Dec 4,2024

Chemours Consent Order Toxicity Studies – Status Update and Results

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Consent Order Toxicity Studies

Status Updates

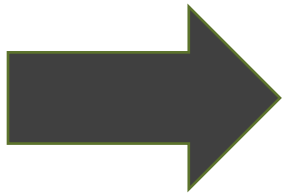
1. Aquatic Toxicology studies
2. Rodent Toxicology studies

Results Summaries

1. Aquatic Toxicology studies
    1. Algae
    2. Acute Daphnia
    3. Fish

PFAS in North Carolina

Consent Order Paragraph 14 Study PFAS



- PFMOAA
- PMPA
- PFO2HxA
- PEPA
- Nafion BP2

Chemours Consent Order: Toxicity Study Details

"The following studies, which shall be conducted following applicable USEPA, OECD protocols as defined in the USEPA TSCA, OPPT or other appropriate programs as determined by DEQ."

Rodent Toxicity Studies:

- 28-day oral immunotoxicity study in rats
- 28-day oral immunotoxicity study in mice
- 90-day repeated dose oral toxicity study in rats
- 90-day repeated dose oral toxicity study in mice

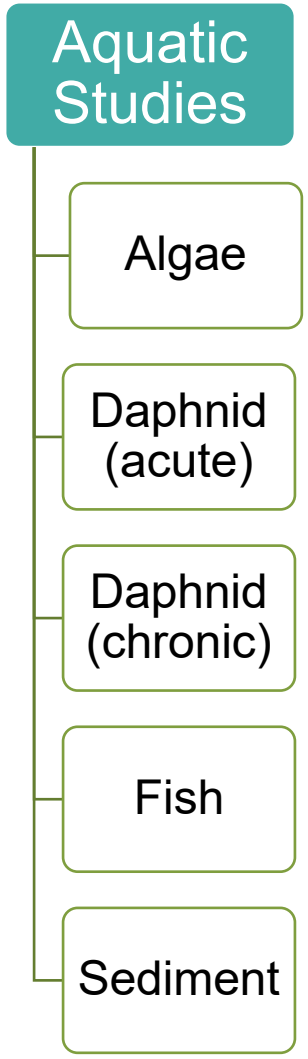
***Rodent Studies**: mouse and rat; classic tox and immunotox*

Ecological Toxicity Studies:

- Algal acute (72-hour growth) toxicity study
- Daphnid acute toxicity study
- Daphnid chronic (reproduction) toxicity study
- Fish acute toxicity study
- Sediment 10-day freshwater invertebrates toxicity test

***Aquatic Tox Studies**: algae, zooplankton, fish, and sediment worms*

Current Status of Consent Order Aquatic Toxicity Studies



Approval Steps:

- Protocols Approved – April & Dec 2022
- Range Finding Tests and Dose Approval – Jan – July 2023
- Definitive Tests Conducted – April – Nov 2023
- Final Report to DEQ – Algae Jan 2024; Acute Daphnia and Fish July 2024
  - others throughout 2024

Current Status of Consent Order Aquatic Toxicity Studies

Aquatic Studies

- Algae
- Daphnid (acute)
- Daphnid (chronic)
- Fish
- Sediment

Approval Step	Algae	Daphia (acute)	Daphnia (chronic)	Fish	Sediment
Final Protocol Approval	April 2022	Dec 2022	Dec 2022	April 2022	Dec 2022
Range Finding Reports	Jan/Feb 2023	March-May 2023	May 2023	April/May 2023	*July 2024*
Analytical Method for Dose Validation	Feb 2023	May 2023	May 2023	May 2023	May 2023
Dose Approval for Definitive Tests	March 2023	June 2023	June 2023	Aug 2023	Aug 2024
Definitive Tests Conducted	May/July 2023	Sept 2023	Sept/Oct 2023	Aug-Oct 2023	
Final Reports to DEQ	**January 2024**	**July 2024**	*Underway*	**July 2024**	

Current Status of Consent Order Rodent Toxicity Studies

Rodent Studies

- *Mouse 28-day Immune Tox*
- *Rat 28-day Immune Tox*
- *Mouse 90-day Classic Tox*
- *Rat 90-day Classic Tox*

Approval Steps:

- Range Finding Tests and Analytical Method Validation
- Definitive Dose Approval
- Final Protocol Approved
- Definitive Tests Conducted
- Final Report to DEQ

Current Status of Consent Order Rodent Toxicity Studies

Rodent Studies

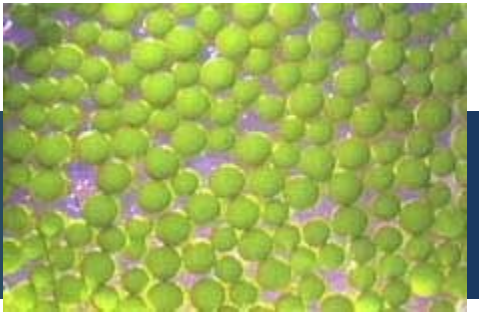
- *Mouse 28-day Immune Tox*
- *Rat 28-day Immune Tox*
- *Mouse 90-day Classic Tox*
- *Rat 90-day Classic Tox*

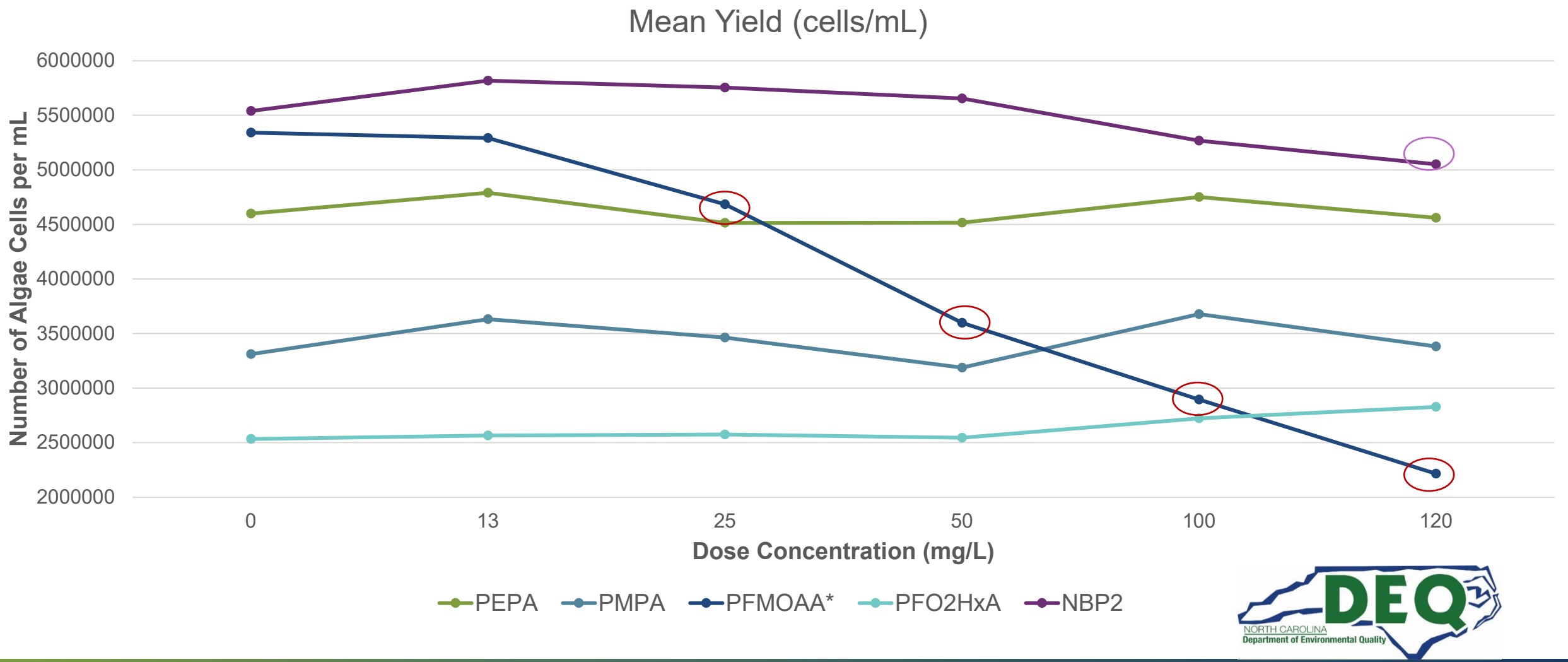
Step	Nafion BP2	PFMOAA	PMPA	PEPA	PFHO2xA
Analytical Method for Dose Validation	DEQ received July 2023; Approved HPLC-CAD Method				
Range Finding Reports	DEQ received July 28, 2023	DEQ received Oct 6, 2023			
Dose Approval for Definitive Tests	Meeting/Approval October 27, 2023	Meeting/Approval August 8, 2024			
Final Protocol Approval	Nov/Dec 2023	***Next step***			
Definitive Tests Conducted	June 2024	*28-day tests first; 90-day tests will be informed by the 28-day dose-response*			
Final Reports to DEQ	*Expected Fall/Winter 2024*				

Algae Results – 96-hour toxicity test

1. Conditions for Validity of test: ***Met for all CO PFAS Compounds****
    1. Cell growth increased exponentially in the negative control replicates over 96-hr period
    2. Variation in growth must be less than 7% across negative control replicates in first 72-hrs
    3. Variation in section-by-section growth rates must be less than 35% ****NBP2 was 40%***
    4. At test termination variation for mean growth rate and mean yield in negative control replicates is less than 15%
2. Range finding study tested 0, 1.0, 10, 100 mg/L doses – no toxic effect observed
3. Definitive test used 0, 13, 25, 50, 100, 120 mg/L for all compounds,

Algae Results – 96-hour toxicity test – measures Growth Inhibition

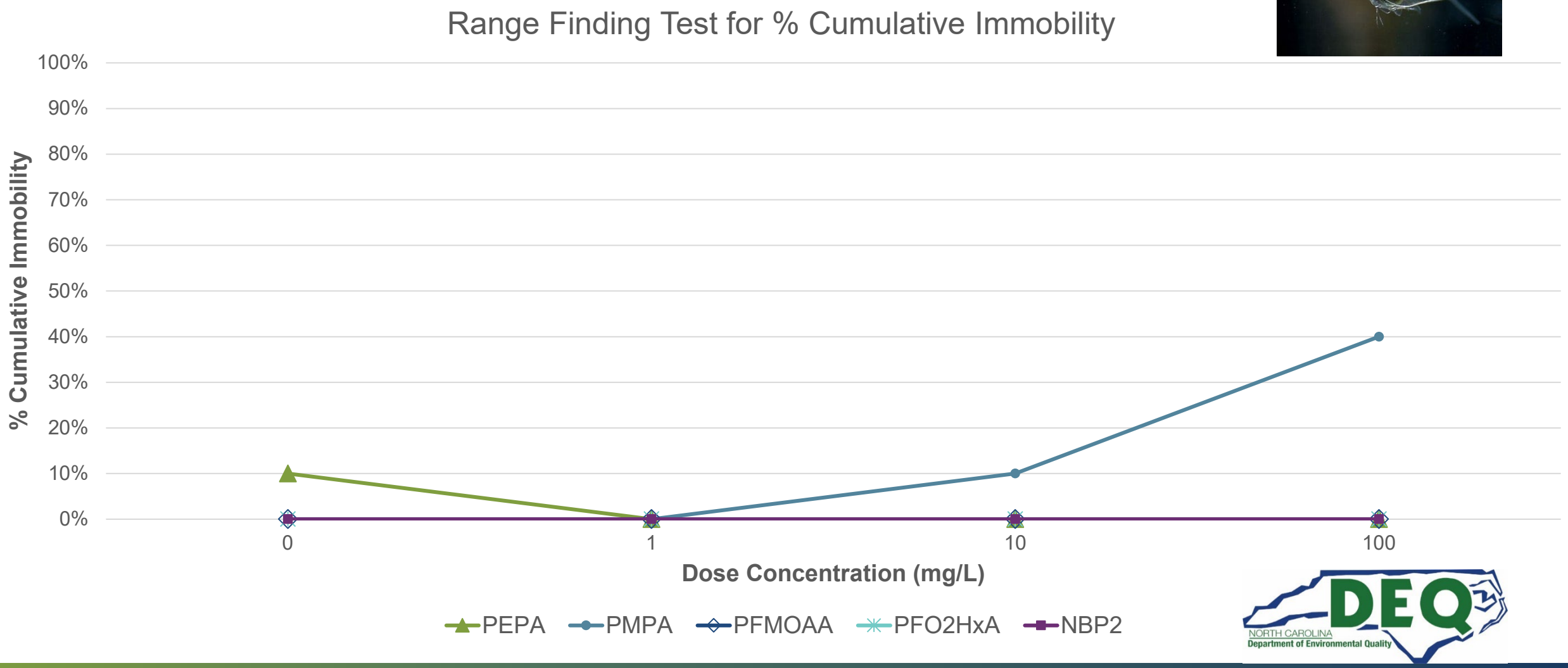




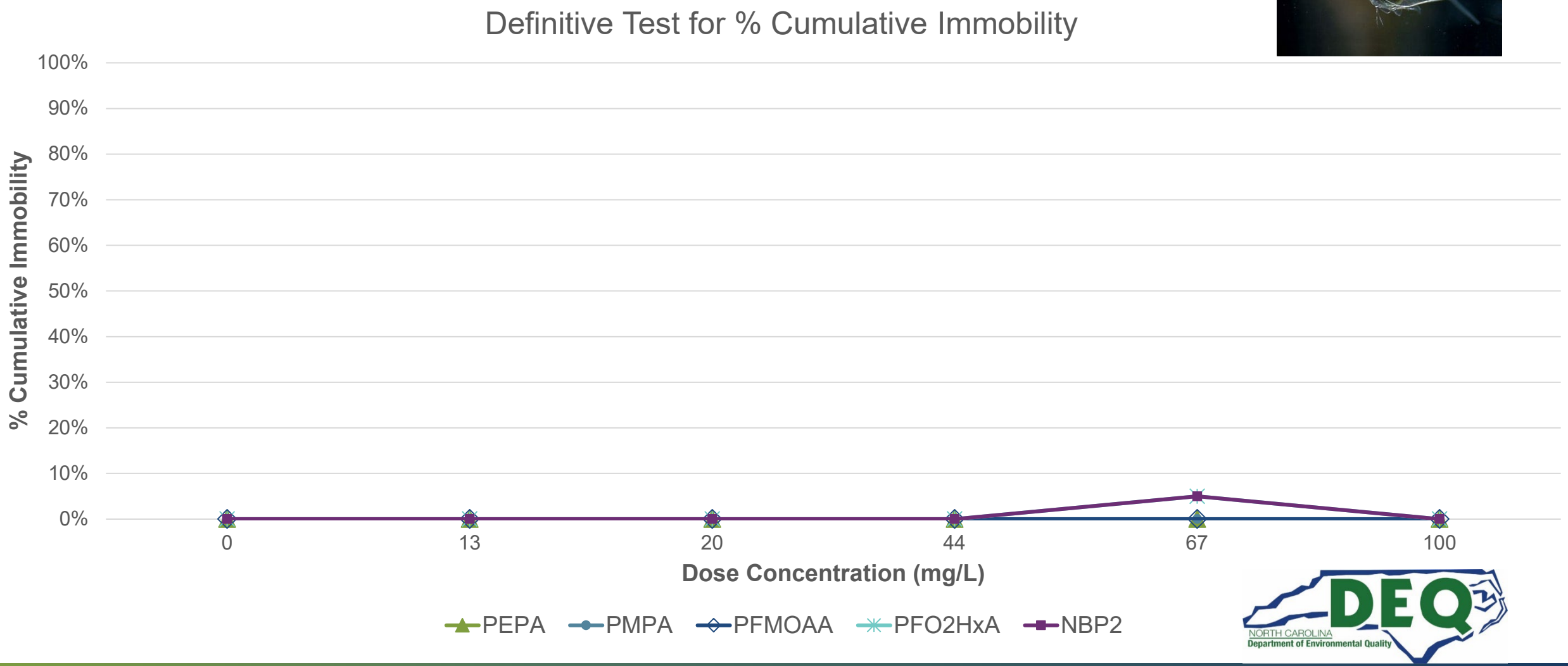
Acute Daphnia Results – 48-hour toxicity test

- Conditions for Validity of test: ***Met for all CO PFAS Compounds***
  - Immobility and/or signs of disease or stress in the control group will not exceed 10% by the end of the test
  - The dissolved oxygen concentration will be ≥ 4.0 mg/L throughout the test.
  - Temperature will not deviate by more than 3°C during the test.
- Range finding doses 0, 1.0, 10, 100 mg/L doses
  - effects only seen in PMPA @ 10 and 100 mg/L doses
- Definitive test doses 0, 13, 20, 44, 67, 100 mg/L

Daphnia Results – 48-hour toxicity test – measures Immobility



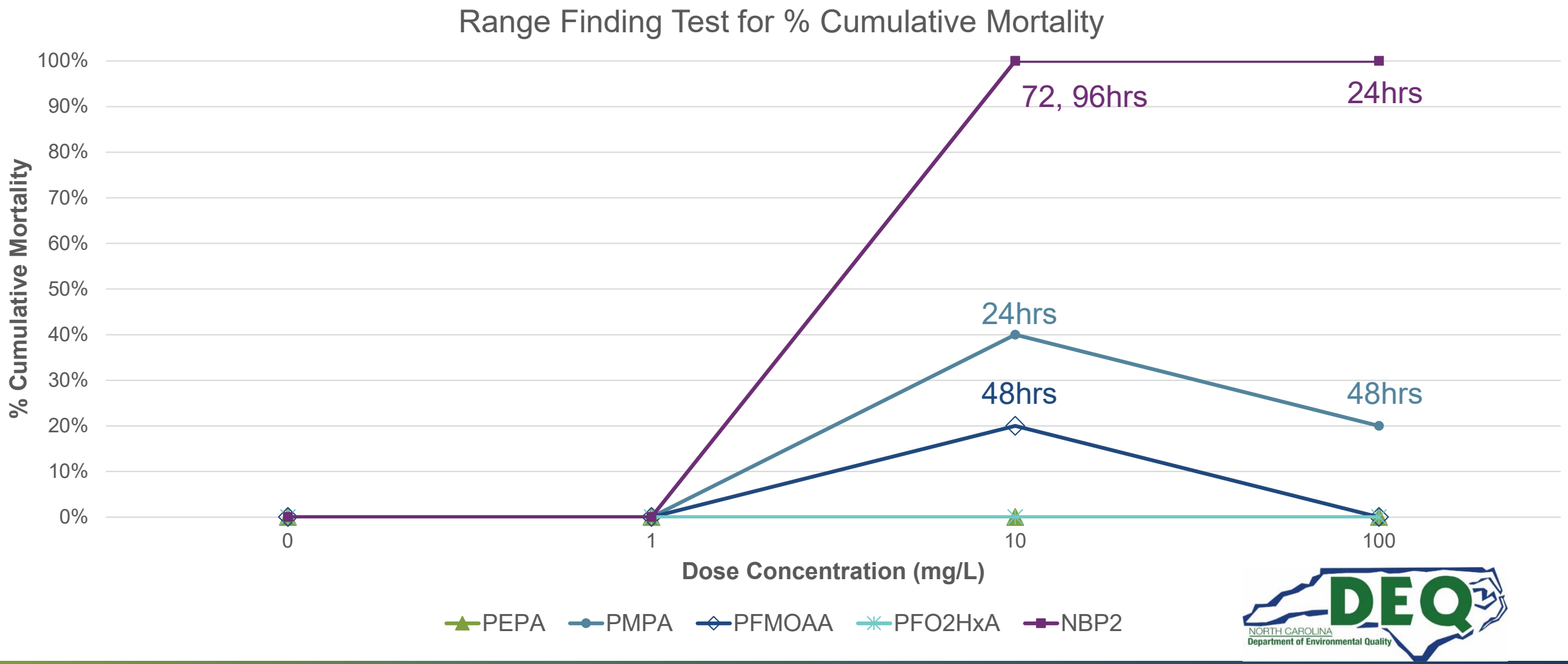
Daphnia Results – 48-hour toxicity test – measures Immobility



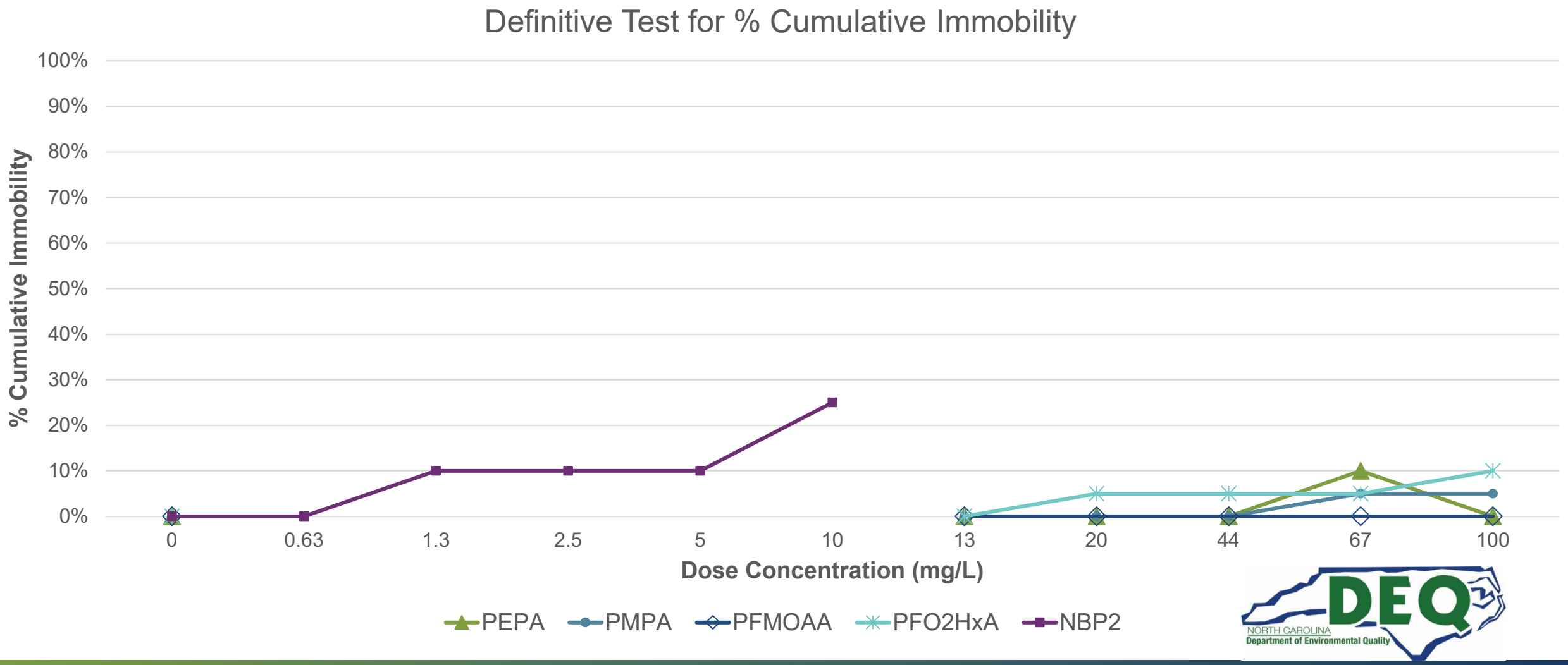
Fish Survival – 7-day toxicity test

- Conditions for Validity of test: ***Met for all CO PFAS Compounds***
  - Mortality and/or signs of disease or stress in fish in the control group(s) will not exceed 10%;
  - The dissolved oxygen will be at least 4.0 mg/L
  - Temperature will not deviate by more than 3°C.
- Range finding doses 0, 1.0, 10, 100 mg/L
  - effects seen in:
    - PFMOAA @ 10 mg/L (48hrs)
    - NBP2 @ 10 (72,96hrs) and 100mg/L(24hrs)
    - PMPA @ 10 (24hrs) and 100mg/L (48hrs)
- Definitive test used 0, 13, 20, 44, 67, 100 mg/L for all compound ***EXCEPT*** NBP2 which was tested at 0. 0.63, 1.3, 2.5, 5, 10 mg/L

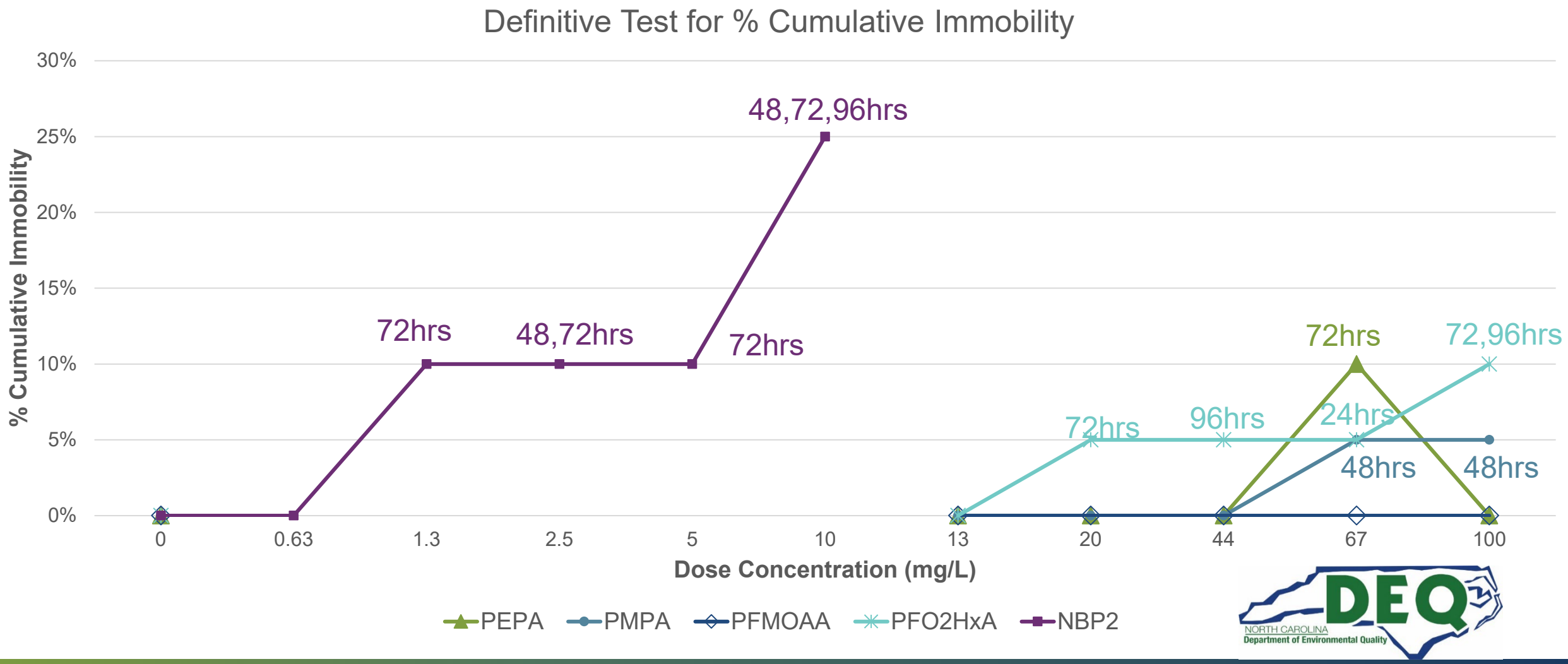
Fish Results– 7-day toxicity test – measures Survival (% Mortality)



Fish Results– 7-day toxicity test – measures Survival (% Mortality)



Fish Results– 7-day toxicity test – measures Survival (% Mortality)



Next Steps: Procedural for the Consent Order

Next Steps:

1. Approve remaining aquatic toxicity final protocol (sediment) – Winter 24/25
2. Review first rodent toxicity final report (NBP2, rat) – Winter 24/25

Remaining Studies with Forthcoming Results

Ecological Toxicity Studies:

- Daphnid chronic (reproduction) toxicity study
- Sediment 10-day freshwater invertebrates toxicity test

Rodent Toxicity Studies:

- 28-day oral immunotoxicity study in rats
- 28-day oral immunotoxicity study in mice
- *90-day repeated dose oral toxicity study in rats*
- *90-day repeated dose oral toxicity study in mice*

Aquatic Toxicology Results – What do these results mean?

The results inform the environmental impacts of the Chemours PFAS contamination in the Cape Fear River.

All 5 of the required aquatic toxicity tests will provide the basis for understanding how the Chemours PFAS compounds have impacted the different trophic levels in the freshwater ecosystem.

These results could be used to derive Bioconcentration Factors (analogous to the Bioaccumulation Factors that DEQ has derived from the 2022/2023 Fish Sampling effort).

These results are unlikely to be used to derive human health values without rodent data to corroborate the findings.

Thank you

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