



North Carolina Department of Health and Human Services  
Division of Public Health

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November 6, 2017

Ronnie Lafevers  
Executive Director  
Camp Dixie  
373 Bladen Union Church Road  
Fayetteville, NC 28306

**Re: Evaluation of October 2017 GenX sampling results for recreational users of the lake at Camp Dixie**

Dear Mr. Lafevers,

In June 2017, the North Carolina Department of Environmental Quality (DEQ) began investigating releases of per- and polyfluoroalkyl substances (PFAS) from the Chemours Fayetteville facility, including releases of a compound known as GenX (or HFPO-DA). In October 2017, N.C. DEQ began testing surface water bodies near the facility, including the lake located at Camp Dixie. The lake at Camp Dixie was sampled for GenX, perfluorooctanoic acid (PFOA), and perfluorooctane sulfonate (PFOS). The sample taken on October 19, 2017 showed levels of GenX at 620 nanograms per liter (ng/L), or parts-per-trillion (ppt). PFOA was detected at 1.93 ng/L and PFOS levels were too low to accurately quantify, but estimated at 1.59 ng/L. PFOS and PFOA levels are well below the EPA lifetime health advisory for drinking water of 70 ng/L.

The N.C. Department of Health and Human Services (DHHS) Occupational and Environmental Epidemiology Branch (OEEB) was asked to review the results to determine if there may be an increased risk for adverse health effects from exposure to levels of GenX in the lake. Based on conversations with the director and staff of the Camp, this lake is used for recreating – children and adults can enter the lake via water slide or “the blob” but must immediately return to shore. Camp staff indicated that consumption of fish caught from the lake is not permitted. The lake is open for use from May 1 through the end of September. **Based on current knowledge, OEEB concludes that exposure to GenX at levels measured in October 2017 while recreating at the lake at Camp Dixie is not expected to harm people’s health.**

The basis for this conclusion is that the estimated dose from incidental ingestion (unintentional drinking) while swimming is ~1,500 times lower than the N.C. DHHS reference dose (RfD) which was derived based on toxicity data for the calculation of the N.C. DHHS provisional health goal for GenX in drinking water. A reference dose is defined as the estimated daily dose below which no adverse non-cancer health effects would be expected over a lifetime of exposure. In addition, exposure through dermal (skin) contact is not expected to be a significant pathway of exposure. Less exposure would occur during other activities in the lake such as canoeing or wading. It is important to note that levels measured in October 2017 may not be representative of

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levels in the lake during the summer when the lake was open for use. Because the lake is drained each winter, current levels of chemicals cannot be used to predict future levels, and follow-up sampling is recommended in Spring 2018. N.C. DHHS will continue to evaluate all new environmental data and health effect data and will update these conclusions if needed. Detailed information on the evaluation of current GenX levels can be found in Attachment A.

If you have any questions or concerns, please feel free to contact me at [beth.dittman@dhhs.nc.gov](mailto:beth.dittman@dhhs.nc.gov) or by phone at (919) 707-5900.

Thank you,

Beth Dittman  
Health Assessor and Principal Investigator  
Health Assessment, Consultation and Education Program  
Occupational and Environmental Epidemiology Branch  
North Carolina Division of Public Health  
North Carolina Department of Health and Human Services

## ATTACHMENT A

### Exposure Considerations

Recreational use of surface water (swimming, boating, wading, etc.) results in exposure to contaminants in the water via incidental ingestion and dermal (skin) exposure. OEEB evaluated exposure to elementary age campers because smaller children generally have the highest exposures due to their smaller body size and other behavioral factors.

#### *Incidental Ingestion*

OEEB calculated an estimated dose that campers would receive through incidental ingestion of water from the lake while swimming. Based on conversations with the director and staff of the camp, the following parameters were used in this calculation:

Age: 6 to <11 years old  
Hours/day: 2  
Days/week: 5  
Weeks/year: 1  
Number of years attending camp: 5

Based on default exposure parameters from the EPA Exposure Factor Handbook [EPA 2011], the following parameters were also used in this calculation:

Body weight: 31.8 kg  
Ingestion rate: 0.12 L/hour

The estimated dose was calculated as follows [ATSDR 2005]:

$$\text{Estimated Dose} = \frac{\text{Concentration} * \text{Ingestion Rate} * \text{Exposure Factor}}{\text{Body Weight}}$$

Where:

Concentration = 0.00062 mg/L (= 620 ppt)  
Ingestion Rate = 0.24 L/day (0.12 L/hour \* 2 hours/day)  
Body Weight = 31.8 kg

The exposure factor is an expression of how often and how long a person may contact a substance in the environment. The exposure factor is calculated with the following general equation:

$$EF = \frac{F \times ED}{AT}$$

Where:

F = frequency of exposure (days/year) = 5 days/week \* 1 week/year = 5 days/year  
ED = exposure duration (years) = 5 years at camp  
AT = averaging time (ED x 365 days/year)

The following derivation and value were used for the exposure factor based on conversations with staff of the camp.

$$EF = \frac{\frac{5 \text{ days}}{\text{year}} \times 5 \text{ years}}{5 \text{ years} \times \frac{365 \text{ days}}{\text{year}}} = 0.0137$$

Using this EF and the estimated dose formula above, the estimated GenX dose from incidental ingestion while swimming is  $6.4 \times 10^{-8}$  mg/kg/day. From the NC DHHS GenX Health Goal calculations, an RfD of 0.0001 mg/kg/day was calculated [NC DHHS 2017]. The estimated dose received through incidental ingestion while swimming is ~1,500 times lower than the reference dose.

### *Dermal Exposure*

To calculate an estimated dose from dermal exposure, a chemical-specific skin permeability coefficient is needed. This number describes the rate at which a chemical is absorbed through the skin. A validated permeability coefficient for GenX is unavailable, so OEEB is unable to calculate an estimated dose from dermal exposure. However, based on limited dermal studies for GenX, there is not evidence that it readily absorbs through the skin [ECHA]. For per-and polyfluoroalkyl substances (PFAS) in general, dermal exposure is a minor exposure pathway. Dermal absorption for this class of chemicals is slow and does not result in significant absorption [ATSDR 2017].

### **Conclusion**

Based on current information, OEEB concludes that exposure to GenX at current levels while recreating in the lake at Camp Dixie is not expected to harm people's health. N.C. DHHS will continue to evaluate all new environmental data and health effect data and will update these conclusions if needed.

## References

[ATSDR 2005] Agency for Toxic Substances and Disease Registry. *Public Health Assessment Guidance Manual (Update)*. January 2005. <http://www.atsdr.cdc.gov/HAC/PHAManual/index.html>.

[ATSDR 2017] Agency for Toxic Substances and Disease Registry. *An Overview of Perfluoroalkyl and Polyfluoroalkyl Substances and Interim Guidance for Clinicians Responding to Patient Exposure Concerns*. June 2017. [https://www.atsdr.cdc.gov/pfc/docs/pfas\\_clinician\\_fact\\_sheet\\_508.pdf](https://www.atsdr.cdc.gov/pfc/docs/pfas_clinician_fact_sheet_508.pdf)

[ECHA] European Chemicals Agency. *ECHA Toxicological Summary for Ammonium 2,3,3,3-Tetrafluoro-2-(Heptafluoropropoxy)Propanoate*. <https://echa.europa.eu/registration-dossier/-/registered-dossier/2679/7/1>

[EPA 2011] US Environmental Protection Agency, Office of Research and Development. *Exposure factors handbook: 2011 edition*. September 2011. <https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252>

[N.C. DHHS 2017] North Carolina Department of Health and Human Services. *Questions and Answers Regarding North Carolina Department of Health and Human Services Updated Risk Assessment for GenX (Perfluoro-2-propoxypropanoic acid)*. July 2017. <https://ncdenr.s3.amazonaws.com/s3fs-public/GenX/NC%20DHHS%20Risk%20Assessment%20FAQ%20Final%20Clean%20071417%20PM.pdf>

## **Report Preparation**

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