ROY COOPER
Governor
ELIZABETH S. BISER
Secretary

NORTH CAROLINA
Environmental Quality

September 15, 2022

Ms. Dawn Hughes
Plant Manager
Chemours Fayetteville Works
22828 NC Highway 87 W
Fayetteville NC 28306

Re: Responses to Barrier Wall and Groundwater Extraction System 90% Design Report, Chemours Fayetteville Works, Fayetteville, NC

Dear Ms. Hughes,

The North Carolina Department of Environmental Quality (DEQ) received the Barrier Wall and Groundwater Extraction System 90% Design Report on March 25, 2022. This report was prepared pursuant to Paragraph 3.b in the Addendum to Consent Order Paragraph 12 which is incorporated into the terms of the Consent Order between Chemours, DEQ and Cape Fear River Watch.

DEQ hereby approves the Barrier Wall 90% Design Report and Groundwater Extraction System with specific conditions that shall be addressed by Chemours. These conditions to DEQ's approval of the 90% Design Report are attached with this letter.

If Chemours wishes to discuss this approval, please contact DEQ.

Sincerely,

Sushma Masemore, P.E.
Assistant Secretary, NC DEQ

North Carolina Department of Environmental Quality
217 West Jones Street | 1601 Mail Service Center | Raleigh, North Carolina 27699-1601
919.707.8600

NC DEQ CONDITIONS FOR CHEMOURS
90% DESIGN OF BARRIER WALL SYSTEM

CONDITIONS RELATING TO PERFORMANCE MONITORING:

1. **Installation of additional monitoring wells:** Within 120 days and in consultation with DEQ, Chemours shall install nine (9) additional groundwater monitoring wells near Willis Creek and on the downgradient side of the barrier wall at locations approved by DEQ:

    a. Four (4) shallow observation wells shall be installed adjacent to Willis Creek to augment data from PIWs-12-15 using either a small footprint tracked drill rig or hand auger.
    b. Five (5) additional observation and monitoring wells shall be installed on the downgradient side of the barrier wall to monitor the Surficial and Black Creek (BC) Aquifers. Three of the five additional wells are requested along the Seep B tributary between the barrier wall and the floodplain. A nested piezometer (surficial aquifer well "A" and BC Aquifer well "B") is requested on the north side of the tributary between OW-46 and OW-47. A BC aquifer well "C" is requested between OW-20 and OW-22. Two additional surficial aquifer wells are requested near and downgradient of the wall equidistant between OW-14 and OW-44 (well "D") and paired with deep BC aquifer well OW-48 (well "E").

    All newly installed monitoring wells should be constructed as two-inch minimum diameter wells unless equipment limitations near Willis Creek do not allow it. Samples should be collected from the new wells by low flow methods at least three times each year for the first two years after installation of the barrier wall.

2. **Sampling of extraction wells**: Extraction wells (EW) referenced in Chemours' April 23, 2022 email response to DEQ shall be sampled in accordance with the following minimum criteria to be reevaluated after two years of data collection:

    a. Before system startup and after well development activities (t=0 months);
    b. 1 month after system startup of all EWs operating at design pumping (t=1 month);
    c. 12 months after system startup (t=12 months); and
    d. 24 months after system startup (t=24 months).

    All samples shall be analyzed for Table 3 + PFAS and EPA Modified Method 537.

3. **Use of additional existing wells for performance monitoring:** Chemours shall conduct sampling of the following eleven (11) existing wells for performance monitoring purposes: PIW-12, PIW-13, PIW-14, SMW-12 PIW-2D, OW-2, OW-3, PIW-5S, OW-8, PIW-10S and PIW-10DR. When the barrier wall is finished, Chemours shall add the two

replacement wells for abandoned PIW-9S and PIW-9D. These thirteen (13) wells, in addition to the proposed PFM well locations, shall be sampled by low flow methods at least three times each year for the first two years after installation of the barrier wall. The samples shall be tested for Table 3+ PFAS and EPA Modified Method 537.

4. **Use of Passive Flux Meters Not Approved:** The use of Passive Flux Meters (PFMs) for measuring the mass flux of Table 3+ PFAS compounds in the PMP is not approved at this time. The efficacy of the PFM method for measuring Table 3+ PFAS unique to the Chemours site has not been demonstrated, particularly related to the capability of the PFM resin to sorb certain short chain Table 3+ compounds and the extraction capability of current laboratory procedures for those PFAS collected in the resin. Traditional groundwater sampling of PFAS shall be conducted for purposes of performance monitoring. Though not required, Chemours may continue to deploy PFMs to evaluate their efficacy and for comparisons with other performance monitoring measures.

5. **Severe Weather Monitoring:** In the event of a major storm event or hurricane crossing the Fayetteville area, the pressure head in wells near the barrier wall shall be more closely monitored, since the barrier wall will be under greatest hydraulic stress from intensive, widespread rainfall and flooding. In consultation with DEQ, Chemours shall deploy additional transducers in wells along and upgradient of the barrier wall alignment and conduct monitoring before and after the storm and for a duration and at a frequency approved by DEQ.

CONDITIONS RELATED TO GROUNDWATER MODELING:

1. **The barrier wall must be modeled as a barrier to groundwater in the manner of a porous media with a low hydraulic conductivity (K) value**: By design, a discrete feature (DF) to simulate the barrier wall in FEFLOW does not function as a low permeability porous media would function, which results in significant simulation limitations and uncertainties. Model improvements are needed to allow useful simulations of, for example, remedy-induced mounding, drawdowns, and seep flows; extraction rate modifications; potential wetland impacts; how the system will react to such things as extreme weather events (hurricanes, unusually dry or wet cycles, etc.); effects of modifications to the system (more or few wells, altered pumping rates); testing of hypothetical wall weaknesses or failure; etc. To address model limitations, Chemours shall submit a new or modified model in which the barrier wall is modeled to ensure that it functions as a barrier to groundwater flow (i.e., a porous media with low permeability). The new or modified model shall also address additional conditions specified in item 2. below. The new or modified model shall be submitted within 120 days of this approval. The seeps in the new or modified model should reflect actual seepage occurring in the field (e.g., seep A-4, seep A tributary, seep B-2, seep B, WC tributary, and other named seeps and tributaries).

After system startup, updates to the model shall be submitted within one year of installation of the barrier wall with an evaluation of how field conditions are comparing with modeled conditions and incorporating changes made to optimize performance of the system. The update shall also include a comparison of observed hydraulic gradient reductions versus model-simulated reductions and a discussion of any substantive discrepancies between the two. Thereafter, model updates shall be submitted every two years.

2. **Additional modeling conditions:**

    a. The model must reflect proper characterization of groundwater entering the model from the western boundary and its flow to the barrier wall remedy; currently, errant localized flows are observed at and near the western boundary.
    b. The seeps in the new or modified model should be simulated to reflect actual discharge of individual surface water (SW) features occurring in the field upgradient and downgradient of the barrier wall before its installation (ambient conditions) and after its installation (optimized conditions). (*See* General Condition # 1 below)
    c. Errant, unrealistic localized flows and seepage along the banks of the Cape Fear River must be corrected.
    d. The assignment of no flow boundaries to mid and lower-level nodes along Cape Fear and Willis Creek must be modified to more realistic boundary conditions or thoroughly justified.
    e. These model improvements shall be made in collaborative dialogue with DEQ. Chemours shall contact DEQ within 14 days to establish a schedule for monthly discussions.

GENERAL CONDITIONS AND INFORMATION REQUESTS:

1. **Collection of Seep and Weep Flow Data:** Chemours shall measure representative flows of seeps and weeps, both upgradient and downgradient of the barrier wall. The initial baseline flow measurements shall be made at a minimum, every eight weeks for the first two years of barrier wall system operation. Measurements should adhere to generally accepted methodologies as outlined, for example, in US Geological Survey, Rantz, et al., 1982 or similar. Locations and frequency shall be re-evaluated after two years of data have been submitted.

    Chemours indicated that flowmeters will be installed on the seep and weep pumps, and any source of groundwater or water pumped to the treatment plant. DEQ also requires that Chemours measure flows on all named seeps and weeps on the downgradient side of the barrier wall. In addition to measurements taken at seeps A, B, C, and D, measurements downgradient of the wall shall include the tributary adjacent to DP14, DP11, just south of DP10, DP5, DP3, and DP-2 (see Figure 2, Waters of the U.S. Findings Report, Geosyntec, October 2020). These flow data will inform performance

monitoring of the barrier wall in the event seepage upgradient or downgradient of the wall is higher than planned (modeled) and can also be used for continued calibration of the groundwater flow model. This condition is also listed in the modeling section, and the data gathered should inform the revised model.

2. **Management of contaminated groundwater during barrier wall construction**: Chemours must ensure that contaminated groundwater does not reach surface waters untreated during barrier wall construction. If it is Chemours' intention to commence installation of the barrier wall before the extraction and treatment system is operational, please describe how contaminated groundwater will be removed from the barrier wall alignment and managed so that it does not reach surface waters.

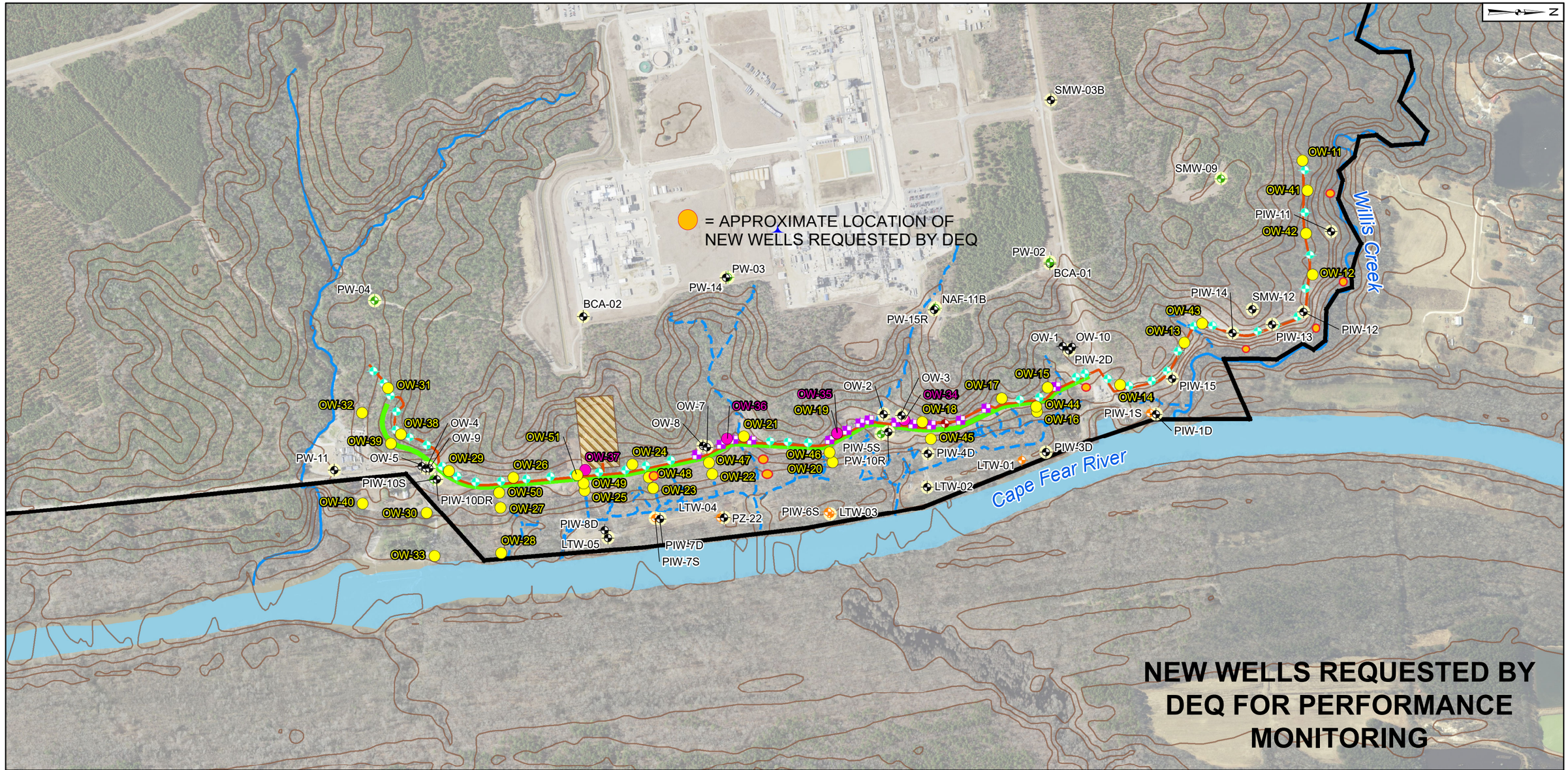
3. **Soil-Bentonite Mix Design:** Chemours shall provide sufficient information to demonstrate that the soil-bentonite-cement mix will have enough cement in it to allow slump testing to evaluate mix consistency before the slurry mixture sets (cures).

4. **Construction Quality Assurance (CQA) Testing:** Chemours shall include a summary table that summarizes all proposed CQA testing. The table should include the component being tested, the property being tested, the test method and standard, the testing frequency, sample size, and acceptance criteria. This table should be in the final CQA plan.

5. **Ex Situ Capture Remedy Plan Update:** Please update the plan sets and figures of the Ex-Situ Capture Remedy in the 90% design submittal to include the three weeps (3 are shown in SC-0.2).

6. **Sufficiency of Compressive Strength:** Chemours shall provide documentation to support Chemours' representation on August 25, 2022 indicating that increasing the compressive strength of the wall will adversely impact the permeability of the wall.

7. **Shear Stress Analysis:** The barrier wall will encounter different types of soil types at different depths and in different locations. These heterogeneous geologic materials may exert significant shear (horizontal) forces on the wall, especially when there is water in the vadose zone encouraging movement of these materials. Chemours shall perform a worst-case analysis of lateral shear stress at a particular cross-sectional area of the wall to demonstrate that lateral displacement of this cross section will not occur during or after construction. This worst-case condition should have saturated, unconsolidated soils on the upgradient side while the downgradient side has dry, unconsolidated soils. These conditions should be considered while heavy earth moving type equipment is along the wall alignment.



Legend

- Perched Zone
- Surficial Aquifer
- Floodplain Deposits
- Black Creek Aquifer
- Black Creek Aquifer Extraction Well
- Surficial Aquifer Extraction Well
- Surficial and Black Creek Aquifer Extraction Well
- Hydraulic Head Observation (Existing Well)
- Hydraulic Head Observation (New Observation Well - Black Creek Aquifer)
- Hydraulic Head Observation (New Observation Well - Surficial Aquifer)
- Site Boundary
- Forcemain
- Barrier Wall; approximate surface elevation at 72 feet mean sea level
- Groundwater Treatment Pad
- Ground Surface Elevation Contour (ft NAVD88) - 10 feet interval
- Seep
- Nearby Tributary
- Nearby Tributary to River
- Cape Fear River

Notes:
ft NAVD88 - feet North American Vertical Datum 1988.

1. Surficial Aquifer extraction wells have been offset for visibility. Therefore, the placement of these wells on this map do not reflect their true geographic coordinates.
2. Conveyance forcemain alignment is preliminary and is subject to change in future submittals.
3. It is anticipated that existing wells PIW-9S and PIW-9D (not shown) will need to be abandoned to facilitate barrier wall installation. Replacement wells OW-37 and OW-51 are shown instead, and will be installed after the wall. The other proposed observation wells, where possible, will be installed prior to wall installation; however it is noted that change conditions during construction may result in adjustments to locations and/or damage to installed wells.
4. Ground surface elevation contours are based on 20-foot DEM grid cells generated from LiDAR. Data from NC OneMap (https://assets.nconemap.gov/pages/hub/ncom-contours-dd.htm).
5. The outline of Cape Fear River is approximate and is based on open data from ArcGIS Online and North Carolina Department of Environmental Quality Online GIS (MajorHydro shapefile).
6. Basemap source: NC OneMap (2019). North Carolina Department of Information Technology, Government Data Analytics Center, Center for Geographic Information and Analysis. Available at https://www.nconemap.gov.

1,000 500 0 1,000 Feet

Hydraulic Head Evaluation Network for Groundwater Remedy

Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Geosyntec Consultants of NC, P.C.
NC License No.: C 3500 and C 295

Raleigh | March 2022

Figure 2

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WC-3
WC-2
Willis Creek
SMW-03B
SMW-09
PIW-11
PW-02
BCA-01
PW-03
PW-14
PW-04
BCA-02
NAF-11B
PW-15R
SMW-12
PIW-14
PIW-13
PIW-12
OW-1
OW-10
PIW-2D
OW-2
OW-3
PIW-15
WC-1
PIW-1S
PIW-1D
OW-7
OW-8
OW-4
OW-9
OW-6
PIW-9S
PIW-9D
PW-11
OW-5
PIW-5S
PW-10R
PIW-4D
PIW-3D
LTW-01
LTW-02
Cape Fear River
PIW-10S
PIW-10DR
OW-30
LTW-04
PZ-22
PIW-6S
LTW-03
PIW-8D
OW-28
LTW-05
PIW-7D
PIW-7S

= ADDITIONAL EXISTING WELLS TO BE USED FOR PERFORMANCE MONITORING

USE OF ADDITIONAL WELLS FOR FOR PERFORMANCE MONITORING

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- Floodplain Deposits
- Black Creek Aquifer
- Black Creek Aquifer Extraction Well
- Surficial Aquifer Extraction Well
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- Willis Creek Sample Location
- Passive Flux Meter Deployment
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1,000 500 0 1,000 Feet

Passive Flux Meter Deployment Plan

Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Geosyntec Consultants of NC, P.C.
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Figure 3