CERTIFICATE AUTHORIZING PENDER COUNTY UTILITIES AND THE TOWNS OF BURGAW, TOPSAIL BEACH, SURF CITY AND WALLACE AND UTILITIES, INC.
TO TRANSFER WATER FROM THE CAPE FEAR RIVER IBT BASIN TO THE SOUTH RIVER, NORTHEAST CAPE FEAR RIVER, AND NEW RIVER IBT BASINS
UNDER THE PROVISIONS OF N.C.G.S. §143-215.22L (w)

On March 31, 2016, the Applicants filed a notice of intent with the Environmental Management Commission (EMC or Commission) to request an Interbasin Transfer (IBT) certificate.

On September 12, 2016, the Applicants submitted the draft Environmental Assessment (EA) to the Department of Environmental Quality (DEQ). As part of the EA, a hydrologic model was used to evaluate the direct impacts on the source river basin. The hydrologic model that was used was the CFNRBHM (combined Cape Fear River basin and Neuse River basin hydrologic model). The North Carolina Division of Water Resources (NCDWR) originally developed individual hydrologic models for the Cape Fear River and Neuse River basins. Recognizing the many interconnections between these two river basins, NCDWR contracted with Hydrologics, Inc. in 2012 to develop a combined basin hydrologic model. The resulting system is modeled using the OASIS water resources program. CH2M Hill, now Jacobs Engineering Group Inc., a consultant working for the Applicants, obtained the CFNRBHM OASIS model from NCDWR on May 14, 2016 to evaluate the hydrologic impacts of the proposed increase in IBT on water resources in the Cape Fear River basin. The model includes a number of scenarios used to represent current and future water demands, discharges, and reservoir operations. The specific scenarios used for this hydrologic analysis were confirmed by NCDWR on June 13, 2016. NCDWR reviewed the inputs for the model runs, which consisted of future water demand forecasts for the Applicants, as documented in the EA, which was reviewed by NCDWR. NCDWR also reviewed and provided comments regarding the model output, which was documented in the technical memorandum, "Hydrologic Modeling Evaluation of the Effects of the Proposed Pender County Interbasin Transfer," included as Appendix F to the EA. Text for the technical memorandum was revised based on NCDWR comments, but additional model runs were not required.

On January 4, 2017, the final EA was submitted to DEQ, following revisions to incorporate NCDWR's review comments provided to the Applicants. DEQ issued a Finding of No Significant Impact (FONSI) for the EA, which was signed by the Director of the NCDWR on April 27, 2017. The EA and FONSI were submitted on May 3, 2017 to the State Environmental Review Clearinghouse for a 30-day public review and comment period.

On November 22, 2017, the Applicants submitted a petition for an IBT certificate (Petition) to the EMC. The requested IBT certificate is for a transfer of up to 14.5 million gallons of water per day (mgd), calculated as a daily average of a calendar month, from the Cape Fear River IBT basin to the South River, New River, and Northeast Cape Fear River IBT basins, based on water use projections to 2045.

On December 5, 2017, NCDWR submitted the Petition to the State Environmental Review Clearinghouse for a 30-day public review and comment period. That 30-day public comment period began on December 8, 2017 and ended on January 8, 2018. During the public comment period, seven comments were received and later forwarded to NCDWR by the State Environmental Review Clearinghouse.

On December 12, 2017, NCDWR provided 30-day notice for a public hearing to be held on January 18, 2018 regarding the Applicants' Petition. On January 17, 2018, inclement weather and hazardous driving conditions in central North Carolina, led to the postponement of the public hearing. As a result, on February 7, 2018, NCDWR provided a 30-day notice to reschedule the public hearing to March 22, 2018 in the Town of Burgaw, which is a location that is convenient to both the source and receiving IBT basins.

A total of four oral comments were received at the public hearing on March 22, 2018 and two individuals submitted written comments during the public comment period which extended from March 22 through April 23, 2018. A record of all public comments received and responses from the Hearing Officer are provided in Part 2 of the Hearing Officer's Report.

The EMC reviewed and considered the entire record, including the Applicants' notice of intent, EA, Petition, proposed certificate, and all other sources of information required by N.C.G.S. §143-215.22L(w). Upon review of the entire record, the EMC considered the statutory factors set forth in N.C.G.S. 143-215.22L(k) and makes the following findings of fact and conclusions of law:

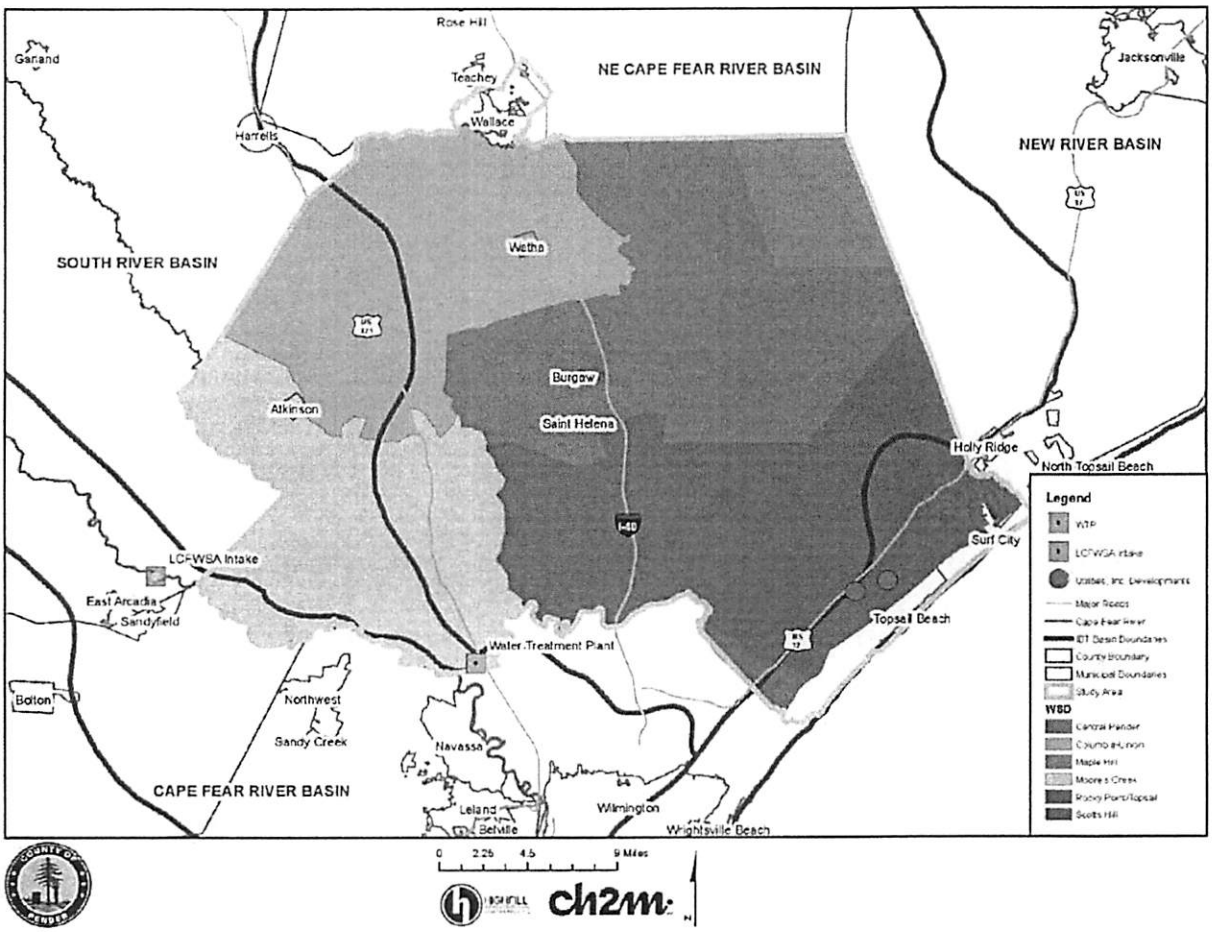
Factors Considered

(1) The Necessity, Reasonableness, and Uses of the Proposed Transfer.
Based on the record and in accordance with requirements of G.S. § 143-215.22L(k)(1), the Commission finds that the Applicants' current water supply sources are insufficient to meet the projected demands of the Applicants' service areas over a 30-year planning horizon beginning in the year 2015 through the year 2045. The Commission finds that following an evaluation of the data provided in the Applicants' Local Water Supply Plans, NCDWR concluded that the water demand projections are reasonable given the comparison of future projections to historical water use data and considering current use for both residential and non-residential uses. Providing water for the anticipated population growth that is expected to occur based on growth projections, as well as prudent planned expansions of the county's service area, is necessary to avoid potential water supply shortfalls and support the anticipated continued growth and development of the county. Thus, the Commission concludes that the requested IBT certificate for the transfer of 14.5 mgd daily average for a calendar month is a necessary and reasonable amount to support the growing residential, commercial, and industrial needs of this area.

Analysis:
Pender County Utilities (PCU) currently obtains its raw water supply from the Cape Fear River through a contract with the Lower Cape Fear Water and Sewer Authority (LCFWASA). The LCFWASA intake and associated Kings Bluff Raw Water Pumping Station are located just above Lock and Dam 1 (L&D #1) on the Cape Fear River. LCFWASA transmits raw water via its existing transmission main to PCU's water treatment plant (WTP), which is located within the Cape Fear River IBT basin.

PCU currently provides potable water to approximately 7,500 customers in two of the county's six water and sewer districts (Rocky Point/Topsail and Scotts Hill WSDs). Figure 1 outlines the river basin boundaries and the county's six water and sewer districts. Finished water crosses from the Cape Fear River IBT basin, where the WTP is located, to the receiving river basins in order to serve the county's customers. This surface water transfer has been occurring since PCU completed its WTP in 2012, but the amount of the transfer has been less than the 2 mgd threshold requiring an IBT certificate. The co-applicants for the IBT certificate all currently obtain their water supply from groundwater sources but are planning to interconnect with PCU to meet their future supply needs.

Figure 1. Pender County with River Basin Boundaries and Water/Sewer Districts



The projected increase in the Applicants' water demand is attributed to anticipated county population growth, commercial and industrial growth, and service area expansion by extending services to those currently served by private wells. In 2015, the total county population was 55,900 with an average day maximum month demand (MMD) for the population served of 1.3 mgd; by 2045 the county population is projected to grow to 109,900 with a MMD of 14.5 mgd. The increased water demand will be primarily fueled by increasing population growth and a greater percentage of the existing county population served with water from PCU as residents move off private groundwater wells onto the county's water distribution system. Concerns related to the reliability of the groundwater as a potable drinking water source, as well as groundwater quality variability, led voters in the Moore's Creek and Central Pender WSDs to approve a bond referendum to expand PCU's water system into areas of these WSDs that are not currently served. As a result of this vote, in 2017 PCU began constructing over 70 miles of water lines in those WSDs, with more than 200 miles of water infrastructure planned over the next 20 years. Population growth and development is fueled by coastal access in Pender County, proximity to the City of Wilmington, and the Pender County Commerce Park on US Highway 421.

Table 1 presents the projected population growth for Pender County and increased IBT demand through 2045. The population in the table represents estimated county population projections, not the service area population for the Applicants; population projections for municipalities within the county are not included in these values. Additionally, the IBT forecast represents the projected water transfer needed in order to satisfy anticipated demand from all sectors, including commercial, industrial, residential, nonrevenue water, and operational requirements for the Applicants. The current water supply for Pender County is provided by a surface water transfer from the Cape Fear River IBT basin, which has remained below the 2 mgd threshold requiring an IBT certificate from the EMC. The co-applicants for the IBT certificate all currently obtain their water supply from groundwater sources but are planning to interconnect with PCU to meet their future supply needs.

Table 1. Pender County Population and Forecasted IBT Demand

Year	Total Population for Pender County	Forecast of IBT from the Cape Fear River basin to the Northeast Cape Fear River, South River, and New River basins, Maximum Month Average Day (in MGD)
2015	55,900	1.3
2020	68,600	3.0
2025	77,800	4.3
2030	86,400	6.6
2035	94,000	9.6
2040	101,800	12.3
2045	109,900	14.5

PCU's current water system annual average daily residential water usage is approximately 40 gallons per capita per day (GPCD). Neighboring Brunswick County reported 67 GPCD for its year-round population in 2016. Onslow Water and Sewer Authority reported 51 GPCD for the same period, Warsaw (in Duplin County) reported 64 GPCD, and East Bladen County Water District reported 115 GPCD. As additional customers are added to PCU's system, the unit consumption values are expected to remain relatively steady. Factors driving this expectation are the prevalence of low-flow fixtures and newer technologies for household appliances in newly constructed houses, along with a reduced need for distribution system flushing as customers are added to the system. These factors will help to balance the addition of services for potentially less efficient existing homes as the system is expanded.

Pender County recently updated its Water Shortage Response Plan (WSRP). Drought surcharges are implemented in stages 3, 4, and 5 of the WSRP; PCU staff have the authority to issue citations for violations to the WSRP based on the number of previous violations and the level of

water shortage. Additionally, the Pender County Water and Sewer Ordinance provides enforceable requirements to ensure the efficient use of water during water emergencies. PCU utilizes a combination of high uniform rates with a conservation rate structure to encourage water conservation. Residential customers are subject to a uniform rate structure, while commercial, industrial, institutional, and irrigation customers are subject to an increasing block rate structure.

In accordance with the requirements of G.S. § 143-215.22L(k)(1) the necessity and reasonableness of the amount of the proposed transfer and its proposed uses were considered, and the county's existing water supply was found to be insufficient to meet projected near-term and long-term future water demands.

More information about the future population growth and water demand projections may be found in Section 2.2 of the EA.

The proposed certificate will allow for the transfer of up to 14.5 mgd daily average for a calendar month, for the month in which IBT is expected to be the highest. This increase is needed in order to support the projected population growth and expanded area serviced by the Applicants through the year 2045.

(2) Present and Reasonably Foreseeable Future Detrimental Effects on the Source River Basin.

Based on the record, the Commission finds and concludes that the detrimental effects on the source basin described in N.C.G.S. § 143-215.22L(k)(2) will be minimal. Additionally, the Commission finds that the Applicants must minimize the impacts of secondary effects caused by growth in Pender County through the continued implementation of existing federal, state, and local regulations and protection programs as described in the EA, Sections 6.1 and 6.2. The provisions for drought management, water conservation, and monitoring and compliance reporting will provide additional protection to the source basin and serve to mitigate impacts; therefore, those conditions are incorporated into this certificate.

Analysis:

To evaluate the direct impacts on the source basin resulting from the proposed IBT certificate, the primary tool used was the CFNRBHM (combined Cape Fear River basin and Neuse River basin hydrologic model). The NCDWR originally developed individual hydrologic models for the Cape Fear River and Neuse River basins. Recognizing the many interconnections between these two river basins, NCDWR contracted with Hydrologics, Inc. in 2012 to develop a combined basin hydrologic model. The resulting system is modeled using the OASIS water resources program.

CH2M Hill, now Jacobs Engineering Group Inc., a consultant working for the Applicants, obtained the CFNRBHM OASIS model from NCDWR on May 14, 2016 to evaluate the

hydrologic impacts of the proposed increase in IBT on water resources in the Cape Fear River basin. The model includes a number of scenarios used to represent current and future water demands, discharges, and reservoir operations. The specific scenarios used for this hydrologic analysis were confirmed by NCDWR on June 13, 2016. NCDWR reviewed the inputs for the model runs, which consisted of future water demand forecasts for the Applicants, as documented in the EA, which was reviewed by NCDWR. NCDWR also reviewed and provided comments regarding the model output, which was documented in the technical memorandum, "Hydrologic Modeling Evaluation of the Effects of the Proposed Pender County Interbasin Transfer," included as Appendix F to the EA. Text for the technical memorandum was revised based on NCDWR comments, but additional model runs were not required.

The CFNRBHM includes all known withdrawals and discharges in both river basins greater than 100,000 gallons per day. The model extends from the headwaters of the Cape Fear and Neuse Rivers in north-central North Carolina to Lock and Dam #1 (L&D #1), northwest of Wilmington. The Cape Fear River is tidally influenced below L&D #1; therefore, river flow cannot be accurately calculated for these conditions by a water balance model such as OASIS. The LCFWASA intake, and source for Pender County's water supply, is directly upstream of L&D #1 in the pool created by the lock and dam structure. The CFNRBHM simulates river flow during the period of record from January 1930 through September 2011, which includes two of North Carolina's most extreme droughts on record (in 2002 and 2007). NCDWR incorporated future water demands to create several future scenarios. Estimates of existing demands and discharges, as well as projections to the year 2045, were developed by NCDWR by using Local Water Supply Plans (LWSPs) provided directly from public water supply systems.

In accordance with the requirements of N.C.G.S. § 143-215.22L(k)(2), four different model scenarios were run in order to evaluate potential effects of the proposed IBT on the source river basin under both current (2010) and future (2045) conditions. The model scenarios were:

- **2010 Baseline**: Current IBT where the Applicants' net demands from the Cape Fear River remain below 2 mgd with current (2010) basin-wide water demands (withdrawals/returns) for the Cape Fear River and Neuse River basins
- **2045 Baseline**: Current IBT where the Applicants' net demands from the Cape Fear River remain below 2 mgd with future (2045) basin-wide water demands (withdrawals/returns) for the Cape Fear River and Neuse River basins
- **2045 Requested IBT**: The Applicants' requested 14.5 mgd IBT with future (2045) basin- wide water demands (withdrawals/returns) for the Cape Fear River and Neuse River basins
- **2045 Maximum Withdrawal**: Maximum allowable withdrawal at L&D #1 (106.6 mgd, which includes the Applicants' requested 14.5 mgd), full allocation (100%) of Jordan Lake water supply pool, and future (2045) basin-wide water demands (withdrawals/returns) for the Cape Fear River and Neuse River basins

Water flow statistics were reviewed for each of the model scenarios described above. The flow statistics included average and median flows, which are representative of normal climatic

conditions, and 10th and 5th percentile flows, which are representative of severe and extreme droughts, respectively.

Units of local government that provide public water service and large community water systems in North Carolina are required to develop and implement a Water Shortage Response Plan (WSRP). A WSRP requires the reduction of water use during drought conditions, and is reviewed and approved by NCDWR. WSRPs must include an expected reduction in demand resulting from water use restrictions which are implemented by the water system, based on a set of triggers established by the water system. WSRPs for public water suppliers in the Cape Fear River and Neuse River basins were incorporated into the CFNRBHM model during the model development when the triggers were based on physical conditions tracked by the model such as stream flow or reservoir level. However, many WSRP triggers for public water suppliers in the Cape Fear and Neuse River basins are not tied to physical conditions and therefore cannot be explicitly represented in the model. Such is the case for all water withdrawals downstream of Jordan Lake on the Cape Fear River, above the withdrawal point for Pender County's water supply above L&D #1. Therefore, the modeling results for the proposed IBT certificate do not include the effects on the river flow at L&D #1 from the implementation of the State required WSRPs.

A more detailed presentation of the results and analysis of the modeling are presented in Appendix F of the EA for comparison purposes to assess the impacts of an IBT on the source basin, as compared to "baseline" conditions under both current and future water demands throughout the Cape Fear River basin.

The effect of the proposed IBT certificate on the surface water resources of the Cape Fear River was evaluated using the CFNRBHM. The greatest potential impact associated with an IBT in a river system is typically water flow changes resulting from the transfer of surface water. Results of the modeling showed that the proposed IBT certificate will not significantly change Cape Fear River elevations above or below L&D #1, downstream river flows, or water quality.

River flow above or upstream from L&D #1 is not expected to be affected by the proposed IBT certificate since the LCFWASA intake, and source of Pender County's water, is located at L&D #1. The modeling assessment point is located upstream of the LCFWASA intake. River flow and low flow frequency at this modeling assessment point were analyzed to provide an estimate of water availability for the withdrawals at L&D #1.

The greatest difference in average, median, 10^{th} percentile, and 5^{th} percentile flows is found between the different time periods, 2010 and 2045, not between the various 2045 scenarios, see Table 2. The pronounced difference in the 2010 and 2045 flows is attributed to the increased future withdrawals within the Cape Fear River basin to meet future water demands. Note that the model does not predict any change in flow between the 2045 Baseline and 2045 Requested IBT scenarios, as expected since the modeling assessment point is above the intake. The decreases in flow from the 2045 Baseline scenario to the 2045 Maximum Withdrawal scenario

are primarily attributed to the 100 percent utilization of the Jordan Lake water supply pool. The slight increase in flow seen between the 2045 Baseline and 2045 Maximum Withdrawal scenarios for the 10th and 5th percentile flows could be attributed to increased returns to the basin downstream of Jordan Lake. These increased returns would be associated with the full utilization of the water supply pool of Jordan Lake for the 2045 Maximum Withdrawal scenario, and the only change in the model at this evaluation point between these two scenarios.

Table 2. Model Scenario Comparison – Cape Fear River Statistics Above L&D #1

Scenario	Average	Median	10th Percentile	5th Percentile
2010 Baseline – River Flow (cfs)	5,355	3,114	917	767
2045 Baseline – River Flow (cfs)	5,289	3,050	904	748
2045 Requested IBT – River Flow (cfs)	5,289	3,050	904	748
Difference from 2010 Baseline (cfs)	-66	-64	-13	-19
Difference from 2010 Baseline (%)	-1.2	-2.0	-1.4	-2.4
Difference from 2045 Baseline (cfs)	0	0	0	0
Difference from 2045 Baseline (%)	0.0	0.0	0.0	0.0
2045 Max Withdrawal – River Flow (cfs)	5,261	3,036	907	757
Difference from 2010 Baseline (cfs)	-94	-78	-10	-10
Difference from 2010 Baseline (%)	-1.7	-2.5	-1.0	-1.3
Difference from 2045 Baseline (cfs)	-28	-14	3	9
Difference from 2045 Baseline (%)	-0.5	-0.5	0.3	1.2

Below or downstream from L&D #1, after withdrawals from LCFWASA (including the Applicants' requested IBT) and Cape Fear Public Utility Authority (CFPUA), modeling results again show differences in flow between the 2010 and 2045-time periods, attributed to increased withdrawals to meet projected demands basin wide. Decreases in flow are observed between the 2045 Baseline and the other 2045 scenarios, reflecting the additional withdrawals from the Cape Fear River represented by those scenarios. The reduction in flow between the 2045 Baseline and 2045 Requested IBT scenarios is relatively small since the only difference is the requested IBT increase from the Applicants. The reduction in flow is much more pronounced between the 2045 Baseline and 2045 Maximum Withdrawal scenarios because the 2045 Maximum Withdrawal scenario simulates the maximum allowable withdrawal at L&D #1 (106.6 mgd, which includes the Applicants' requested 14.5 mgd) and a full allocation of the Jordan Lake water supply pool. Table 3 presents Cape Fear River flow statistics below L&D #1.

Table 3. Model Scenario Comparison – Cape Fear River Statistics Below L&D #1

Scenario	Average	Median	10th Percentile	5th Percentile
2010 Baseline – River Flow (cfs)	5,297	3,055	858	649
2045 Baseline – River Flow (cfs)	5,214	2,971	825	606
2045 Requested IBT – River Flow (cfs)	5,196	2,953	805	585
Difference from 2010 Baseline (cfs)	-101	-102	-53	-64
Difference from 2010 Baseline (%)	-1.9	-3.3	-6.2	-9.9
Difference from 2045 Baseline (cfs)	-19	-18	-20	-21
Difference from 2045 Baseline (%)	-0.4	-0.6	-2.5	-3.5
2045 Max Withdrawal – River Flow (cfs)	5,112	2,881	747	538
Difference from 2010 Baseline (cfs)	-185	-174	-111	-111
Difference from 2010 Baseline (%)	-3.5	-5.7	-12.9	-17.1
Difference from 2045 Baseline (cfs)	-103	-90	-78	-68
Difference from 2045 Baseline (%)	-2.0	-3.0	-9.7	-11.6

During periods of extreme low flow, represented by the 10th and 5th percentile flows, each of the 2045 scenarios exhibits a reduction in flow below L&D #1 compared to the 2010 Baseline scenario. The differences between the 2010 and 2045-time periods can be attributed to increased withdrawals upstream of L&D #1 to meet greater projected basin wide demands in 2045. A comparison of the modeling results for the 2045 Baseline and 2045 Requested IBT scenarios shows little difference between the two scenarios in relation to the magnitude, duration and frequency of river flow and stage elevations (see Appendix F of the EA, Figure 14). The magnitude of predicted flow changes is provided above in Table 3. For the 2045 Requested IBT scenario, average flows decrease by less than 0.5 percent whereas the 10th and 5th percentiles flows decrease by 2.5 and 3.5 percent, respectively when compared to the 2045 Baseline. Even with a 3.5 percent reduction in the 5th percentile flow for the period of record (95 percent of flows during this period are greater) there is still 585 cubic feet per second (cfs), or 378 MGD, of flow passing at L&D #1. For the 2045 Maximum Withdrawal scenario, there is a 2.0 percent reduction for the average flow period and up to an 11.6 percent reduction for extreme low flow periods, as indicated by the 5th percentile flow, when compared to the 2045 Baseline flows. At this most extreme low flow event modeled, there is still 538 cfs (348 MGD) of flow passing at L&D #1. The modeled changes in flow in 2045 will not impact the water withdrawal ability for

International Paper, which also supplies the Town of Riegelwood, the only intake downstream of L&D #1. International Paper's demand in 2016, including water provided to Riegelwood, was 33.2 MGD average day and 42.4 MGD maximum day; the pumping capacity is 49 MGD.

The effect below L&D #1 from public water suppliers withdrawing water from the Cape Fear River, including the Applicants' requested IBT increase, during drought periods will be mitigated by the implementation of the State-required WSRPs, which mandate specified reductions of withdrawals. Pursuant to 15A NCAC 02E .0600, during exceptional drought designation "water users shall reduce water use by at least 20% below the amount used in the month prior." As stated previously, the WSRPs for public water supplies downstream of Jordan Lake are not built into the CFNRBHM due to a lack of triggers based on physical conditions tracked by the model.

Modeling metrics can capture not only the potential for low flows to occur with the proposed increase in IBT, but also the length of period of these low flows (duration) and the potential for reoccurrence of low flow events (frequency). River stage and timing of low flow periods are also important metrics, most specifically as they relate to the flow over L&D #1 and the functionality of its fish ladder, particularly during spawning periods. The largest modeled change in flow duration resulting from the proposed IBT certificate is an additional four days in January (a non-spawning month) with the flow potentially less than 1,000 cfs. The model results also predict a potential increase of five days in December for a river stage between 11.0 and 11.5 feet above MSL (dam crest is 11.0 feet above MSL). The model shows these potential additional low flow/lower stage days occurring in non-spawning months; however, the predicted stage always remains above the dam crest elevation, allowing for continuous access to the fish ladder for passage at L&D #1.

The maintenance of downstream flow is important to anadromous fish, especially with regard to flows during the spawning period from late winter through spring (February through June). Anadromous fish including the Shortnose Sturgeon, American Shad, and Striped Bass travel from the Cape Fear estuary to areas above L&D #1 during their spawning periods. A rock arch fish ladder was built at L&D #1 by the U.S. Army Corps of Engineers to provide passage for spawning fish. To mitigate the effect of low flows during the spawning period, the center of the fish ladder was designed to be between one and two feet lower than the rest of the ladder. This allows the concentration of flow in the middle of the fish ladder to allow continued fish passage during low flow events.

The design of the fish ladder includes an assumed "spawning flow" of 5,000 cfs. The average simulated flow using the CFNRBHM during the spawning period for the 2010 Baseline model scenario is 6,927 cfs, and the median flow is 4,450 cfs. A frequency analysis was performed to quantify the percent of time the Cape Fear River was at or below the spawning flow of 5,000 cfs. The increase in the frequency of flows below 5,000 cfs between the 2010 Baseline and the 2045 Maximum Withdrawal scenarios is 0.9 percent above L&D #1 and 1.7 percent below L&D #1.

These percent changes are small in comparison to the natural variability of the flow in the Cape Fear River during this period of the year. Modeling results indicate that during the spawning period, there could be a 2.4% decrease in river flow from the 2045 Baseline (846 cfs) to the 2045 Proposed IBT (825 cfs) for the 5th percentile flow level.
It is not anticipated that the requested IBT certificate will have a significant effect on the natural factors that control the water quality in the Lower Cape Fear River. This is due to the small volume of water that the requested IBT certificate represents in comparison to the typical river flow and range of natural variability in flow, as well as the adjacent swamp/marsh and tidal influences downstream of L&D #1.

(3) Cumulative Effects on the Source Major River Basin of Any Current or Projected Water Transfer or Consumptive Water Use.
Based on the record, the Commission finds and concludes that the proposed IBT represents a small water transfer within a large river system and that the cumulative effects of this proposed water transfer and consumptive water uses as described in N.C.G.S. § 143-215.22L(k)(3) will not have a significant effect on the source basin. The provisions for drought management, water conservation, and monitoring and compliance reporting will provide additional protection to the source basin and, therefore, those conditions are incorporated into this certificate.

Analysis:
Current and projected water use and water transfer data were used to develop the input data sets for the Cape Fear Neuse River Basin Hydrologic Model (CFNRBHM). The model was used to evaluate both current and future scenarios of basin water use, including the IBT increase proposed by the Applicants' IBT certificate request. Complete results of the modeling are presented in Appendix F of the EA.

The total amount of water leaving the Cape Fear River basin is considered as part of the cumulative impacts analysis for the proposed IBT certificate. Currently, there is one existing IBT certificate issued by North Carolina to regulate water transfers from the Cape Fear River IBT basin. Brunswick County has an IBT certificate allowing the transfer of up to 17 mgd from the Cape Fear River IBT basin to the Shallotte and Waccamaw River IBT basins. Additional water uses from the Cape Fear River IBT basin include many public water systems, registered water withdrawals, and industrial and agricultural users. The registered North Carolina municipal public water systems and registered water withdrawals are listed in Appendix C, the Distribution Lists for Public Notices. In accordance with the requirements of G.S. § 143- 215.22L(k)(3), registered North Carolina municipal public water systems were considered and included in the CFNRBHM model to evaluate water resource impacts.

Within the Cape Fear River IBT basin, the potential secondary effects associated with the proposed transfer would primarily be attributed to withdrawals from the LCFWASA intake located just above L&D #1, potentially reducing flows in the Cape Fear River downstream of L&D #1. However, hydrologic modeling has shown that any downstream flow impacts would be

minimal, and during drought periods will be mitigated by the implementation of the State-required Water Shortage Response Plans (WSRPs). The only difference between the 2045 Baseline and 2045 Requested IBT modeling scenarios is the requested IBT increase from the Applicants; the reduction in flow between these model scenarios is relatively small. For the 2045 Requested IBT scenario, average flows decrease by less than 0.5 percent whereas the 10th and 5th percentiles flows decrease by 2.5 and 3.5 percent, respectively when compared to the 2045 Baseline. Even with a 3.5 percent reduction for the 5th percentile flow over the period of record, there is still 585 cubic feet per second (cfs), or 378 MGD, of flow passing at L&D #1. The Applicants' IBT certificate request of 14.5 MGD represents less than 4% of the flow volume during those extreme and infrequent low flow conditions.

Modeling results indicate the potential for additional low flow/lower stage days occurring in non-spawning months. However, the predicted stage always remains above the dam crest elevation, allowing for continuous access to the fish ladder for passage at L&D #1. Modeling results further indicate that in-stream flow patterns will not be significantly impacted, which protect in-stream aquatic habitat, aquatic resources and water quality, as well as fish passage access, which will not be inhibited by the proposed IBT increase. It is not anticipated that the requested IBT certificate will have a significant effect on the natural factors that control the water quality in the Lower Cape Fear River. This is due to the small volume of water that the requested IBT certificate represents in comparison to the typical river flow and range of natural variability in flow, as well as the adjacent swamp/marsh and tidal influences downstream of L&D #1.

(4) Present and Reasonably Foreseeable Future Beneficial and Detrimental Effects on the Receiving Basins.

Based on the record, the Commission finds and concludes that present and reasonably foreseeable future beneficial effects on the receiving basins will include supporting the projected population growth and associated development. The transfer will also enable Pender County's water system service area to extend to portions of the county not currently served and will enable the co-applicants to move off groundwater as their primary water supply.

The Commission finds that the transfer will support population growth and service area expansion by extending county water services to those currently served by private wells and that growth and expansion will result in reasonably foreseeable future indirect and cumulative impacts, including effects on wastewater assimilation, fish and wildlife habitat, and water quality impacts resulting from development and increased impervious area. However, the Commission finds and concludes that present and reasonably foreseeable future detrimental effects on the receiving basins will be mitigated or avoided with existing federal, state, and local regulations and protection programs as described in the EA, Sections 6.1 and 6.2.

Analysis:

The New River, Northeast Cape Fear River, and South River IBT basins are the receiving basins to which water is currently transferred from the Cape Fear River IBT basin; the IBT certificate requested by the Applicants seeks to increase the amount of the transfer. In accordance with the requirements of N.C.G.S. § 143-215.22L(k)(4), the present and reasonably foreseeable future beneficial and detrimental effects on the receiving basins were considered. See factor (k)(1) for reasonably foreseeable future beneficial effects on the New River, Cape Fear River, and South River IBT basins, which includes supporting the projected population growth and associated development, as well as the planned expansion of the area serviced by Pender County through the year 2045.

Future infrastructure and facility construction needed in order to facilitate the proposed increase in water transferred to meet projected 2045 water demands will undergo a separate environmental permitting process and assessment of potential environmental impacts which will also address specific measures necessary to mitigate or avoid detrimental impacts on the receiving basins.

Potential Secondary and Cumulative Impacts
Within the receiving basins, the potential secondary and cumulative impacts associated with the proposed IBT certificate would primarily be attributed to Pender County's projected growth and land use changes associated with population increases and expansion of the service area. The potential for secondary and cumulative impacts to occur is greatest along major, existing transportation corridors such as US 17 and NC 210 and along the coast. Population growth will occur at a slower pace throughout the more rural portions of the county, and therefore, the likelihood of any secondary and cumulative impacts in these areas is expected to be limited. Any development within the county is subject to coastal area protection programs that are designed to both protect natural resources and protect development from the hazards of the coastal region. Further mitigation for secondary and cumulative impacts related to stormwater, floodplains, riparian buffers, surface waters, wetlands, open spaces and parks, water usage, land management, historic preservation, tree preservation, endangered species protection, wastewater treatment, and regional transportation planning measures will be provided, as directed by the state and federal programs and local ordinances, where applicable.

While water service is being expanded, Pender County is not planning large-scale addition of a centralized sanitary sewer system. The continuation of onsite wastewater treatment, either with septic systems or small community systems, will generally keep development densities lower than with a centralized system. The majority of water distributed within the PCU water and sewer districts will be treated and infiltrated within the receiving river basins in which the water is utilized. The county currently has a combination of public and private wastewater treatment systems that are in use or under construction. Wastewater collection and treatment requirements for future development will be governed by the current County Unified Development Ordinance requirements for septic systems and community/public wastewater disposal, which will mitigate for or remediate any detrimental impacts on the receiving basins.

Secondary and cumulative impacts to surface water resources have the potential to occur across the county as development occurs and water distribution infrastructure is added. Increased development will lead to more impermeable surface area, which will result in increased stormwater runoff during rain events. Without practices in place to control runoff rates, scouring of receiving stream channels will increase, exacerbating erosion and degrading water quality with increased sediment loads. The increase in runoff may increase loads of other pollutants as well, which could cause a decline in water quality and create subsequent secondary impacts to aquatic habitat, wetlands, and sensitive aquatic and amphibian species in the county. Water resources protection programs are in place at the local level, along with the coastal stormwater rules and the Coastal Area Management Act (CAMA). Implementation and enforcement of these programs will prevent and mitigate any significant secondary and cumulative impacts to Pender County's water resources.

(5) Reasonable Alternatives to the Proposed Transfer.
Based on the record and in accordance with the requirements of N.C.G.S. § 143-215.22L(k)(5), the Commission finds and concludes that reasonable alternatives to the proposed IBT certificate were considered. The Commission finds and concludes that recommended alternative (Alternative 2) is the most feasible and cost effective for meeting the Applicants' water supply needs while minimizing detrimental environmental impacts. The Commission further finds and concludes that the other alternatives considered either did not meet the projected water supply needs for the Applicants through 2045, had greater environmental impacts, and/or were significantly costlier than the recommended alternative. The Applicants' water supply needs cannot be satisfied by alternatives within the receiving basins due to either inadequate supply or lack of a surface freshwater source.

Analysis:
In accordance with the requirements of G.S. § 143-215.22L(k)(5), the availability of reasonable alternatives to the proposed transfer was considered. The following seven water supply alternatives were defined and evaluated for their ability to meet the Applicants' water supply needs through 2045. The following information regarding water supply alternatives is from Section 3 of the EA. The EA provides a full discussion; a brief summary of the alternatives is provided below:

Alternative 1: No Action Alternative. No increase in IBT would occur and no alternatives to meeting projected demands would be implemented. No additional water would be transferred from the Cape Fear River IBT basin; the transfer amount would remain less than 2 MGD, calculated as a daily average of a calendar month. This alternative would preclude PCU and its co-applicants from fully meeting future water needs of their customers.

Alternative 2 (preferred alternative): Increase the purchase of raw water from the Cape Fear River via the existing contract with LCFWASA consistent with future water demand projections. PCU would expand the existing water treatment plant capacity, use existing water infrastructure, and continue water resources management measures to minimize the IBT. PCU is currently

constructing a 0.5 MGD WWTP in the US421 corridor, which can be expanded to 4 MGD. The WWTP would discharge treated wastewater effluent to the Cape Fear River basin, thereby minimizing IBT.

Alternative 3: The water supply would continue to be from the Cape Fear River, similar to Alternative 2, but treated wastewater effluent would be returned to the Cape Fear River basin to ultimately avoid or minimize IBT. Currently, PCU provides a limited amount of wastewater collection and treatment. In the near future, PCU will have the potential to discharge up to 4.25 MGD to the Cape Fear River Basin, with no plans for large scale addition of a centralized sanitary sewer collection system. In order to return wastewater to the Cape Fear River to avoid an IBT, significant investment in wastewater collection, pumping, and treatment infrastructure would be required since the majority of the wastewater generated in the county is treated onsite. The source basin is geographically removed from almost all of the existing and anticipated development; the cost for the wastewater collection and treatment facilities required to avoid the IBT would be significant, estimated at over $350 million in 2006.

Alternative 4: Use surface water sources in the South River, Northeast Cape Fear River, and New River basins to meet future demands. The estimated available water supply for the Northeast Cape Fear River was evaluated based on a study conducted by the U.S. Geological Survey; it was found to have insufficient flow to create a run-of-river intake to meet the future needs of PCU and its co-applicants. The South River basin is smaller than the Northeast Cape Fear River basin, so it is assumed that the availability of a run-of-river intake is even more limited than the Northeast Cape Fear River. The New River Basin is on the coast and there is no surface freshwater source from which to withdraw water, so development of a surface water source within that IBT basin is not an option.

Alternative 5: Utilize the Atlantic Ocean as a water supply to meet future demands. The water would need to undergo a desalination treatment process before it could be used as a drinking water source. The existing WTP is incapable of treating saline water, so a new desalination facility would need to be constructed, leaving the existing WTP under-utilized. An attempt to fully utilize the existing WTP with the saline water source would require a new pretreatment facility that would be larger and more expensive to construct and operate than the existing WTP itself. The source water would need to be pumped to the pretreatment facility and the WTP, requiring a significant amount of additional infrastructure, energy and ongoing operational costs, especially since saline waters are highly corrosive. Since the higher water demands are currently along the coast, this scenario would also result in pumping the water across nearly the entire width of the county twice. Another challenge with desalination plants concerns what to do with the highly concentrated brine that is generated by the treatment process. Because this alternative would add a new desalination WTP, significant transmission infrastructure modifications and a different pumping scheme would be required to interconnect with the existing distribution system and serve the demands across the county. This alternative would result in increased environmental impacts related to construction and the additional pumping and treatment would result in increased energy demand, leading to higher cost and greenhouse gas emissions.

Alternative 6: New groundwater sources would reduce use of surface water from the Cape Fear River basin and avoid or minimize the need for IBT. This alternative would require the development of a groundwater supply by PCU or the purchase of groundwater from other systems. PCU's co-applicants are all currently reliant on groundwater for their potable water needs. While some of these utilities may have some limited additional supply capacity to provide to PCU, they are not able to supply the full needs of PCU, and will need to supplement their own water source through the planning period of 2045. Saltwater intrusion has been observed to be moving inland, making reliance on groundwater supplies risky. The poor water quality in areas of saltwater intrusion would likely necessitate membrane treatment, which is significantly more expensive and requires more energy than traditional water treatment. If the Capacity Use regulations were extended to Pender County in the future because of continuing indications of aquifer overuse in the area, PCU and its co-applicants would be required to significantly reduce their withdrawal and dependency on groundwater. PCU has already developed an expandable surface WTP to limit its reliance on groundwater. This facility is not capable of treating brackish groundwater with increasing chloride concentrations without a complete change in treatment processes such as the utilization of membranes.

Alternative 7: PCU would use water resource management tools to reduce water demands, thereby reducing the required IBT. These tools may include new policies and regulations, financial incentives, rate structure modifications, reclaimed water use, water efficiency improvements, and conservation. With the growth that Pender County is experiencing and the need for PCU to extend their system to unserved parts of the county, as well as the current level of unit consumption and water management tools, PCU does not expect that implementing additional water resources management tools alone will reliably and predictably reduce future potable water supply demands enough to avoid an increase in IBT. This alternative is not a feasible solution by itself for meeting the county's long-term water supply needs.

(6) Applicants' Use of Impoundment Storage Capacity.

Based on the record, the Commission finds and concludes that the factor set forth in N.C.G.S. § 143-215.22L(k)(6) is not applicable to this IBT request.

(7) Purposes of Any US Army Corps of Engineers Multipurpose Reservoir Relevant to the Petition.

Based on the record, the Commission finds and concludes that the factor set forth in N.C.G.S. § 143-215.22L(k)(7) is not applicable to this IBT request.

(8) Whether the Applicants' Service Area is Located in Both the Source and Receiving River Basins.

In accordance with the requirements of N.C.G.S. § 143-215.22L(k)(8), the Commission finds and concludes that the Applicants' service area population is located 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.

Analysis:

Pender County Utilities currently serves customers in the Rocky Point/Topsail and Scotts Hill water and sewer districts (WSDs), see Figure 1. PCU also currently serves customers in St. Helena and Watha. PCU constructed over 70 miles of water lines in the Moore's Creek and Central Pender WSDs in 2017. Future service expansion within all six of the county's WSDs is expected over the next 30 years. The co-applicants' service area populations are all within the receiving river basins.

(9) Any Other Facts or Circumstances Reasonably Necessary to Carry Out the Purposes of the Statute.

In accordance with the requirements of N.C.G.S. § 143-215.22L(k)(9), the Commission finds and concludes that to protect the source basin during drought conditions, and to mitigate the future need for allocations of the limited resources of this basin, a drought management plan is appropriate. The plan shall describe the actions that the Applicants will take to protect the Cape Fear River IBT Basin during drought conditions. The provisions for drought management, water conservation, and monitoring and compliance reporting as specifically incorporated into this certificate will provide additional protection to the source basin.

Decision

The Commission reviewed the entire record, including the Petition, the EA, all oral and written comments, and all accompanying materials or evidence submitted during the relevant comment periods and considered the factors set forth in N.C.G.S 143-215.22L(k). Based on the record and its consideration of the statutory factors, the Commission finds that the Applicants, Pender County, the Towns of Burgaw, Topsail Beach, Surf City, and Wallace as well as Utilities, Inc. (for water service to the Belvedere Plantation and Olde Pointe developments, as referenced in the EA and Petition), have established by a preponderance of the evidence that:

1. the benefits of the proposed transfer outweigh the detriments of the proposed transfer;
2. the detriments have been or will be mitigated to the maximum degree practicable;
3. the amount of the transfer does not exceed the amount of the projected shortfall under the Applicants' water supply plans after first taking into account all other sources of water that are available to the Applicants; and
4. there are no reasonable alternatives to the proposed transfer.

Therefore, and by duly made motion, the Commission grants the Applicants' request to transfer a maximum of 14.5 million gallons per day (mgd), calculated as a daily average of a calendar month basis from the Cape Fear River IBT Basin to the South River, New River, and Northeast Cape Fear River IBT basins.

Pursuant to N.C.G.S. § 143-215.22L (w), the certificate is subject to the conditions below. The Applicants shall comply with any plan that is approved pursuant to this Certificate and any approved amendments to such plan. A violation of any plan approved pursuant to this Certificate will be considered a violation of the terms and conditions of this Certificate.

1. Within 90 days of receipt of the IBT Certificate, the Applicants shall prepare and submit a water conservation plan subject to approval by the North Carolina Division of Water Resources (NCDWR) that specifies the water conservation measures, including a rate pricing structure, to be implemented by the Applicants in the receiving river basins to ensure the efficient use of the transferred water. The Applicants submitted a water conservation plan for review April 6, 2017, which was approved by the NCDWR effective November 30, 2017 and distributed for a 30-day public review via the State Environmental Clearinghouse on December 8, 2017. Except in circumstances of technical or economic infeasibility or adverse environmental impact, the water conservation plan shall provide for the mandatory implementation of water conservation measures by the Applicants that equal or exceed the most stringent water conservation plan implemented by a public water system that withdraws water from the source river basin. The Towns of Burgaw, Topsail Beach, Surf City, and Wallace as well as Utilities, Inc. (for water service to the Belvedere Plantation and Olde Pointe developments), identified as co-applicants on this IBT Certificate, shall implement water conservation plans at least as stringent as the requirements imposed on Pender County in order to receive any surface water transferred under this Certificate. The Certificate Holder shall

not transfer any water to any other unit of local government beyond those listed in the Certificate, unless approved by the EMC. All units of local government receiving any transferred water originating from the Cape Fear River IBT basin by the Applicants are bound by this condition in full.

2. Within 90 days of receipt of the IBT Certificate, the Applicants shall prepare and submit a drought management plan subject to approval by the NCDWR that specifies how the transfer shall be managed to protect the source river basin (Cape Fear River IBT basin) during drought conditions or other emergencies that occur within the source river basin. The Applicants submitted a drought management plan for review April 6, 2017, which was approved by the NCDWR effective November 30, 2017 and distributed for a 30-day public review via the State Environmental Clearinghouse on December 8, 2017. Except in circumstances of technical or economic infeasibility or adverse environmental impact, this drought management plan shall include mandatory reductions in the permitted amount of the transfer based on the severity and duration of a drought occurring within the source river basin and shall provide for the mandatory implementation of a drought management plan by the Applicants that equals or exceeds the most stringent water conservation plan implemented by a public water system that withdraws water from the source river basin. All co-applicants to this IBT Certificate shall implement a drought management plan at least as stringent as the requirements imposed on Pender County. 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.

3. Within 90 days of receipt of the IBT Certificate, the Applicants shall submit a quarterly compliance and monitoring plan subject to approval by the NCDWR. The plan shall include methodologies and reporting schedules for reporting the following information: daily transfer amount calculated as the average daily over the maximum month, compliance with certificate conditions, progress on mitigation measures, drought management, and reporting. A copy of the approved plan shall be kept on file with the NCDWR for public inspection. The NCDWR shall have the authority to make modifications to the compliance and monitoring plan as necessary to assess compliance with the certificate. The NCDWR will monitor the transfer from the Cape Fear River IBT basin to the South River, Northeast Cape Fear River, and New River IBT basins, as regulated by the IBT certificate. The quarterly compliance and monitoring report shall be submitted to the Commission no later than 30 days after the end of the quarter. The Applicants shall employ any methods or install and operate any devices required to measure the amount of water that is transferred during each calendar quarter, calculated as a daily average of a calendar month.

4. The Commission may amend the certificate to reduce the maximum amount of water authorized to be transferred whenever it appears that an alternative source of water is available to the certificate holder from within the receiving river basins, including, but not limited to, the purchase of water from another water supplier within the receiving basins or to the transfer of water from another sub-basin within the receiving major river basin.

5. The Commission shall amend the certificate to reduce the maximum amount of water authorized to be transferred if the Commission finds that the Applicants' current projected water needs are significantly less than the Applicants' projected water needs at the time the certificate was granted.
6. The Applicants will not resell the water that would be transferred pursuant to the certificate to another public water system. This limitation shall not apply in the case of a proposed resale or transfer among public water systems within the receiving river basin as part of an inter-local agreement or other regional water supply arrangement, provided that each participant in the inter-local agreement or regional water supply arrangement is a co- applicant for the certificate and will be subject to all the terms, conditions, and limitations made applicable to any lead or primary applicant. The Towns of Burgaw, Topsail Beach, Surf City, and Wallace as well as Utilities, Inc. (for water service to the Belvedere Plantation and Olde Pointe developments) are co-applicants to this IBT certificate.
7. The Commission may reopen and modify or revoke this Certificate to ensure continued compliance with N.C.G.S. Chapter 143, Article 21, Part 2A.

NOTICE: The holders of this certificate are jointly and severally responsible for compliance with the terms, conditions and requirements stated herein, and are therefore jointly and severally liable for all penalties assessed to enforce such terms, conditions and requirements as provided in N.C.G.S. §143-215.6A.

This the 19th day of October, 2018.

Julie A Wilsey

Julie A. Wilsey, Vice-Chairwoman

CERTIFICATE OF SERVICE

This is to certify that I have this day served the foregoing Certificate upon the Applicants, local government officials, and the Division of Water Resources in the manner described below as follows:

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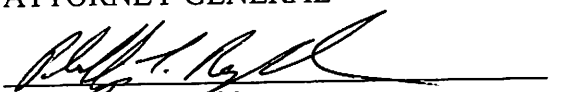
JOSHUA H. STEIN
ATTORNEY GENERAL



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