NC DEPARTMENT OF HEALTH AND HUMAN SERVICES

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April 6, 2020

To Whom It May Concern:

The North Carolina Department of Health and Human Services (NC DHHS) reviewed the Corrective Action Plan (CAP) submitted in December 2019 by Chemours to the North Carolina Department of Environmental Quality (NC DEQ), with a specific focus on the human health screening level exposure assessment (HH-SLEA) portion of the CAP, located in Appendix F.

The HH-SLEA makes broad conclusions about potential risk to people living, working, or playing near the site. The limitations of the data and analysis used to support these conclusions are summarized below and detailed in Attachment A:

1) The HH-SLEA did not include all appropriate exposure pathways, such as air, swimming in pools, and subsistence fishermen who may also live near the plant and use private wells. Pathways with insufficient data to quantify exposure should still be acknowledged and accounted for when making conclusions.
2) The HH-SLEA did not assess the full scope of per- and polyfluoroalkyl substances (PFAS) in the affected community and surrounding environment. Many environmental media were not tested for all Table 3+ PFAS. In addition, given the history of PFAS production at the site, legacy PFAS (i.e. PFAS listed in EPA Method 537) should be considered in the HH-SLEA.
3) The exposure point concentrations (EPCs) chosen for certain environmental media will underestimate potential exposure to PFAS for off-site receptors. The HH-SLEA often relied on "current condition" assumptions, where it was assumed that all drinking water exposures were minimized by filtration systems and air emissions were decreased by facility air scrubbers. These assumptions do not account for past exposures and risks, future scenarios where current control methods may fail, groundwater migration, or future residents who may install new wells without awareness of the underlying groundwater contamination.
4) Exposure factors chosen for certain exposure pathways will underestimate potential exposure to PFAS for off-site receptors.
5) Several scientific assumptions were made without referencing the appropriate citations or evidence.
6) The CAP cleanup goals and HH-SLEA hazard assessment are based solely on HFPO-DA (also known as GenX), which may underestimate total risk from other PFAS that currently lack toxicity data.

There are several significant data gaps and uncertainties as documented by this public comment and in Section 8 of Appendix F which currently preclude a robust and meaningful risk characterization for this site. These gaps include an incomplete exposure assessment and a lack of toxicity data for most PFAS that were assessed in the CAP. Given this, NC DHHS disagrees with the assertion in section 6.2.4 of the CAP that the HH-SLEA is sufficient to conclude that offsite groundwater remediation is not needed to protect human health.

NC DHHS appreciates the opportunity to evaluate the Corrective Action Plan in detail and has reviewed our concerns with NC DEQ. Given the pace of current research, as toxicology and treatment technology knowledge expand, the corrective action plan should be periodically revised and updated. NC DHHS looks forward to continued collaboration with NC DEQ to respond to public health concerns from the affected community near the Fayetteville Works Facility.

Sincerely,

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Attachment A

The North Carolina Department of Health and Human Services (NC DHHS) reviewed the Corrective Action Plan (CAP) submitted in December 2019 by Chemours to the North Carolina Department of Environmental Quality (NC DEQ), with a specific focus on the human health screening level exposure assessment (HH-SLEA) portion of the CAP, located in Appendix F titled "Offsite Human Health Screening Level Exposure Assessment (SLEA) of Table 3+ PFAS".

A detailed list of NC DHHS concerns about the HH-SLEA follows. Unless otherwise noted, all section, figure, and table numbers refer to those found in Appendix F.

1) The HH-SLEA did not include all appropriate exposure pathways.
   a) The evaluation did not address inhalation of ambient air in the surrounding community during and after facility stack emissions. Since it is known that air emissions from this site were significant enough to affect groundwater in the surrounding community, it may be assumed that there is also exposure via inhalation. Two footnotes on Table F-2-1 seem to indicate that at one point in the development of the HH-SLEA the inhalation route was considered; however, no data are included to estimate ambient air levels or estimated dose. The conceptual site model (Figure 2) has a footnote that vapors in ambient air are not evaluated because "this pathway is unlikely to be significant" but no supporting documentation is provided to show how this conclusion was made.
   b) Many families in the community use well water to fill their swimming pools, but this potential exposure pathway was not considered. Although swimming is not likely to be a significant pathway of exposure in isolation, a "reasonable maximum exposure" scenario should account for individuals potentially exposed through multiple pathways.
   c) Residents were excluded from also being considered recreationalists. It is fair to assume people with contaminated well water living near the Fayetteville Works facility also recreate in the area, including swimming and fishing, and consume fish from affected waterways. Total exposure from all these combined pathways should be assessed.
   d) Lack of available data precluded evaluation of exposure through consumption of livestock or local wildlife. The HH-SLEA acknowledges that this is a presumed complete exposure pathway, but no effort was made to quantify these pathways or account for them when drawing conclusions about potential health hazards.
2) The HH-SLEA did not assess the full scope of per- and polyfluoroalkyl substances (PFAS) in the affected community and surrounding environment.
   a) Given the documented history of PFAS production at this site, NC DHHS suggests that the HH-SLEA includes analysis of both legacy (EPA Method 537) and emerging (Table 3+) PFAS.
   b) Home-grown produce was not collected and directly analyzed for PFAS concentrations. The rationale for this decision provided in the CAP was that harvest-ready produce could not be collected due to seasonal limitations. However, various harvest-ready produce is available year-round.
   c) Levels of HFPO-DA in produce were estimated using a model. Given that the physical and chemical properties of PFAS differ from other organic pollutants, it is unclear that the model used is appropriate for this purpose and been validated for PFAS at other sites.

d) Several environmental media were not assessed for all listed Table 3+ PFAS. This includes untreated well water, surface water used for public drinking water, and home-grown produce. Throughout the HH-SLEA, (ex: Section 5.2.2) data for Table 3+ analytes are mentioned, but the dataset only includes some of the Table 3+ PFAS, not all. This is misleading, and for each media and exposure unit, the analytes being considered should be clearly and explicitly stated. Wherever possible, environmental media should be analyzed for legacy and emerging PFAS.
e) A limited number of fish were collected from the Cape Fear River. The data provided in the HH-SLEA are insufficient to determine if the samples are truly representative of fish populations in the river. NC DHHS recommends a minimum of five fillet samples from individual fish per species per sampling site, or three composite samples per species per sampling site, with each composite consisting of tissue from three to seven fish of the same species. Additionally, fish were not collected from Kings Bluffs (55 miles downstream) even though PFAS have been historically detected in the surface water here. There is also inconsistent reporting of fish collected between the text (Section 5.4.1), Figure 7, and Table B-4.

3) The exposure point concentrations (EPCs) chosen for certain environmental media will underestimate potential exposure to PFAS for off-site receptors.
a) Well water concentrations were averaged over each exposure unit to calculate EPCs. This approach may significantly underestimate potential exposures for residents with the highest levels of PFAS in their water. Averaging multiple private well results is inappropriate for calculating an EPC for a private well user because they do not receive their drinking water from multiple wells. A reasonable maximum exposure scenario should consider maximum measured contaminant levels in each exposure unit.
b) The HH-SLEA also presented a "current conditions" scenario where it was assumed that all drinking water exposures were minimized by filtration systems and air emissions were decreased by facility air scrubbers. It is important not to overstate the conclusions from that scenario and continue to consider cases where filtration systems may fail, groundwater migrates toward untreated wells, or new wells are drilled in the area resulting in exposure to untreated drinking water. Further, the results from the performance testing of the thermal oxidizer have not yet been received, preventing confirmation of its effectiveness at the time of this review.
c) Surface soil samples were taken at 30 locations in each exposure unit and composited into a single sample that was assumed to be representative of surface soils for the whole exposure unit. This approach could greatly underestimate soil exposure in certain areas where PFAS deposition is higher. Multiple discrete surface soil samples should be taken and analyzed throughout each exposure unit, with higher sampling density in areas that correspond with suspected deposition patterns.
d) Underestimating soil PFAS concentrations by compositing 30 samples into one could also lead to underestimating the level of PFAS in produce, since soil concentration is an important factor in the model used to estimate PFAS levels in produce.
e) Most surface soil samples were collected from right-of-way areas near roads. A hydrogeologist should be consulted to determine if proximity to a roadway and ensuing

runoff would affect PFAS residence times in surface soil compared to residence times in the areas of yards used to grow produce.

4) Exposure factors chosen for certain exposure pathways will underestimate potential exposure to PFAS for off-site receptors.
   a) In Table F-2-4, the exposure frequency for swimming is listed as 12 events per year based on professional judgement. This might underestimate the reasonable maximum exposure to PFAS while swimming, such as residents who may swim multiple times a week during the summer.
   b) In Table F-2-4, the exposure factors used to evaluate exposure while swimming do not match the footnotes. Specifically, footnote 4 indicates that the exposure time for children is 270 minutes (4.5 hours), but the table lists 3.5 hours/event as the exposure time for children. Additionally, footnote 4 indicates that the exposure time for adults is 210 minutes (3.5 hours), but the table lists 7.5 hours/event as the exposure time for adults.
   c) In Table F-2-2, the soil ingestion rates for adults is listed as 330 mg/day per EPA 2014. When looking at this reference, the adult soil ingestion rate for outdoor workers is 100 mg/day. This discrepancy should be corrected.
   d) In Table F-2-5, the fish ingestion rates given are for recreational fishermen. There are portions of the North Carolina population who are subsistence fishermen, and intake rates for subsistence fishermen should be used to account for these populations. Using recreational fishermen intake rates will significantly underestimate potential exposure from this pathway.
5) Appropriate citations or evidence should be referenced for statements about physical and chemical properties of PFAS with ether bonds discussed in Section 2.6; statements about the effectiveness of filtration systems such as Section 5.2; and statements about dermal exposure presented in Section 8.3.1.
6) There are several significant data gaps and uncertainties which currently preclude a robust and meaningful risk characterization for this site.
   a) Because there are no toxicity data for most Table 3+ PFAS, NC DHHS recommends removing "noncarcinogenic human health hazard from assumed exposure to Table 3+ PFAS in the vicinity of the Facility" from the stated goals in the executive summary of the HH-SLEA.
   b) The characterization of potential risk to the affected community presented in the HH-SLEA does not adequately account for the deficiencies listed in this public comment, as well as the lack of toxicity data for most Table 3+ PFAS.
   c) It would be helpful to explicitly clarify what fraction of total PFAS exposure is attributable to HFPO-DA compared to other Table 3+ PFAS.
   d) Regarding footnote 13, which references the relative source contribution, the conclusions made may be premature given the data gaps surrounding other potential exposure routes such as household dust and inhalation.
7) The NC DHHS derived oral reference dose is currently the appropriate toxicity value to use for HFPO-DA based on the following considerations:
   a) The NC Secretaries' Science Advisory Board has reviewed the NC DHHS oral reference dose for HFPO-DA and recommended its use as the foundation for protecting affected and sensitive populations and providing corresponding risk assessments and advice.

b) The Thompson et al. 2019 oral reference dose was derived from a rat study, which has been shown to be a less sensitive species for some effects of PFAS compared to mice models.
c) The USEPA draft oral reference dose is still in draft form, and USEPA has explicitly stated that it should not be used since it is not final and may change following public comment[1].
d) Although the DHHS derived oral reference dose should be used for calculations, it is incorrect to say the NC DHHS determined the use of the reference dose "in a regulatory context" (ex: Section 7.1 in Appendix F) since NC DHHS is not a regulatory agency.

[1] https://www.epa.gov/sites/production/files/2018-11/documents/factsheet_pfbs-genx-toxicity_values_11.14.2018.pdf