Proposed Surface Water Quality PFAS Standards, Implementation Plan and Regulatory Impact Analysis

Water Quality Committee - July 10, 2024

Julie Grzyb, Deputy Director, DWR

Chris Ventaloro, Water Quality Standards Coordinator, DWR

Stephanie C. Bolyard, PhD, Senior Engineer to the Assistant Secretary, ADM

Background - Previous Surface Water Quality Standard WQC and EMC Presentations

November 2023 EMC Meeting

- Information Items - Proposed PFAS Toxicological Summaries and Potential Affected Sources

Link: edocs.deq.nc.gov/WaterResources/Browse.aspx?id=2617341&dbid=0&repo=WaterResources

January 2024 WQC Meeting

- Information Items - Implementation Strategy for Proposed PFAS Surface Water Quality Standards; Cost and Benefits Analysis Approach

Link: edocs.deq.nc.gov/WaterResources/Browse.aspx?id=2617413&dbid=0&repo=WaterResources

March 2024 WQC Meeting

- Information Item - Implementation Plan Timeline; DWR Stakeholder Meetings Overview and Feedback

Link: edocs.deq.nc.gov/WaterResources/Browse.aspx?id=2617353&dbid=0&repo=WaterResources

May 2024 WQC Meeting

- Information Item – Proposed surface water standards, implementation plan update and cost benefit analysis

Link: edocs.deq.nc.gov/WaterResources/Browse.aspx?id=2617363&dbid=0&repo=WaterResources

Presentation Overview

- Proposed 02B PFAS Surface Water Standards
- NPDES Implementation Rules and Update
- Fiscal Analysis Snapshot
- Request to Proceed with Rulemaking

Proposed 02B PFAS Surface Water Standards

Types of North Carolina Water Quality Standards Federal and State Rules

Groundwater Standards
(protect resource)

State Regulations

Drinking Water Standards
(treatment)

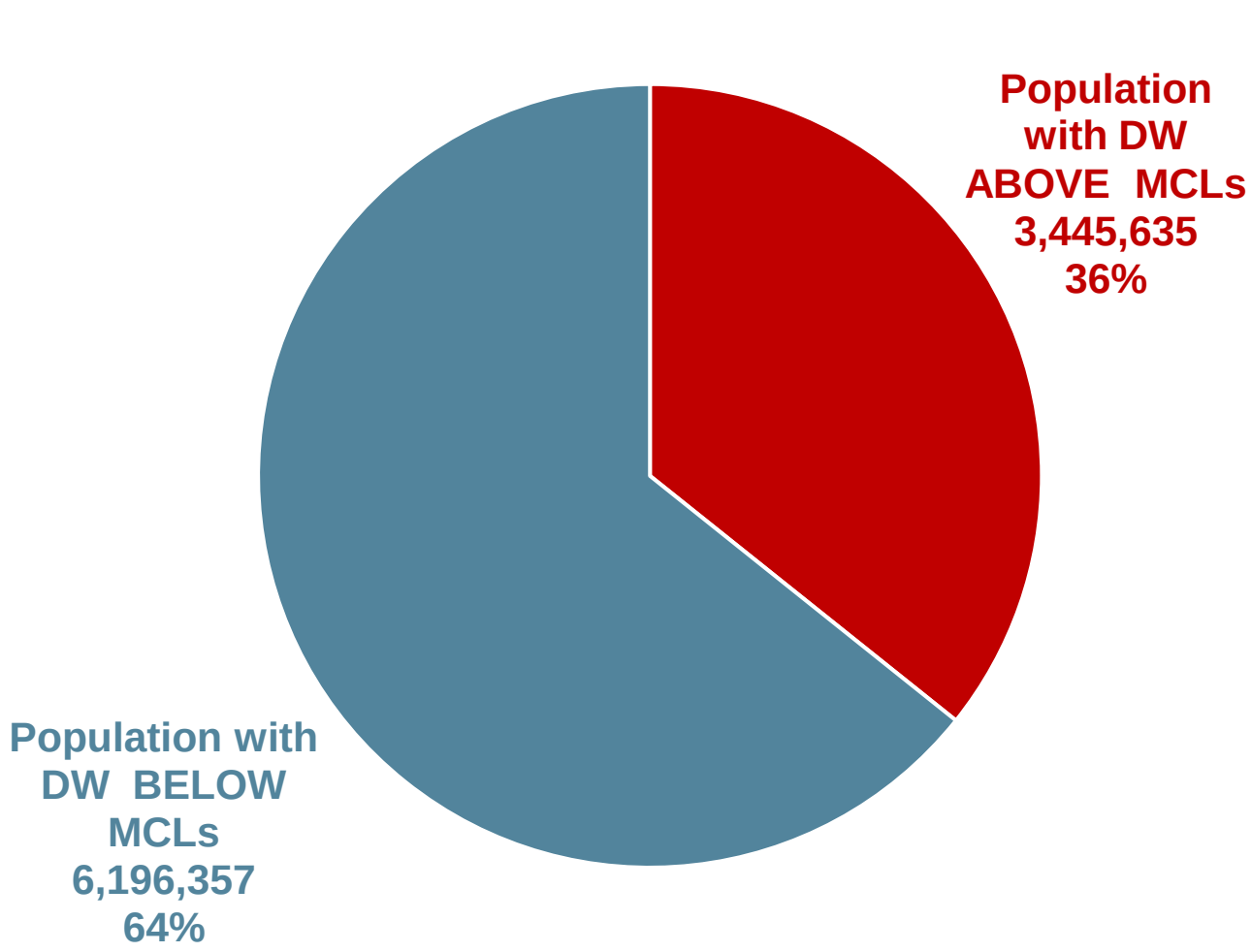
Safe Drinking Water Act

Surface Water Standards
(protect resource)

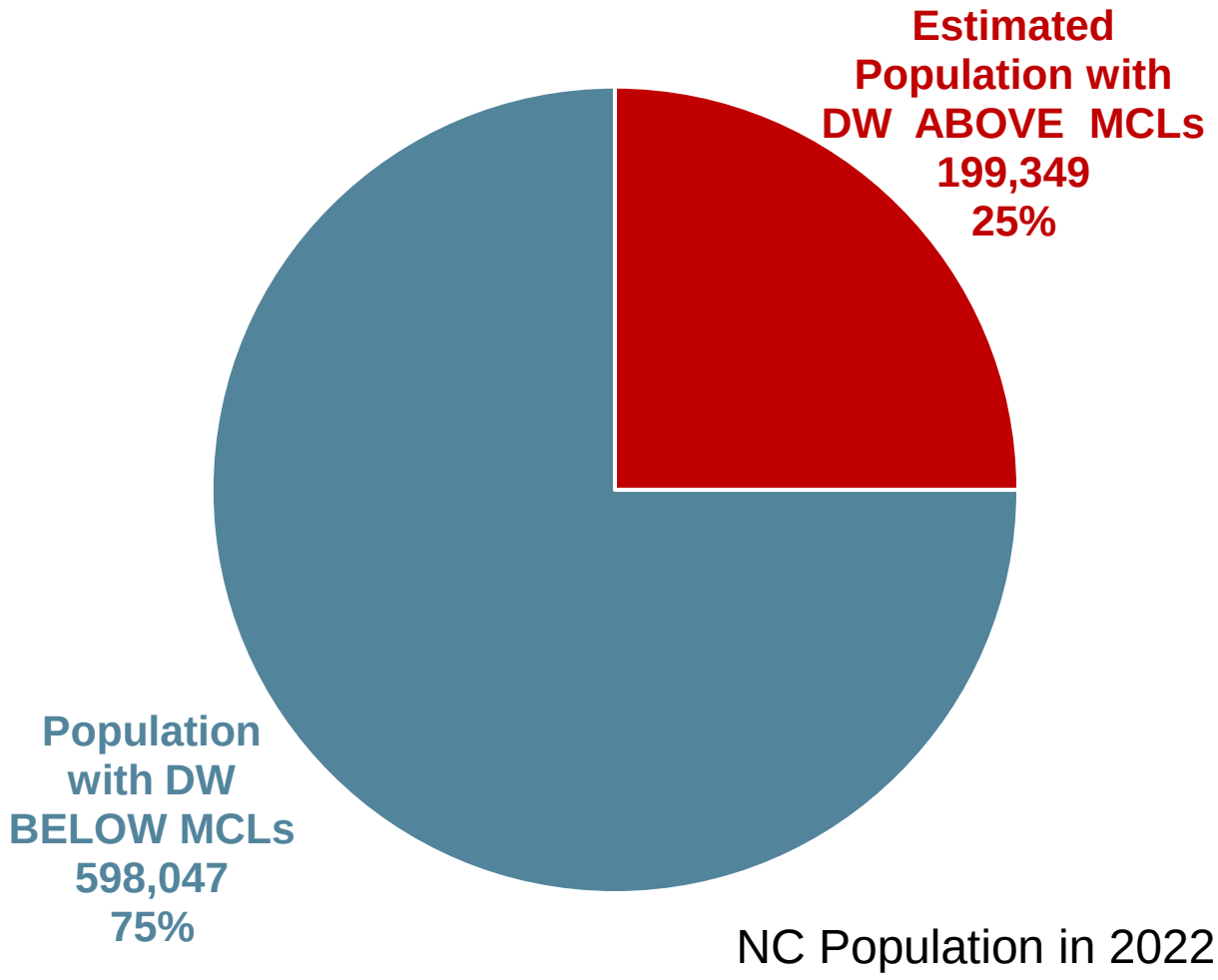
Clean Water Act

PFAS Currently in Drinking Water in NC

NC Population on Public Water Systems (9,641,992 people)



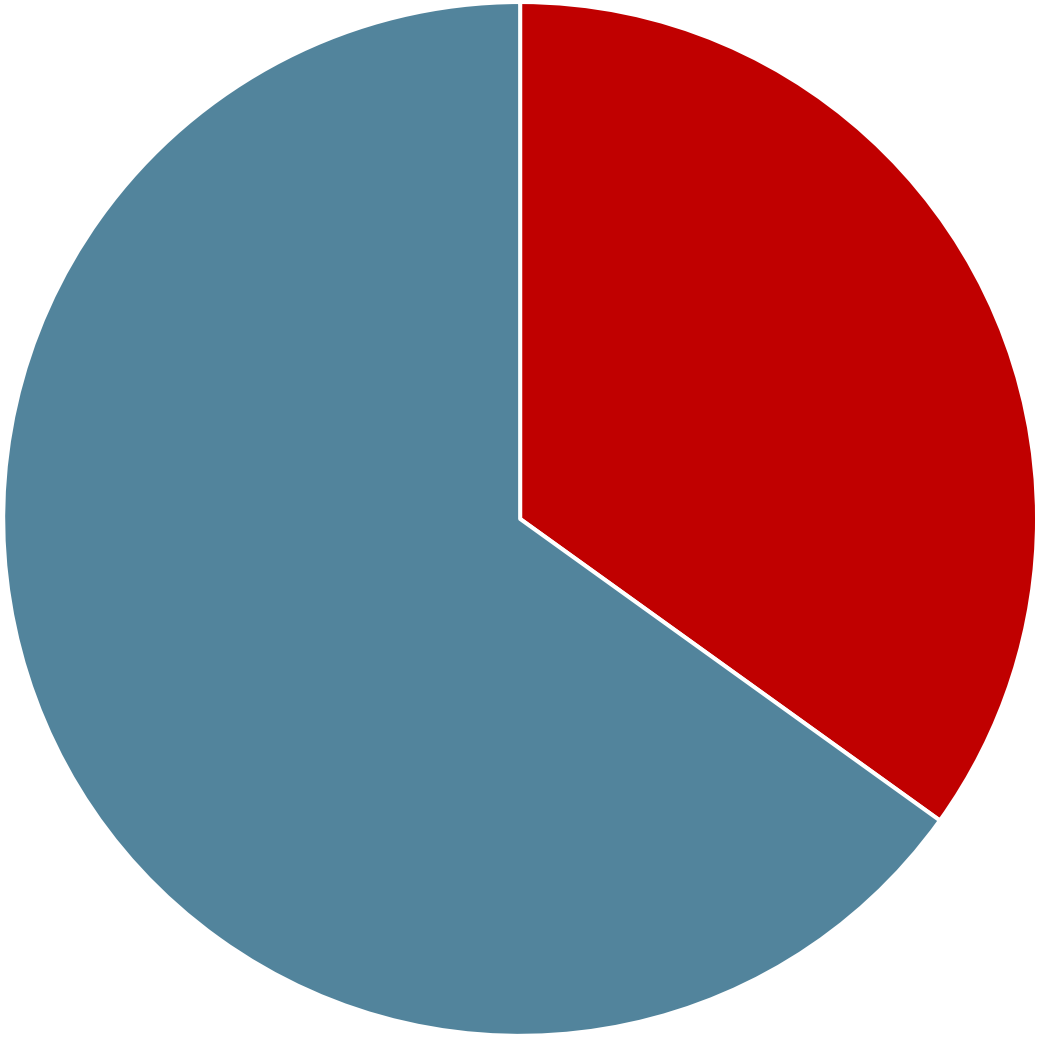
NC Population on Private Wells (797,396 people)



NC Population in 2022

PFAS Currently in Drinking Water in NC

Over 3.6 million North Carolinians are estimated to have PFAS in their drinking water *ABOVE* the federal MCLs



NC Population in 2022

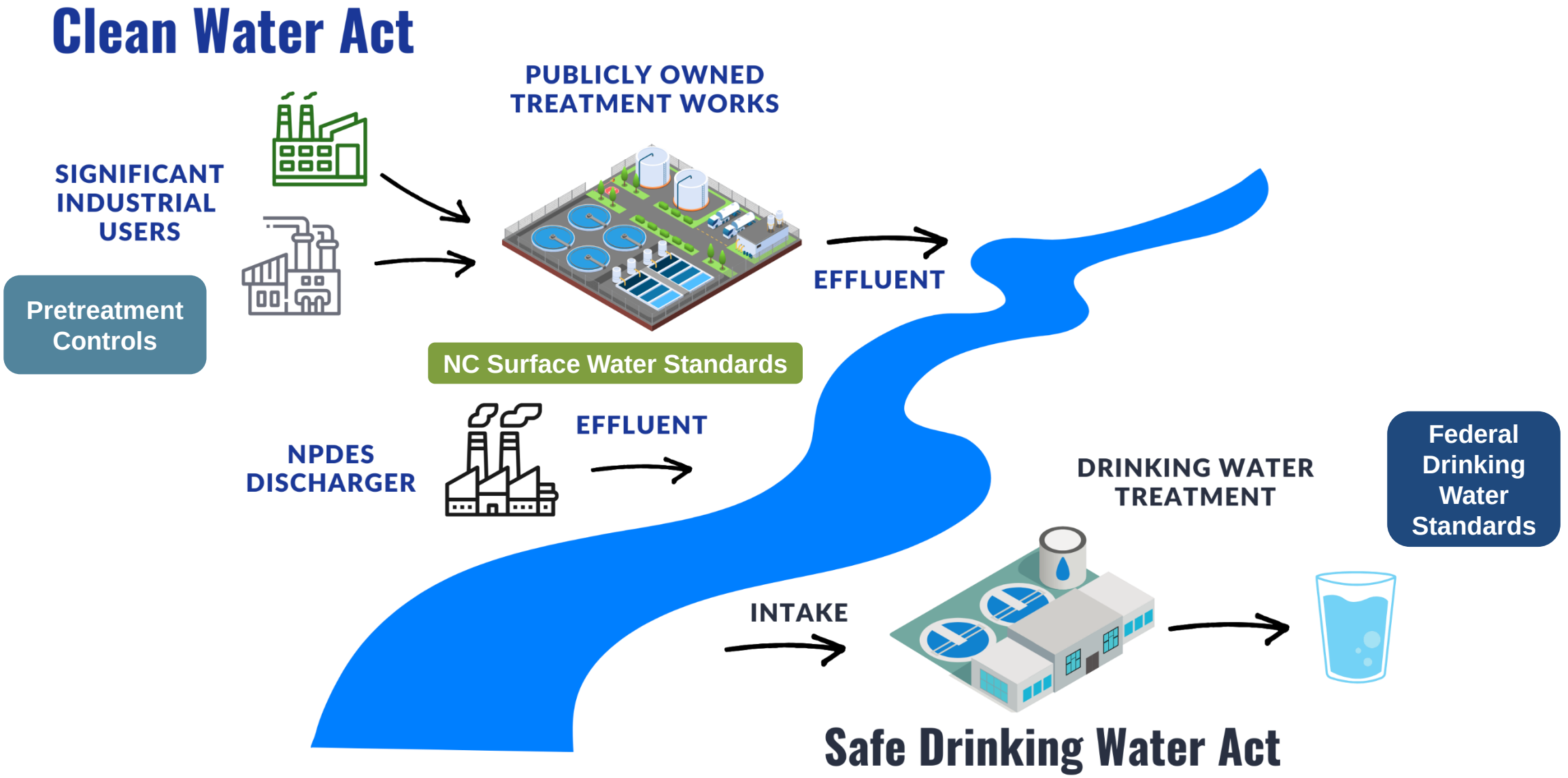
Proposed PFAS Compounds for Surface Water Standards Development

	PFAS Compound	Acronym
1	Perfluorooctane sulfonic acid	PFOS
2	Perfluorooctanoic acid	PFOA
3	Hexafluoropropylene oxide dimer acid	HFPO-DA (GenX)
4	Perfluorobutanesulfonic acid	PFBS
5	Perfluorononanoic acid	PFNA
6	Perfluorohexanesulfonic acid	PFHxS
7	Perfluorobutanoic acid	PFBA
8	Perfluorohexanoic acid	PFHxA

Why these specific PFAS Compounds?

1. Health effects of all compounds are published in peer-reviewed scientific studies and have been evaluated by a federal agency and other scientific experts
2. This health effects data supports development of a reference dose and/or cancer slope factor
3. All compounds have been detected in NC's environmental media (for example: air, water, soil, and fish)
4. All compounds can be accurately measured by EPA Test Method 1633

Upstream Impacts on Surface Water Intakes and Drinking Water Treatment Burden



How the Standards Are Derived

- PFAS numeric values determined as follows:
  1. Derived per the procedures and calculations described in EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B-00-004, October 2000) and the exposure values currently supported by EPA (EPA 820-F-15-001, June 2015) or,
  2. Based on the 2024 EPA Safe Drinking Water Act PFAS Maximum Contaminant Levels (MCLs)

- PFAS standards are protective of both the water supply and fish tissue consumption designated uses (for example: public drinking water sources)

Toxicological Values for Standards Calculations

1. Reference Dose (RfD)

   Value a person can be exposed to for a lifetime without health impacts

2. Cancer Slope/Potency Factor (CSF or CPF)

   The cancer risk based on dose of exposure

3. Bioaccumulation Factor (BAF) or Bioconcentration Factor (BCF)

   Value a chemical is taken up from water and diet (BAF) or water alone (BCF)

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Toxicity Information Available for Deriving Water Supply Standards for PFAS

	PFAS Compound	Reference	Critical Health Effects	Toxicity Benchmarks and Values Available
1	PFOS	2023 EPA Toxicity Assessment+	Developmental and Cardiovascular effects	RfD, **CSF**, MCL
2	PFOA	2023 EPA Toxicity Assessment+	Renal cell carcinomas	RfD, **CSF**, MCL
3	HFPO-DA (GenX)	2021 EPA Toxicity Assessment+	Liver effects	RfD, **MCL**
4	PFBS	2021 EPA Toxicity Assessment+	Thyroid effects	**RfD**
5	PFNA	2021 ATSDR** Toxicity Assessment+	Developmental effects	**RfD**^, MCL
6	PFHxS	2021 ATSDR** Toxicity Assessment+	Thyroid effects	**RfD**^, MCL
7	PFBA	2022 EPA IRIS Assessment	Liver and Thyroid effects	**RfD**
8	PFHxA	2023 EPA IRIS Assessment	Developmental effects	**RfD**

*PFOS & PFOA values are based on carcinogenic toxicity values. For compliance purposes, if the calculated effluent limit for PFOA or PFOS is less than the Limit of Quantitation of 4.0 ng/L then the permit effluent limits will be set at 4.0 ng/L in Rule .0404(f) - Water Quality Based Effluent Limitations

+Used as basis for EPA's PFAS National Primary Drinking Water Regulation (NPDWR)
^RfD used in NPDWR has been evaluated/modified to protect for lifetime exposures
**ATSDR= Agency for Toxic Substances and Disease Registry

Toxicity Information Available for Deriving Fish Consumption Standards for PFAS

	PFAS Compound	Reference	Critical Health Effects	Toxicity Benchmarks and Values Available
1	PFOS	2023 EPA Toxicity Assessment+	Developmental and Cardiovascular effects	RfD, **CSF**, MCL
2	PFOA	2023 EPA Toxicity Assessment+	Renal cell carcinomas	RfD, **CSF**, MCL
3	HFPO-DA (GenX)	2021 EPA Toxicity Assessment+	Liver effects	**RfD**, MCL
4	PFBS	2021 EPA Toxicity Assessment+	Thyroid effects	**RfD**
5	PFNA	2021 ATSDR** Toxicity Assessment+	Developmental effects	**RfD**^, MCL
6	PFHxS	2021 ATSDR** Toxicity Assessment+	Thyroid effects	**RfD**^, MCL
7	PFBA	2022 EPA IRIS Assessment	Liver and Thyroid effects	**RfD**
8	PFHxA	2023 EPA IRIS Assessment	Developmental effects	**RfD**

*PFOS & PFOA values are based on carcinogenic toxicity values. For compliance purposes, if the calculated effluent limit for PFOA or PFOS is less than the Limit of Quantitation of 4.0 ng/L then the permit effluent limits will be set at 4.0 ng/L in Rule .0404(f) - Water Quality Based Effluent Limitations

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**ATSDR= Agency for Toxic Substances and Disease Registry

General Criteria Derivation Calculation (USEPA, 2000)

Water + Fish Consumption (Water Supply Waters)

Noncancer**

$$WQS = RfD \times RSC \times \frac{BW}{WCR + (FCR\ x\ BCF)}$$

Cancer**

$$WQS = \frac{RL}{CPF} \times \frac{BW}{WCR + (FCR\ x\ BCF)}$$

RL = Risk Level = $1x10^{-6}$

WQS = Water Quality Standard

Toxicity benchmarks

RfD = Oral Reference Dose

CPF = Carcinogen Potency Factor or Cancer Slope Factor (CSF)

Exposure Factors

RSC = Relative Source Contribution

BW = Body Weight = 80 kg*

WCR = Water Consumption Rate = 2.4 L/day*

FCR = Fish Consumption Rate = 22.0 g/person-day*

BCF = Bioconcentration Factor or Bioaccumulation Factor (BAF), if available

*Values currently used by EPA for National Recommended Criteria (EPA 820-F-15-001, June 2015)

**From EPA Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA-822-B-00-004, October 2000). Modified to show differences in cancer & non-cancer calculations.

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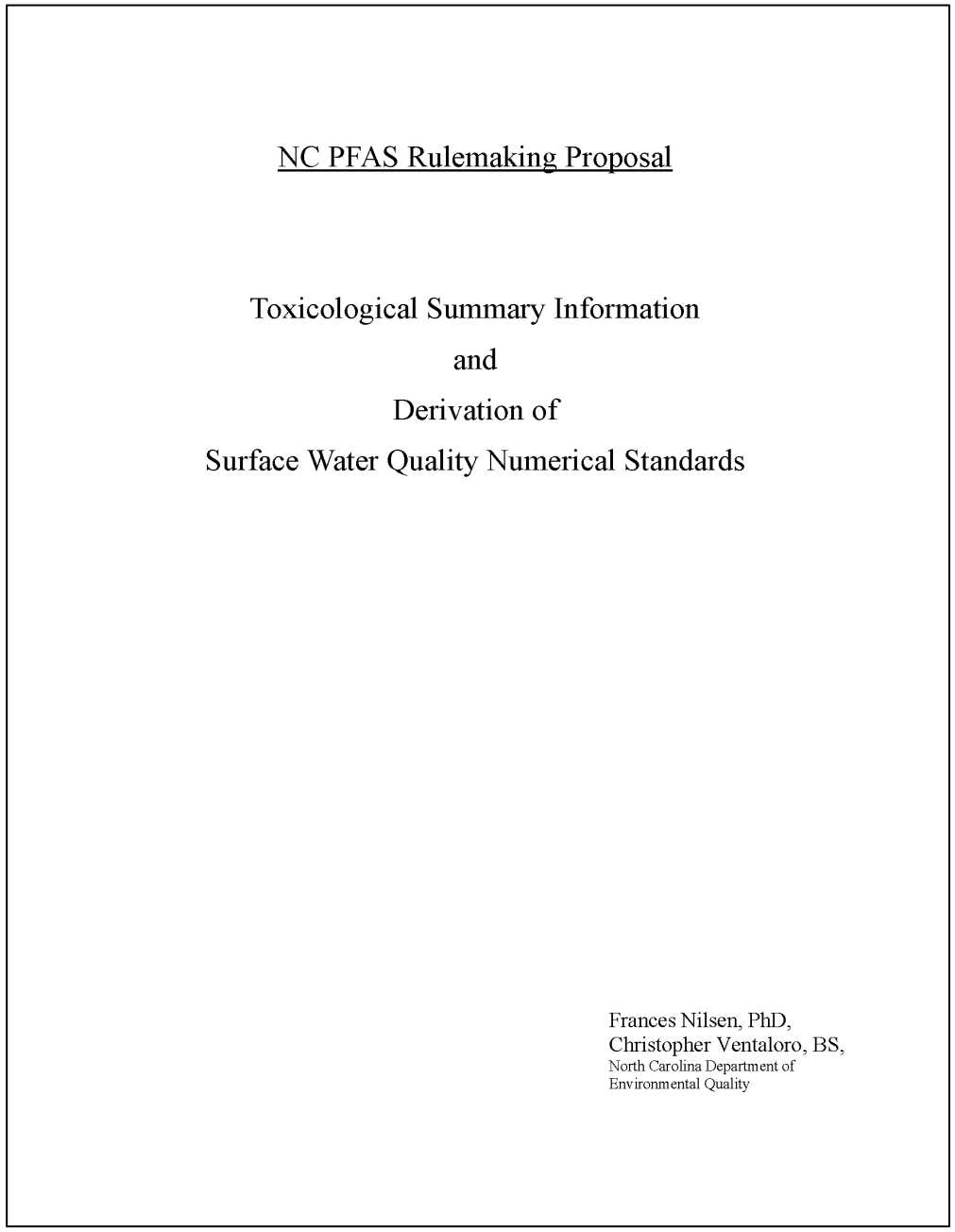

- Full summary of toxicological basis is included in the Regulatory Impact Analysis.
- Highlights principal studies and health effects.
- Defines toxicological values and their basis.
- Discusses derivation of PFAS water quality criteria for discharges to water supply and non-water supply waters.

Title 15A NCAC Subchapter 02B – Surface Water and Wetland Standards

Section .0200: Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina

.0201, .0202, .0203, .0204, .0205, .0206, .0208, **.0211**, **.0212**, **.0214**, **.0215**, **.0216**, **.0218**, .0219, **.0220**, .0221, .0222, .0223, .0224, .0225, .0226, .0227, .0228, .0230, .0231

Summary of Proposed PFAS Standards to be added to 02B

PFAS Compound	Proposed 02B Numeric Criteria		Permit Effluent Limit
	Water Supply (ng/L) 15A NCAC 02B .0212, .0214, .0215, .0216, .0218	Non-Water Supply Waters (Class C & SC-Fish Consumption) (ng/L) 15A NCAC 02B .0211 & .0220	
PFOS*	0.06	0.06	Calculated based on site-specific conditions. If PFOS and PFOA effluent limits are calculated at < 4.0 ng/L, the effluent limits will be 4.0 ng/L (for those permits with reasonable potential to exceed the 02B numeric criteria).
PFOA*	0.001	0.01	
HFPO-DA (GenX)	10	500	
PFBS	2,000	10,000	
PFBA	6,000	200,000	
PFHxA	3,000	200,000	
PFNA	9	20	
PFHxS	10	70	

* Proposed health-based standards for PFOA and PFOS are below Limit of Quantitation. Permit effluent limit compliance for PFOA and PFOS will be determined based on 4.0 ng/L as reported by EPA as a Limit of Quantitation from national lab validation of the wastewater test method (1633).

NPDES Implementation Rules & Update

Surface Water in North Carolina

What is surface water?

- Surface Water is considered any body of water above ground, including streams, rivers, and lakes. It is a key component of the hydrologic cycle and provides various societal and ecosystem services, including drinking water, agricultural irrigation, and habitat for aquatic plants and wildlife.

Total discharges to surface waters NC (maximum permitted flow)

- Publicly owned treatment works (POTWs) with pretreatment programs: ~1,188 million gallons per day
- Industrial Dischargers (Majors): ~305 million gallons per day

Example uses of surface water in NC

- 22% of community drinking water systems use surface water as source water (~444 systems)
- 41% of large public water supply (PWS) systems serving more than 10,000 people exceed EPA PFAS maximum contaminant levels (MCLs).
- Approximately 3.6 million residents are impacted by drinking water quality that exceeds EPA PFAS MCLs.

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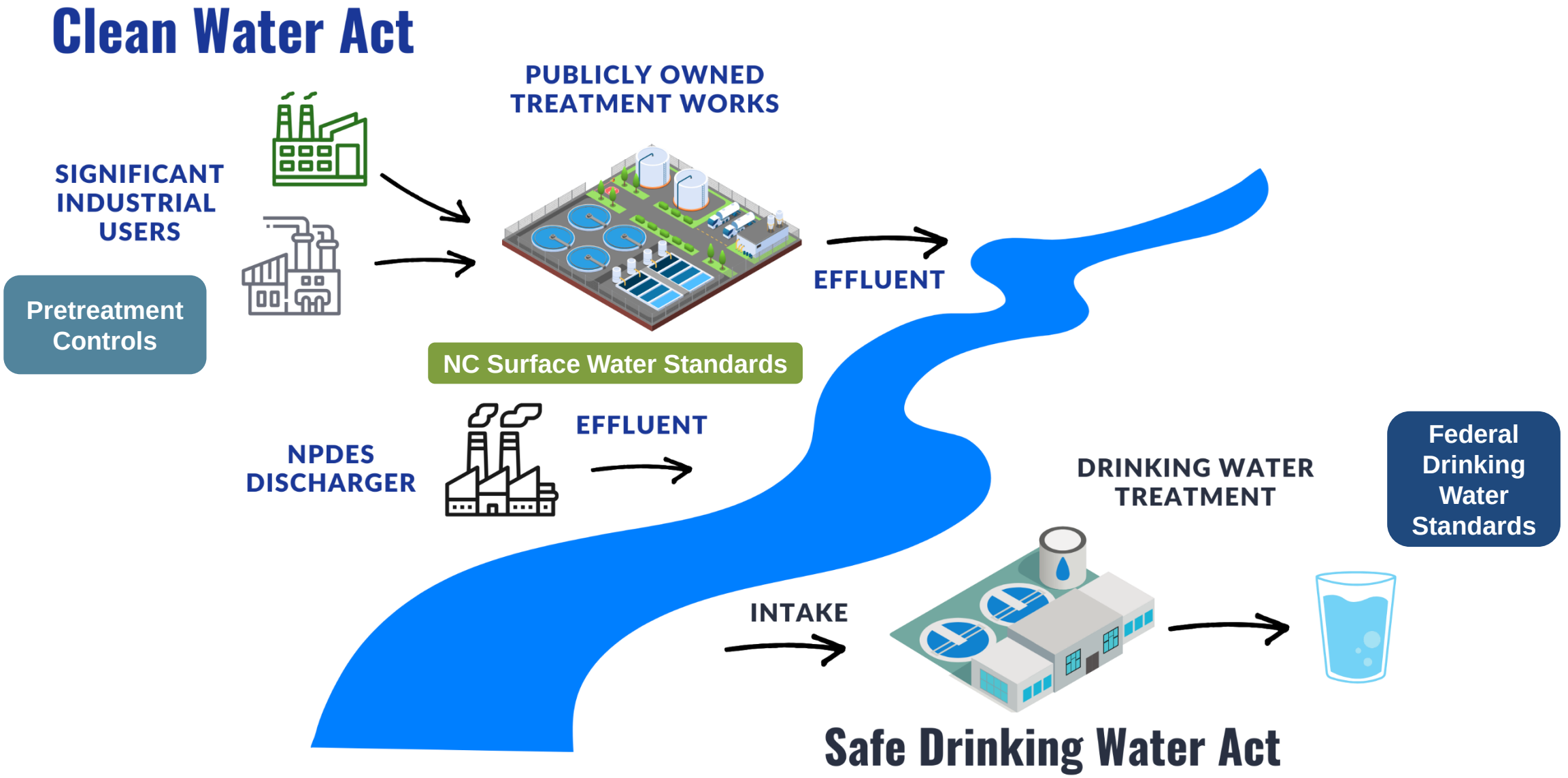
PFAS Surface Water Quality Standards Rulemaking Guiding Principles

- Protect drinking water sources from upstream dischargers and other sources of contaminants into surface water.
- Reduce drinking water treatment cost burden to North Carolinians by addressing upstream dischargers.
- Reduce wastewater treatment cost burden to North Carolinians by addressing dischargers with background sources (e.g., residential) or are passive receivers after upstream reductions have occurred.
- Provide clarity to regulated sources and reasonable time for monitoring and taking actions to meet effluent limits.

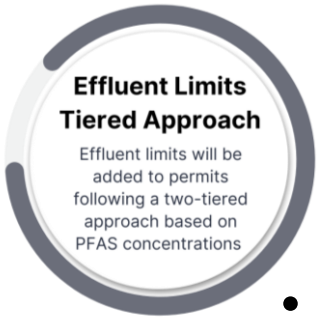
Upstream Impacts on Surface Water Intakes and Drinking Water Treatment Burden



Number of Facilities Anticipated to be Associated with a PFAS Use Industry

Permit/Facility Type	# of Permits or Facilities	# of PFAS Affected Facilities
Industrial Direct Dischargers	56	39
POTWs with Pretreatment Programs	126	113
Significant Industrial Users	606	464

NPDES Implementation of PFAS Standards



Why Assessment Monitoring and Tiers?

- To allow time for large municipalities with many industrial users to initiate industrial and effluent monitoring that enables them to identify sources and implement measures that will reduce PFAS loadings.

- To address facilities that are discharging significant amounts of PFAS (PFOA, PFOS and GenX) in their wastewaters in Tier 1.

- To allow time for downstream facilities to see improvements in the level of PFAS in source waters, which would reduce their treatment costs.

- To allow time for background levels (or what is often referred to as residential levels) to be assessed.

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NPDES Permitting

- For PFOA and PFOS, the Limit of Quantitation in EPA test method 1633 is 4.0 ng/L.
- Effluent limits for PFOA and PFOS that are calculated to be less than the Limit of Quantitation shall be given a permitted effluent limit of the Limit of Quantitation which is 4.0 ng/L.
- Programs Not Included: Minor POTWs without pretreatment programs, 100 percent domestic non-municipal wastewater treatment plants, and NPDES facilities with General Permits shall not be evaluated by the Division for PFAS limits unless there is reasonable potential for their wastewaters to contain PFAS and their discharge impacts a downstream water use designation.
- NPDES permits for new sources or new dischargers for industrial direct dischargers, Major POTWs, or Major or Minor POTWs with pretreatment programs shall include PFAS effluent limits based on PFAS water quality standards that have a reasonable potential to cause or contribute to exceedance of any PFAS water quality standards.

NPDES Permitting Stakeholder Feedback

Results of stakeholder discussions have been incorporated into 2B PFAS rules in Section 15A NCAC 02B .0404 Water Quality Based Effluent Limitations.

- Report all PFAS analyzed in EPA test method 1633 (EPA is requiring this)
- Limited implementation to two tiers to identify and prioritize all dischargers that are contributing PFAS in Tier 1. This reduces the costs of compliance for dischargers in Tier 2. This approach reduces costs for downstream drinking water systems.
- Tier 1 facilities can request to move to Tier 2 if the PFAS in their effluent discharge is not greater than 10 percent of the PFAS in their source surface water intake.
- For PFOA and PFOS values reported less than the Limit of Quantitation, the facility shall report to the Division the actual numerical lab measurement for all samples.

Fiscal Analysis Snapshot

Cost-Benefit Analysis Approach

Costs

- What are the costs associated with the proposed PFAS regulatory changes?

Private Sector

Local Government

State Government

Benefits

- Estimate the anticipated benefits of the proposed PFAS rules and their alternatives, including quantification and monetization.

Quantitative: Human Health & Preservation of Property Value

Qualitative: Additional Human Health Benefits, Co-Pollutant Removal, & Shift to Polluter Pays

Public Water Supply and Private Well Treatment Cost Savings

Regulatory Impact Analysis

- The attached Fiscal and Regulatory Impact Analysis (RIA) was developed per G.S. 150B-21.4.
  - Includes reason for rule amendment, fiscal analysis approach, cost and benefits summary, and rule alternatives
  - Supporting Information
    - Appendix A – Toxicological Summary Information and Derivation of Surface Water Quality Criteria
    - Appendix B – Proposed PFAS Surface Water Rules
    - Appendix C – NCDEQ - Costs and Benefits to Industry, the Public, and the Environment Associated with NCDEQ's Proposed Per- and Polyfluoroalkyl Substances

Fiscal Analysis Summary

Impact Summary of Proposed Rules from 2024-2060:

Monitoring & Treatment Costs

- Total costs to private and public entities are projected to be $11,193,892,532 over 36 years.

Monetized Benefits

- Total benefits projected to be $11,675,248,686* over 36 years and includes:
  - Human health benefits
  - Savings to downstream drinking water utilities
  - Private well avoided treatment
  - State and federal wastewater infrastructure funding
  - Preservation of property value

Qualitative Benefits

- Extensive avoided health impacts:
  - Additional Cancers not monetized
  - Cardiovascular and Endocrine effects avoided for improved quality of life
  - Reproductive, Developmental, and Neonatal effects avoided for healthier children
- Removal of co-pollutants
- Shifting treatment burden from rate payers to polluters

*Does not include natural and environmental resource benefits as reports are expected in the coming months. This valuation is expected to be significant and will further increase the total benefits value estimated here.

Fiscal Analysis Key Takeaways

1. Impacts to regulated industries and POTWs are significant due to the presence of PFAS contamination throughout North Carolina.
2. Monetized benefits to the state as a whole and over 10 million residents outweigh the costs through improvements in short and long-term health, quality of life, preservation of property value, and other societal and economic factors.
3. Non-monetized benefits provide additional value to the state's residents, economy, and the environment.
4. Lack of action is projected to place an extensive financial burden on North Carolinians that exceeds the total costs and benefits of the proposed rules.
5. EMC and the public must **equally weigh** both costs and benefits to address PFAS pollution.

Recommendation

Recommendation

Approval to proceed to the EMC with request for public notice and hearings for the proposed rule amendments to Surface Water Quality Standards Rules 15A NCAC 02B .0211, .0212, .0214, .0215, .0216, .0218, and .0220 and Permitting Rule .0404 and the associated Fiscal and Regulatory Impact Analysis.

Questions?

Julie A. Grzyb
Deputy Director
Division of Water Resources
NC DEQ
julie.grzyb@deq.nc.gov

Chris Ventaloro
Water Quality Standards Coordinator
Division of Water Resources
NC DEQ
christopher.ventaloro@deq.nc.gov

Stephanie C. Bolyard, PhD
Senior Engineer to the Assistant Secretary
Secretary's Office NC DEQ
Stephanie.Bolyard@deq.nc.gov