Regulatory Impact Analysis

Rule Citation:	15A NCAC 02L .0202
Rule Title:	Groundwater Quality Standards
DEQ Division:	Division of Water Resources (DWR)
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Impact Summary:	State government:	Yes
	NC DOT:	Yes
	Local government:	Yes
	Federal government:	Yes
	Private entities:	Yes
	Substantial Impact:	Unknown; net benefit expected

1. Necessity for Rule Change

North Carolina is required by N.C. General Statute 143-214.1 and N.C. Administrative Code Subchapter 15A NCAC 02L to adopt groundwater quality standards to protect the use of groundwater as a source of drinking water. Further, the Division of Water Resources (DWR) is required by Rule 15A NCAC 02L .0202(g) to evaluate and revise, as necessary, these standards every three years. This process is known as the "triennial review." The 2016 triennial review has been completed, and DWR has identified 47 contaminants for which standards should be adopted such that the rule will reflect the most recent health and toxicological information. As research supporting our understanding of the human health effects of contaminants found in groundwater advances, updating the groundwater standards ensures that cleanup requirements are set at a level that minimizes the risk that private well water consumers (including sensitive subgroups) will experience adverse health effects over a lifetime of exposure without being unduly burdensome for site owners.

2. Purpose of Rule

In accordance with Rule 15A NCAC 02L .0103(a), the purpose of the rules established in Subchapter 15A NCAC 02L is to "maintain and preserve the quality of the groundwaters, prevent and abate pollution and contamination of the waters of the State, protect public health and permit management of the groundwaters for their best usage by the citizens of North Carolina." Historically, the North Carolina Environmental Management Commission (EMC) has considered the best usage of groundwaters of the State to be as a source of drinking water.

The groundwater quality standards (hereafter referred to as "the standards" or "groundwater standards") for the protection of the groundwaters of the State are codified in subject Rule 15A NCAC 02L .0202. These standards represent the maximum allowable concentrations resulting from any discharge of contaminants to the land or waters of the State that may be tolerated without creating a threat to human health or that would otherwise render the groundwater unsuitable for its intended best usage. The standards are used by various State regulatory programs to protect groundwater as a source of drinking water. The standards should not be confused with "maximum contaminant levels" (MCLs) which are established as part of the federal Safe Drinking Water Act and apply only to the treated drinking water supplied by public drinking water systems.

The EMC is proposing to adopt groundwater quality standards for 47 contaminants. The proposed standards are based on the most current available toxicological information and other relevant health risk assessment data in accordance with the criteria for establishing groundwater standards found in 15A NCAC 02L .0202(d), (e), and (f).

2.1 Regulatory Programs that use the Groundwater Standards

The groundwater standards are used primarily by the following State regulatory programs to establish target cleanup levels:

- Brownfields (NC DEQ-DWM)
  - reuse of abandoned or underutilized contaminated property;
- Underground Storage Tanks (NC DEQ-DWM)
  - regulates USTs that store petroleum or certain hazardous substances;
  - closure activities and corrective actions to address spills and releases from USTs;
- Superfund (NC DEQ-DWM)
  - monitoring and remediation of hazardous substance and waste disposal sites;
  - includes the Inactive Hazardous Sites program, which addresses contamination at more than 1,900 chemical spill or disposal sites and about 700 landfills that operated prior to 1982;
  - includes the Dry-cleaning Solvent Cleanup program, which addresses contamination at dry cleaner sites;
- Solid Waste (NC DEQ-DWM)
  - permitting and compliance of solid waste facilities that include municipal solid waste landfills, industrial waste landfills, and construction/demolition waste landfills;
- Hazardous Waste (NC DEQ-DWM)
  - prevention of hazardous substance release;
  - groundwater monitoring to determine extent of contamination;
  - cleanup of contaminated sites;
- Non-Discharge (NC DEQ-DWR)
  - permitting of wastewater treatment and disposal/reuse systems while avoiding discharge to surface waters;
  - includes wastewater irrigation, high-rate infiltration, residuals management;
- Groundwater Protection (NC DEQ-DWR)
  - permitting and monitoring of injection, remediation, and recovery wells as well as some high capacity drinking water wells.

- Asphalt Testing Program (NC DOT)
  - under the Roadside Environmental Unit, perform on-site testing of asphalt for Department construction activities.

3. Regulatory Baseline

As part of the permanent rulemaking process, North Carolina General Statute 150B-19.1 requires agencies to quantify to the "greatest extent possible" the costs and benefits to affected parties of a proposed rule. To understand what the costs and benefits of the proposed rule changes would be to regulated parties, it is necessary to establish a regulatory baseline for comparison. For the purpose of this fiscal note, the following items are considered to comprise the baseline:

- the current version of Rule 15A NCAC 02L .0202 (effective March 6, 2018);

- the Practical Quantitation Limit for each contaminant (Table 1). This is consistent with 15A NCAC 02L .0202(c) which states that "substances which are **not naturally occurring** and for which **no standard is specified** shall not be permitted in concentrations at or above the practical quantitation limit. . . ."

  > Practical Quantitation Limit -- or "PQL" -- is defined in 15A NCAC 02L .0201 as "the lowest concentration of a given material that can be reliably achieved among laboratories within specified limits of precision and accuracy by a given analytical method during routine laboratory analysis."

  Rule 15A NCAC 02L .0202 (b)(3) further clarifies: "Where naturally occurring substances exceed the established standard, the standard shall be the naturally occurring concentration as determined by the Director." Of the 40 organic contaminants in this rulemaking, none are considered "naturally occurring" and none have a standard already adopted; therefore, the PQL is the regulatory baseline for the 40 organic contaminants. Of the seven metal/inorganic contaminants, all seven can be found in their elemental form in the environment. Where these metals are found in groundwater at levels above natural background concentration, it is typically the result of anthropogenic inputs such as from industrial processes. For this reason, it is assumed that none of these metals will be found at natural background concentrations greater than their corresponding PQL. As such, the PQL will also be considered the regulatory baseline for all seven inorganic/metal contaminants.

  The majority of PQLs used as the baseline in this analysis were established by either the DEQ Water Sciences Laboratory[1] or by commercial laboratories that have been certified by DEQ. PQLs were sought from commercial laboratories only for those contaminants for which a PQL was not available from the DEQ Water Sciences Laboratory.

  PQLs can vary from laboratory to laboratory as well as within a laboratory based upon equipment used or other factors such as matrix effects and dilution; for this reason, we compared PQLs from several of the larger commercial laboratories certified by DEQ. In most

[1] *For PQL values:* NCDEQ Chemistry Laboratory "QA/QC Limits PQLs" https://files.nc.gov/ncdeq/Water+Quality/Chemistry+Lab/Operations/Quality+Assurance/NCDENR_DWR_WSS_LAB_PQLs.pdf

cases, the PQLs reported by commercial laboratories for a given contaminant were uniformly higher or lower than our proposed standard; in those cases, we concluded that the selection of a PQL from a particular laboratory over another would have no effect on the impact of the proposed rule.

For a handful of contaminants, there was more variability between PQLs reported by different commercial laboratories. In the case of acetic acid, for example, one lab reported a PQL of 1,000 µg/L and another reported a PQL of 10,000 µg/L. In these cases, we considered the lowest reported PQLs as the regulatory baseline from which to compare the potential effects of our proposed standards. We reasoned that the lowest PQL best represented the capability of commercial laboratories and would be more typical of current regulatory requirements.

There were three contaminants for which a PQL was not available from either the DEQ Water Sciences Laboratory or a DEQ-certified commercial laboratory. For 1,4-dibromobenzene, we used a PQL from the DEQ Water Sciences Laboratory for the chemically-similar contaminant bromobenzene[2]. For acetochlor ESA and acetochlor OXA, we substituted the Lowest Concentration Minimum Reporting Level (LCMRL) as reported in EPA Method 535[3] for the PQL. As described in EPA 815-R-11-001 the LCMRL "represents an estimate of the lowest concentration of a compound that can be quantitatively measured by members of a group of experienced drinking water laboratories."

It is important to note that Interim Maximum Allowable Concentrations (IMAC) have been established, per Rule 15A NCAC 02L .0202, for 44 of the 47 contaminants proposed for adoption; however, because IMACs are established on a temporary basis by the Director of DWR -- and not through the permanent rulemaking process -- they are not considered the regulatory baseline. The estimated fiscal impact of the proposed rulemaking would likely be considerably reduced in most cases if this analysis were to take into account the 44 existing IMACs when these health-based values are higher than the PQL. The contaminants for which there is not an existing IMAC are: 2,6-dinitrotoluene; perfluorooctane sulfonic acid (PFOS); and strontium.

There are five contaminants for which the proposed standard is lower than the IMAC: acetochlor ESA, acetochlor OXA, 2,4-dinitrotoluene, n-butanol, and perfluorooctanoic acid (PFOA). Compared to the current IMACs, these proposed standards could potentially increase remediation costs at sites for which one or more of these contaminants is the driver. The impact of the proposed standards in relationship to the IMACs for these contaminants is summarized in Section 7; however, the main focus of this analysis is the impact as compared to the PQLs. The North Carolina Office of State Budget and Management considers the PQLs to be the regulatory baseline because of the temporary nature of the IMACs and their creation outside of the rulemaking process. Generally, temporary rules are not part of the regulatory baseline because of their time-limited status and because they have not been subject to the

[2] *For identification of chemically-similar contaminant to 1,4-dibromobenzene*: U.S. EPA Chemistry Dashboard https://comptox.epa.gov/dashboard/dsstoxdb/results?search=DTXSID4024012#similar-molecules

[3] *For LCMRL values for Acetochlor ESA and OXA:* U.S. EPA Document # EPA/600/R-05/053 "Method 535. Measurement of Chloroacetanilide and other Acetamide herbicide degradates in drinking water by solid phase extraction and liquid chromoatography/tandem mass spectrometry (LC/MS/MS)" Version 1.1, April 2005, J.A. Shoemaker, M.V. Bassett

permanent rulemaking process, particularly economic analysis, public comment, and external review.

4. Proposed Changes to the Baseline

The only proposed changes to the subject rule are the adoption of standards for the 47 contaminants listed in Table 1. No changes are proposed to the existing standards already in rule. Of these 47 contaminants, 7 are metals/inorganics and 40 are organics. They include pesticides/herbicides, petroleum products/fuels, and chemical manufacturing/industrial solvents. Most have multiple uses that cross industries and regulatory programs.

Table 1: Groundwater Standards Proposed for Adoption

Contaminant	Proposed Standard µg/L (ppb)	PQL all reported in µg/L (ppb)							Is the proposed standard ≤ PQL?
		State Lab	Certified Commercial Lab					Based on LCMRL	
			#1	#2	#3	#4	#5		
Metals/Inorganics									
antimony and compounds	1	**10**							Yes
beryllium and compounds	4	**5.0**							Yes
cobalt and compounds	1	**50**							Yes
strontium and compounds	2,000	**10**							No
thallium and compounds	2	**2.0**							Yes
tin (inorganic forms)	2,000	**10**							No
vanadium and compounds	7	**10**							Yes
Organics									
acetic acid	5,000			**1,000**		10,000			No
acetochlor	100			**4.0**					No
acetochlor ESA	500							**0.4**	No
acetochlor OXA	500							**0.5**	No
acetophenone	700		4	10	10	**2**	10		No
acrolein	4		**5**	20	10	100	10		Yes
alachlor	2			**4**		6			Yes
aldrin	0.002	**0.03**							Yes
benzyl alcohol	700	**30**							No
bromomethane	10	**2**							No
n-butanol	590			**50**		250	**50**		No
sec-butanol	10,000		5,000	5,000			**250**		No

Contaminant	Proposed Standard µg/L (ppb)	PQL all reported in µg/L (ppb)							Is the proposed standard ≤ PQL?
		State Lab	Certified Commercial Lab					Based on LCMRL	
			#1	#2	#3	#4	#5		
4-chlorotoluene	24	**1**							No
dalapon	200		5	5.0		**4**			No
1,4-dibromobenzene	70	**1**[+]							No
dichloroacetic acid	0.7			**1.0**	**1**				Yes
p,p'-DDE	0.1	**0.03**							No
2,4-dichlorophenol	0.98	**10**							Yes
2,4-dinitrotoluene	0.05	**10**							Yes
2,6-dinitrotoluene	0.05	**10**							Yes
dinoseb	7	**0.6**							No
diphenyl ether	180		10	10	10	**2**			No
diquat	20			**2.0**					No
endosulfan sulfate	40	**0.03**							No
endothall	100			**10**		20			No
alpha-hexachlorocyclohexane	0.006		0.04	**0.0013**		0.01	0.02		No
beta-hexachlorocyclohexane	0.02		0.04	**0.0013**		0.01	0.02		No
2-hexanone	40		10	10	**5**	10	10		No
4-isopropyltoluene	25	**1**							No
methyl isobutyl ketone	100		**10**	**10**		**10**	**10**		No
methyl methacrylate	25		5	**2.0**	2	5	10		No
1-methylnapthalene	1		1.6	0.8	10	**0.5**	1		No
2-methylphenol	400	**10**							No
perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) (Total)	0.07		**0.002**	**0.002**		2	**0.002**		No
Propylene glycol	100,000		50,000	**10,000**		**10,000**	**10,000**		No
1,2,4,5-tetrachlorobenzene	2		5	10	10	**2**	10		Yes
1,1,1,2-tetrachloroethane	1	**1**							Yes
1,1,2-trichloroethane	0.6	**1**							Yes
2,4,5-trichlorophenol	63	**10**							No
2,4,6-trichlorophenol	4	**10**							Yes

[+] PQL for chemically-similar compound bromobenzene;
Values shown in **bold** indicate regulatory baseline for purposes of this fiscal analysis, as described in Section 3.

5. Human Health Outcomes and the Environment

The contaminants for which we are proposing standards are encountered in the environment at a wide range of sites. These sites can include chemical industry, furniture industry, abandoned hazardous waste, landfills, metalworking, wood treating, printing, plating, asphalt testing, and military facilities. We encounter solvents at furniture manufacturing and restoration, textile, wood treating, landfill and paint and printing sites. We encounter pesticides, herbicides, intermediates and solvent carriers at sites where agricultural chemicals have been stored, disposed or spilt during mixing. Metals are frequently found in groundwater at metal working, finishing, and plating sites. In addition to direct releases, some contaminants change the chemistry of the subsurface and mobilize naturally-occurring metals.

One tool we use to help protect groundwater from this ubiquitous usage and potential discharge of chemicals is the set of groundwater standards codified in Rule 15A NCAC 02L .0202. These standards are adopted to prevent chemical contamination of the groundwaters of the state so that they can be suitable for use as a source of drinking water.

Because the standards are established for the protection of waters that may be used for human consumption, it is critical to consider how the proposed standards could affect public health outcomes. The population that is potentially most directly affected by a change to the standards are the over three million North Carolina residents who use self-supported domestic water (i.e., wells)[4]. The residents who rely on public groundwater supplies are not covered by this analysis because the North Carolina groundwater standards are not applicable to these systems. Public drinking water systems are regulated under separate federal "maximum contaminant levels" (MCLs).

All of the groundwater standards proposed in this rulemaking are supported by the most recent health effects data or odor and taste thresholds published by the U.S. Environmental Protection Agency (EPA) or other relevant peer-reviewed, published data. For example, when developing standards, DWR often consults EPA's Integrated Risk Information System (IRIS) database. The IRIS database provides high-quality risk assessments that detail the potential human health effects of hundreds of different chemicals and provide toxicological information necessary to develop standards that are protective of human health.

The majority of this regulatory impact analysis is concerned with quantifiable and non-quantifiable costs and benefits to regulated parties and government agencies. In order to consider these economic impacts, we had to establish a regulatory baseline. Discussed in Section 3, the regulatory baseline we used is the Practical Quantitation Limit, or PQL. The PQL is a technology-based value used by laboratories to communicate their confidence in their test results. The PQL is not based on health effects data; as such, it should not be compared to a groundwater standard for purposes of determining human health impacts.

To further explain, in this analysis we compare the proposed groundwater standards to the PQLs when considering costs to regulated parties. This is because the adoption of the standard will replace the PQL as the regulatory baseline – the standard and the PQL can be compared when

[4] *For estimated number of private groundwater well users in North Carolina:* https://epi.dph.ncdhhs.gov/oee/wellwater/figures.html

looking at regulatory effects. But it would not be appropriate to compare the standards to the PQL when considering human health effects because the standard is a health- or aesthetics-based value and the PQL is not. The PQL does not inform the level of human health protection of the standard.

Some of the proposed standards in this rulemaking are numerically higher than the PQL and may therefore provide some measure of regulatory relief. Although providing regulatory relief, the higher standards will not adversely affect health outcomes of consumers of well water. This is because neither the PQLs nor the proposed standards surpass the risk management levels established in Rule 15A NCAC 02L .0202(d). For example, for p,p'-DDE (a breakdown product of commercial pesticide DDT, a known carcinogen) the PQL is 0.03 µg/L and the proposed standard is 0.1 µg/L. Although the standard is higher than the PQL, and that could provide regulatory relief, neither the PQL nor the standard surpasses the lifetime cancer risk of one in a million, as required by Rule 15A NCAC 02L .0202(d)(2). In this context, the two values can be considered equivalent as far as managing lifetime cancer risk. In another example, the PQL for dinoseb (an herbicide known to be toxic, but not classified as a carcinogen) is 0.6 µg/L and the proposed standard is 7 µg/L. For this contaminant, the PQL and the higher standard can be considered equivalent in that neither value surpasses the systemic threshold concentration as required by Rule 15A NCAC 02L .0202(d)(1). In other words, there would not be an increase in the appreciable risk of deleterious effects during a lifetime from daily exposure at either level. In both scenarios, the cleanup goals established using the technology-based PQLs provided a conservative level of protection that exceeded the point at which there would be no observable effects to the population. Therefore, setting a numerically higher standard that reflects a risk management threshold will not increase risk to public well water consumers. In short, adoption of these standards will reduce unnecessary regulatory burdens to owners of contaminated sites while maintaining at least an equivalent level of environmental, aesthetics, and human health protection.

The regulatory relief associated with this rulemaking could, in fact, provide an indirect benefit to the environment and human health. For some programs, regulatory relief will result in savings to funding sources for remediation projects. This would make funding available to more contaminated sites which would ultimately improve groundwater protections for consumers of private well water.

6. Costs and Benefits Analyses

6.1 Standards less than (or equal to) the PQL

Rule 15A NCAC 02L .0202(b)(1) states: "Where the standard for a substance is less than the practical quantitation limit, the detection of that substance at or above the practical quantitation limit constitutes a violation of the standard." Of the 47 standards proposed in this rulemaking, 16 are lower than (or equal to) the PQL (Table 2). For these 16 contaminants, the PQL will remain the regulatory baseline upon adoption of the standards, and the adoption of standards will neither increase nor decrease regulatory requirements.

As discussed in Section 5 of this document, the adoption of these standards will not change the level of environmental or public health protection already in effect.

For these reasons, the adoption of the 16 standards in Table 2 should have no quantifiable impact on regulated persons, at least for the foreseeable future, and no impact on public health outcomes.

Table 2: Proposed Groundwater Standards that are Less than (or equal to) the PQL

Contaminant
Metals/Inorganics
antimony and compounds
beryllium and compounds
cobalt and compounds
thallium and compounds
vanadium and compounds
Organics
acrolein
alachlor
aldrin
dichloroacetic acid
2,4-dichlorophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
1,2,4,5-tetrachlorobenzene
1,1,1,2-tetrachloroethane
1,1,2-trichloroethane
2,4,6-trichlorophenol

It is likely that environmental chemical testing methods and technologies will improve for some or all of these 16 contaminants over time, thereby allowing laboratories to achieve lower PQLs. In the event that a PQL is achieved that is lower than the standard, the standard would replace the PQL as the regulatory baseline. At that point, the standard would provide regulatory relief which could result in cost savings for remediation, monitoring, and permitting. It is impossible, however, to predict how fast – or how much – testing technology will improve for a given contaminant, so we have not attempted to quantify this possible future impact.

6.2 Standards greater than the PQL

Of the 47 standards proposed in this rulemaking, 31 are greater than the PQL (Table 3). Unlike the 16 standards that are less than the PQL (Table 2), these 31 standards will replace the PQL as the regulatory baseline upon adoption of the rule. For purposes of this analysis, the adoption of these 31 standards will reduce unnecessary regulatory burden. As a result, there should be some economic benefit and no economic cost to regulated parties.

The proposed standards are health-based values that take into account lifetime risks to human health from consumption of a contaminant. Neither the PQLs nor the proposed standards surpass the risk management levels established in Rule 15A NCAC 02L .0202(d). As such, the proposed standards are considered at least as protective of the environment, aesthetics, and human health as the technology-based PQL values.

Table 3: Proposed Groundwater Standards that are Greater than the PQL

Contaminant
Metals/Inorganics
strontium and compounds
tin (inorganic forms)
Organics
acetic acid
acetochlor
acetochlor ESA
acetochlor OXA
acetophenone
benzyl alcohol
bromomethane
n-butanol
sec-butanol
4-chlorotoluene
dalapon
1,4-dibromobenzene
p,p'-DDE
dinoseb
diphenyl ether
diquat
endosulfan sulfate
endothall
alpha-hexachlorocyclohexane
beta-hexachlorocyclohexane
2-hexanone
4-isopropyltoluene
methyl isobutyl ketone
methyl methacrylate
1-methylnapthalene
2-methylphenol

Contaminant
perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) (Total)
propylene glycol
2,4,5-trichlorophenol

For contaminants in Table 3, there should be some economic benefit to regulated parties from having the regulatory threshold lowered. This benefit would be realized by those regulated parties for whom one (or more) of the contaminants listed in Table 3 is a main driver for their site remediation. For purpose of this analysis, driver contaminants are contaminants that are either potentially widespread or have the greatest economic cost in cleanup of sites.

As mentioned earlier, there are Interim Maximum Allowable Concentrations (IMACs) already in effect for 44 of the 47 contaminants. This includes all but two of the contaminants in Table 3: Strontium and compounds and PFOS. In practice, the regulatory requirement (i.e., cleanup goal) for contaminants with an approved IMAC is the IMAC; however, because we are considering the PQL – not the IMAC – as the baseline for this analysis, we must compare the economic impact of the proposed standard against the PQL.

At the same time, we recognize that because there are existing IMACs, the bulk of the benefit we report should be considered an *ongoing* benefit rather than a benefit that will begin at some point in the future. In other words, we are attempting to quantify the ongoing benefit to the regulated parties from the adoption of the standard as compared to the PQL, absent the IMAC.

Many of the regulatory programs that are subject to the groundwater standards use the standards in similar ways. It makes sense, then, that those programs for which one or more of the contaminants in Table 3 are the driver contaminants might benefit in similar ways. Monetizing these benefits was challenging for many of these programs, though, due to the degree of variability between sites, unpredictability of future contaminant levels, lack of available data, and the complex nature of groundwater remediation. We quantified impacts when possible, but more often, we described the impacts in qualitative terms.

6.2.1 Benefits, in general

During preparation of this document, it became evident that a number of our regulatory programs would potentially benefit (or are already benefiting) in similar ways from the proposed standards. Benefits that can be generalized to multiple programs are listed below. Additional benefits (or lack thereof) specific to each regulatory program are discussed in greater detail under the programs' respective headings.

If a cleanup goal for a contaminant is relaxed (i.e., standard > PQL), and that contaminant is a driver for either monitoring or cleanup requirements, then the responsible party for a regulated site may benefit in one of more of the following ways:

- Reduced frequency of monitoring: cost savings would include the labor costs to sample monitoring wells, analytical costs, and the costs of mapping and reporting results to DEQ. Decisions to allow reduced frequency of monitoring will be made by regulatory staff on a case-by-case basis.
- Reduced number of contaminants being monitored: costs saved include the cost to analyze the samples. Analytical costs vary widely by contaminant and laboratory.
- Reduced number of groundwater wells being monitored: costs saved include the cost to sample the well (labor costs). The cost savings realized by ceasing monitoring at a well will be somewhat reduced in the short term by the one-time costs associated with closing the well. Sites such as landfills, inactive hazardous waste sites, and USTs will incur these well closure costs at some point in time, regardless of the standard. But a numerically-higher standard may result in those costs being incurred years earlier.
- Reduced cleanup time: cost savings from completing groundwater remediation in a shorter period of time would largely be from spending less on operation and maintenance of the cleanup technology. These costs can be substantial and would likely make up the largest portion of cost savings realized from the proposed standards.
- Use of a more cost efficient cleanup technology: the type of technology used to reduce contaminant levels to the groundwater standard is site specific and depends on factors such as number and types of contaminants, contaminant properties, extent of contamination, hydrogeologic properties (soil and rock type), and cleanup goals. These factors, including the type of cleanup technology used at a site, will affect the time and cost to clean up groundwater.

The State agencies responsible for providing oversight of these regulatory programs could also realize potential benefits by freeing up staff capacity or funding resources that will be reinvested to address currently unmet needs:

- Regulated sites that achieve compliance with groundwater standards earlier – perhaps years earlier -- will require significantly less staff time in terms of oversight over the long term. This will reduce staff time spent on reviewing reports, analyzing data, and preparing correspondence per site. It will also result in the need for less travel to perform each site visit, which will save on fuel and vehicle maintenance costs. However, any savings to staff time and resources due to one project's early completion will be immediately reinvested to address the large backlog of other sites in need of staff attention across the state. For this reason, we did not expect any direct budgetary savings.

6.2.2 Brownfields

None of the contaminants in Table 3 are known drivers for cleanup of Brownfields sites. As such, the proposed standards would not have any economic impact on parties regulated under this program.

6.2.3 Hazardous Waste

The primary purpose of the Hazardous Waste Section of DEQ is to prevent and reduce releases of hazardous waste and to clean up contaminated sites. Sources of hazardous waste can include, but are not limited to, industrial or manufacturing processes such as wood preservation, chemicals manufacturing, petroleum refining, pesticides manufacturing, iron and steel production, and explosives manufacturing. Hazardous waste can also come from discarded common household products such as batteries, fluorescent lightbulbs, cathode ray tubes, paint thinners, herbicides, and adhesives.

In North Carolina, sites with groundwater contaminated by hazardous waste are required to cleanup to the groundwater standard or, in the absence of a standard, to the PQL. Of the contaminants in Table 3, the Hazardous Waste Section identified only one proposed groundwater standard that could potentially result in a cost impact to regulated hazardous waste sites: perfluorooctane sulfonic acid (PFOS) + perfluorooctanoic acid (PFOA) (Total). PFOS and PFOA are commonly-used man-made chemicals that have been used in manufacturing of fabrics, food packaging, carpet, and cookware. They are also present in aqueous film-forming foam (AFFF) which is used as a fire suppressant at military bases, fire training facilities, and airports and as a chemical fume suppressant at some types of industrial facilities.

The proposed standard for PFOS and PFOA is based on U.S. EPA drinking water health advisories[5] for PFOS and PFOA. These advisories considered the best available peer-reviewed laboratory studies of the health effects of these contaminants on rats and mice and also incorporated information from epidemiological studies from incidents of human exposure to these contaminants. Due to similarities in adverse effects that were observed following exposures to PFOS and PFOA and numerically-identical toxicity values, U.S. EPA recommends comparing the combined concentrations of PFOS and PFOA to the published health advisories. Therefore, the proposed groundwater standard for PFOS and PFOA will apply whether these contaminants are found individually or in combination.

For purposes of this analysis -- which relies on the PQL being the regulatory baseline in the absence of a standard – the proposed groundwater standard for PFOS + PFOA (Total) could provide some economic relief to regulated parties for which one or both of these contaminants is the driver for cleanup. The Hazardous Waste Section identified only one site -- a privately-owned chemical manufacturer -- at which PFOS or PFOA is driving groundwater cleanup. Two other sites are

[5] *For determination of combined PFOS/PFOA groundwater standard:* U.S. EPA drinking water health advisory https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos

currently required to sample for PFOS and PFOA – another privately-owned chemical manufacturer and a municipal-owned fire training facility; however, cleanup at these sites is not driven by the presence of PFOS or PFOA, so they are not expected to be impacted by the numerically higher standard.

Estimates of potential cost savings from the numerically higher standard were not provided for the one chemical manufacturing site. In the absence of quantifiable data for the one hazardous waste site, the general benefits summarized in Section 6.2.1 are applicable. The Hazardous Waste Section stated, though, that they do not expect an appreciable economic impact from adopting the proposed standard.

If we were to take into consideration the existing IMAC for PFOA, the potential regulatory benefit from the proposed combined standard would be reduced, eliminated, or possibly reversed. The size of the effect would depend, in part, on which of the contaminants -- PFOA or PFOS – is the driver contaminant. The IMAC for PFOA, which serves as the cleanup goal *in practice,* is 2 µg/L. For PFOS, there is no IMAC so the cleanup goal is the PQL, which is 0.002 µg/L. The proposed combined groundwater standard for PFOS + PFOA (Total) is 0.07 µg/L, which falls between the current cleanup goals for the two constituents. Because the cleanup goals for these two constituents are being combined into one standard -- and that standard is higher for one contaminant and lower for the other -- the Hazardous Waste Section expects potential benefits from the higher PFOS standard to be offset by the potential costs from the lower PFOA standard. With that being said, we do not have enough information to predict whether the costs and benefits would be offset equally or whether there could be some net costs or net benefits. That would depend on factors that will vary from site to site such as whether one or both contaminants are being monitored, their relative concentrations, the scale and complexity of the remediation, and the available remediation technology.

We also considered whether there could be an outsized regulatory effect due to the fact that the PFOA cleanup goal is changing by a larger order of magnitude than the PFOS cleanup goal. We concluded that assumptions based on differences in order of magnitude would be overly speculative because of the variability between sites, unpredictability of future contaminant levels, lack of available data, and the complex nature of groundwater remediation. Data was not available to monetize these various cost and benefit scenarios.

6.2.4 Superfund

The potential impacts on parties regulated under Superfund are as follows:

6.2.4.1 Dry Cleaning Solvent Cleanup

None of the contaminants in Table 3 are known drivers for cleanup of dry cleaning solvent sites. As such, the proposed standards would not have any economic impact on parties regulated under this program.

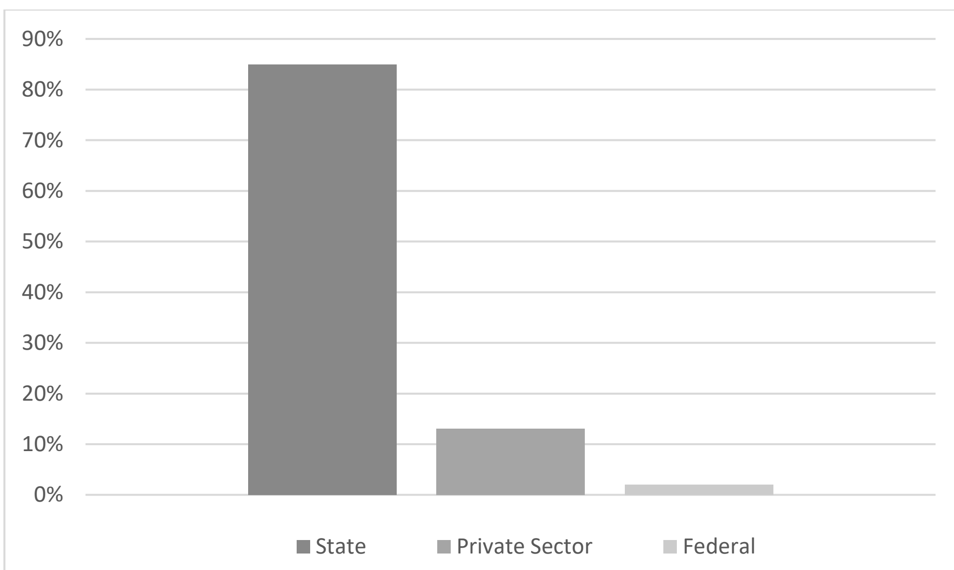
Inactive Hazardous Waste

The Inactive Hazardous Sites Program addresses sites contaminated with hazardous substances not related to permitted discharges. These are referred to as "inactive" sites because the original industries at the sites are generally no longer operating. Releases from these sites occurred before there were regulations prohibiting such releases. Some are the result of newer product spills. Most of these sites have since gone out of business or reorganized, making it difficult or impossible to find financially-viable responsible parties to do remediation. Compounding the complexity of remediating these sites is the lack of documentation regarding how, where, and when the release or releases occurred.

The Inactive Hazardous Sites Branch (IHSB) reported that, as of June 2019, there were 2,561 open IHSB cases. Of these, 666 were old landfills that received hazardous wastes before there were any regulations. The other 1,895 are non-landfill sites. IHSB estimated that about 80% of the non-landfill sites are orphaned, which means they are left to the State to manage and pay for remediation, as funding allows. Of the 2,561 open cases, only about 13% are being remediated using private funds.

In addition to the State-funded and privately-funded sites, there are 75 inactive hazardous sites for which the federal government (EPA and Department of Defense) has responsibility under the Superfund Program. These are the sites on the National Priority List which are considered the most hazardous waste sites.

Figure 1: Responsible Parties for Inactive Hazardous Waste Sites



Remediation of hazardous waste sites is costly, some sites costing in the millions of dollars. For the landfills, DEQ receives funding from the statewide solid waste disposal tax. For the remaining orphaned sites, DEQ receives only $400,000 per year. Because of this large funding shortfall for orphaned sites, many of them are uncontrolled and have multiple hazards with limited investigation completed.

Table 4 lists the chemicals (from the subset in Table 3) that IHSB reported are commonly found at inactive hazardous waste sites, and for which the proposed standards would potentially provide some cost savings.

Table 4: Contaminants found at Inactive Hazardous Waste Sites

4-chlorotoluene	2-methylphenol
endosulfan	2,4,5-trichlorophenol
methylnaphthalene	p,p'-DDE

Staff stated that 4-chlorotoluene would probably have the highest impact in terms of reducing remediation costs as that can be one of the driver contaminants. Every site is different in terms of which contaminants are present, the degree of contamination, and the scale and complexity of remediation required to meet groundwater standards. It follows that the cost for remediation is extremely variable. For this reason, we did not attempt to monetize the potential cost savings of the proposed standards. It is reasonable, however, to assume that sites with a driver contaminant such as 4-chlorotoluene could see a significant cost savings over the life of the remediation, which typically spans decades.

It is assumed that all types of inactive hazardous waste sites for which the State has responsibility, including landfills, have the potential to realize some amount of cost savings:

- Cost savings for cleanup of non-landfill orphaned sites and landfills would be realized by both DEQ as the regulator and by the taxpayer. DEQ would see cost savings from reduced staff time and resources needed for oversight of the sites' cleanup. This includes savings from performing fewer site visits and spending less time reviewing reports and preparing correspondence. This ultimately benefits the state taxpayer.
- Cost savings to landfills will translate into savings to the statewide solid waste disposal tax fund, leaving more funding available for remediation at landfills.
- The private sector could realize a direct benefit from cost savings on their own sites.
- Sites for which the federal government has responsibility will likely realize a lesser benefit than State-managed sites. The reason for this is that the federal government manages sites involving the most

hazardous contaminants, none of which are part of this proposed rulemaking.

In the absence of quantifiable data, the general benefits summarized in Section 6.2.1 are applicable to all parties responsible for inactive hazardous waste sites.

6.2.5 Solid Waste Program

Within the Solid Waste Program, the parties that might be impacted are the following types of landfills:

- **Municipal Solid Waste (MSW) landfills -** nonhazardous waste from household, commercial, and institutional sources;
- **Construction and Demolition Debris (C&D) landfills –** solid waste from the construction, remodeling, repair, or demolition operations on pavement and buildings or structures; and
- **Industrial Waste (IW) landfills –** solid waste from manufacturing or industrial processes that is not a hazardous waste regulated under Subtitle C of RCRA. Includes waste resulting from manufacturing processes such as electric power generation, fertilizer/agricultural chemicals, iron and steel manufacturing, organic chemicals, transportation equipment, etc. Does not include mining waste or oil and gas waste.

MSW and C&D landfills are required to perform groundwater monitoring for a suite of contaminants set by federal and state regulation. Which contaminants they monitor for depend primarily on the age of the landfill. Older landfills -- permitted before Oct 9, 1993 -- monitor groundwater for contaminants listed in 40 CFR Part 258 “Criteria for Municipal Solid Waste Landfills” Appendix I “Constituents for Detection Monitoring” (typically referred to as “Appendix I”)[6]. Newer landfills -- permitted on or after Oct 9, 1993 -- also monitor groundwater for Appendix I contaminants; however, if they have exceedances, they are required to do additional monitoring of contaminants in the “List of Hazardous Inorganic and Organic Constituents” (“Appendix II”). If a contaminant is not listed on Appendix I or II, it is generally not required to be monitored at MSW or C&D landfills, although there are occasional exceptions based on waste stream.

IW landfills operate under a somewhat different groundwater monitoring scheme. In addition to monitoring for Appendix I contaminants, IW landfills also monitor for contaminants depending on the makeup of their specific waste stream. This results in greater variability between individual IW landfill facilities.

[6] *For determination of which contaminants are monitored at landfills:* Appendix I and II referenced from NC Solid Waste Section Environmental Monitoring List, Oct 15, 2018 https://edocs.deq.nc.gov/WasteManagement/0/edoc/1257181/SWS_EnviroMonitoring_Constituents_List.pdf

Table 4 summarizes the numbers and types of landfills at which each of the proposed contaminants have been or are currently being monitored. It also states whether the contaminant is listed in Appendix I or II. About two thirds of the proposed contaminants have been tested for in groundwater at one or more of the three types of landfills. According to DWM Solid Waste Section staff, changing waste streams and other variables at landfills make it difficult to identify when one contaminant over another is the main driver for assessment or cleanup of contaminated groundwater. This means that even if a proposed contaminant was detected at a level above the PQL, we cannot claim that the adoption of a standard that is numerically higher has or has not benefited these landfills. For this reason, we have not attempted to monetize the ongoing fiscal impact of the proposed standards on landfills.

Table 4: Proposed Contaminants Monitored at NC Solid Waste Landfills

Contaminant	Listed in 40 CFR Part 258 Appendix I or II?	Type & Number of Landfills at which Contaminant has been Monitored
Metals/Inorganics		
strontium and compounds	-	IW -1 MSW - 2
tin (inorganic forms)	Appendix II	MSW-28 C&D-9
Organics		
acetochlor ESA	-	none
acetochlor OXA	-	none
acetophenone	Appendix II	MSW-2 C&D-2
benzyl alcohol	Appendix II	MSW-3
bromomethane	Appendix I	none
n-butanol	-	none
sec-butanol	-	none
4-chlorotoluene	-	IW-4
dalapon	-	none
1,4-dibromobenzene	-	none
p,p'-DDE	Appendix II	MSW-4
dinoseb	Appendix II	MSW-5
diphenyl ether	-	IW-1
diquat	-	none
endosulfan sulfate	Appendix II	none
endothall	-	none
alpha-hexachlorocyclohexane	-	MSW-18 C&D-6
beta-hexachlorocyclohexane	-	MSW-15 C&D-4
2-hexanone	Appendix I	MSW-21

		C&D-5 IW-1
4-isopropyltoluene	-	MSW-3 IW-1
methyl isobutyl ketone	Appendix I	MSW-34 C&D-5 IW-2
methyl methacrylate	Appendix II	MSW-8
1-methylnapthalene	-	none
2-methylphenol	Appendix II	MSW-3
perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) (Total)	-	None* *Leachate from lined landfills will be tested beginning in 2019.
propylene glycol	-	none
2,4,5-trichlorophenol	Appendix II	MSW-2

Although about one third of the contaminants have not been monitored at these types of landfills, we cannot say with reasonable certainty that they will not be monitored in the future. Degradation of landfill materials over time or the development of a leak in a liner could result in the detection of a previously-undetected contaminant. It is also common for the makeup of materials collected at a landfill (waste stream) to vary over time. This could result in the introduction of additional contaminants to the groundwater and additional testing requirements. Further compounding the difficulty in monetizing a fiscal impact is that it is impossible to predict if future analytical testing will detect higher levels or lower levels of a particular contaminant. For these reasons, we have not attempted to monetize the future fiscal impact of the proposed standards on landfills.

In the absence of quantifiable data, the general benefits summarized in Section 6.2.1 are applicable to all parties responsible for regulated solid waste landfills.

It is assumed that all regulated landfills could potentially benefit from a numerically-higher groundwater standard for the reasons stated above. This benefit could be realized regardless of ownership. According to DWM, there were approximately 311 active and inactive MSW, C&D, and IW landfill facilities in North Carolina as of February 1, 2019[7]. The majority of these types of landfills are owned either by private entities or local governments, although there is a total of seven landfills owned by state and federal governments (Table 5). We do not anticipate one type of landfill or one subgroup of owner to benefit more than another.

[7] *For data on numbers of NCDWM Solid Waste permitted facilities:* https://deq.nc.gov/about/divisions/waste-management/sw/data/facility-lists

Table 5: Ownership of C&D, IW, and MSW Landfills in North Carolina

	Privately-owned	Local Govt-owned	State-owned	Federal-owned	Sub-Total
C&D	34	51	0	1	86
Industrial	40	2	0	0	42
MSW	42	135	2	4	183
				TOTAL	**311**

6.2.6 Underground Storage Tanks

The Underground Storage Tank (UST) Section of DEQ oversees programs related to the cleanup of contaminated soil and groundwater due to releases of contaminants from USTs. These sites are required to cleanup to the groundwater standard or, in the absence of a standard, to the PQL. Of the contaminants in Table 3, only those associated with petroleum products were identified by the UST Section as potential contaminants of concern at UST release sites. This subset of contaminants is listed in Table 6.

Table 6: Potential Non-Driver Contaminants at UST Sites

Benzyl alcohol	Methyl isobutyl ketone
Bromomethane	1-methylnapthalene
n-Butanol	2-methylphenol
4-chlorotoluene	Propylene glycol
2-hexanone	2,4,5-trichlorophenol
4-Isopropyltoluene	

While each of the contaminants in Table 6 has the potential to be found at UST sites, none of them are considered drivers for assessment and remediation of petroleum releases. This is because other petroleum products -- such as MTBE and benzene – are usually the drivers as they are more widespread and have substantially greater cleanup costs. The contaminants in Table 6 are found in very small amounts, as additives or incidental contamination.

Although none of the proposed standards are for driver contaminants, we still anticipate some economic benefit to various parties from adopting standards that are numerically higher than the associated PQLs. Currently, when non-driver contaminants are found at levels above the PQLs, closeout of a UST remediation site can be delayed. Under this scenario, soil excavation and groundwater cleanup (e.g., pump and treat) activities will cease, but groundwater monitoring will continue until the site is closed out. Non-driver contaminants tend to be less volatile than the driver contaminants and are therefore harder to remediate, relying more on passive remediation techniques such as natural biodegradation and time.

For example, if a site is successfully remediated for the driver contaminant (such as MTBE) by soil excavation and treatment of groundwater, but levels of another contaminant (such as 1-methylnapthalene) remain elevated above the PQL, excavation and treatment cease, but monitoring for the non-driver contaminants must continue. Adopting a standard that it numerically higher than the PQL should result in fewer instances and shorter durations of delayed closeouts.

The UST Section conservatively estimated that elevated levels of non-driver contaminants, such as those listed in Table 6, could delay closeout of UST petroleum release sites by as much as five years and affect up to 10% of active remediation sites annually. These are rough estimates based on decades of staff experience and are solely meant to provide a basis for analysis. The actual duration of closeout and number of sites affected is highly variable from site to site and year to year. Staff estimated that approximately 400 sites in a year achieve successful cleanup of the driver contaminant. It follows that the closeout of 40 sites (10%) might be delayed due to lingering presence of non-driver contaminants.

The largest portions of cleanup costs are associated with soil excavation, groundwater cleanup, and groundwater monitoring. Since soil excavation and groundwater cleanup are not factors for non-driver contaminants, those costs are not included in this analysis. The UST Section estimated that delaying closeout of one site could cost up to $10,000 per year for ongoing monitoring (sampling and laboratory analyses). This is likely an overestimate for many sites, but it should provide a reasonable basis to consider the maximum possible cost for a complex site. Costs will be highly variable between sites due to differences in site-specific conditions, monitoring frequencies, and contaminants being tested.

The responsible parties for the majority of UST sites are private commercial entities (50.84%) or private non-commercial entities (36.74%). Responsible parties can include tank owners, operators, and landowners. A total of 5.54% of sites are owned by government entities, which include federal (e.g., military bases, post offices) state (NCDOT, prisons, hospitals), or local governments. The remaining 6.88% are State-lead sites, which are sites where the State assumes responsibility for remediation when the commercial responsible party cannot or will not perform remediation as required.

Table 7: Responsible Parties of Active Storage Tank Sites in North Carolina

Responsible Party	# Active Sites	% Active Sites
Commercial	7,045	50.84%
Non-commercial	5,091	36.74%
State-lead	953	6.88%
Government-owned (state, local, federal)	768	5.54%
TOTAL	13,857	100%

Over five years, it is assumed the responsible parties would receive a cost savings proportional to the number of sites they own or operate. The one exception to that is for commercial sites. Commercial sites have access to funds from the State's UST Commercial Trust Fund dedicated to cleaning up contaminated UST sites. The net costs for commercial sites are limited to a $20,000 deductible per site, regardless of how extensive the remediation plan. After meeting the deductible, commercial sites are eligible for reimbursement from the UST Commercial Trust Fund for 100% of their expenses.

Currently, the UST Commercial Trust Fund does not have enough funds to cover all the commercial remediation projects in a given year. As such, the North Carolina General Assembly limits reimbursements to a subset of commercial UST remediation sites that are ranked as having an Intermediate risk or greater to human health and the environment. Assessment and remediation work at the remaining commercial UST sites has been suspended indefinitely. These are sites that are not receiving reimbursement either because they are lower risk and are therefore ineligible or because the UST Commercial Trust Fund has insufficient funds to reimburse all eligible projects in a given funding cycle. In the near term, the proposed rulemaking will be of little or no benefit to sites not eligible for funding (i.e., lower risk sites), but these sites may benefit in the long term as funding becomes available.

It stands to reason that the potential savings to commercial sites will be shifted to the UST Commercial Trust Fund. The UST Commercial Trust Fund will save money on current remediation sites, thereby leaving more money available for remediation of additional sites. In turn, cleanup of additional sites provides an indirect benefit to a localized subset of private well water consumers and the environment in the form of improved groundwater protection.
Aside from the subset of well water consumers who will benefit from savings to the UST Commercial Trust Fund, privately-owned *non-commercial* sites stand to benefit the most from the proposed standards as they are responsible for the vast majority of sites for which no such trust fund is available.

The UST Section Trust Fund Branch will realize cost savings due to reduced assessment, corrective action, and monitoring costs. This savings will be re-invested to address the substantial backlog of sites that need attention. Government-owned sites are not eligible for money from the State Trust Fund, so the agencies themselves will realize direct benefits from reduced monitoring costs. Data was not readily available on the proportion of federal versus state versus local government-owned sites, so we assumed each government subgroup would benefit equally.

Table 8 presents the estimated maximum savings over the next 5 years for each responsible party subgroup and the benefit to the UST Commercial Trust Fund. These amounts were estimated as follows:

Total savings for all parties over the 5 years:
40 sites per year x $10,000/year = $400,000 per year x 5 years = $2,000,000
($1,754,884 Net Present Value, using 7% discount rate)

The cost savings proportionate to each subgroup of responsible parties over 5 years was estimated as follows:
% of Active Sites x $1,754,884 / 100.

Table 8: Maximum Cost Savings for UST Responsible Parties Over Five Years in Millions of 2019 Dollars

Responsible Party	% Active Sites	Savings ($M)
UST Commercial Trust Fund	50.84%	**$0.8922**
Non-commercial	36.74%	**$0.6447**
State-lead commercial	6.88%	**$0.1207**
Government-owned (state, local, and federal)	1.85%	**$0.03246**
	1.85%	**$0.03246**
	1.85%	**$0.03246**
Commercial sites	*(see UST Trust Fund)*	**$0**
TOTAL	100%	$1.75498 *rounded to* **$1.76M NPV**

This is likely an overestimate for the reasons stated above as well as the fact that some sites might still experience some delayed closeout if contaminant levels remain higher than the new standard. The proposed standards for these contaminants were, in many cases, proposed by the UST Section in order to provide regulated parties from relief from the numerically-lower PQLs. As such, it is reasonable to expect that a majority of sites will receive some benefit from the proposed standards in the form of reduced monitoring costs. More precisely, these sites will continue to receive some *ongoing* benefit from the proposed standards since the standards are already in effect as IMACs.

6.2.7 DWR Groundwater Protection Program

6.2.7.1 Hazardous Waste Injection Wells

Administered by DWR, the Groundwater Protection Program uses the groundwater standards for remediating sites in which hazardous waste was disposed of by injecting it into underground wells, a practice that is now prohibited. There are very few of hazardous waste injection well sites still under DWR oversight.

The impact of the proposed standards on parties regulated under DWR's Groundwater Protection Program is expected to be negligible. Any potential impact will be mitigated by Rule 15A NCAC 02L .0407 which allows remediation of groundwater contamination to either the groundwater standards **or** to a level that is "as closely thereto as is economically and technologically feasible." It is unlikely, therefore, that the adoption of a groundwater standard that is higher than the technology-based PQL would provide a cost savings beyond that which is already allowed by this provision. In some cases, Rule 15A NCAC 02L .0407(c) requires remediation levels based on values other than the groundwater standards, such as IMACs, federal drinking water standards, or contaminant solubility. Because the regulatory baseline for this program is varied and not limited to the groundwater standard, we do not anticipate any economic impact on parties regulated under this program.

6.2.7.2 Non-discharge Sites

DWR is authorized under Subchapters 15A NCAC 02L (Groundwater Classification and Standards) and 15A NCAC 02T (Waste Not Discharged to Surface Waters) to issue permits that allow the discharge of waste onto land or into the subsurface under conditions outlined in a "non-discharge" permit. Infrequently, cleanup activities from these discharges may be required. Staff reported that there are no cleanup activities underway on permitted sites for any of the 31 contaminants in Table 3, and none of the 31 contaminants are part of permittees' required monitoring suite. For this reason, there is no data available to quantify how many non-discharge sites could potentially be affected. Staff indicated that of the proposed standards, only PFOS/PFOA is currently being considered for monitoring in the future. Without data on current levels of PFOS/PFOA at these sites, or an estimate on how many sites would exceed the PQL for this contaminant, staff cannot speculate on many sites might benefit from a standard that is numerically higher than the PQL. For these reasons, we have not attempted to monetize the potential economic impact to current or future non-discharge permittees.

DWR's Groundwater Protection Program anticipates no direct or indirect economic impact to their program from the proposed rule.

6.2.8 NC Department of Health and Human Services (NC DHHS)

The On-Site Water Protection Branch programs within NC DHHS provide oversight of sub-surface on-site wastewater treatment systems. They also provide consultative services related to wastewater and private drinking water wells to local health departments. They use the groundwater standards for non-regulatory purposes only. Staff confirmed that the proposed changes to the groundwater standards should have no impact on their programs.

6.2.9 Agriculture

Although some of these contaminants are products used in agriculture -- particularly pesticides (including herbicides) -- our standards will not affect the agricultural community. Use of herbicides in agriculture is regulated by different criteria, typically lifetime Health Advisory Levels (HAL) or maximum contaminant levels (MCL). Use of other types of pesticides is subject to other federal and state regulations and is not required to comply with EMC's groundwater standards.

DWR contacted the Department of Agriculture and Consumer Services who reported no anticipated direct or indirect economic impact to the agency from the proposed rule.

6.2.10 NC Department of Transportation (NCDOT)

The program within NCDOT that will be primarily affected is the Asphalt Testing Program. The NCDOT Asphalt Testing Program performs on-site testing of asphalt for Department construction activities using ASTM Method D2172-88. This method requires the use of solvents. Solvents stored, spilled, or disposed of onsite near operating labs can result in releases of these solvents to the environment.

NCDOT identified four contaminants on our proposed standards list that have been detected in groundwater at some asphalt testing sites: acetic acid, n-butanol, sec-butanol, and methyl-isobutyl-ketone. All of these are breakdown products of solvents. In the absence of groundwater standards for these four contaminants, NCDOT states that they use background concentrations as the threshold to determine compliance of their sites with 15A NCAC 02L .0202. They reported that the proposed standards for acetic acid, n-butanol, sec-butanol, and methyl-isobutyl-ketone are slightly higher than background concentrations; as such, compliance with the proposed standards may be achieved more readily.

Because the presence and detection of contaminants at each site is highly variable and unpredictable, NCDOT could not provide estimates of the number of sites that would benefit or the likelihood of benefit from the numerically higher standards. They did state, though, that any potential benefit would likely be negligible. Further minimizing a potential benefit is the fact that a change to the standards for these four contaminants would only be realized if one of these contaminants were the main driver for remediation at a particular site. This type of data was not available for our analysis. For these reasons, we have not attempted to monetize the potential benefit.

In the absence of quantifiable data for asphalt testing sites, the general benefits summarized in Section 6.2.1 are applicable. If there are benefits to NCDOT in terms of cost savings, it would most likely be realized in the form of savings to their Highway Maintenance Fund, which funds groundwater remediation projects among many other transportation-related projects.

6.2.11 Private wells

None of the contaminants for which we are proposing standards are currently required to be analyzed for under Section 15A NCAC 18A .3800 Private Drinking

Water Well Sampling. Nor do these rules require that well water comply with our groundwater standards. The State does not use the groundwater standards to regulate the water quality of private well water. The burden to monitor water quality of private well water is on the well owners. Information relating to the groundwater standards may be provided by NC DHHS to a well owner if there is a concern about possible contamination, but the well owner would not be required to take action. For these reasons, the proposed groundwater standards should not have any economic impact on private well owners.

6.3 Interim Maximum Allowable Concentrations (IMACs)

If this analysis were to take into account existing IMACs, the estimated cost savings would likely be considerably reduced for all but five contaminants. For the five contaminants for which the proposed groundwater standard will be lower than the IMAC, there could be some remediation costs not accounted for in this analysis. Remediation costs would be limited to responsible parties for sites at which one of the following contaminants is a driver: acetochlor ESA, acetochlor OXA, 2,4-dinitrotoluene, n-butanol, and perfluorooctanoic acid (PFOA). For PFOA, potential costs would be offset by potential benefits of the higher PFOS standard (see Section 6.2.3). For n-butanol, which was identified by NCDOT as a contaminant at asphalt testing sites, the potential costs from a lower cleanup goal would likely be negligible since it is a non-driver contaminant (see Section 6.2.10). For acetochlor ESA, acetochlor OXA, and 2,4-dinitrotoluene, the costs to site owners of a lower cleanup goal would be associated with increased monitoring frequency and duration and potential use of a more expensive cleanup technology. State agencies could also incur opportunity costs from reduced staff capacity and funding resources that would have otherwise been reinvested at additional sites in need of cleanup. There are few sites at which these particular contaminants are the main drivers for cleanup, so the potential amount of costs realized is likely very low.

7. Summary

The agency anticipates that if the groundwater standards are adopted as proposed, there would be an ongoing net benefit to regulated parties from having standards that are numerically-higher than the regulatory baseline for 31 of the 47 contaminants (Table 3). For purposes of this analysis, the regulatory baseline is the Practical Quantitation Limit (PQL) and not the existing Interim Maximum Allowable Concentrations (IMACs). Because there are existing IMACs in place for all but two of the contaminants in Table 3, the bulk of the cost savings would be considered largely an ongoing benefit rather than a benefit that will begin at some point in the future.

For the other 16 contaminants (Table 2) included in this rulemaking, we concluded that the adoption of standards will neither increase nor decrease regulatory requirements because the PQL will remain the baseline. For this reason, the adoption of the 16 standards in Table 2 should have no quantifiable impact on regulated persons, at least for the foreseeable future.

Benefits associated with this rulemaking would be realized by parties regulated primarily under the agency's UST, Hazardous Waste, Inactive Hazardous Waste, and Solid Waste Landfill programs. For most programs, we provided qualitative descriptions of the potential benefits, many of which could be generalized to all programs. We provided quantitative data when available and made assumptions based on past data and trends when appropriate.

With the exception of the UST program, we did not attempt to monetize the potential benefits. This is because of the high degree of variability among sites in terms of which contaminants are present, which contaminants are the drivers for cleanup, the degree of contamination, the scale and complexity of remediation required to meet groundwater standards, the protracted length of time required to remediate groundwater, the age of some sites (i.e., lack of data). Together with the fact that we cannot reasonably predict future levels of groundwater contamination nor the pace at which cleanup and testing technologies will advance, we were hesitant to monetize future benefits associated with the groundwater standards as this would be overly speculative.

Unquantified benefits to regulated parties include reduced frequency of monitoring, reduced number of contaminants being tested, reduced number of groundwater wells being monitored (labor costs) and reduced cleanup time. Cost savings from completing groundwater remediation in a shorter period of time would largely be from spending less on operation and maintenance of the cleanup technology. Operation and maintenance costs can be substantial and would likely make up the largest portion of cost savings realized from the proposed standards.

The only quantified cost savings were related to the UST Program. It was estimated that over a five-year period, non-commercial UST owners, the State Commercial UST Trust Fund, and federal, state and local government agencies could realize a total maximum savings of $1.76M (net present value).

Unquantified benefits to State government include savings to staff time and resources for DEQ and NCDOT due to reduced administrative oversight.

Perhaps the largest beneficiary of this rulemaking would be the state taxpayer who would potentially benefit in terms of cost savings to the following state funds that provide full or partial funding for groundwater remediation projects:

- UST Commercial Trust Fund – funds groundwater remediation at commercial UST sites;
- State Highway Maintenance Fund – funds groundwater remediation at asphalt testing program;
- Solid Waste Disposal Tax Fund – funds groundwater remediation at inactive hazardous waste landfills.

Savings to these funds in the near term would allow remediation at more sites in the long term. This should result in improved compliance with the groundwater standards, which would result in further protection of the groundwaters of the state as a resource and as a source of drinking water. This benefit would be realized by the environment and by those citizens who consume private well water.

If this analysis were to take into account existing IMACs, the estimated cost savings would likely be considerably reduced for all but five contaminants for which the proposed standard is lower than the IMAC. As summarized in Section 6.3, there could be some remediation costs associated with these contaminants which are not accounted for in this analysis. The costs to site owners of a lower cleanup goal would be associated with increased monitoring frequency and duration and potential use of a more expensive cleanup technology. State agencies could also incur opportunity costs from reduced staff capacity and funding resources that would have otherwise been reinvested at additional sites in need of cleanup. Remediation costs would be limited to sites at which one of the five contaminants is the driver for cleanup. Only one such site was identified during this analysis; for this site, the potential costs from a lower PFOA standard would be either fully or partially offset by the potential savings from a higher PFOS standard.

The agency does not have sufficient data to reasonably predict whether the total quantified and unquantified impacts of the proposed rulemaking will meet or exceed the $1,000,000 threshold for substantial economic impact as defined in G.S. 150B-21.4. It is reasonable to expect, however, that there will be a net direct benefit to regulated entities and state government and a zero to net-positive indirect benefit for well water consumers and the environment. The amount of savings could not be determined because of the high degree of variability and unpredictability of contaminated sites and remediation methods.

Appendix I References

1. *For PQL values:* NCDEQ Chemistry Laboratory "QA/QC Limits PQLs" https://files.nc.gov/ncdeq/Water+Quality/Chemistry+Lab/Operations/Quality+Assurance/NCDENR_DWR_WSS_LAB_PQLs.pdf

2. *For identification of chemically-similar contaminant to 1,4-dibromobenzene*: U.S. EPA Chemistry Dashboard https://comptox.epa.gov/dashboard/dsstoxdb/results?search=DTXSID4024012#similar-molecules*For LCMRL values for Acetochlor ESA and OXA:* U.S. EPA Document # EPA/600/R-05/053 "Method 535. Measurement of Chloroacetanilide and other Acetamide herbicide degradates in drinking water by solid phase extraction and liquid chromatography/tandem mass spectrometry (LC/MS/MS)" Version 1.1, April 2005, J.A. Shoemaker, M.V. Bassett

3. *For the definition of Lowest Concentration Minimum Reporting Level:* U.S. EPA Document # EPA 815-R-11-001 "Technical Basis for the Lowest Concentration Minimum Reporting Level (LCMRL) Calculator" December 2010.

4. *For estimated number of private groundwater well users in North Carolina:* https://epi.dph.ncdhhs.gov/oee/wellwater/figures.html

5. *For determination of combined PFOS/PFOA groundwater standard:* U.S. EPA drinking water health advisory https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos

6. *For data on numbers of NCDWM Solid Waste permitted facilities:* https://deq.nc.gov/about/divisions/waste-management/sw/data/facility-lists

7. *For determination of which contaminants are monitored at landfills:* Appendix I and II referenced from NC Solid Waste Section Environmental Monitoring List, Oct 15, 2018 https://edocs.deq.nc.gov/WasteManagement/0/edoc/1257181/SWS_EnviroMonitoring_Constituents_List.pdf