fear IBT River Basin to the Shallotte and Waccamaw basins. The request is based on a maximum daily transfer. Due to changes in the IBT statute as a result of passage of Session Law 2013-388, also known as SB 341, the Division has requested that Brunswick County translate this max day request into a daily average of the peak month.

1. MAXIMUM DAILY TRANSFER

Maximum daily transfers in Table 1 were provided previously in the EA (Tetra Tech, 2013a) and IBT Petition (Tetra Tech, 2013b). These were based on water demand projections as described in the EA and Petition (Table 2), an estimate of the proportion of system demand met by the 211 groundwater treatment plant, and apportionment among IBT basins as detailed in Appendix F of the EA.

Table 1. Brunswick County Maximum Daily Surface Water Transfer (Actual 2010; Projected 2020 – 2050)

Year	Total Water Demand (MGD) – Max Day	Withdrawal from Surface Water Source (MGD) ¹	Total Return to Source Basin (MGD)	IBT – Shallotte (MGD)	IBT – Waccamaw (MGD)	Total IBT (MGD)
2010	21.32	16.83	8.31	7.71	0.81	8.52
2020	28.47	22.47	11.09	10.57	0.81	11.38
2030	33.76	27.76	13.70	13.25	0.81	14.06
2040	39.52	33.52	16.54	16.17	0.81	16.98
2050	45.11	39.11	19.30	19.00	0.81	19.81

Year	Total Water Demand (MGD) – Max Day	Withdrawal from Surface Water Source (MGD) ¹	Total Return to Source Basin (MGD)	IBT – Shallotte (MGD)	IBT – Waccamaw (MGD)	Total IBT (MGD)
Max Day IBT Request ²		36 ²	17.76	17.43	0.81	18.3 ³
IBT Exceeding Grandfathered Amount of 10.5 MGD				7.8 ³		

Notes:

¹ The flow amounts are surface water only for the Northwest WTP and do not include flows from the 211 WTP.

² Based on the proposed treatment capacity of 36 MGD finished water for the Northwest WTP and an approximate 30-year time horizon. Additional raw water that is withdrawn from the river for backwash, clarifier blowdowns, and process water is not included. This water is discharged back to the Cape Fear source basin via NPDES permit.

³ Values have been rounded up.

Table 2. Brunswick County Water Demand Projections (MGD)

Year	2000 ¹	2010 ¹	2011 ¹	2020	2030	2040	2050
Retail Demand	1.903	5.088	5.370	6.653	8.078	9.631	11.137
Industrial Demand	3.934	1.993	2.193	2.193	2.193	2.193	2.193
Wholesale Demand	3.005	4.895	4.885	6.052	7.348	8.761	10.131
Non-Revenue Demand	1.039	0.865	1.334	1.652	2.006	2.392	2.766
Average Demand	9.880	12.841	13.781	16.549	19.626	22.978	26.227
Peak Month Demand ²	12.680	18.192	22.009	26.479	31.401	36.764	41.963
Peak Day Demand ³	17.900	21.319	25.798	28.465	33.756	39.522	45.111
Peak Day Capacity (%) ⁴	60%	71%	86%	95%	113%	132%	150%

Notes:

¹ All entries for 2000, 2010 and 2011, including Peak Month and Peak Day, are from actual water demand data

² For 2020-2060, Peak Month Demand = Average Demand x 2011 Monthly PF (1.60)

³ For 2020-2060, Peak Day Demand = Average Demand x 1.72 (average Maximum Day Peaking Factor for the combined output from the plants over the past 12 years)

⁴ Peak Day Capacity = Peak Day Demand / 30 MGD (existing treatment capacity)

2. PEAK MONTH TRANSFER

Daily finished water flows for the Brunswick County water system provided in the EA and IBT Petition are shown in Figure 1. The peak daily flows always occur in July. Similarly, peak month flows also occur in July (Figure 2).

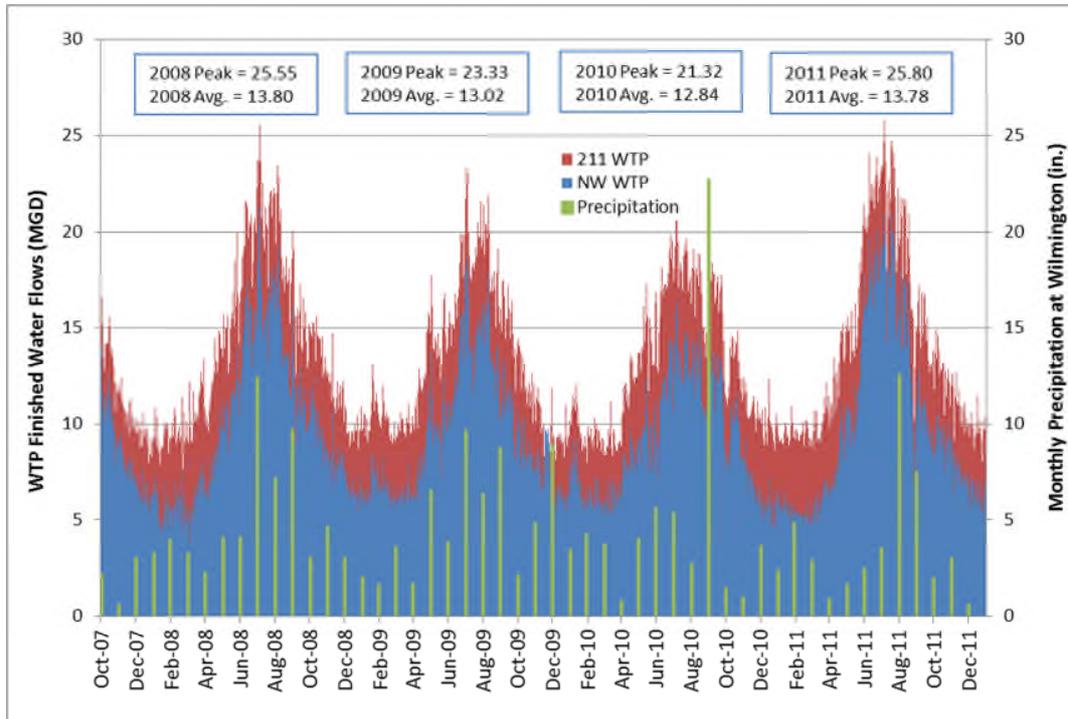


Figure 1. Brunswick County - Finished Water Flows for October 2007 through 2011 (Daily Flow)

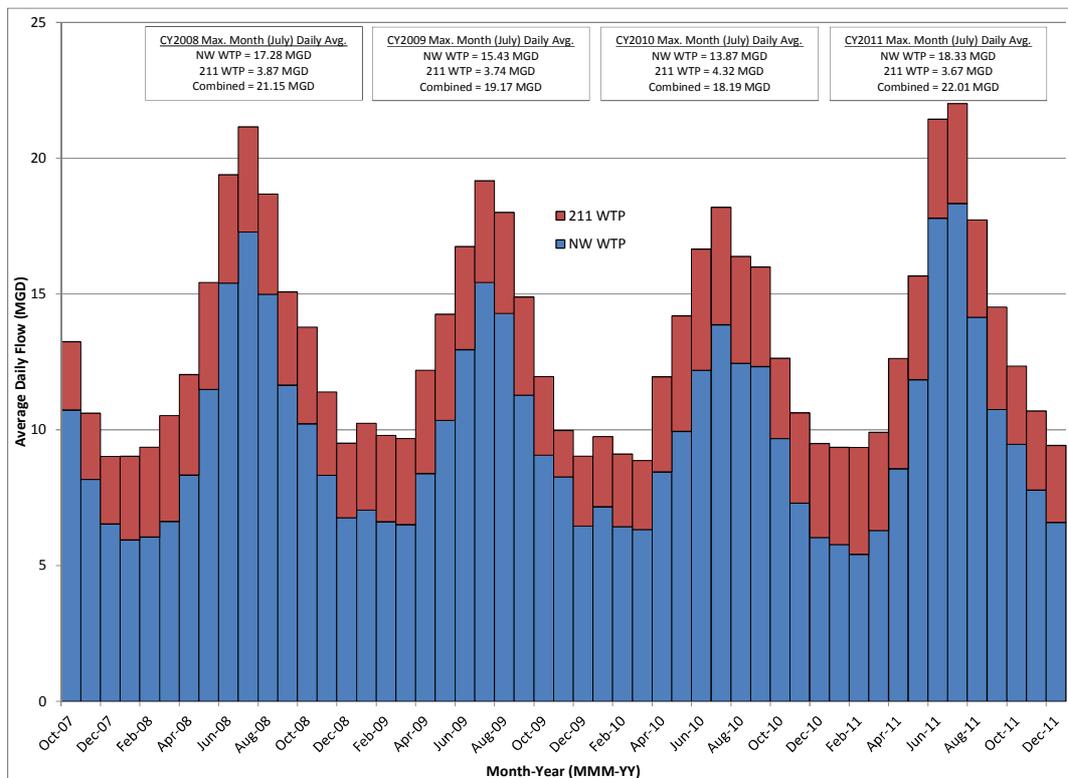


Figure 2. Brunswick County - Finished Water Flows for October 2007 through 2011 (Monthly Averages)

Using data from Tables 1 and 2, future peak month transfers have been calculated (Table 3). The approach uses peak month projections for the system, subtracts the demand supplied by the 211 groundwater plant, and allocates surface water flows between IBT basins using the same proportions from Table 1. Demand supplied by the 211 plant in future years is assumed to be equal to the max capacity multiplied by the ratio of peak month to peak day for the system. The resulting total IBT request in terms of daily average of the peak month is 17.0 MGD.

Table 3. Brunswick County Peak Monthly Surface Water Transfer (Actual 2010; Projected 2020 – 2050)

Year	Total Water Demand (MGD) – Peak Month	Withdrawal from Surface Water Source (MGD)	Total Return to Source Basin (MGD)	IBT – Shallotte (MGD)	IBT – Waccamaw (MGD)	Total IBT (MGD)
2010	18.19	13.87	6.85	6.36	0.67	7.03
2020	26.48	20.90	10.31	9.83	0.75	10.58
2030	31.40	25.82	12.74	12.32	0.75	13.08
2040	36.76	31.18	15.39	15.04	0.75	15.80
2050	41.96	36.38	17.95	17.67	0.75	18.43
Peak Month IBT Request		33.49 ¹	16.53	16.21	0.75	17.0

Notes:

¹ Based on the proposed treatment capacity of 36 MGD finished water for the Northwest WTP, considered a max day projection for an approximate 30 year time horizon (see Table 1), multiplied by the projected ratio of peak month to peak day (0.9302) from Table 2.

3. IMPLICATIONS FOR IMPACT ANALYSIS

Impact analysis using the Cape Fear Hydrologic Model was previously presented in Section 6.1 of the EA and Section 8.1 of the IBT Petition. The analysis considered monthly demand flows and therefore captures the peak month associated with the IBT request in Table 3. Also part of the analysis, a more extreme case scenario compared to a monthly average representation set each day in July at the cumulative, daily maximum withdrawal (for all users at Lock and Dam #1). Therefore, the impact analysis more than captures the impacts of the IBT in terms of peak month and no additional analysis is warranted.

4. REFERENCES

Tetra Tech. 2013a. Environmental Assessment, Brunswick County Interbasin Transfer. Prepared for Brunswick County, North Carolina. Prepared by Tetra Tech. Research Triangle Park, NC. June 2013.

Tetra Tech. 2013b. Brunswick County Interbasin Transfer Petition. Prepared for Brunswick County, North Carolina. Prepared by Tetra Tech. Research Triangle Park, NC. June 2013 Draft.

**APPENDIX C:
EXPECTED IMPACT OF CURRENT AND PROPOSED WATER DEMAND REDUCTION
MEASURES MEMORANDUM**

Memorandum

To: Harold Brady, NC Division of Water Resources **Date:** September 12, 2013

From: Victor D'Amato, J Todd Kennedy
Tetra Tech **Subject:** Expected Impact of Current and Proposed Water Demand Reduction Measures

cc: Jerry Pierce, Brunswick County
Trevor Clements, Tetra Tech **Proj. No.** 100-RTP-T23440

Brunswick County has prepared a petition to the Environmental Management Commission for an Interbasin Transfer Certificate. During the EMC's July 10th Water Allocation Committee meeting, a question was asked about the effectiveness of Brunswick County's existing and proposed water use reduction measures. This technical memorandum addresses this inquiry by discussing the County's water conservation measures and evaluating their likely current impact and anticipated future impact on water demand, while comparing the major measures with state requirements and water conservation measures implemented by comparable water utilities and state and national standards, including North Carolina's 2008 drought preparedness and management law, S.L. 2008-143. The law requires most public water utilities extending waterlines or expanding water treatment capacity and applying for various grant funds to implement six programs/measures: (1) a leak detection and repair program, (1) a water supply plan/water shortage response plan, (3) meter all water use, (4) no decreasing block rate structure for residential meters, (5) a reclaimed water evaluation, and (6) a consumer education program.

1. WATER CONSERVATION MEASURES

Brunswick County's water use reduction program includes the following main elements:

- Water conservation ordinance, including voluntary and mandatory water use restriction conservation stages
- Pricing signals, including tiered water rates and separate irrigation metering and rates
- Metering program, includes advanced retail metering and irrigation metering
- Leak program, including advanced metering infrastructure retrofit and distribution system leak detection and repair
- Customer education and community outreach
- Water reuse, including existing reuse facilities and a residential water reuse feasibility study
- Planned aquifer storage and recovery (ASR) study at the 211 WTP

Each of these program elements is described in following sections.

2. WATER CONSERVATION ORDINANCE

Brunswick County has the authority to impose water restrictions if a public water supply shortage occurs. All water customers are subject to the water use restrictions. Additionally, the County's wholesale customers are required to adopt the County's conservation measures at a minimum. In some cases, the wholesale customer has enacted more stringent measures than the County. The water use restrictions are organized in stages, with Stage 1 being voluntary and Stages 2 and 3 being mandatory. The stages are defined as follows (see also Chapter 1-13, Article V of County ordinances, <http://library.municode.com/index.aspx?clientId=19946> for more details about specific voluntary and mandatory prohibitions):

Stage 1—Water conservation alert. A Stage 1 water shortage emergency may be declared in the event of an immediate water shortage, as so declared by state and/or local officials, or when there are three (3) consecutive days when water demand exceeds eighty (80) percent of the water production capacity. Water production capacity shall be defined as the maximum volume of water that meets or exceeds state and federal standards that the water treatment process can produce during a twenty-four (24) hour period. Water production capacity can vary depending on system component reliability and/or raw water conditions. During a declared Stage 1 water shortage emergency, voluntary water conservation practices (described in Chapter 1-13, Article V of County ordinances) shall be encouraged.

Stage 2—Water shortage warning. A Stage 2 water shortage emergency may be declared in the event of an immediate water shortage, as so declared by state and/or local officials, or when there are two (2) consecutive days when water demand exceeds ninety (90) percent of the water production capacity. During a declared Stage 2 water shortage emergency, certain water using activities shall be prohibited.

Stage 3—Water shortage danger. A Stage 3 water shortage emergency may be declared in the event of an immediate water shortage, as so declared by state and/or local officials, or when there is one (1) day when water demand exceeds one-hundred (100) percent of the water production capacity. During a declared Stage 3 water shortage emergency, additional activities shall be prohibited, in addition to the activities prohibited under Stage 2.

In the event that the prohibition of the activities listed is not sufficient to maintain an adequate supply of water for fire protection, all use of water for purposes other than maintenance of public health and safety shall be prohibited. Residential water use shall be limited to the amount necessary to sustain life through drinking, food preparation and personal hygiene.

2.1. Comparison with State and National Practice

As indicated in Section 1, North Carolina's 2008 drought preparedness and management law, S.L. 2008-143, requires applicable public water utilities to develop "an approved water supply plan pursuant to G.S. 143-355," that includes a Water Shortage Response Plan, although the requirements of the plan are largely left to the discretion of the utility. It should be emphasized that Brunswick County's water conservation ordinance was first adopted in 2002.

Table 1 provides a detailed comparison between the water ordinance structure of Brunswick County and nearby water authorities, while Table 2 compares triggers. Brunswick County's ordinance is comparable to that of nearby Columbus County, Bladen County and the Cape Fear Public Utility Authority (City of Wilmington and New Hanover County). Brunswick County's ordinance imposes stricter water conservation measures on commercial businesses including carwashes, golf courses, and commercial establishments. Brunswick County restricts the use of water in the aforementioned businesses in conservation Stage 3 while none of the surrounding counties enact similar restrictions.

Table 1. Comparison of Brunswick County water conservation ordinance measures with peers

Category		Restriction	Brunswick County, NC	Columbus County, NC	Bladen County, NC	Cape Fear Public Utility Authority
Residential	Maintenance	Inspect and repair defective faucets and toilets	Voluntary (Stage 1)	Voluntary (Stage 1)	Voluntary (Stage 1)	Voluntary (Normal)
		Install water saving showerheads	Voluntary (Stage 1)	Voluntary (Stage 1)	-	Voluntary (Normal)
		Install water saving devices in toilets	Voluntary (Stage 1)	Voluntary (Stage 1)	-	Voluntary (Normal)
	Domestic activities	Do not take baths, and take no more than 5 minute showers	Voluntary (Stage 1)	Voluntary (Stage 1)	-	Voluntary (Normal)
		Do not leave faucets running while shaving, brushing teeth, rinsing or preparing food	Voluntary (Stage 1)	Voluntary (Stage 1)	-	Voluntary (Normal)
		Only operate clothes washers and dishwashers when fully loaded	Voluntary (Stage 1)	-	Voluntary (Stage 1)	Voluntary (Normal)
		Do not use water-cooled air conditioners if the cooling water is not recycled unless there are health or safety concerns	Voluntary (Stage 1) Mandatory (Stage 2)	Voluntary (Stage 1) Mandatory (Stage 2)	-	Mandatory (Stage 4)
		Do not operate dishwasher during peak demand hours	Voluntary (Stage 1)	Voluntary (Stage 1)	-	-
		Use disposable dishes when possible	Voluntary (Stage 1)	-	-	-
	Lawn	Do not water lawn or shrubbery during peak demand hours	Voluntary (Stage 1)	Voluntary (Stage 1)	-	Mandatory (Stage 1)
		Use spring loaded nozzles on garden hoses	-	-	Voluntary (Stage 1)	Voluntary (Normal)
		Irrigate landscape a maximum of one inch per week	-	-	Voluntary (Stage 1)	-
		Irrigate landscape a maximum of 1/2 inch per week	-	-	Mandatory (Stage 2)	-
		Water plants deeply to encourage root growth	-	-	Voluntary (Stage 1)	Mandatory (Stage 2)
		Only irrigate at night	Voluntary (Stage 1)	-	Mandatory (Stage 2)	Mandatory (Stage 1)
		Only irrigate three days per week	-	-	-	Mandatory (Stage 1)
		Only irrigate two days per week	-	-	-	Mandatory (Stage 2)
		Only water lawns, grass, shrubbery, trees, flowers, or vegetable gardens using hand-held hoses, containers or drip systems	Mandatory (Stage 2)	Mandatory (Stage 2)	-	-
		Do not water garden and landscape more than necessary for survival	Voluntary (Stage 1)	-	Mandatory (stage 3)	-
		Do not water lawns, grass, shrubbery, trees, or flowers	Mandatory (Stage 3)	-	-	Mandatory (Stage 4)
	Outdoor and Car Washing	Limit vehicle washing to a minimum	Voluntary (Stage 1)	Voluntary (Stage 1)	-	-
		Residential users may only wash vehicles 2 days/week and use less than 5 gallons per vehicle	-	-	-	Mandatory (Stage 2)
		Do not wash any mobile equipment (cars, trucks, trailers, boats, boats)	Mandatory (Stage 2)	Mandatory (Stage 2)	-	Mandatory (Stage 3)
Do not fill previously drained swimming or wading pools		Voluntary (Stage 1) Mandatory (Stage 2)	Voluntary (Stage 1) Mandatory (Stage 2)	-	Mandatory (Stage 2)	

Category		Restriction	Brunswick County, NC	Columbus County, NC	Bladen County, NC	Cape Fear Public Utility Authority
		Do not fill newly constructed swimming or wading pools	Voluntary (Stage 1) Mandatory (Stage 2)	Voluntary (Stage 1) Mandatory (Stage 2)	-	Mandatory (Stage 4)
		Do not use "make up" water for pools	-	-	-	-
		Do not use water for ornamental fountains unless recycled	Mandatory (Stage 2)	Mandatory (Stage 2)	-	-
		Do not wash outside areas	Voluntary (Stage 1) Mandatory (Stage 2)	Voluntary (Stage 1) Mandatory (Stage 2)	Voluntary (Stage 1) Mandatory (Stage 2)	Mandatory (Stage 2)
		No washing the exterior of office buildings, homes, or apartments	Mandatory (Stage 2)	Mandatory (Stage 3)	-	Mandatory (Stage 4)
	Other	Do not intentionally waste water	Mandatory (Stage 2)	Mandatory (Stage 2)	Voluntary (Stage 1)	-
Commercial	Lawn and Shrubbery	Plant vendors can water their commercial crop as they see fit	-	-	-	Mandatory (Stage 2)
		Commercial plant vendors cannot water their commercial crop	Mandatory (Stage 3)	-	-	-
	Golf Courses	Golf courses cannot irrigate their greens	Mandatory (Stage 3)	-	-	-
		Golf courses must submit a 10% reduction plan	-	-	-	Mandatory (Stage 1)
		Golf courses must submit a 20% reduction plan	-	-	-	Mandatory (Stage 2)
		Golf courses must submit a 30% reduction plan	-	-	-	Mandatory (Stage 3)
		Golf courses must submit a 50% reduction plan	-	-	-	Mandatory (Stage 4)
		Golf courses can only water using water from storm water ponds, wastewater effluent and irrigation wells	-	Mandatory (Stage 2)	-	-
	Car Washes	Car Washes may not operate	Mandatory (Stage 3)	-	-	-
	Other Business	Do not serve drinking water in restaurants without customer	Mandatory (Stage 2)	Mandatory (Stage 2)	-	Mandatory (Stage 2)
		Charity car wash events are not allowed	-	-	-	Mandatory (Stage 3)
		Automobile dealers may not wash cars in preparation for delivery	-	-	-	Mandatory (Stage 4)
		Do not allow businesses that wash home's exteriors to operate	Mandatory (Stage 2)	Mandatory (Stage 3)	-	Mandatory (Stage 4)
		Do not wash the exterior of office buildings, homes, or apartments	Mandatory (Stage 2)	Mandatory (Stage 2)	-	Mandatory (Stage 4)
	Public Works	Do not use fire hydrant water use except for fire or another public	Mandatory (Stage 2)	Mandatory (Stage 2)	Mandatory (Stage 2)	Mandatory (Normal)
Do not allow cleaning of emergency vehicles		-	-	-	-	
Do not use water for dust control		Mandatory (Stage 2)	Mandatory (Stage 2)	-	Mandatory (Stage 3)	
Broad Categories	Non-essential uses of drinking water are banned	-	-	Mandatory (Stage 3)	-	
	All water uses except public health and safety are banned	>Stage 3	>Stage 3	Mandatory (Stage 4)	-	
	Water is rationed from pick up stations	-	-	Mandatory (stage 5)	-	
Financial Incentives	Drought surcharge x1.5	-	-	Mandatory (Stage 3)	-	

Category	Restriction	Brunswick County, NC	Columbus County, NC	Bladen County, NC	Cape Fear Public Utility Authority
	Drought surcharge x2.0	-	-	Mandatory (Stage 4)	-
	Drought surcharge x5.0	-	-	Mandatory (Stage 5)	-
	Offense Fine	Fines, potential discontinuation	\$500, potential discontinuation	\$250-500, potential discontinuation	-
Reduction Goal	5% of last month's water bill for residential customers	-	-	Voluntary (Stage 1)	-
	10% of last month's water bill for residential customers	-	-	Mandatory (Stage 2)	-
	20% of last month's water bill for residential customers	-	-	Mandatory (Stage 3)	-
	25% of last month's water bill for residential customers	-	-	Mandatory (Stage 4)	-
	20% reduction for commercial and industrial water customers	Mandatory (Stage 2)	Mandatory (Stage 2)	-	-
	50% reduction for commercial and industrial water customers	Mandatory (Stage 3)	Mandatory (Stage 3)	-	-

Table 2. Comparison of Brunswick County water conservation ordinance triggers with peers

	Brunswick County, NC	Columbus County, NC	Bladen County, NC	Cape Fear Public Utility Authority
Stage 1	1) Declaration by state or local officials 2) Three consecutive days when water demand exceeds 80% of the water production capacity	1) Declaration by state or local officials 2) Three consecutive days when water demand causes all wells in each water district to be pumped more than 12 hours per day	Pumping time > 10 hrs, 20% reduction in seasonal normal distance from static water level and pump intake, 20% increased pumping time for same output	Declared by local officials
Stage 2	1) Declaration by state or local officials 2) Two consecutive days when water demand exceeds 90% of the water production capacity	1) Declaration by state or local officials 2) Two consecutive days when water demand causes all wells in each water district to be pumped more than 16 hours per day	Pumping time > 12 hrs, 40% reduction in seasonal normal distance from static water level and pump intake, 40% increased pumping time for same output	1) Declared by local officials 2) Three consecutive days when water demand exceeds 80% of the water production capacity
Stage 3	1) Declaration by state or local officials 2) One consecutive day when water demand exceeds 100% of the water production capacity	1) Declaration by state or local officials 2) Water demand in each water district depletes tank capacity to less than 50% and the wells are at full production for 24 hours	Pumping time > 14 hrs, 60% reduction in seasonal normal distance from static water level and pump intake, 60% increased pumping time for same output	1) Declared by local officials 2) Two consecutive days when water demand exceeds 90% of the water production capacity

	Brunswick County, NC	Columbus County, NC	Bladen County, NC	Cape Fear Public Utility Authority
Stage 4	-	-	Pumping time > 20 hrs, 80% reduction in seasonal normal distance from static water level and pump intake	1) Declared by local officials 2) One consecutive day when water demand exceeds 100% of the water production capacity
Stage 5	-	-	Water level at pump intake elevation	-

2.2. Water Demand Impacts

Brunswick County's *water emergency response and management* ordinance was adopted in 2002 and amended in 2008 (revised penalties for failing to comply with the ordinance to include discontinuation of service) and 2010 (added conservation goals for each water use restriction stage). Since its adoption in 2002, Stage 1 restrictions have been implemented two times, once in 2008 (for 76 days) and once in 2011 (for 70 days). Stage 2 and 3 restrictions have not been implemented. However, the actual implementation of water restrictions typically has only minor direct impact on annual average water demand, unless water restrictions continue for extended periods of time. Rather, the main water demand impact of a water conservation ordinance is to increase user awareness and affect behavioral change over time. The substance of the ordinance indirectly educates users about activities that minimize their water consumption.

Accurately assessing the impact of Brunswick County's water conservation ordinance on water demand is confounded by a number of variables that may have a stronger signal than the ordinance in affecting annual average and peak demands. For example, as discussed in the Environmental Assessment document, weather – heat and precipitation in particular – is believed to have a more profound effect on annual average and peak water demand based on their influence on outdoor water uses. Other conservation measures will also impact water demand. Nevertheless, Figure 1 presents trends in per capita water demand for Brunswick County's retail customers during the period of 2000 through 2012 (note that 2001-2005 data was not available). While these data are not conclusive with respect to the impact of the ordinance on water demand, they do provide a baseline against which future data can be compared. We expect to see stronger trends in water demand over longer time series.

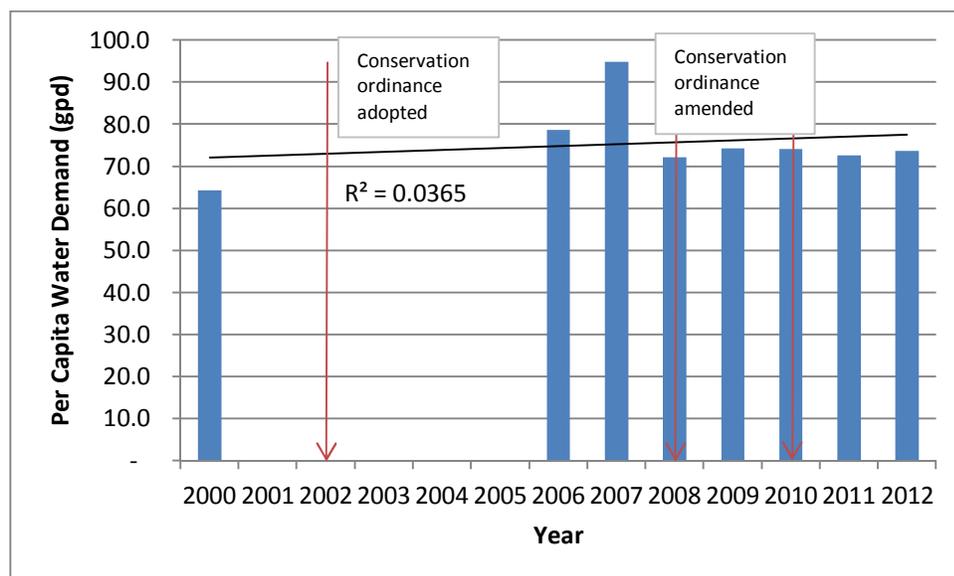


Figure 1. Per capita retail water demand in Brunswick County: 2000, 2006-2012

Elsewhere, water conservation ordinances have been shown to have significant effects on water demand in residential and commercial settings. One study in Santa Fe, New Mexico, found that residential water use was reduced by 28 percent as a result of emergency water regulation ordinances (during the period of drought) that are structured in a similar manner to Brunswick County (Tippet, 1999). Similarly, a second study found that water use restrictions reduced water demand by 29 percent on average across eight water agencies in California (Renwick, 1999). Michelsen et al (1999) found that each individual conservation program lowered water demand by 1.1 to 4 percent on average. The authors assert that non-price programs (e.g., water restrictions, customer education, etc.) exhibit diminishing returns and that marginal

program effectiveness diminishes with the number of total implemented programs in the area of interest. Another study conducted in Aurora, Colorado found that pricing and outdoor water restriction policies do not act independently and also found that water reduction varies between classes of customers (Kenney et al., 2008). It was estimated that water restrictions caused a 12.1 percent decrease in water demand and that the price elasticity (a measure of how demand changes with price, it is defined as the percentage change in quantity demanded in response to a one percent change in price) during restrictions was -0.37 as compared to -0.6 when restrictions were not applied; in other words, increasing water restrictions decreased price elasticity. Moncur et al. (1987) found similar price elasticities of -0.36 without water restrictions and -0.41 with enforced water restrictions. Table 3 summarizes water demand reductions resulting from water restrictions.

Table 3. Summary of published water demand reductions resulting from use restrictions

Study	Percent Reduction
Tippet (1999)	28
Renwick (1999)	29
Kenney (2008)	12.1
Mean	23

Based on the data presented in Table 3, it is reasonable to conservatively estimate a 10 percent water demand reduction as a cumulative result of Brunswick County's non-price programs, including the water conservation ordinance and customer education (discussed in more detail in Section 6) against a baseline condition without these programs. This results in a 1.53 MGD savings in CY 2011 (based on an average day demand of 13.78 MGD) and a 2.91 MGD savings in CY 2050 (based on a projected average day demand of 26.23 MGD), assuming that these non-price programs are sustained over the period of the evaluation.

3. PRICING SIGNALS

The main elements of the County's water service pricing that affect water demand are tiered (conservation or inclining block) rates and separate metering and inclining block rates for outdoor (irrigation) uses.

The rates for retail meters include a base charge that increases with larger service meter sizes from \$11/month (for ¾-inch retail meters) to \$27/month (for 4-inch retail meters). In addition to this base charge, retail water rates include three usage tiers, charged at \$3.05, \$3.10 and \$3.15 per 1,000 gallons, as monthly usage increases. The conservation rate structure was last amended in 2000. Additional tiered rate details can be found in the Environmental Assessment or at

<http://www.brunco.net/Departments/LandDevelopment/Utilities/WaterSewerRates.aspx>.

The County implemented an inclining block irrigation water rate in 2010 that has higher tiers for water used for irrigation. Irrigation meter rates have five tiers, ranging from \$3.05 per 1,000 gallons to \$4.00 per 1,000 gallons, with the rate increasing with higher usage. Although the installation of irrigation meters is not mandatory, there is a strong incentive to use them because metered irrigation water is not included in the user's sewer bill, and all residential wastewater flows over 3,000 gallons per month are billed at the relatively high rate of \$6.50 per 1,000 gallons (note that all commercial wastewater flows are billed at a constant rate of \$6.50/1,000 gallons and that industrial wastewater flows are billed using a declining block rate structure).

3.1. Comparison with State and National Practice

North Carolina's 2008 drought preparedness and management law, S.L. 2008-143, requires applicable public water utilities to "not use a rate structure that gives residential water customers a lower per-unit water rate as water use increases" (i.e., a declining block rate structure). Other rate setting procedures are left to the discretion of the utility. Note that Brunswick County's conservation rate structure was implemented in 2000, well before required by S.L. 2008-143.

A significant body of literature has examined the impacts of pricing on residential and commercial water demand. A recent report presented a meta-analysis of price elasticity in residential water demand and found a mean price elasticity of -0.41 and a median price elasticity of -0.35 (Dalhuisen, 2003). A price elasticity value of -0.41 signifies that for every 1% increase in price, water demand will decrease by 0.41% on average. Consequently a 10% increase in price can be expected to yield a 4.1% decrease in water demand. These findings are corroborated by a number of additional studies relating water pricing to water demand that are summarized in Table 4.

Table 4. Summary of mean potable water price elasticities from relevant studies

Citation	Mean Price Elasticity
Stallworth (2000)	-0.30
Renwick (1998)	-0.33
Espey (1997)	-0.51
Dalhuisen (2003)	-0.41
Moncur (1987)	-0.35
Kenney (2008)	-0.37
Corral (1999)	-0.30
Mean	-0.37

An EPA publication estimated that commercial price elasticity is significantly higher than residential price elasticity suggesting that increases in water prices will drive greater reductions in water demand in commercial customers when compared to residential users (Stallworth, 2000). Stallworth reported residential price elasticities between -0.2 and -0.4 and industrial price elasticities between -0.5 and -0.8. Olmstead et al. (2006) also reported relatively high values for industrial price elasticity ranging from -0.44 to -0.97. Consequently, significant water reductions can be attained from commercial and industrial customers by implementing pricing signals alone.

Irrigation metering can also have significant impacts on residential water demand. Inman et al. (2006) reported a 25% increase in price elasticity for outdoor uses when compared to the price elasticity for indoor water use. In other words, pricing signals for outdoor water use should have a greater impact on water demand than similar pricing signals for indoor or combined uses.

Additionally it should be noted that increasing block price structures generally result in larger price elasticities than uniform pricing structures (Olmstead, 2007).

A recent report from the UNC Environmental Finance Center examined water and wastewater rates and structures in over 500 communities across North Carolina (Eskaf, 2013). A comparison of their statewide

average rates with those used by Brunswick County is summarized in Table 5. A comparison of the statewide proportion of utilities incorporating irrigation rates and inclining block rate structures is provided in Table 6, illustrating that Brunswick County is among a significant minority of utilities with both irrigation and increasing block rates.

Table 5. Summary of North Carolina statewide versus Brunswick County water rates

Rate Element	State Median	Brunswick County
Residential base charge	\$14.01/month	\$11.00/month
Monthly Consumption Allowance	2000 gallons/month	None
Maximum Quantity of First Residential Block	5000 gallons/month	6000 gallons/month
Amount charged for 3,000 gallons	\$20.88	\$20.15
Amount charged for 5,000 gallons	\$28.88	\$26.25
Amount charged for 10,000 gallons	\$49.03	\$41.70

Table 6. Summary of statewide versus Brunswick County water rate characteristics

Rate Characteristic	Percentage of State Utilities	Brunswick County
Provides residential irrigation rates	15%	Yes
Uses residential increasing block structure	28%	Yes

3.2. Water Demand Impacts

Per the discussion above, pricing signals are generally more effective than water conservation ordinances in directly affecting user behavior. In general, the stronger the signal, the greater the impact on water use. Although Brunswick County's retail rates are tiered in relatively small increments (\$0.05 per 1,000 gallons), strong economic incentives are provided to encourage users to install irrigation meters. Additionally, the County's irrigation rate structure includes more tiers with larger rate increments than for retail, non-irrigation usage. Because irrigation uses are such a significant element of Brunswick County's water demand and because of the price elasticity of outdoor water metering, focusing conservation efforts on irrigation is appropriate.

Figure 2 and Figure 3 show peaking factors during the time period of 2000-2012 for the peak month and peak day, respectively. Using these data to determine the impact of Brunswick County's irrigation rates of peak demands is confounded by the effect of the seasonal population of resort and vacation areas in Brunswick County, particularly since the peaking factors are based on total water demand data, which includes relatively new wholesale customers such as Bald Head Island, Caswell Beach, Holden Beach and Ocean Isle Beach, among others. Accordingly, it is difficult to draw conclusions from these figures. However, based on the mean price elasticity of -0.37 from Table 4, we can estimate water demand reductions of about 0.6 percent for each price tier. More detailed analyses would be needed to determine whether irrigation season peaking factors have decreased while controlling for seasonal population

increases in served resort areas or to quantify the effects of Brunswick County’s tiered water rates on demand versus its base water rate of \$3.05/1,000 gallons.

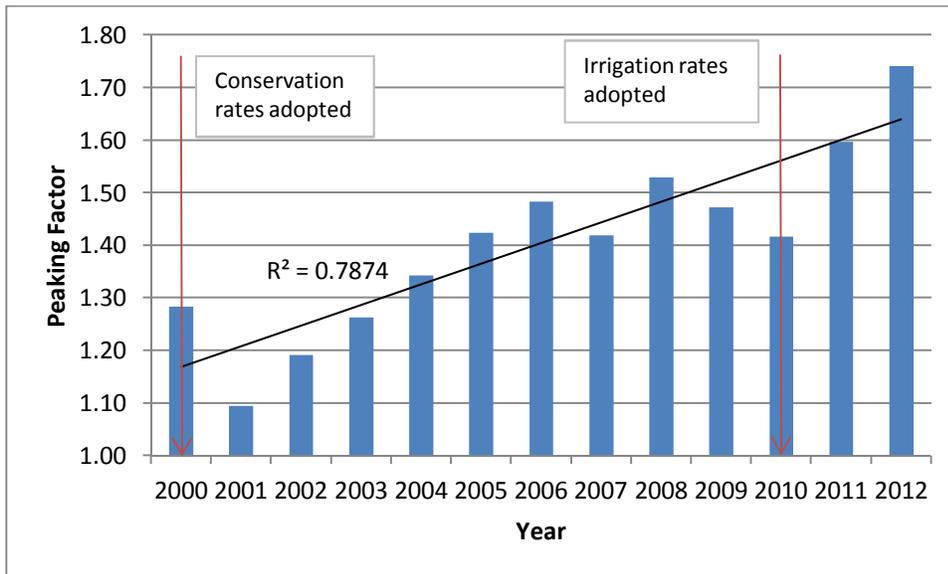


Figure 2. Peak month peaking factor for Brunswick County, 2000-2012

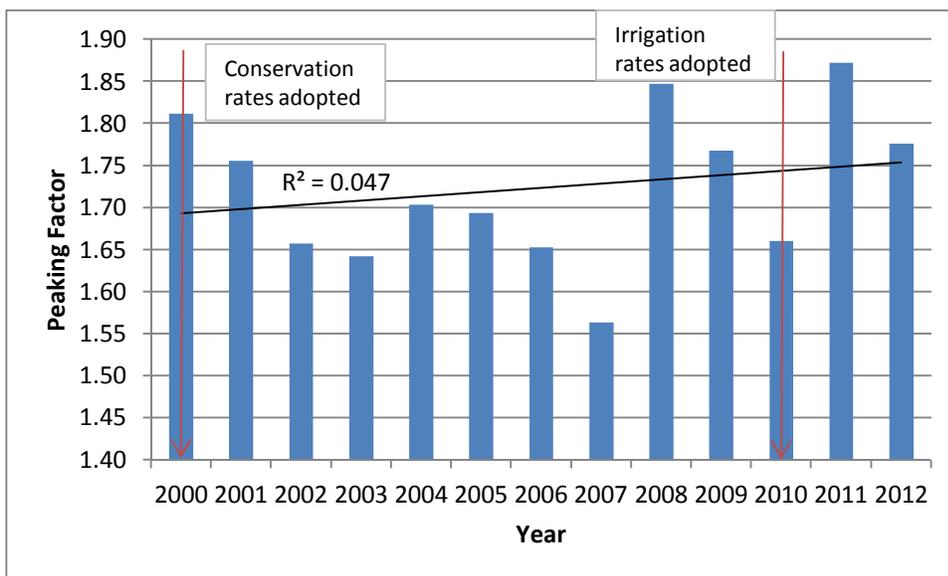


Figure 3. Peak day peaking factor for Brunswick County, 2000-2012

4. METERING PROGRAM

In addition to its aforementioned irrigation metering and tiered irrigation rate program discussed in Section 3, Brunswick County is also in the process of retrofitting retail meters with Advanced Metering Infrastructure (AMI) systems that will allow meters to be read quickly and remotely, enhancing the County’s ability to both analyze water use to improvement management and identify abnormal water usage (which often indicates plumbing leaks) and notify customers as appropriate. Installation of the AMI system began in 2010, at which time Brunswick County projected that it would take six years to

complete. As of the preparation of the Environmental Assessment, the County was about one-third of the way through retrofitting its retail customers' meters. They are currently about one-half of the way through the system and are projected to stay on schedule to complete the installation in 2016.

4.1. Comparison with State and National Practice

North Carolina's 2008 drought preparedness and management law, S.L. 2008-143, requires applicable public water utilities to meter "all water use except for water use that is impractical to meter, including, but not limited to, use of water for firefighting and to flush waterlines." Additionally, it states that "local government water systems and large community water systems shall require separate meters for new in-ground irrigation systems that are connected to their systems."

Brunswick County had been metering all applicable water uses prior to S.L. 2008-143 and has proactively implemented the aforementioned metering upgrade program that goes above and beyond state law.

4.2. Water Demand Impacts

Improved metering in and of itself is not expected to have a large impact on water demand (an exception is that residential metering has been shown to have significant effects on residential water usage in locations where no metering previously existed). However, metering upgrades do improve and streamline data collection and management which results in more robust and accurate water accounting. Irrigation metering provides Brunswick County with a vehicle to implement pricing strategies that are likely to have direct impacts on customer use (described in Section 3). The AMI system retrofit enhances Brunswick County's ability to detect and remedy leaks including those associated with individual retail customers who are promptly notified of potential plumbing leaks or abnormal water use. The County's leak detection and repair program is discussed in more detail in Section 5.

5. LEAK DETECTION AND REPAIR

In addition to the AMI retrofit program described in Section 4, Brunswick County implements an annual inspection program of their complete water system with a special emphasis on water mains in easements. As the County's distribution system is relatively new, a routine water main replacement program is not currently warranted. However, leaks are tracked to determine whether any lines are failing and the County has a policy that requires immediate repair of any reported water main leaks 24 hours a day, 365 days per year.

5.1, Comparison with State and National Practice

North Carolina's 2008 drought preparedness and management law, S.L. 2008-143, requires applicable public water utilities to implement "a leak detection and repair program," but leaves the specifics of the program largely to the discretion of the utility. As previously indicated, Brunswick County's program includes proactive leak detection and repair on a system-wide basis and for individual residential customers.

Brunswick County monitors non-revenue water demand (water that was produced but not paid for by a customer and was likely lost as a result of leaks, theft, or metering inaccuracies) on a monthly basis. In fiscal year 2012, the County's non-revenue water percentage was 7 percent, which is below industry standards that typically range from 10 to as high as 25 percent, although relevant benchmarks or standards are highly dependent on the design, age, condition and layout of the system (note that alternative non-revenue water metrics such as loss per connection or unit length of network may be more appropriate indicators of system condition). Brunswick County has a digitally mapped system and field crews are equipped with computers with digital mapping available in their vehicles. A hydraulic model of the

County’s water system is updated annually and compared with results of annual fire hydrant flow testing to ensure that the system is performing as expected.

Residential leakage reduction can dramatically lower water demand in areas with high leakage rates. Mayer et al. (2004) studied three separate study sites in Florida, San Francisco and Seattle and found that leak reduction measures led to 20 percent, 19.8 percent and 6.6 percent reductions in total water demand respectively. The results of a large literature review suggested a 9 to 12 percent reduction in indoor water consumption as a result of retrofit programs that installed toilet dams, faucet aerators, and low flow showerheads (Inman, 2006). Additionally Mayer et al., found that the majority of indoor residential leaks were a result of leaky toilet dams. Studies reported in Inman found water savings ranging from 28 to 44 percent as the result of residential leak reduction and the replacement of toilet valves.

5.2. Water Demand Impacts

Water lost to leaks from a potable water distribution system should be captured in the utility’s non-revenue water demand, which is typically calculated as the difference between the metered treated/pumped water and the amount of water delivered to customers. Accordingly, the impact of a system-wide leak detection and repair program should be reflected in non-revenue water demand trends.

Brunswick County’s non-revenue water demand for 2000-2012 (note that 2001-2005 data was not available) is summarized in Figure 4. Although, there are a number of confounding factors affecting the data presented, it appears that non-revenue demand has declined during this time period. If we assume that non-revenue water demand has been reduced from a baseline average of 10 percent to a new average of 8 percent, then approximately 0.28 MGD of water have been saved per day based on year 2011 average daily flow.

We expect non-revenue demand as a percentage of total demand to level off or possibly continue to decline modestly, as improved technology allows for the identification and repair of smaller leaks in the future. In any case, Brunswick County’s performance with respect to non-revenue water is very good compared to industry standards and an appropriate program is in place to continue or improve upon this performance.

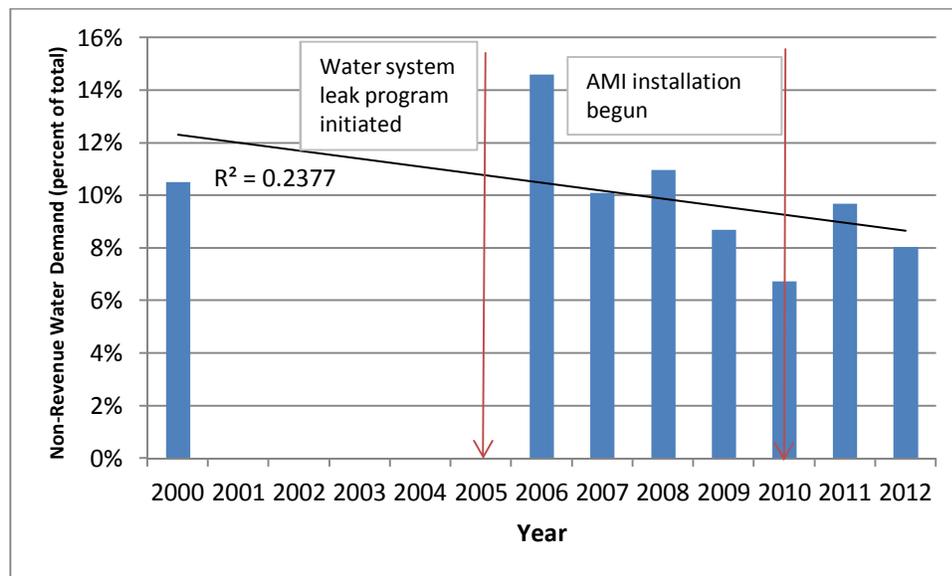


Figure 4. Non-revenue water demand in Brunswick County: 2000, 2006-2012

6. CUSTOMER EDUCATION

The County provides water conservation information to its customers through various means including their website, in water bill mailers and at public events. For example, the County has developed a water conservation brochure which is available in hard copy and on their website at <http://www.brunasco.net/Departments/LandDevelopment/Utilities/BrochuresUtilities.aspx>. The County also maintains a Frequently Asked Questions list (http://www.brunasco.net/Portals/0/bcfiles/finance/fin_faqs.pdf) and produces annual water quality and wastewater performance reports, available at <http://www.brunasco.net/Departments/LandDevelopment/Utilities/AnnualReports.aspx>.

The County also works with the Cooperative Extension Service on water conservation and sustainable landscaping practices, and with property owners associations in a number of large subdivisions to promote water conservation.

6.1. Comparison with State and National Practice

North Carolina's 2008 drought preparedness and management law, S.L. 2008-143, requires applicable public water utilities to implement "a consumer education program that emphasizes the importance of water conservation," but leaves the specifics of the program largely to the discretion of the utility.

Customer education has been shown to have water demand reduction impacts on a short time scale. Syme (2000) found that information campaigns reduced water demand by 10 to 25 percent during the period that they were active. The water reduction significantly decreased, however, once the campaigns were concluded. Renwick (1999) found that information campaigns relying solely on voluntary reduction measures reduced household water demand by an average of 8 percent. Borisova (2013) found that educational programs had little to no impact 2 months after their completion. Additionally Inman et al. (2006) presented an estimate of the effects of public awareness campaigns suggesting relatively small effects, with demand reductions ranging from 2 to 6 percent (4.6 percent average).

Therefore information campaigns may be expected to yield significant but short term impacts and a sustained campaign is needed to affect longer-term water demand reductions.

6.2. Water Demand Impacts

Customer outreach and education builds a culture of water conservation over time, similar to the long-term impacts of a water conservation ordinance, as discussed in Section 2. Quantifying the impact of an education program on water demand is only practical when considering the combined effects of multiple water conservation measures over longer periods of time. The per capita water demand data summarized in Figure 1 can be used as a baseline for future evaluation.

An estimate of the cumulative effects of this measure and Brunswick County's water conservation ordinance on water demand is provided in Section 2.2.

7. WATER REUSE

The County owns six wastewater treatment plants (WWTPs) that are permitted for reuse: Ocean Ridge Plantation, Sea Trail, West Brunswick Regional, Northeast Brunswick Regional, Shallotte WWTP and Ocean Isle Beach WWTP. The Carolina Shores WWTP recharges the surficial groundwater aquifer via spray irrigation, but is not permitted for reuse. Several other small reuse systems and a number of other land application (surface or subsurface) systems are located in but not owned or operated by the County.

The largest water reclamation plant in the County is the West Regional plant, with a permitted capacity of 6.0 MGD. This plant includes a reclaimed water line that extends to four golf courses, in addition to three dedicated land application sites. The Sea Trail WWTP provides effluent for two golf courses at Sea Trail.

The Ocean Ridge WWTP provides water to three golf courses at Ocean Ridge. The Ocean Isle Beach and Shallotte WWTPs irrigate dedicated reuse sites, planted with trees. The Northeast Regional plant produces reuse quality water and is permitted for reuse, but it is not currently delivering reuse water except for a small amount within the boundaries of the plant. Average daily reuse flows for these facilities in fiscal year 2013 are summarized in Table 7.

Table 7. Average daily reclaimed water flows for Brunswick County reuse facilities in fiscal year 2013

Reuse facility	Average daily reclaimed water flow (MGD)
Sea Trail	0.19
West Brunswick	1.90
Ocean Ridge	0.04
Shallotte	0.16
Ocean Isle Beach	0.17
TOTAL	2.46

The County is currently conducting a study to assess the feasibility of residential water reuse (costs, demand, layout and public acceptance issues) in the Town of Saint James and the Winding River development. The County estimates that residents in these areas might have a seasonal reclaimed water demand of up to 1.3 MGD.

7.1. Comparison with State and National Practice

North Carolina's 2008 drought preparedness and management law, S.L. 2008-143, requires applicable public water utilities to evaluate "the extent to which the future water needs of the water system can be met by reclaimed water," but leaves the specifics of the program largely to the discretion of the utility.

Water reuse at golf courses and dedicated land application sites has become a fairly common practice in North Carolina, although southeastern North Carolina and Brunswick County, in particular, have been well ahead of most other areas of the state in implementing these reuses.

There are but a few examples of residential lawn irrigation with reclaimed water in North Carolina. The most notable example is in the Town of Cary. Cary was one of the first communities to implement water reuse and shares similar traits with Brunswick County in that its community is comprised largely of residential communities that use a lot of water for residential lawn irrigation. Cary's first community to utilize reclaimed water for landscape and residential lawn irrigation was Wessex Subdivision. For comparison with Brunswick County's plans for St. James and Winding River, Cary currently delivers about 1.0 MGD of reclaimed water to residential customers on the peak day.

7.2. Current and Future Water Demand Impacts

Brunswick County's current reuse program likely offsets only a small amount of potable water demand, since golf courses often use non-potable sources (e.g., dedicated irrigation wells, reclaimed wastewater, stormwater) for irrigation. Dedicated land application sites for receiving reclaimed water provide no

offset of potable water demand, although they do help recharge regional aquifers which may be drawn upon as a source of potable water.

Future water demand impacts of Brunswick County's reclaimed water program have the potential to be significant. The St. James and Winding River areas currently being studied have the potential to offset 1.3 MGD of potable water demand currently being used to irrigate residential landscapes. Brunswick County hopes that the current residential reuse study is the first step towards a more ambitious residential reuse program, although no long-term projections of potential water demand offsets have yet to be developed.

It is important to note that offsetting seasonal irrigation water demand will have an impact on average day as well as peak day and peak month water demands.

8. AQUIFER STORAGE AND RECOVERY STUDY

The County is planning a study of aquifer storage and recovery (ASR) at the 211 Water Treatment Plant (WTP) to reduce withdrawal of surface water during peak demand periods. The technical viability of this option is currently unknown.

ASR is the storage of treated drinking water in underground aquifers during periods of low customer use and recovering and using the water later. A common use of ASR is for management of peak demand and raw water supply in public drinking water systems. In this scenario, excess treated drinking water can be injected during periods when supply exceeds demand and can be recovered when demand exceeds the treatment or source water withdrawal capacity.

The North Carolina Division of Water Quality (NCDWQ) suggests that if a clean aquifer is used as the injection zone and the aquifer matrix and native groundwater are chemically compatible with the injected water, the recovered water should be roughly the same quality as when it was injected and thus should require only additional disinfection treatment prior to distribution to the public (NCDWQ, 2013).

8.1. Comparison with State and National Practice

Although ASR has been routinely used in some other states, North Carolina has only entertained ASR proposals within the last decade. One of the first ASR projects is being implemented by Greenville Utilities (GUC) in Pitt County, the design of which will allow GUC to store over 300 million gallons of drinking water. Additionally, the Cape Fear Public Utility Authority (CFPUA), serving Wilmington, NC, has completed construction of an Aquifer Storage and Recovery facility which is currently being tested to complete permitting requirements. The facility consists of a well that injects treated drinking water from the CFPUA's distribution system into groundwater aquifers during the cooler months when demand for water from customers is low. During summer months when customer water demand is high, the well pumps this water from the ground so that it can be used in the distribution system (CFPUA, 2013). By pursuing a study of ASR, Brunswick County is proactively exploring currently-available options for offsetting the proposed IBT.

NCDWQ requires an injection permit for the construction and operation of a well for ASR. A water supply well permit is required and the Public Water Supply Section must approve of the use of the ASR well in a public water system.

Major issues that must be addressed in an ASR permit application include (<http://portal.ncdenr.org/web/wq/aps/gwpro/asr>):

- A complete water quality analysis of the water to be injected (all National Primary and Secondary Drinking Water Standards) as well as a basic water quality analysis of native water in the aquifer.
- Modeling of potential reactions between the injected water and native waters and between the injected water and aquifer matrix. Modeling should evaluate the potential for oxide formation, swelling of clays, and other adverse water quality and aquifer reactions.

- Monitoring at points other than the ASR well itself.
- Disinfection by-products and disinfectants are the only compounds currently allowed to exceed 2L standards in the injected water, but this is only justified on the basis that the injected water is treated drinking water to be recovered and used as treated drinking water.

8.2. Current and Future Water Demand Impacts

ASR has the potential to offset the IBT by allowing excess water treated at the 211 WTP to be stored for future use during peak demand periods. The potential impact of ASR on the IBT will not be known until the study is completed.

9. SUMMARY AND CONCLUSIONS

Brunswick County has enacted an aggressive water demand reduction program, consisting of seven major measures, as summarized in Table 8. Determining the water demand reduction impacts of individual measures, particularly over relatively short time periods, is difficult. Nevertheless, expected water demand reduction has been estimated based on actual Brunswick County data where sufficient to draw such conclusions, and using the results of published literature. Based on this analysis, we estimate that Brunswick County's water demand reduction program is saving at least 1.8 MGD of potable water per year, on average based on 2011 water demand data. Furthermore, we estimate that Brunswick County can save at least 4.1 MGD in 2050 as a result of existing and planned water demand reduction measures, although water demand forecasting can be very difficult due to uncontrollable variables that may affect baseline water demand (e.g., new water using appliances, weather changes that influence outdoor uses).

Table 8. Brunswick County water demand reduction measures and estimated impacts

Measure	Water demand benefits	Current (2011) demand impact	Future (2050) demand impact
Water conservation ordinance	Builds long-term customer ethic Provides tool for limiting water use during emergency	Minimal direct impacts 1.53 MGD with sustained customer education and non-price measures	Minimal direct impacts 2.91 MGD with sustained customer education and non-price measures
Pricing signals	Builds long-term customer ethic Reduces irrigation demand	Unknown, but likely significant (especially during peak use/irrigation periods)	Unknown, but likely significant (especially during peak use/irrigation periods)
Metering improvements	Allows for improved water demand accounting Facilitates leak detection	No direct impacts	No direct impacts
Leak detection and repair	Reduces non-revenue water demand	0.28 MGD	0.54 MGD
Customer education	Builds long-term customer ethic	1.53 MGD with sustained customer education and non-price measures	2.91 MGD with sustained customer education and non-price measures

Measure	Water demand benefits	Current (2011) demand impact	Future (2050) demand impact
Water reuse	Can reduce potable water demand for non-potable uses	Unknown, likely minor	1.3 MGD seasonally (roughly 0.65 MGD annual average)
ASR	Shave peak flows Offset IBT	Under study	Pending results of study
ESTIMATED ANNUAL AVERAGE DEMAND REDUCTION	N/A	>1.81 MGD	>4.10 MGD

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APPENDIX D:
WATER SHORTAGE RESPONSE PLAN

WATER SHORTAGE RESPONSE PLAN

1. PURPOSE

The purpose of the Water Shortage Response Plan is to provide guidance to Public Utilities staff, County Administration, and the customers of the Brunswick County Public Utilities during periods of drought and other events that result in a shortage of potable water. The Water Shortage Response Plan is intended to provide a framework of steps and activities to be implemented as conditions require.

2. RESPONSIBILITY FOR DECLARATION OF A WATER SHORTAGE

Under the County's current Water Emergency Ordinance, the Director of Public Utilities or his authorized representative is authorized to declare that a water emergency exists. Depending on the severity of the emergency, voluntary (Stage 1) and mandatory (Stage 2 and Stage 3) staged water use restrictions as described in this ordinance shall be imposed upon all water customers. This declaration shall be made after consultation with the Public Utilities staff, County Administration, and County wholesale customers.

3. SHORTAGE RESPONSE ACTION LEVELS

STAGE 1 - WATER CONSERVATION ALERT

A Stage 1 water shortage emergency may be declared in the event of an immediate water shortage, as so declared by state and/or local officials, or when there are three (3) consecutive days when water demand exceeds eighty percent (80%) of the total water plant production capacity. Water production capacity shall be defined as the maximum volume of water that meets or exceeds state and federal standards that the water treatment plant process can produce during a twenty-four (24) hour period. Water production capacity can vary depending on system component reliability and/or raw water conditions or availability.

STAGE 2 – WATER SHORTAGE WARNING

A Stage 2 water shortage emergency may be declared in the event of an immediate water shortage, as so declared by state and/or local officials, or when there are two (2) consecutive days when water demand exceeds ninety percent (90%) of the water production capacity. Water production capacity shall be defined as the maximum volume of water that meets or exceeds state and federal standards that the water treatment process can produce during a twenty-four (24) hour period. Water production capacity can vary depending on system component reliability and/or raw water conditions or availability.

STAGE 3 – WATER SHORTAGE DANGER

A Stage 3 water shortage emergency may be declared in the event of an immediate water shortage, as so declared by state and/or local officials, or when there is one (1) day when water demand exceeds one hundred percent (100%) of the water production capacity. Water production capacity shall be defined as the maximum volume of water that meets or exceeds state and federal standards that the water treatment process can produce during a twenty-four (24) hour period. Water production capacity can vary depending on system component reliability and/or raw water conditions.

4. NOTIFICATION PROCEDURES

Upon declaration of each stage of water shortage emergency, the following methods may be used to inform the County staff, wholesale customers, County retail customers, and Industrial Customers.

PUBLIC NOTICE

The Public Utilities Department staff will draft a Public Notice announcing the Water Shortage Stage and the actions that water customers must take to comply with the Water Emergency Ordinance. The Public Notice will be provided by the County's Public Information Officer to all media outlets that serve the Brunswick County area. The Public Notice will include phone numbers that customers may call with questions.

WHOLESALE CUSTOMER NOTIFICATION

A copy of the Public Notice will be e-mailed or faxed to the Utilities Director for all of the County's Wholesale Customers. The Public Utilities Director or his authorized representative shall call each wholesale customer to confirm the receipt of the Public Notice and to respond to any questions about the notice.

TRAINING COUNTY STAFF

A copy of the Public Notice will be provided to the staffs of the Utilities Customer Service Division, Northwest Water Treatment Plant, 211 Water Treatment Plant, and Water Distribution Division. Depending on the stage, a list of possible questions with the recommended responses will be provided to the staff likely to receive calls from the public.

DIRECT MAILING TO CUSTOMERS

Depending on the stage and severity of the event, the County may elect to send a direct mailing to all County water customers. In the event of an immediate need to reduce water consumption, a notice would be sent to all water customers. If the event is an expected event, an insert to the water bill would be the method of communication.

NEWSPAPER ADVERTISEMENT

Depending on the stage, the County may elect to purchase space in the local newspapers to inform the public. The ad would include the language included in the Public Notice.

5. STAGE CONDITIONS

The basis for the determination of a water emergency shall be the County's ability to provide potable water to its customers. For a Stage 1 emergency, a declaration will be made when the potable water demand or the anticipated potable water demand will be eighty percent (80%) of the combined treatment capacity of the County's Northwest Water Treatment Plant and the 211 Water Treatment Plant for more than three (3) consecutive days. If the available raw water supply or the treatment capacity is diminished, the eighty percent (80%) level will be determined based upon the amount of raw water available or treatment capacity available.

For a Stage 2 emergency, a declaration will be made when the potable water demand or the anticipated potable water demand will be ninety percent (90%) of the combined treatment capacity of the County's Northwest Water Treatment Plant and the 211 Water Treatment Plant for more than two (2) consecutive days. If the available raw water supply or the treatment capacity is diminished, the ninety percent (90%) level will be determined based upon the amount of raw water available or treatment capacity available.

For a Stage 3 emergency, a declaration will be made when the potable water demand or the anticipated potable water demand will be one hundred percent (100%) of the combined treatment capacity of the County's Northwest Water Treatment Plant and the 211 Water Treatment Plant for more than a twenty-four (24) hour period. If the available raw water supply or the treatment capacity is diminished, the one hundred percent (100%) level will be determined based upon the amount of raw water available or treatment capacity available.

The available raw water supply shall be determined by the capacity of the Lower Cape Fear Water and Sewer Authority to supply raw water to the County from its Kings Bluff Water Pump Station for the Northwest Water Treatment Plant. The raw water flow is measured at the pump station and at the Northwest Water Treatment Plant. The available raw water supply for the 211 Water Treatment Plant shall be determined by the combined capacity of the wells supplying the plant. The flow is measured at each well and at the plant.

6. COMPLIANCE WITH THE PROVISIONS OF THE PLAN

The water plant staff shall monitor potable water levels pumped into the system at the plant and at the booster pump stations to determine the overall demand. By comparing the flow records prior to issuance of the declaration, the staff can determine the level of compliance in each of the pressure zones associated with the booster pump station. The water distribution staff will concentrate its efforts in those areas identified by the plants with the highest levels of apparent non-compliance. The distribution staff will attempt to educate those property owners who are not in compliance with the declaration. After one warning, property owners would be fined for non-compliance.

7. PLAN REVIEW AND ADOPTION

The draft Water Shortage Response Plan was provided to the County Public Utilities staff for review and comment. After those comments had been addressed, copies were provided to the County Manager, Customer Service Manager, Public Information Officer, and Director of Engineering Services for review. After their review and approval copies were provided to our wholesale customers for their review and comments. A draft copy of the plan was provided to the NC DENR staff in the Wilmington Regional Office. A final draft will be sent to the Board of Commissioners for review and approval. Amendments to the plan would follow the same process with Board of Commissioners approval required for all amendments.

8. VARIANCES

All appeals for a variance must be submitted to the Director of Public Utilities in writing. The Director of Public Utilities will review the request and the following criteria will be used to determine if a variance can be granted:

- A. Impact on the overall water conservation goals
- B. Potential property damage
- C. Potential alternative sources of water supply
- D. Volume of water to be consumed
- E. Duration of usage
- F. Number of similarly situated property owners

The Director of Public Utilities must provide a written determination on the request for a variance within three (3) working days of the receipt of the variance. If the request for a variance is denied, the property owner has the right to appeal the determination to the Board of Commissioners. The Board of Commissioners would hear the appeal at the next regularly scheduled meeting provided the appeal request is received at least seven (7) days in advance of the next meeting.

9. EVALUATION

During the declaration of the Water Shortage Event, the County staff will monitor the water usage. A spreadsheet will be developed to track water produced at the plants and water pumped at the various booster pump stations. The pre-declaration usage will be compared to the post-declaration usage to determine an overall percentage reduction in demand. If the desired reduction in demand has not occurred, changes in the plan or enforcement of the plan will be recommended.

After the water shortage event has concluded, a post-event evaluation will be held. Changes in the Water Shortage Response Plan will be recommended to the Board of Commissioners based upon the problems and issues that were discovered during the event.

**APPENDIX E:
NC REGISTER PUBLICATION**

Brunswick County Public Utilities – Request for Interbasin Transfer Certificate

NOTICE OF PUBLIC HEARING
Monday, September 9, 2013 at 7:00 PM
Leland Town Hall
102 Town Hall Drive
Leland, NC 28451

The North Carolina Environmental Management Commission (EMC) will hold a public hearing to receive comments on Brunswick County Public Utilities' petition for an interbasin transfer (IBT) certificate.

Brunswick County Public Utilities currently provides water to more than 34,000 retail customers and 11 wholesale customers through its two water treatment plants (WTPs). The Northwest WTP, permitted for 24 million gallons per day (MGD), is located near the City of Northwest and receives raw water from the Cape Fear River via the Lower Cape Fear Water and Sewer Authority. The 211 WTP is permitted for 6 MGD and treats groundwater from the Castle Hayne Aquifer. Wastewater within the County is handled through individual onsite septic systems, clustered and centralized land application, reuse, and surface water discharging systems. This treatment, service, and disposal of water creates an interbasin transfer from the Cape Fear River Basin to the Shallotte and Waccamaw River Basins, both of which are subbasins to the Lumber River Basin

The County is requesting an IBT certificate to transfer 18.3 MGD, limited on a maximum daily basis, from the Cape Fear River Basin to the Shallotte River Basin. The County currently has a grandfathered transfer capacity of 10.5 MGD. This increase is based on a 30-year water demand projection (through the year 2042).

The public hearing will start at 7 pm on Monday, September 9th at the Leland Town Hall, 102 Town Hall Drive, Leland, NC 28451. The public may review the petition and supporting environmental document at the Division's web site at: http://www.ncwater.org/Permits_and_Registration/Interbasin_Transfer/status/brunswick/. The document may also be viewed at the hearing or during normal business hours at the offices of the Division of Water Resources (512 N. Salisbury Street, Room 1106, Archdale Building, Raleigh).

The purpose of this announcement is to encourage interested parties to attend and/or provide relevant written and verbal comments. Division staff requests that parties submit written copies of oral comments. Based on the number of people who wish to speak, the length of oral presentations may be limited.

If you are unable to attend, you may mail written comments to Harold Brady, Division of Water Resources, 1611 Mail Service Center, Raleigh, NC 27699-1611. Comments may also be submitted electronically to Harold.M.Brady@ncdenr.gov. Mailed and emailed comments will be given equal weight. All comments must be postmarked or emailed by October 8, 2013.

APPENDIX F:
STATE CLEARINGHOUSE RESPONSE TO PETITION REVIEW



North Carolina
Department of Administration

Pat McCrory, Governor

Bill Daughtridge, Jr., Secretary

September 17, 2013

Mr. Harold Brady
NCDENR
Division of Water Resources
1611 Mail Service Center
Raleigh, North Carolina 27699

Re: SCH File # 14-E-4300-0066; Petition to transfer surface waters from the Cape Fear River Basin into the Shallotte and Waccamaw IBT River Basins.

Dear Mr. Brady:

The above referenced environmental impact information has been reviewed through the State Clearinghouse under the provisions of the North Carolina Environmental Policy Act.

No comments were made by any state/local agencies in the course of this review. Therefore, no further environmental review action on your part is required for compliance with the Act.

Sincerely,

A handwritten signature in cursive script that reads "Crystal Best".

Crystal Best

State Environmental Review Clearinghouse

cc: Region O

Mailing Address:
1301 Mail Service Center
Raleigh, NC 27699-1301

Telephone: (919)807-2425
Fax (919)733-9571
State Courier #51-01-00
e-mail state.clearinghouse@doa.nc.gov

Location Address:
116 West Jones Street
Raleigh, North Carolina

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: BRUNSWICK

H01: WATER SUPPLY SYSTEMS

STATE NUMBER: 14-E-4300-0066

DATE RECEIVED: 08/14/2013

AGENCY RESPONSE: 09/09/2013

REVIEW CLOSED: 09/13/2013

MS LYN HARDISON
CLEARINGHOUSE COORDINATOR
DENR LEGISLATIVE AFFAIRS
GREEN SQUARE BUILDING - MSC # 1601
RALEIGH NC

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DENR - COASTAL MGT
DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION

PROJECT INFORMATION

APPLICANT: NCDENR
TYPE: State Environmental Policy Act
Environmental Review

DESC: Petition to transfer surface waters from the Cape Fear River Basin into the Shallotte and Waccamaw IBT River Basins. View petition at <http://www.ncwater.org/files/ibt/Brunswick/BrunswickIBTPetition.pdf> - View supporting Final EA/FONSI at <http://www.ncwater.org/files/ibt/Brunswick/BrunswickIBTEnvironmentalAssessmentJune2013.pdf> Next public hearing scheduled for Sept. 9, 2013 at 7:00 pm at the Leland Town Hall, 102 Town Hall Drive, Leland, NC

CROSS-REFERENCE NUMBER: 13-E-4300-0406

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: NO COMMENT COMMENTS ATTACHED

SIGNED BY:

Lyn B. Hardison

DATE:

9-6-13

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

Kerry Moraw

COUNTY: BRUNSWICK

H01: WATER SUPPLY SYSTEMS

STATE NUMBER: 14-E-4300-0066

DATE RECEIVED: 08/14/2013

AGENCY RESPONSE: 09/09/2013

REVIEW CLOSED: 09/13/2013

MS CARRIE ATKINSON
CLEARINGHOUSE COORDINATOR
DEPT OF TRANSPORTATION
STATEWIDE PLANNING - MSC #1554
RALEIGH NC

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DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION

PROJECT INFORMATION

APPLICANT: NCDENR
TYPE: State Environmental Policy Act
Environmental Review

DESC: Petition to transfer surface waters from the Cape Fear River Basin into the Shallotte and Waccamaw IBT River Basins. View petition at <http://www.ncwater.org/files/ibt/Brunswick/BrunswickIBTPetition.pdf> - View supporting Final EA/FONSI at <http://www.ncwater.org/files/ibt/Brunswick/BrunswickIBTEnvironmentalAssessmentJune2013.pdf> Next public hearing scheduled for Sept. 9, 2013 at 7:00 pm at the Leland Town Hall, 102 Town Hall Drive, Leland, NC

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If additional review time is needed, please contact this office at (919)807-2425.



AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: NO COMMENT COMMENTS ATTACHED

SIGNED BY: _____

[Handwritten Signature]

DATE: _____

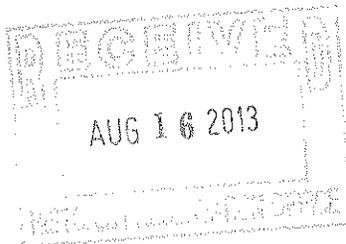
8/30/13

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: BRUNSWICK

H01: WATER SUPPLY SYSTEMS

STATE NUMBER: 14-E-4300-0066
DATE RECEIVED: 08/14/2013
AGENCY RESPONSE: 09/09/2013
REVIEW CLOSED: 09/13/2013



MS RENEE GLEDHILL-EARLEY
CLEARINGHOUSE COORDINATOR
DEPT OF CULTURAL RESOURCES
STATE HISTORIC PRESERVATION OFFICE
MSC 4617 - ARCHIVES BUILDING
RALEIGH NC

CH 09-0947

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DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION



A - We at this time
JCS/eff
8-23-13

PROJECT INFORMATION

APPLICANT: NCDENR
TYPE: State Environmental Policy Act
Environmental Review

Due 9/3/13

DESC: Petition to transfer surface waters from the Cape Fear River Basin into the Shallotte and Waccamaw IBT River Basins. View petition at <http://www.ncwater.org/files/ibt/Brunswick/BrunswickIBTPetition.pdf> - View supporting Final EA/FONSI at <http://www.ncwater.org/files/ibt/Brunswick/BrunswickIBTEnvironmentalAssessmentJune2013.pdf> Next public hearing scheduled for Sept. 9, 2013 at 7:00 pm at the Leland Town Hall, 102 Town Hall Drive, Leland, NC

CROSS-REFERENCE NUMBER: 13-E-4300-0406

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If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: NO COMMENT COMMENTS ATTACHED

SIGNED BY:

Renee Gledhill-Earley

DATE:

9.9.13

AUG 19 2013

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: BRUNSWICK

H01: WATER SUPPLY SYSTEMS

STATE NUMBER: 14-E-4300-0066

DATE RECEIVED: 08/14/2013

AGENCY RESPONSE: 09/09/2013

REVIEW CLOSED: 09/13/2013

MS CAROLYN PENNY
CLEARINGHOUSE COORDINATOR
CC&PS - DIV OF EMERGENCY MANAGEMENT
FLOODPLAIN MANAGEMENT PROGRAM
MSC # 4719
RALEIGH NC

RECEIVED

AUG 16 2013

~~W.C. Floodplain Mapping Program~~

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DEPT OF TRANSPORTATION

PROJECT INFORMATION

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CROSS-REFERENCE NUMBER: 13-E-4300-0406

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If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: NO COMMENT COMMENTS ATTACHED

SIGNED BY:

Janet Wealing

DATE:

8/19/13

~~NO~~ Comment

