Rule Analysis
Fiscal Impacts of Proposed Revisions to Rules I5A NCAC 02C .0100 Well Construction Standards
Environmental Management Commission

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Impacts are primarily private industry, but also slightly impact state, county and local (municipal) government resources

Purpose of Rules

In order to protect public health and the state's groundwater resources from adverse effects of improperly constructed, operated, maintained, or abandoned wells, NCGS 87-87 directs the Environmental Management Commission (EMC) to adopt rules governing the location, construction, repair, and abandonment of wells, the operation of water wells or well systems with a designed capacity of 100,000 gallons per day or greater, and the installation and repair of pumps and pumping equipment.

In fulfillment of the EMC's charge, the well construction rules in 15A NCAC 2C .0100 establish minimum construction standards for water supply wells and certain other types of wells.

These rules were last revised in 2002. Since that time, it has become evident that several revisions are needed in order to provide clarifications, address new well construction materials, and provide better protection of public health and groundwater quality.

Effective, clear and comprehensive well construction rules are critical in carrying out the EMC's charge of preserving and protecting the waters of the state from contamination and protecting human health. These well construction standards, by regulating the location, construction and abandonment of water wells, help prevent contamination of the resource and protect human health. Beginning on July 1, 2008, local health departments will use these rules, either as they stand, or as a baseline for more protective standards, to regulate proper well construction and abandonment in order to assure that groundwaters of the state are protected and provide for safe water supplies for our state's growing population.

Throughout this fiscal note, alternatives to the proposed rule or revision were examined also if the estimated cost exceeded a threshold. These alternatives, which are broken down into preferred, less stringent and more stringent options, are designed to ensure that other possibilities were examined for feasibility and cost/benefit analysis in addition to the proposed rule or revision. Please note that the

Summary Table of Annual Cost Estimates at the end of this report indicates 'preferred option' cost estimates.

Affected Parties

These rule revisions are anticipated to primarily affect Certified Well Contractors (CWCs) that operate in North Carolina. Some economic impacts are also expected to occur for local governments and private citizens.

Most well contracting companies in North Carolina operate as small businesses. An exception is some large, national and international environmental consulting companies that frequently install monitoring wells as part of their business. Typical well contracting companies that install water supply wells in North Carolina operate one or more large drill rigs. The drill rig represents a substantial capital investment for these companies. They generally only have between one and ten employees that are CWCs and some additional uncertified helpers, and the mid-size to larger companies also have some managerial and administrative staff. Their business is sometimes fairly cyclical, with periods of intense activity and some slower periods. These cycles are closely tied in with the economic circumstances in the state, particularly with the real estate market. The economic impact that is expected to occur for these businesses for these proposed rule changes will generally affect the average installation cost (both materials and labor) for a well. The fact that they apply equally to all businesses means that none of them will gain any competitive advantage or be unfairly singled out. These proposed rule changes are generally expected to increase the average cost of a well installation a relatively minor amount, probably between $300 and $400 per well based on the total estimated rule revision costs and number of wells installed annually, which will likely be passed on to the consumer. For reference, it is estimated that an average well in North Carolina (actual costs vary based on depth, complexity and geographic area) costs between $3,000 and $6,000.

Basic Economic Impact

<u>Baseline / Assumptions</u>
The total number of private drinking water wells being constructed annually in the state is not known, but the Department of Environment and Natural Resources estimates it to be between 10,000 and 20,000 per year statewide based on records of well completions submitted. For this analysis we are assuming that 15,000 private drinking water wells will be constructed each year. The term Department, as used in this document, shall refer to the Department of Environment and Natural Resources (DENR).

In addition to private drinking water wells, DENR estimates that approximately 1,000 monitoring wells, 250 groundwater remediation wells, and100 large capacity/community wells are constructed annually in North Carolina.

For the purposes of this analysis, we are estimating that the current number of active CWCs in North Carolina is approximately 890 (based on a recent database pull) and that there are approximately 300 individual well drilling firms operating in North Carolina, with approximately 250 that primarily or exclusively install private drinking water wells and the remaining constructing other types of wells.

A key assumption of these proposed revisions is that these rules will serve as the local health department rules once the Private Drinking Water Well program is implemented in July 1, 2008. However, some local health departments will certainly use modified versions of these rules for their own inspection and enforcement programs, since conditions vary throughout the state and different health departments have different priorities. As previously noted, a fiscal analysis was performed by DEH to address the rules that address the Private Drinking Water Well program. That analysis, and this fiscal analysis as well, cannot and do not attempt to predict exactly what the individual counties may do to modify these rules, since they are allowed to impose different but equally or more stringent versions of these rules (or entirely different ones as long as they are at least as stringent) if they desire.

The costing portion of this analysis is based on what cost or benefit the proposed revision may potentially have above and beyond what the current or 'status quo' scenario is as the rules currently stand. The costs or benefits that are quantified as estimates represent the *additional* cost or benefit that may be incurred, not the total cost of the entire rule. This analysis is based on estimates that were purposefully made somewhat on the high side, therefore the cost estimates are likely on the high side of what the actual (unknown) impact will be.

Methodology to estimate the cost of an Environmental Health Specialist

The following cost estimate has been very slightly modified from an estimate made by the North Carolina Division of Environmental Health (DEH) for a Fiscal Analysis of a set of their rules. To determine the cost to counties to provide Environmental Health Specialists for field work, a sample of costs were collected from several counties chosen to provide a fairly representative sample of health departments. The counties chosen were Cleveland County, a rural county with rapid population growth, Wake County, an urban area with rapid growth, Pitt County with a moderately sized municipality and moderate growth, and Scotland County a rural county with minimal growth pressures. To capture the full cost of employing an Environmental Health Specialist, including management, office space, office support, transportation and training, the entire amount the counties budget for environmental health programs was divided by the number of field staff doing hands-on field work in each county and the four-county sample as a whole. The results are as follows:

County	**Cleveland**	**Pitt**	**Scotland**	**Wake**	**4 Counties**
Environmental Health Budget	$855,799	$1,275,000	$220,783	$3,562,606	$5,914,188
Number Field Staff	10.5	14.6	3	33	61.1
Cost per Field Person	$81,505	$87,329	$73,594	$107,957	$96,795

Hours available were determined by subtracting 104 days of weekend time, 10 days of holiday time, 14 days of vacation time, 12 days of sick leave, and three days for training from 365 days in a year and then multiplying the work days times 8 hours per day. This yields 220 days per year multiplied by 8 hours per day equals 1,760 work hours per year. The average hourly cost was then simply determined by dividing the four county annual cost per field person ($96,795) by 1,760 hours, which yields $55 per hour for a county health inspector.

Methodology to estimate the cost of a Certified Well Contractor

According to Payscale.com, the current median average hourly wage for a 'driller' (non-oilfield) is approximately $18.00. However, this number does not accurately represent the total costs associated with a typical CWC. To estimate this actual cost, the 1997 US Census Bureau Economic Census for Water Well Drilling Contractors was consulted (the 2002 version did not have a separate entry for well contractors and the 2007 census is not yet published). This census indicated that there were 890 well contractors in North Carolina in 1997, with a total "Value Added" number of $53,797,000 statewide. This number is the total value of construction work minus subcontracted work and materials, fuel, supplies, etc. This number is being used here as a proxy estimate to represent total labor costs, management, training, office support, overhead, depreciation, etc. When this number is adjusted for inflation to 2007 using the online US Bureau of Labor Statistics Consumer Price Index (CPI) inflation calculator, it works out to $70,031,960. When this is divided by 890 well contractors, it works out to be $78,688 per employee per year. When this $78,688 is divided by 1,760 work hours per year (as derived above in calculations done by DEH to estimate a county health inspector cost), the result is approximately $45 per hour for a CWC.

For proposed revisions, changes or additions with an estimated impact that exceeds $400,000 annually, alternative scenarios were investigated, with the proposed change being the preferred option, as well as a more stringent option, and a less stringent option. These alternative options are designed to identify if the proposed, preferred option, is the best choice with regards to benefits versus potential costs.

These proposed rule changes will have a substantial economic impact, as well as primarily affecting small businesses. Costs (including both impacts and benefits) to private industry, property owners and state and local governments are estimated to be approximately $6,834,700 for the first year and slightly less for following years.

Benefits for Registration

Rule **15A NCAC .0103 Registration (Authority GS 87-87)** currently require persons engaged in the business of installing or repairing pumps for wells to register bi-annually with the Department. The purpose of this is to maintain a database of all individuals, other than Certified Well Contractors (CWCs), who regularly work on equipment for water supply wells so that if there is an issue with a well the pump installer may also be identified. The proposed rule would make an exemption for CWCs, many of whom also install pumps, in order to reduce paperwork.

Based on a comparison of overlap between the CWC database and the registered pump installers' database, it is estimated that approximately 250 CWCs also install pumps. If the proposed rule saves an estimated 0.5 hours per year for each CWC, then the estimated annual cost savings is: 250 CWCs x 0.5 hours x $45/hour = $5,600.

Costs for Permits

Rule **15A NCAC .0105 Permits (Authority GS 87-87; 143-215.1)** currently states under what conditions a permit for a well is required. In order to ensure proper design and construction for certain types of wells which have a high potential to adversely affect groundwater if they are improperly constructed, permits are required prior to construction. Under the proposed rule, the circumstances under which monitoring well permits are required have been clarified to make it clear that temporary wells installed off of the site of a release require permits. This will improve the Department's ability to enforce completion and abandonment requirements for temporary monitoring wells.

Rule .0105(b)(3): It is estimated, based on permit data and the well construction database, that approximately 1,000 monitoring wells are constructed annually. Of these, approximately 100 (10%) are estimated to be constructed off of the site where the release occurred. Temporary wells are estimated to account for approximately 20% of all monitoring well installations, so therefore approximately 20 temporary monitoring wells per year are constructed offsite from the contamination release area. Based on an average of hourly rates for a staff scientist level employee for Golder Associates and CH2M Hill (both large environmental consultant firms with a presence in NC), an hour of a staff scientist level employee is billed out at a rate of approximately $86 per hour. Therefore, if one hour of an environmental scientist time is spent preparing a permit for temporary offsite monitoring wells and 20 are installed annually, the estimated annual cost is $1,720. The annual cost for the Department to review the permits would be: 20 wells x $75 per hour staff time = $1,500. The total annual cost of this proposed rule is therefore $3,200.

Rule .0105(h)(3): Wells that are screened across multiple aquifers can allow pollutants to freely travel between aquifers, causing a previously uncontaminated aquifer to become contaminated. The primary concern is in the coastal plain, where saline aquifers could easily be interconnected with fresh aquifers, thereby causing extensive contamination of the previously fresh aquifer. The proposed rule revision has added a requirement that permit applications for wells screened in multiple aquifers or zones must include information related to the head and water quality in the aquifers to be tapped, in order to provide the Department information sufficient to prevent harmful interconnection of aquifers. This proposed rule will primarily affect the private industry or municipality that installs the well or well system.

This proposed revision requires that measurements of head (water level elevation) and 7 different water quality constituents be reported for each interval the well is proposed to be screened in. Based on permit and database information, it is estimated

that approximately 100 large scale industrial or public water supply wells are installed annually. An estimated 70% of these would be expected to be installed in the Piedmont/Mountains where they aren't screened in separate zones. Of the remaining 30 wells, it's estimated that 65% (~20) wells probably won't be screened in definably separate zones or aquifers or will be able to obtain the necessary data from other nearby wells or data sources. The remaining 10 wells will then require monitoring wells for the necessary data. Assume that each well will be screened in an average of three separate zones or aquifers. These depths will certainly vary considerably, but estimate that the shallow, intermediate and deep zones or aquifers will average 100', 250' and 500' below land surface. This will require three monitor wells per large scale well with a total linear feet of 850 feet for all three wells. A reasonable rate for monitor well installation is $40 per foot. Therefore, the estimated annual monitor well installation cost will be $340,000. The labor cost to purge, measure and sample the 30 monitoring wells is estimated to be as follows: 3 hours per well x 30 wells x $62 per hour for jr. scientist/technician level personnel (averaged from the CH2M Hill and Golder Associates hourly billing rate lists) + 2 hours per well x 30 wells x $86 per hour for staff scientist time to review and report the data = $10,740. The estimated cost for sample analysis is based on 30 samples and an average per sample cost of $190 (based on a North Carolina commercial lab quote) which yields $5,700. The resulting total annual estimated cost of this proposed revision is $356,400.

Costs for Standards of Construction: Water Supply Wells

Rule **I5A NCAC .0107 Standards of Construction: Water Supply Wells (Authority GS 87-87; 87-88)** stipulates well location setbacks, sources of water, materials, grouting materials and procedures, well development, and other similar well construction standards. This rule essentially regulates the 'nuts and bolts' aspects of properly constructing a water supply well such that it is in a location that will not be likely to cause it to draw in contaminated water and that it is constructed using proper materials and techniques that minimize the chances of well failure and causing harm to human health or contamination of the groundwater.

Rule .0107(a)(2)(A): Subchapter (a) of this rule regulates location setback requirements for water supply wells. These setbacks are critical to ensure that water supply wells are not located too close to potential sources of groundwater contamination, such as septic systems, landfills, chemical storage areas, etc. The estimated costs from this proposed revision would be borne primarily by individuals purchasing land for house construction or buying a completed residence and lot.

(Preferred Option)
According to several county health department inspectors, septic drainfields commonly fail within the first 5 to 10 years of operation. Therefore, it has become common practice for local health departments to require that a drainfield 'repair area' be included as part of the permitted septic area. However, current rules do not recognize this repair area as a potential contaminant source. The proposed rule revision adds these repair areas as potential contaminant sources since they are so

commonly put to use after the original drainfield fails. According to the Division of Environmental Health (DEH), approximately 35,000 septic systems (tank, drainfield and repair area) are installed each year. This is an average of 350 systems per county per year. An estimated 30 counties of the 100 total currently do not enforce any setbacks for repair areas, which means approximately 10,500 septic systems are potentially in this category. Of these 10,500 potentially conflicting septic systems, a conflict between the repair area and the location of the water supply well may arise in an estimated 50% of these lots where there would not have been a conflict before, meaning approximately 5,250 septic systems could be affected annually. Since approximately 15,000 water supply wells are installed annually, then approximately 43 percent of residences with septic systems also concurrently have a water supply well installed, meaning a total of approximately 2,250 septic systems and wells that could be affected by this proposed rule revision. However, it is anticipated that in at least 90% of these cases, the well will be installed with the reduced setback provision (discussed later). Therefore, the remaining 225 instances may actually result in an increase in lot size. We anticipate that in these scenarios, where the initial developer chooses to demarcate larger lots, the land will be undeveloped and not residential yet (i.e. former farmland). Additionally, most septic systems are installed in rural areas, and in 2007, according to the US Department of Agriculture, National Agricultural Statistics Service, the average value of farmland in North Carolina is $4,600 per acre. If an average setback distance to a repair area is 75 feet, a circle of this radius is approximately 0.4 acres in area (i.e. average lot size increase for affected counties). Therefore, the total annual cost of this proposed rule is: 225 septic systems x 0.4 acres of additional land needed for the setback x $4,600 per acre = $414,000.

(Less Stringent Option)
In this option, the drainfield repair area would still include the repair area as a potential contaminant source. However, the setback distance would be 25 feet instead of the proposed 100 feet. A setback distance of 25 feet from a repair area that never gets utilized would likely not present any issues. It should be noted, however, that repair areas are commonly necessary and a setback distance of 25 feet to an active septic field is very risky at best, and many states with well programs disallow water supply wells less than 100 feet from a septic drainfield for health reasons. Using the same line of reasoning as above, except changing the average setback distance to a repair area to 25 feet, produces a circle with a radius of 25 feet which is equivalent to an area of 0.05 acres. Therefore, the total annual cost of the less stringent option is: 225 septic systems x 0.05 acres of additional land needed for the setback x $4,600 per acre = $51,750. However, due to the severe potential health risks of such a scenario, it is anticipated that many counties would (wisely) increase this setback to 100’ for their own rules, offsetting much of this cost differential. Additionally, although no attempts were made to quantify the increased health care and loss of productivity due to increased illness from consumption of contaminated water, these would be expected to increase considerably.

(More Stringent Option)
In this option, the drainfield repair area would still include the repair area as a potential contaminant source. However, the setback distance would be 100 feet

without an option of a reduction in setback distance for fixed lot conditions. This more stringent option will be also examined more thoroughly in Rule .0107(d)(4)(C). Using the same line of reasoning as above, except changing the average setback distance to a repair area to 100 feet, produces a circle with a radius of 100 feet which is equivalent to an area of 0.72 acres. Therefore, the total annual cost of the more stringent option is: 2,250 septic systems x 0.72 acres of additional land needed for the setback x $4,600 per acre = $7,452,000.

Rule .0107(a)(3)(A): This Subparagraph makes allowances for reducing setback distances from several specified contaminant sources (e.g. septic systems, animal barns, etc.) for lots with restrictive conditions or lot sizes. The intent of this is to still maintain minimal safe setbacks, but allow for situations in which the full setback distance cannot be achieved, such as conflicting structure placements or lot sizes that are too small. This Subparagraph is proposed to be clarified in regards to reduced separation distances for restrictive lot conditions (.0107(a)(3)) so that there is no reduction in the separation distance to a septic tank system installed in saprolite. This is in order to be more protective for wells located on lots with saprolite septic systems. Saprolite is a specific term which essentially pertains to former rock that has been weathered in place to an unconsolidated form and which frequently exhibits some of the structure or fabric of the parent rock. This is deemed necessary since there is considered to be less biologic activity for contaminant breakdown and a greater proximity of the drainfield to subsurface fractured bedrock, which can act as rapid conduits for groundwater flow to water supply well intakes. Additionally, this proposed change will make this subparagraph consistent with Rule 15A NCAC 18A .1956(6), which are the DEH rules dealing with septic system installations. Since this rule is a clarification of existing rules, no attempt was made to quantify potential costs, which would be anticipated to be relatively minor.

Rule .0107(b): This Subparagraph specifies that the source of water for a well shall not be from a water bearing zone or aquifer that is contaminated and also stipulates the minimum depth from land surface that the water for the well can be directly drawn from. The intent of this is to prevent contaminated water from being used for potable wells and disallow wells that may be drawing water from to shallow of a source that is more likely to be contaminated than a deeper source. The current standard minimum depth for a source of water is 20 feet for most of the state. However, with setbacks being reduced more frequently due to restrictive lot conditions, a requirement is being proposed which would make the minimum depth 35 feet below land surface for a well to draw water from for wells that are less than the standard setback distances. This proposed rule revision is essentially recast in Rule .0107(d)(4)(C) and the cost analysis is therefore done for that proposed Rule revision.

Rule .0107(d)(1)(F): Rule .107(d) specifies the types of allowable materials and specifications for well casings. Well casings perform a critical role in preventing surficial and shallow contamination from traveling down along the well borehole and getting to the well intake. The Subparagraph specified currently states that drive shoes, which are metal collars with hardened beveled edges, are required for casing that is to be driven into consolidated rock. The drive shoe helps prevent the casing

from deforming as it is driven into the rock. The rule currently does not require a drive shoe if the casing is fully grouted along its entire length. The proposed rule revision will require a drive shoe in all cases, since the casing still needs to be driven into rock in most cases, and full grout will still not be protective of a highly deformed casing in bedrock. Of the estimated 15,000 domestic water wells installed annually, approximately two-thirds of these are located in the Piedmont/Mountain areas of the state (i.e. areas that would require drive shoes). It is estimated that approximately 50% (5,000) of these 10,000 wells will be PVC and won't need a shoe. Of the remaining 5,000 wells, possibly one-fourth (1,250) might typically get a full casing grout and would not currently need a drive shoe. Therefore, if 1,250 wells will now need shoes, which cost approximately $60 each, the total annual cost of materials is $75,000. The estimated annual labor cost to weld the shoes on the casing is: 0.5 hour x $45 per hour x 1,250 wells = $28,125, making the total estimated annual cost of this revision $103,100.

Rule .0107(d)(2)(D): This Subparagraph proposes that thermoplastic casing for wells must be at least equivalent or greater in thickness than SDR 21 or Schedule 40. Thinner plastic casing material is considered too weak and easily broken, thereby threatening the integrity of the well.

According to a representative of the National Ground Water Association (NGWA), of the SDR PVC types, SDR 21 and 17 are the most commonly used for well construction. Additionally, ASTM standard F480-06B, which sets standards for PVC casing used for water well construction, only discusses the use of Schedule 40 or 80 and not anything thinner. Additionally, it appears that thinner PVC schedules, such as Schedule 20, are fairly uncommon and are not expected to currently be used much if at all in North Carolina. Based on local cost estimates, for 6 ¼-inch PVC casing, the heavy wall SDR 21 casing is $1 more per foot than the thinner wall SDR 27.6 casing. For the same diameter Schedule 40 casing, the cost differential is $0.28 more per foot than SDR 27.6. A brief search did not identify any source for 2-inch PVC casing in the thinner SDR sizes. Based on experience, Schedule 40 is most commonly specified for monitoring wells or other small diameter wells since it is very common and easy to obtain. Therefore, this cost estimate will only look at water supply wells, which are expected to be much more likely to utilize the thinner SDR sizes. Of the estimated 15,000 private drinking water wells installed annually, it is roughly estimated that 50% utililize PVC casing. Of this 7,500, possibly about 50% (3,750) use Schedule 40 since it's common and reasonably inexpensive. Of the wells using SDR casing, maybe 75% (2,813) use SDR ratings thinner than 21 since it's less expensive. This means that 2,813 wells, which are estimated to have an average casing depth of 35 feet, would need to be upgraded to thicker SDR or Schedule 40 PVC. This yields 98,455 linear feet of casing, and with an average cost differential of $0.64 per foot (assuming 50% will use thicker SDR and 50% will switch to Schedule 40), so the estimated annual cost of this proposed revision is $63,000.

Rule .0107(d)(4)(C): (Preferred Option)
This Subparagraph proposes that, in cases where well setbacks are less than the standard distances due to restrictive lot conditions, the well shall be cased to a minimum of 35 feet. This is considered necessary since the use of reduced setbacks

due to lot size issues or restrictive lot conditions is becoming more common and superior well construction methods are now necessary to help eliminate contamination problems. It is estimated that of the 15,000 private drinking water wells installed annually, approximately 1/2 or 7,500 of these wells are installed with reduced setback distances. It is also estimated that of these approximately 7,500 wells, approximately 50% would already have greater than 35 of casing anyway due to depth to bedrock. A reasonable estimate is $20 per foot of the extra boring and casing depth. Therefore, the total estimated annual materials cost of this proposed rule change would be: 3,750 wells per year x 15 feet of extra casing per well x $20 per foot = $1,125,000. The estimated total annual labor cost would be: 0.5 hours for the extra boring and installation time x $45 per hour x 3,750 wells = $84,375. The sum total estimated annual cost is therefore $1,209,400.

(Less Stringent Option)
In this option, the well would only be required to be cased to 25 feet instead of 35 feet in the case of wells with reduced setback distances. This would be considerably less protective than the above, preferred option, but still slightly more protective than the current scenario. Using the same reasoning as above, the estimated annual cost, with only 5 feet of extra casing instead of 15 feet of extra casing and only an extra 0.25 hour of labor, would be $417,200.

(More Stringent Option)
In this option, the option for reduced setbacks with fixed lot conditions would be done away with entirely. This would be expected to be somewhat more protective than the above, preferred option, but the level of extra protection is unknown. With this scenario, similar reasoning used for Rule .0107(a)(2)(A) is used to calculate the potential estimated annual cost. With an estimated 15,000 annual well installations, and nearly all of them occurring on lots with septic systems (it appears that lots with septic systems but municipal water are more common than lots with wells but municipal waste treatment), an estimated 1/2 or 7,500 wells are installed with reduced setbacks due to lot size restrictions. These 7,500 wells would be required to have 100-foot setbacks from septic systems instead of a potential 50-foot setback currently allowable. This means that 7,500 lots would require an extra 50-foot radius area of property, which equates to 0.18 acres. Therefore, the total annual cost of this proposed rule is: 7,500 lots x 0.18 acres of additional land needed for the setback x $4,600 per acre = $6,210,000.

Rule .0107(d)(9): This Subparagraph proposes that a CWC must place a watertight seal on the wellhead prior to removing his equipment from the site. The purpose of this proposed requirement is to prevent having an open borehole or casing that can act as a direct channel for pollutants, vermin or other undesirable materials to contaminate the aquifer. Of the approximately 15,000 private drinking water wells installed annually, it is roughly estimated that approximately 50% (7,500) are drilled, cased and left for a separate pump installer to complete the well (In the other wells, the driller completes the entire well and wouldn't have left the site prior to sealing the wellhead anyway). An inexpensive cap to cover the well costs approximately $5, so therefore the total estimated annual cost of this proposed change would be $37,500.

Rule .0107(f)(3)(C): (Preferred Option)
Proposed Rule .0107(f) specifies the allowable methods of grout emplacement. If the grout for a water well is placed haphazardly or improperly, the grout will likely not form an effective seal that prevents surficial pollutants from contaminating deeper portions of the aquifer and the well intake. Gravity flow (e.g. pouring) methods of grout emplacement are currently allowed in the upper 20 feet of the annular space (space between the borehole and the casing). However, sometimes standing water or other obstructions in the borehole prevent the grout from effectively flowing or sealing. This Subparagraph proposes that if water or other obstructions are present in the annular space, the grout must be pumped or pressure grouted or the water/obstructions must be removed prior to pouring the grout.

For this cost estimate for the proposed rule, a best case scenario and worst case scenario were estimated and the cost estimate was simply an average of these two since the most likely case is unknown.

The best case scenario assumes that 10% (1,500) of the 15,000 water wells installed annually will have water or some obstruction which can't be removed in the annular space and will need to be pressure grouted. There are an estimated 250 well drilling companies that primarily or exclusively install private water wells, and an estimated 50% (125) of these companies don't have any grout pumping equipment. If only 50 of these companies run into scenarios where they need grout pumping equipment frequently enough to justify purchasing it, and the cost of the equipment is estimated (on the low side) at $8,000, then the first year cost of this proposed rule will be $400,000, and then to much lower levels (equipment operating and maintenance costs) thereafter.

The worst case scenario assumes that 60% (9,000) of the 15,000 water wells installed annually will have water or some obstruction which can't be removed in the annular space and will need to be pressure grouted. There are an estimated 250 well drilling companies that primarily or exclusively install private water wells, and an estimated 50% (125) of these companies don't have any grout pumping equipment. If 100 of these companies run into scenarios where they need grout pumping equipment frequently enough to justify purchasing it, and the cost of the equipment is estimated (on the high side) at $12,000, then the first year cost of this proposed rule will be $1,200,000, and then to much lower annual levels (equipment operating and maintenance costs) thereafter.

The average of these two scenarios is $800,000 for the first year. The average fuel & maintenance cost for a typical 10 HP pressure grouter is estimated to be approximately $750 per year. With an estimated 100 companies operating pressure grouters under the new proposed rule, the estimated total annual fuel & maintenance cost is approximately $75,000.

(Less Stringent Option)
In this option, if there is standing water in the borehole, the water would be required to be pumped out prior to emplacement of the grout. This would be considered less

effective than the preferred option, however, due to the fact that it is difficult to effectively pump water out of the annular space in many cases (the water will flow back in before the well can be effectively grouted). With this scenario, it is estimated that possibly 63 (1/2 of the estimated 125 above) companies would need to purchase some sort of relatively simple but effective 'trash pump', which could be used to pump the water out. These cost approximately $1,000 for one of reasonable quality. Therefore, the initial, first year cost would be $63,000. Labor would probably be about 1 hour per well, and with an average of 45% of the 15,000 annually installed wells (average of best and worst case scenarios above) or 6,750 wells needing to be pumped, resulting in an annual estimated $303,750. This labor cost would be an annual cost, and there would be an additional annual fuel and maintenance cost associated with operating the pump, which would be estimated at about 15% that of a grouter, or $11,300.

(More Stringent Option)
In this option, the allowance to remove the water instead of pumping grout would be removed. If there is any water or obstruction in the well, the grout must be pumped. Using the same reasoning as the preferred option, this would be expected to bring the annual cost estimate much closer to the worst case scenario. In this scenario, it is estimated that maybe 75% of wells would have some water or other obstruction and need to have the grout pumped. If an average of the best and worst case scenarios for a grout pump is calculated, this yields $10,000 for a grout pump. In this scenario, the first year cost would be estimated at 125 companies needing to pay $10,000 for a pump, which results in $1,250,000. The annual fuel and maintenance costs would also increase somewhat above the estimated $75,000, since the grout pump equipment would be used more frequently.

Rule .0107(f)(3): This proposed subparagraph would allow the use of bentonite grout in the upper three feet of annular space. Currently, the regulation stipulates that bentonite grout may be used from three feet below land surface and deeper, but cement grout must be used in the upper three feet to the surface. This proposed rule change is based on field experience from state and county well inspectors that indicate that bentonite grout is sufficiently flexible but stiff and self-sealing to prevent excessive casing movement or open channels in the grout and generally provide a more effective surficial seal. This proposed rule change has both anticipated costs and benefits.

A reasonable estimate of the number of wells currently using bentonite grout as the primary grouting material is approximately 30% or 4,500 wells. The remaining estimated number of other wells that use cement grout exclusively would be unaffected by this rule. Under the current rule the upper 3 feet would have been cement, but it now can be bentonite. Based on a calculation of the volume of the annular space in this upper 3-foot segment times the number of potentially affected wells (4,500), a sum total volume is obtained. The materials cost of bentonite grout versus cement grout differential was then calculated, with bentonite grout being approximately $1.50 more per cubic foot. This cost differential times the sum total volume yields an annual estimated cost of $21,500.

The cost savings associated with this proposed rule change is the result of a time savings factor. If a CWC uses bentonite grout for the entire well, there is no need to spend time mixing up a separate batch of cement as they do under the current rule. Additionally, the county well inspector doesn't need to observe the CWC mixing cement grout. If the average time savings is 0.5 hour per well not mixing cement for the upper 3 feet of the well, then the approximate annual savings of this proposed rule is: (0.5 hours x $45 per hour CWC time) + (0.5 hours x $55 per hour county inspector time) x 4,500 wells = $225,000.

Costs for Standards of Construction: Wells Other than Water Supply

Rule **15A NCAC .0108 Standards of Construction: Wells Other than Water Supply (Authority GS 87-87; 87-88)** stipulates well construction methods, sources of water, materials, grouting materials and procedures, well development, and other similar well construction standards for wells other than water supply wells. These types of wells most typically include groundwater monitoring wells and injection and recovery wells for groundwater contamination remediation at groundwater pollution incident sites. The fact that these wells are installed in and around contaminated areas mean that, although they aren't used for water supply purposes, they need to be regulated to prevent further contamination of the groundwater or spreading contaminants to deeper uncontaminated aquifers. This rule essentially regulates the 'nuts and bolts' aspects of properly constructing a water supply well such that it is in a location that will not be likely to cause it to draw in contaminated water and that it is constructed using proper materials and techniques that minimize the chances of well failure and causing harm to human health or contamination of the groundwater.

Rule .0108(l): This proposed subparagraph requires the use of a protective steel cover or manhole set in concrete to protect the wellhead from damage. This measure is intended to ensure that non-water supply wellheads have sufficient protection from damage from site activities such as vehicles, equipment etc. since they are frequently installed in industrial areas. If the wellhead gets damaged, it can act as a conduit for surficial contamination to impact local groundwater. It is estimated, based on data from the GW-1 database and permit data, that approximately 1,250 monitor wells and remediation wells are installed annually. Most environmental consultants that install these wells specify a steel protective cover or manhole anyway to prevent costly damage, so possibly only 10% of these wells will not have any protective cover specified when constructed. A typical steel upright or manhole cover for these type of wells costs approximately $40. Therefore, the annual cost estimate for this proposed change is: (125 wells per year x $40) + (0.75 hours x $45 per hour CWC time x 125 wells per year) = $9,200.

Rule .0108(t): This proposed subparagraph clarifies the use of a centering guide or centralizer in sand or gravel pack wells. The centering guide or centralizer prevents the casing from being pressed against one side of the borehole annular space while the sand or gravel is emplaced. It can reduce the effectiveness of the sandpack or also prevent the grout from forming an effective seal if the casing is pressed against

one side of the borehole annular space. Based on the frequency of the use of sand or gravel packing materials in these types of wells, it is estimated that approximately 75% (938) of the 1,250 monitoring/remediation wells would need a centering guide. A typical centering guide costs approximately $14. The estimated annual cost of this proposed clarification is therefore approximately $13,100.

Costs for Pumps and Pumping Equipment

Rule **15A NCAC .0109 Pumps and Pumping Equipment (Authority GS 87-87; 87-88)** regulates pumps, pumping equipment and other associated equipment and materials for use in water wells.

Rule .0109(e): (Preferred Option)
This proposed subparagraph revision deals primarily with the use of wellhead vents. It is important for the wellhead to be vented to prevent large changes in air pressure in the casing as water levels rise and fall during periods of pumping and recovery. The wellhead vent allows the air in the well casing to be vented to atmospheric air, allowing it to equilibrate. However, large scale flooding events such as hurricane Floyd can cause many thousands of wells to become contaminated through infiltration of polluted surficial floodwaters into the well. This proposed revision would require that if a well is located within a 100 year floodplain the vent opening must be reinforced and located above the base flood elevation or it must be equipped with a check valve device to prevent the entrance of floodwaters.

For this cost estimate for the proposed rule, a best case scenario and worst case scenario were estimated and the cost estimate was simply an average of these two since the most likely case is unknown.

The best case scenario assumes that only 5% (750) of the 15,000 water wells installed annually will be installed within the 100 year floodplain. These 750 wells will require that the well vent either be mounted to some reinforced structure located above the base flood elevation or will need a check valve apparatus. If the materials cost approximately $25, then the total annual estimated materials cost will be $18,750. The annual estimated labor cost for these vent installations is approximately 0.75 hours of CWC time at $45 per hour for 750 wells or $25,312. The estimated annual time cost for determining if any given well is located in a 100 floodplain is 0.5 hours of CWC time at $45 per hour for 15,000 wells annually plus 0.5 hours of county health inspectors time for 15,000 wells annually for verification, which works out to a total of $750,000. Therefore, the best case scenario total annual estimated cost of this rule revision is $794,000.

The worst case scenario assumes that 15% (2,250) of the 15,000 water wells installed annually will be installed within the 100 year floodplain. These 2,250 wells will require that the well vent either be mounted to some reinforced structure located above the base flood elevation or will need a check valve apparatus. If the materials cost approximately $50, then the total annual estimated materials cost will be $112,500. The annual estimated labor cost for these vent installations is

approximately 1.5 hours of CWC time at $45 per hour for 2,250 wells or $151,875. The estimated annual time cost for determining if any given well is located in a 100 floodplain is 0.5 hours of CWC time at $45 per hour for 15,000 wells annually plus 0.5 hours of county health inspectors time for 15,000 wells annually for verification, which works out to a total of $750,000. Therefore, the worst case scenario total annual estimated cost of this rule revision is $1,014,400.

The average annual estimated cost of these two scenarios is $904,200.

(Less Stringent Option)
With this option, the requirement to install a flood resistant well vent only applies if the well is located in an area that might flood (i.e. don't apply a standard, just leave it up to individual judgment about whether the well may get flooded or not). Given that many individuals don't have an instinctive sense about whether an area might or might not flood over the lifetime of the well, it is estimated that CWCs and county health inspectors would only feel comfortable not installing flood resistant well vents in maybe only 25% or 3,750 of the annual well installations in NC. Therefore, the flood resistant vents would likely be required in an estimated 11,250 wells. This option removes the cost estimates for CWCs and county health inspectors to determine if a well is located in a flood plain. Using the reasoning and averages for the best and worst case scenarios for materials and CWC labor for installation, the total annual estimated cost for this option would be: 11,250 wells x 1 hour installation time x $45 per hour CWC time = $506,250. The estimated annual materials cost, with 11,250 wells and an average materials cost of $38, would be $427,500. The total annual estimated cost for the less stringent option would therefore be $933,800.

(More Stringent Option)
This option would simply require flood resistant vents for all water supply well installations regardless of the location. The estimated cost for this would be the same as the less stringent option above except that the total wells would be 15,000 instead of 11,250. This yields an annual estimated cost of $1,245,000.

Rule .0109(f): This proposed subparagraph revision replaces the requirement for a hose bibb on the wellhead with a threadless sample tap or hose bibb. The reason that threadless is specified is that it prevents a homeowner from hooking a hose to the wellhead which could be attached to a herbicide or pesticide sprayer or placing a hose in contaminated water, either of which could result in a back siphoning scenario which would directly contaminate the well and groundwater. A review of two plumbing equipment suppliers indicates that an average cost difference between threaded and threadless taps is approximately $0.35 more for the threadless tap, therefore for 15,000 wells annually the estimated annual cost for this proposed revision is $5,300.

Rule .0109(k): This proposed subparagraph revision requires that if a threaded hose bibb is attached to the wellhead, it must have a backflow preventer. The backflow preventer is specified to prevent the backflow siphoning scenario described

previously. A review of several plumbing equipment suppliers indicates that an average cost for a backflow preventer is approximately$5, and an estimated 50% (7,500) of the 15,000 annually constructed wells may also have a threaded tap installed, so the total estimated annual cost for this proposed revision is $37,500.

Benefits for Well Tests for Yield

Rule **15A NCAC .0110 Well Tests for Yield (Authority GS 87-87; 87-88)** requires that water supply wells be tested for capacity (yield) and specifies how the testing is to be done. Well yield or capacity is a measure of the well's ability to produce water. This information is important to ensure that the well will be able to produce the amount of water that is necessary and it also serves as an important source of groundwater data.

Rule .0110(b)(4): This proposed subparagraph removes a requirement from the approved procedure for testing public, industrial or irrigation wells that the testing be continued until water levels in the well cease to decline. In these types of tests, the well is pumped at a rate that is anticipated to be at or near the required capacity of the well and water levels in the well are periodically collected. Typically, the water level will rapidly decline and then stabilize (cease to decline) after a period of time. However, in some hydrologic circumstances the well will effectively never cease to decline and the CWC is forced to make up numbers in order to follow the regulations. The removal of this requirement is anticipated to produce better quality data and will also waste less of the CWCs time waiting for a water level to cease to decline that physically cannot. The anticipated annual savings of this proposed change is: 250 wells per year of this type x 2 hours per well average CWC time saved x $45 per hour = $22,500.

Costs and benefits for Well Maintenance: Repair: Groundwater Resources

Rule **15A NCAC .0112 Well Maintenance: Repair: Groundwater Resources (Authority GS 87-87; 87-88)** regulates the methods and materials to be used for well repairs and also requires that wells must be maintained by the owner so that they do not become sources or channels of contamination. This regulation is important in that it also places some of the burden for ensuring that wells do not act as sources or channels of contamination on the well owner since this is still a potential issue long after the well has been constructed. It also has important requirements for the methods of well repair, which commonly involve the use of well liners.

Rule .0112(b): This proposed addition requires that dewatering wells be permanently abandoned within 30 days of the completion of the dewatering activity. Dewatering wells are relatively simple shallow wells that are typically pumped to lower the water table at construction sites or mining sites where shallow groundwater may interfere with soil excavation and construction activities. Once the dewatering wells are removed, the borehole can act as a channel for shallow or surficial pollutants to contaminate the groundwater. Permanently abandoning the well, which

for this type of wells consists primarily of filling the borehole with cement or bentonite grout after the well has been removed, prevents contaminant migration from shallow zones to deeper groundwater zones. The per well abandonment cost is anticipated to be low since these are shallow wells and they don't need to be abandoned by a CWC since they aren't under the purview of the Well Contractor Certification Commission. The anticipated annual cost resulting from this proposed revision is: 5,000 estimated (roughly) dewatering wells in need of abandonment each year x $50 per well abandonment cost = $250,000.

Rule .0112(c): This proposed addition stipulates that the well owner shall not place any potential sources of contamination closer to the well than the distances specified in the setbacks specified in Rule .0107 described earlier. This revision is considered necessary since it has been determined that it is common practice for well owners to store hazardous substances and materials near the well. This is designed to prevent this occurrence, which is deemed a significant threat to the groundwater resource. The potential costs of this proposed revision were considered and were determined to be extremely difficult to even roughly quantify, since there are so many potentially varying scenarios.

Rule .0112(e): This proposed revision requires well owners to either repair or permanently abandon any well that has broken screens, casing, wellhead or other fixtures. The existing rule only states that the well in disrepair must be repaired or abandoned. This opened up a 'loophole' that allowed some well owners to declare that the well was temporarily abandoned (since the term abandoned covers both permanent and temporary abandonment) simply by placing a seal on top of the damaged well. Damaged wells are considered a hazard and threat to the resource since they can allow shallow or surficial pollutants to migrate down and contaminate the groundwater. It's estimated (roughly) that perhaps 3,500 total well abandonments are done annually. Of these, possibly 10% (350) take advantage of the 'loophole' and call the well temporarily abandoned, when in reality it should be permanently abandoned. An average well abandonment is estimated to cost approximately $1,000, so therefore the total estimated annual cost of this revision is $350,000.

Rule .0112(f): This proposed revision states that well liners must be grouted within 10 working days of confirmatory analytical testing results or installation of the liner. A well liner a method of well repair in which an inner pipe or casing is placed inside of the primary well casing and sealed off at a level above or partially within the main well intake. The intent is to seal off any zones of the well above or partially within the primary intake that may be allowing contaminants to enter the well. Typically, these liners are placed in the well without grout to initially confirm that the liner is going to seal off the area where the contaminants are suspected to be entering the well. However, the current regulations only allow 10 working days before the liner must be permanently grouted in place, which often isn't enough time for analytical sampling to confirm that the liner is properly placed. This revision is anticipated to have a cost benefit in that it will prevent liners from being grouted that weren't properly placed. The benefit of this revision is based on an estimated (roughly) 500 liners annually that need to be re-done due to improper placement and an estimated cost of approximately $300 to re-do a liner, which results in total annual estimated

benefit of $150,000.

Costs and benefits for Abandonment of Wells

Rule **15A NCAC .0113 Abandonment of Wells (Authority GS 87-87; 87-88)** regulates the methods and materials to be used for well abandonments. Proper abandonment of wells and borings prevents surficial and shallow contaminants from having an easy pathway to deeper groundwater and aquifers.

Rule .0113(b)(3): This Subparagraph currently requires that any well that is not properly grouted in accordance with the regulations must be either overreamed (effectively drilling around the outside of the casing) and re-grouted in accordance with the regulations prior to abandonment or the casing must be removed and the well grouted. This proposed revision makes allowances for abandonment requirements for ungrouted water supply wells that were installed prior to the effective date of these regulations. Many water wells were installed prior to the effective date of these regulations and frequently don't comply with the current regulations. Concerns have been raised by county health officials and CWCs that it is often very difficult and prohibitive to attempt to set their equipment up over an old well that may have fences, sheds and other structural additions built around it since the well was constructed. Setting up the rig over the old well is required to overream it and grout it properly. Since most well owners would rather not see their fences torn down and their structures potentially damaged to gain rig access to an old well, most simply ignore the regulation and leave the well alone. This revision would help address this situation by allowing ungrouted wells constructed prior to the effective date to be abandoned by a simpler and far less intrusive method.

According to an experienced local CWC who is familiar with this issue and has done these type of abandonments, a typical abandonment of an 'average' water supply well would cost approximately $1,600 total. An abandonment of an ungrouted water supply well with otherwise identical specifications as the 'average' water supply well would be approximately twice as much at $3,200. According to DEH for a fiscal analysis of their proposed 15A NCAC 2C .0300 rules, approximately 5% (750) of the total 15,000 new well installations will result in an older well being located on the lot that will need to be abandoned (per the proposed .0300 regulations). In addition, DWQ estimates that an additional approximately 750 water supply well abandonments would be required annually in addition to the new ones generated by the proposed .0300 regulations, making a total of 1,500 estimated number of water supply wells being abandoned annually. Of this 1,500, a reasonable estimate of 25% predate the effective date of these regulations and are ungrouted and 5% postdate the regulations and are ungrouted. Therefore, an estimated 450 total wells annually may be ungrouted of the total 1,500 being abandoned. The annual anticipated estimate cost savings from this revision is: (450 total ungrouted wells per year x $3,200 = $1,440,000) – (375 ungrouted (pre 2C rules) x $1,600 + 75 ungrouted (post 2C rules) x $3,200 = $840,000) = $600,000.

Rule .0113(b)(10)(A) and.0113(b)(10)(B): This Subparagraph currently stipulates

methods for properly abandoning shallow and deep temporary wells and monitor wells. The intent is that shallow wells may be abandoned by backfilling, and deeper wells or ones that are in the water table must be abandoned using grout, which is more protective. There are two separate proposed revisions regarding this subparagraph, both of which will have separate cost estimates.

(Preferred Option)

The first proposed revision adds test borings to temporary wells and monitor wells. This proposed addition is intended to address the issue of test borings (which are primarily geotechnical and environmental soil borings, but can also include borings for mining, etc.). These types of borings can penetrate to considerable depths, and if they are left ungrouted after completion of the boring, they can easily act as conduits for surficial and shallow contamination to reach deeper groundwater and aquifers. This proposal would require the same abandonment methods being proposed for temporary wells and monitoring wells. The estimated costs of this addition were difficult to calculate, since there are no official records associated with these types of borings. The following attempt to quantify the estimated costs associated with this proposed revision examines the number of companies in NC that have CWCs on staff and are known or have been verified as doing a sizeable percentage of their business doing these types of test borings. The proposed revision states that any test boring (also monitoring wells and temporary wells, but these aren't included since they are the 'baseline' condition) that is less than 20 feet deep or doesn't penetrate the water table may be backfilled with cuttings (which is how likely nearly all of them are currently abandoned). If they are deeper than 20 feet or penetrate the water table, they must be completely filled with grout. Based on the CWC database, there are approximately 25 firms that have an average of 2.6 CWCs each that do primarily or a large proportion of their business completing test borings. Some of these firms are based in nearby states, and since some also do other types of well installations, a total of 20 full time equivalent (FTE) CWCs performing exclusively test borings was estimated for NC. If these 20 FTEs work an estimated 160 days a year (based on weekends off, sick leave, vacation, weather issues, training, equipment breakdowns and maintenance, etc.) and can do an estimated 5 borings a day, then an estimated 16,000 test borings are conducted annually in NC. If an estimated 2/3rds of these are deeper than 20 feet or penetrate the water table, then 10,667 borings must be abandoned using grout annually. Based on a calculation of an "average" test boring diameter and depth, a volume is obtained for a materials (grout) calculation, which yields an estimated annual cost of $653,087. An estimate of 0.5 hours per boring seems reasonable for abandonment, therefore the estimated annual labor cost of this proposed revision is: $45 per hour x 10,667 wells x 0.5 hours = $240,008. Therefore the total annual cost of this proposed revision is $893,100.

(Less Stringent Option)

In this option, the test borings (considered separately from temporary wells and monitor wells) would only need to be abandoned if they penetrate the water table. This option is considered less than optimal since the water table moves up and down throughout the year and during times of drought or low water levels, a test boring could be installed that soon intercepts the water table during wetter periods. This could allow a short circuit route for contamination to reach groundwater. Using the

same reasoning as above, it's estimated that possibly 50% of the borings would penetrate the water table. This would mean that of the 16,000 estimated annual borings, 8,000 would need to be abandoned with grout. Therefore, the annual estimated materials cost of this option would be $489,800. The annual estimated labor cost would be $180,000. Therefore, the total annual cost of this option would be $669,800.

(More Stringent Option)
In this option, since test borings generally are entirely ungrouted (as opposed to monitor wells and temporary wells, which are), all test borings would need to be abandoned using grout. Using the same reasoning above, the annual estimated materials costs for 16,000 test borings would be $979,600. The annual estimated labor cost would be $360,000. Therefore, the total annual cost of this option would be $1,339,600.

The second proposed revision is effectively designed to eliminate a gap in the current regulations in that it specifies depths and conditions for which temporary and monitoring wells and test borings must be abandoned. However, the way it is currently written it allows for less protective method of abandonment for deeper wells or borings that don't penetrate the water table. This proposed revision would set an absolute depth limit of 20 feet below land surface for wells that may be abandoned using the less protective method if they don't penetrate the water table. Any temporary, monitoring well or test boring that penetrates the water table or is deeper than 20 feet must be abandoned using grout (however, since the current rule only requires monitoring and temporary wells to be abandoned, test borings were not included in this calculation). It's estimated that there are approximately 1,000 monitoring wells and 500 temporary wells installed annually. Furthermore, it's estimated that 5% (75) of these fall into the category of being deeper than 20 feet but don't penetrate the water table and therefore can currently be abandoned with the less protective (easy) method of backfilling. The proposed revision would require these 75 wells to be abandoned with grout, which is estimated to cost $200 more per well for the grout abandonment method versus backfilling, which would result in an estimated annual cost of $15,000.

Costs and benefits for Data and Records Required

Rule **15A NCAC .0114 Data and Records Required (Authority GS 87-87; 87-88)** regulates how records for well completions and abandonments are to be completed and submitted. These records are important for maintaining an up to date database of these activities so that the information can be retrieved at a later date and information on well and groundwater usage can be estimated.

Rule .0114(b)(1): This Subparagraph currently indicates what agencies must be included in submittals of well completion and abandonments and what information must be included. The current version only requires that the location of the well or abandonment be depicted so that it may later be located. This has caused a wide variety of roughly drawn maps and other indecipherable figures that are nearly

useless for determining the location. The proposed revision stipulates that the recorded location of the well or abandonment must be accurate to within 100 feet. This requirement falls well within the capabilities of virtually all commercially available global position system (GPS) units. This would require that CWCs and homeowners that currently don't have a GPS unit would need to buy one. A reasonably inexpensive but more than adequate recreation GPS unit can be purchased for $200, and it's estimated that approximately 250 CWCs (some individually and some as multiple company-wide purchases) and 50 homeowners would need to purchase one of these units, which would result in an up front first year cost of approximately $60,000. The estimated 50 homeowners per year needing a GPS unit is expected to stay fairly constant, resulting in a $10,000 estimated ongoing annual cost for this rule

Impact on State (DOT)

The proposed revision that would have the most significant impact on the NC DOT would be Rule .0113(b)(10)(A) and .0113(b)(10)(B). This proposed revision, which was discussed previously, stipulates methods for properly abandoning shallow and deep temporary wells, monitor wells and test borings. The intent is that shallow wells and borings may be abandoned by backfilling, and deeper wells and borings or ones that are in the water table must be abandoned using grout, which is more protective. As part of their roadway and bridge construction investigations, DOT completes significant numbers of geotechnical test borings to determine subsurface conditions and load bearing capacity of soils. This proposed rule would only affect the geotechnical borings that are deeper than 20 feet or penetrate the water table. The previous cost estimate that was performed for this impact analysis is anticipated to have captured a portion of the cost to DOT, since DOT subcontracts out a significant amount of the geotechnical work to private geotechnical drilling companies. Therefore, the impact analysis that is being estimated here is considered to be a partial subset of the previously performed cost estimate (i.e. the intent here is to capture the entire additional impact to DOT alone, but this number should not be simply added to the total cost for the entire impact analysis).

Using similar reasoning as done with the previous impact analysis for this proposed revision, it is estimated that the DOT performs approximately 4,480 test borings per year. Since the majority of these borings are completed along future road rights-of-way, the depths are anticipated to be considerably shallower than geotechnical borings for larger structures. Assuming that only an estimated 1/3rd of the borings will be deeper than 20 feet or penetrate the water table, this means that an estimated 1,493 test borings will require abandonment with grout annually. Using similar reasoning as above, the estimated annual materials cost would be $91,409. The estimated annual labor cost would be $33,592. This yields an annual estimated (internal) cost to DOT of $125,000.

Since DOT also subcontracts out some of its geotechnical work, and assuming that all of the additional costs would be passed on directly to DOT, an estimated ten percent of the total number of borings as estimated in the previous cost estimate are for DOT. Therefore, ten percent of $893,095 is $89,310, which would then get passed on to DOT. The total (both direct internal costs and external billed costs) estimated annual impact to

DOT would then be $214,300.

Benefits

The benefits from revising, strengthening and clarifying the well construction standards are manifold. New techniques and materials in well construction methods have caused the need for revisions to the methods that are currently regulated. The revisions addressing these new advances will allow CWCs to work more efficiently and, at the same time, construct wells which are more protective of the groundwater resource and human health.

These proposed revisions are the result of input from DWQ staff, local health departments, the Division of Environmental Health, the NC Groundwater Association (the state's leading professional association for CWCs), the Well Contractors Certification Commission and Clean Water for North Carolina (a private, non-profit safe drinking water advocacy group). Each of these stakeholders contributed their experience with the rules and related groundwater issues, resulting in many changes that are intended to strengthen existing requirements, clarify the intent of the rules, clarify or simplify processes involved in complying with the rules, and ease the burden of compliance where a particular rule or portion of a rule does not provide significant environmental benefit. These revisions are considered to be evolutionary improvements of the existing rules, which have been in place in various iterations since 1971. The public, well contractors, local health departments, and state agencies all benefit from the proposed revisions by virtue of the collective and historical experience of these stakeholders.

In addition, the demands being placed on the groundwater resource of the state are growing considerably with the current population and economic growth and continuing into the foreseeable future. Current growth trends in North Carolina indicate that the states population is estimated to increase to over 12 million people by 2030, which is an increase of over 50 percent. This burgeoning population will place considerable demands on the water resources of the state, particularly groundwater, since surface water is already heavily utilized. Trends in housing developments also place burdens on the resource, by greatly increasing the density of residences on smaller and smaller lots. With rapidly escalating housing and property costs in municipal areas, the recent emphasis and demand for housing has occurred in more rural areas surrounding the municipalities. These developing areas are frequently too distant for municipal water supplies and municipal waste treatment options. These increasing pressures being placed on the groundwater resource will considerably increase the chances of contamination of the resource and the numbers of individuals consuming contaminated water. The costs associated with consumption of contaminated groundwater, in the form of increased illness and mortality and associated health care costs and loss of productivity, are extremely high. Therefore, the need for improved well construction regulation cannot be understated.

Since water wells are almost entirely completed below land surface, they are easy to ignore and are prime examples of the 'out of sight – out of mind' principle.

Most individuals who aren't aware of groundwater issues consider a well to be nothing more than a 'pipe in the ground' from which water issues forth. However, a modern, properly constructed well is considerably more complex than this. Their complexity and the multitude of ways (both properly and improperly) that they can be constructed has necessitated that comprehensive regulations governing their construction be developed. The regulated community themselves, primarily CWCs, have always wanted, above all, that the rules be clear, fair, unambiguous and protective of human health and the resource upon which their livelihood depends. These rule revisions were developed in consultation with stakeholders in both the regulated community and the environmental professionals that are responsible for administering and enforcing these regulations. Many of the existing shortcomings or inconsistencies of the current rules have been identified by the stakeholders and addressed by these proposed revisions.

An overarching reason for having strong and effective regulations governing well construction is the under-appreciated fact that improperly constructed wells or improperly abandoned wells and borings represent a considerable threat to the groundwater resource of the state. As a general rule, horizontal hydraulic conductivity (the ability of a material to allow water to flow through it) is much greater than vertical hydraulic conductivity. This means that, for the most part, surficial and shallow contamination will generally reach deep groundwater and aquifers with some difficulty and over long periods of time. However, in the vicinity of surficial or shallow contamination, a single improperly constructed or open abandoned well or boring can easily short circuit the at least minimal amount of natural protection afforded to deeper groundwater and aquifers and allow the contaminants to quickly pollute deeper zones. Unfortunately, once groundwater has been contaminated, it is extremely difficult and costly to reasonably remediate and virtually impossible to effectively restore it to its pre-contaminated status. It costs tens to hundreds of thousands of dollars to assess the extent of a single incident of groundwater contamination, and many hundreds of thousands to millions of dollars to restore the groundwater to anything close to its previously uncontaminated state. As an example, the Dry Cleaning Solvent Cleanup Act Program under the Division of Waste Management, in their 2007 annual report, estimate that an average dry cleaning solvent site cleanup costs approximately $250,000. They also estimate that as many as 1,500 contaminated former or active dry cleaning sites may exist in North Carolina with an estimated 750 potentially eligible for the cleanup program. Therefore, the benefits of improved well construction standards, though difficult to accurately quantify, are easily in the millions of dollars annually.

These revised well construction standards will work in concert with the recently legislated Private Drinking Water Well program, which is scheduled to come on line in July 1, 2008. These regulations, as enumerated in 15A NCAC 2C .0300, will require all counties in North Carolina to implement well permitting, inspection and testing programs for all newly constructed drinking water wells. Many counties will adopt the 15A NCAC 2C .0100 Well Construction Standards, which will need to be protective of human health, the water resource, and clear to follow and regulate.

Risks

These rules are designed to stand alone as minimum standards for well construction. With making broad estimates such as these, particularly since many of them are based on best professional judgment due to a lack of existing hard data, there is always the risk that the estimated financial impact of these proposed rule revisions could be substantially different than that listed in this analysis. However, reasonable attempts were made to make estimates on the conservative (high) side, rather than basing the estimates on the low side.

Another potential risk to the anticipated benefits of these rule revisions, although it has always been present as a risk, is that developers and less than honest CWCs may consider it a 'cost of business' to be occasionally penalized for substandard well construction practices. In this scenario, which is not believed to be at all widespread, but it certainly does occur to some extent, a CWC or developer knowingly stipulates construction materials or methods that aren't in compliance with the current standard. The developer or CWC may get caught periodically, but the estimated cost savings from the substandard practices offset the penalty. With the increase in costs due to some of these more stringent regulations, the temptation to engage in this practice may slightly increase. However, the risk of this is believed to be much more than offset with the implementation of the Private Drinking Water Well program in 2008, since this program will entail significantly more regulatory oversight of the entire well construction process at the local level. There is also some level of risk that must be dealt with regarding tolerance levels in implementing these rules, a good example of which is found in regards to the setback distances. The field inspectors making decisions on whether or not to enforce marginal distance deficiencies with setbacks must balance the risk of contamination with being overly conservative. For example, the setback for a water supply well and a fertilizer, pesticide, herbicide or other chemical storage area is 100 feet. If an inspector measures the distance to be 99 feet, should they enforce the regulation or attribute the discrepancy to measurement error? The risk becomes one of potential (although unlikely) legal liability if they don't enforce the regulation and the well becomes contaminated with some type of chemical. However, homeowners will be very distressed and annoyed if they are told they need to have a new well installed at least one foot further from the storage shed.

Summary Table

Annual Cost Estimates (for Preferred Option where applicable)

Activity	**Private Impact**	**Local Govt. Impact**	**DOT Impact**
15A NCAC 02C .0103 Registration	$5,600 savings		
15A NCAC 02C .0105 Permits	$178,200*	$178,200*	
15A NCAC 02C .0107(a)	$414,000		
15A NCAC 02C .0107(d)	$1,413,000		
15A NCAC 02C .0107(f)	$896,500 costs & $101,200 savings	$123,800 savings	
15A NCAC 02C .0108	$22,300		
15A NCAC 02C .0109	$534,500	$412,500	
15A NCAC 02C .0110	$22,500 savings		
15A NCAC 02C .0112(b)	$250,000		
15A NCAC 02C .0112(e)	$350,000		
15A NCAC 02C .0112(f)	$150,000 savings		
15A NCAC 02C .0113(b)	$908,100 cost & $600,000 savings		$214,300
15A NCAC 02C .0114	$60,000		
Total Anticipated Impact	**$5,905,900**	**$714,500**	**$214,300**

Notes:
* This cost (for 15A NCAC 02C .0105(h)(3)) is expected to be divided equally between local governments installing large capacity water supply wells and private industry installing industrial wells.
-These estimates are rounded to the nearest hundred dollars.

Based on the results of this fiscal analysis, it is expected that these proposed rule revisions will have a ‘substantial’ economic impact. The primary reason that these rule revisions are considered as having a substantial economic impact is that the expected annual cost over any 12-month period exceeds $3 million. Additionally, the regulated parties that will be most affected by these proposed rule revisions are small businesses, who will likely pass on the estimated $300 to $400 added cost per well to the customer. For reference, an average residential water supply well in North Carolina is estimated to cost between $3,000 and $6,000.

15A NCAC 02C .0102 is proposed for amendment as follows:

15A NCAC 02C .0102 DEFINITIONS

The terms used in this Subchapter shall be as defined in G.S. 87-85 and as follows, ~~As used herein,~~ unless the context otherwise requires:

(1) "Abandon" means to discontinue the use of and to seal ~~the~~ a well according to the requirements of 15A NCAC 2C .0113 of this Section.

(2) "Access port" means an opening in the well casing or well head installed for the primary purpose of determining the position of the water level in the ~~well.~~ well or to facilitate disinfection.

(3) "Agent" means any person who by mutual and legal agreement with a well owner has authority to act in his behalf in executing applications for permits. The agent may be either general agent or a limited agent authorized to do one particular act.

(4) "Annular Space" means the space between the casing and the walls of the borehole or outer casing, or the space between a liner pipe and well casing.

~~(4)~~(5) "ASTM" means the American Society for Testing and Materials.

~~(5)~~(6) "Casing" means pipe or tubing constructed of specified materials and having ~~specified~~ dimensions and ~~weights,~~ weights as specified in the Rules of this Subchapter, that is installed in a borehole, during or after completion of the borehole, to support the side of the hole and thereby prevent caving, to allow completion of a well, to prevent formation material from entering the well, to prevent the loss of drilling fluids into permeable formations, and to prevent entry of contamination.

~~(6)~~(7) "Clay" means a substance comprised of natural, inorganic, ~~finely ground~~ fine-grained crystalline mineral fragments which, when mixed with water, forms a pasty, moldable mass that preserves its shape when air dried.

~~(7)~~(8) "Commission" means the North Carolina Environmental Management Commission or its successor, unless otherwise indicated.

~~(8)~~(9) "Consolidated rock" means rock that is firm and coherent, solidified or cemented, such as granite, gneiss, limestone, slate or sandstone, that has not been decomposed by weathering.

~~(9)~~(10) "Contaminate" and "Contamination" ~~means~~ mean the introduction of foreign materials of such nature, quality, and quantity into the groundwaters as to exceed the groundwater quality standards specified in 15A NCAC 2L (Classifications and Water Quality Standards Applicable to the Groundwaters of North Carolina).

[Note: As specified in 15A NCAC 2L .0202(b)(3), where naturally occurring substances exceed the established standard, the standard shall be the naturally occurring concentration as determined by the Director.]

~~(10) "Department" means the Department of Environment and Natural Resources.~~

(11) "Designed capacity" ~~shall mean~~ means that capacity that is equal to the yield that is specified by the well owner or his agent prior to construction of the well.

(12) "Director" means the Director of the Division of Water Quality or the Director's delegate.

(13) "Division" means the Division of Water Quality.

(14) "Domestic use" means water used for drinking, bathing, or other household purposes, livestock, or gardens.

(15) "Formation Material" means naturally occurring material generated during the drilling process that is composed of sands, silts, clays or fragments of rock and which is not in a dissolved state.

(16) "GPM" and "GPD" mean gallons per minute and gallons per day, respectively.

(17) "Grout" ~~shall mean and include the following:~~ means a material approved in accordance with Paragraph .0107(e) of this Section for use in sealing the annular space of a well or liner or for sealing a well during abandonment.

~~(a) "Neat cement grout" means a mixture of not more than six gallons of clear, potable water to one 94 pound bag of portland cement. Up to five percent, by weight, of bentonite clay may be used to improve flow and reduce shrinkage.~~

~~(b) "Sand cement grout" means a mixture of not more than two parts sand and one part cement and not more than six gallons of clear, potable water per 94 pound bag of portland cement.~~

~~(c) "Concrete grout" means a mixture of not more than two parts gravel to one part cement and not more than six gallons of clear, potable water per 94 pound bag of portland cement. One hundred percent of the gravel must pass through a one-half inch mesh screen.~~

~~(d) "Gravel cement grout, sand cement grout or rock cutting cement grout" means a mixture of not more than two parts gravel and sand or rock cuttings to one part cement and not more than six gallons of clear, potable water per 94 pound bag of portland cement.~~

~~(e) "Bentonite grout" means the mixture of no less than one and one-half pounds of commercial bentonite with sufficient clear, potable water to produce a grout weighing no less than 9.4 pounds per gallon of mixture. Non-organic, non-toxic substances may be added to improve particle distribution and pumpability. Bentonite grout may only be used in those instances where specifically approved in this Section and only as recommended by the manufacturer.~~

~~(f) "Specialty grout" means a mixture of non-organic, non-toxic materials with characteristics of expansion, chemical resistance, rate or heat of hydration, viscosity, density or temperature sensitivity applicable to specific grouting requirements. Specialty grouts may not be used without prior approval by the Director. Approval of the use of specialty grouts shall be based on a demonstration that the mixture will not adversely impact human health or the environment.~~

(18) "Liner pipe" means pipe that is installed inside a completed and cased well for the purpose of preventing the entrance of contamination into the well or for repairing ~~ruptured~~ ruptured, corroded or punctured casing or screens.

(19) "Monitoring well" means any well constructed for the primary purpose of obtaining samples of groundwater or other liquids for examination or testing, or for the observation or measurement of

groundwater levels. This definition excludes lysimeters, tensiometers, and other devices used to investigate the characteristics of the unsaturated zone but includes piezometers, a type of monitor well constructed solely for the purpose of determining groundwater levels.

(20) "Owner" means any person who holds the fee or other property rights in the well being constructed. ~~A well is real property and its construction on land rests ownership in the land owner in the absence of contrary agreement in writing.~~

[Note: Absent a contrary agreement in writing, the Department will presume that the well owner and the land owner are the same person.]

(21) "Pitless adapters" or "pitless units" are devices specifically manufactured to the standards specified under ~~15A NCAC 2C .0107(i)(5) of this Section~~ 15A NCAC 2C .0107(j)(5) for the purpose of allowing a subsurface lateral connection between a well and plumbing appurtenances.

(22) "Public water system" means a water system as defined in 15A NCAC 18C (Rules Governing Public Water Supplies).

(23) "Recovery well" means any well constructed for the purpose of removing contaminated groundwater or other liquids from the subsurface.

(24) "Saline" means having a chloride concentration of more than 250 milligrams per liter.

(25) "Secretary" means the Secretary of the Department of Environment and Natural Resources or the Secretary's delegate.

~~(24)~~(26) "Settleable solids" means the volume of solid particles in a well-mixed one liter sample which will settle out of suspension, in the bottom of an Imhoff Cone, after one hour.

~~(25)~~(27) "Site" means all contiguous property under the same ownership or all contiguous property wherein wells are under the same ownership.~~the land or water area where any facility, activity or situation is physically located, including adjacent or nearby land used in connection with the facility, activity or situation.~~

~~(26)~~(28) "Specific capacity" means the yield of the well expressed in gallons per minute per foot of draw-down of the water level (gpm/ft.dd). ~~(gpm/ft. dd) per unit of time~~.

~~(27)~~(29) "Static water level" means the level at which the water stands in the well when the well is not being pumped and is expressed as the distance from a fixed reference point to the water level in the well.

~~(28)~~(30) "Suspended solids" means the weight of those solid particles in a sample which are retained by a standard glass microfiber filter, with pore openings of one and one-half microns, when dried at a temperature of 103 to 105 degrees Fahrenheit.

~~(29)~~(31) "Temporary well" means a well, other than a water supply well, that is constructed to determine aquifer characteristics, and which will be ~~properly~~ permanently abandoned or converted to a permanent well within five days (120 hours) of the completion of drilling of the borehole.

~~(30)~~(32) "Turbidity" means the cloudiness in water, due to the presence of suspended particles such as clay and silt, that may create esthetic problems or analytical difficulties for determining contamination.

~~Turbidity, measured in Nephelometric Turbidity Units (NTU), is based on a comparison of the cloudiness in the water with that in a specially prepared standard.~~

~~(31)~~(33) "Vent" means an opening in the well casing or well head, installed for the purpose of allowing changes in the water level in a well due to natural atmospheric changes or to pumping. A vent ~~can~~ may also serve as an access port.

(34) "Water supply well" means any well intended or usable as a source of water supply, G.S. 87-85 notwithstanding.

~~(32) "Well" means any excavation that is cored, bored, drilled, jetted, dug or otherwise constructed for the purpose of locating, testing, developing, draining or recharging any groundwater reservoirs or aquifer, or that may control, divert, or otherwise cause the movement of water from or into any aquifer.~~

~~(33)~~(35) "Well capacity" shall mean the maximum quantity of water that a well will yield continuously as determined by methods outlined in 15A NCAC 2C .0110.

(36) "Well contractor" means a person who undertakes to perform a well contractor activity or who undertakes to personally supervise or personally manage the performance of a well contractor activity on the person's own behalf or for any person, firm, or corporation. As used herein, "well contractor" shall be deemed to include a person who constructs, repairs, or abandons a well that is located on land owned or leased by that person.

~~(34)~~(37) "Well head" means the upper terminal of the well including adapters, ports, valves, seals, and other attachments.

~~(35)~~(38) "Well system" means two or more ~~cross-connected wells.~~ wells connected to the same distribution or collection system or, if not connected to a distribution or collection system, two or more wells serving the same site.

~~(36)~~(39) "Yield" means the amount of water or other fluid that can be extracted from a well under a given set of conditions.

History Note: *Authority G.S. 87-85; 87-87; 143-214.2; 143-215.3;*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; July 1, 1988; March 1, 1985; September 1, 1984.

15A NCAC 02C .0103 is proposed for amendment as follows:

15A NCAC 02C .0103 PUMP INSTALLER REGISTRATION

~~Pump Installer Registration:~~

(a)~~(1)~~ All persons, firms, or corporations engaged in the business of installing or repairing pumps ~~or other equipment in wells~~ or pumping equipment shall register ~~bi-annually~~ with the ~~Department.~~ Department by completing and submitting to the Department a registration form provided by the Department for this purpose.

(b)(2) Registration shall be accomplished. After initial registration, each pump installer shall renew registration during the period from April 1 to April 30 of every odd-numbered year, by completing and submitting to the department Department a registration form provided by the department Department for this purpose.

(c)(3) Upon receipt of a properly completed application form, the Department shall issue a certificate of registration to the applicant. the applicant will be issued a certificate of registration.

(d) Certification as a well contractor in accordance with 15A NCAC 27 shall be deemed to constitute registration in accordance with this Rule.

History Note: *Authority G.S. 87-87; 143-215.3(a)(1a); 143-355(e);*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; July 1, 1988; April 20, 1978.

15A NCAC 02C .0105 is proposed for amendment as follows:

15A NCAC 02C .0105 PERMITS

(a) It is the finding of the Commission that the entire geographical area of the state is vulnerable to groundwater pollution from improperly located, constructed, operated, altered, or abandoned non-water supply wells and water supply wells not constructed in accordance with the standards set forth in 15A NCAC 2C .0107 of this Section. wells. Therefore, in order to ensure reasonable protection of the groundwater resources, prior permission from the Division Department must shall be obtained for the construction of the types of wells enumerated in Paragraph (b) of this Rule.

(b) No person shall locate or construct any of the following wells until a permit has been issued by the Director. Department:

(1) any water-well or well system with a design designed capacity of 100,000 gallons per day (gpd) or greater;

(2) any well added to an existing system where the total design designed capacity of such existing well system and added well will equal or exceed 100,000 gpd;

(3) any monitoring well, well or monitoring well system, including temporary wells, constructed to assess the impact of an activity not permitted by the state, when if installed on property other than that on which the unpermitted activity took place;

(4) any recovery well;

(5) any well for recharge or injection purposes;

(6)(5) any well with a design deviation from the standards specified under the rules of this Subchapter. Subchapter, including wells for which a variance is required.

(c) The Director may delegate, through a Memorandum of Agreement, to another governmental agency, the authority to permit wells that are an integral part of a facility requiring a permit from the agency. Provided, however, that the permittee comply with all provisions of this Subchapter, including construction standards and the reporting requirements

~~as specified in 15A NCAC 2C .0114. In the absence of such agreement, all wells specified in Paragraph (b) of this Rule require a well construction permit in addition to any other permits.~~

(d) The Department shall issue permits for wells used for recharge or injection purposes in accordance with 15A NCAC 2C .0200.

(e) The Department shall issue permits for private drinking water wells in accordance with 15A NCAC 2C .0300, including private drinking water wells with a designed capacity greater than 100,000 gallons per day and private drinking water wells for which a variance is required.

~~(d)~~(f) An application for a permit shall be submitted by the owner or his agent. In the event that the permit applicant is not the owner of the property on which the well or well system is to be constructed, the permit application ~~must~~ shall contain written approval from the property owner and a statement that the applicant assumes total responsibility for ensuring that the well(s) will be located, constructed, maintained and abandoned in accordance with the requirements of this Subchapter.

~~(e)~~(g) The application shall be submitted to the ~~Division,~~ Department on forms furnished by the ~~Division,~~ Department, and shall include the following:

~~(1) For all wells:~~

~~(A)~~(1) the owner's ~~name~~ name; ~~(facility name);~~

~~(B)~~(2) the owner's mailing address ~~(facility address);~~ and proposed well site address;

~~(C)~~(3) description of the well type and activity requiring a permit;

~~(D)~~(4) ~~facility~~ site location (map);

~~(E)~~(5) a map of the ~~facility and general site area,~~ site, to scale, showing the locations of:

~~(i)~~(A) all property boundaries, at least one of which is referenced to a minimum of two landmarks such as identified roads, intersections, streams or lakes within 500 feet of proposed well or well system;

~~(ii)~~(B) all existing wells, identified by type of use, within 500 feet of proposed well or well system;

~~(iii)~~(C) the proposed well or well system;

~~(iv)~~(D) any test borings within 500 feet of proposed well or well system; and

~~(v)~~(E) all sources of known or potential groundwater contamination (such as septic tank systems; pesticide, chemical or fuel storage areas; animal feedlots; landfills or other waste disposal areas) within 500 feet of the proposed ~~well site;~~ well.

~~(F)~~(6) the well ~~drilling~~ contractor's name and state certification number, if known; and

~~(G)~~(7) construction diagram of the proposed well(s) including specifications describing all materials to be used, methods of construction and means for assuring the integrity and quality of the finished well(s).

~~(2)~~(h) For water supply wells or well systems with a designed capacity of 100,000 gpd or greater the application shall include, in addition to the information required in ~~Subparagraph (e)(1)~~ Paragraph (g) of this Rule:

~~(A)~~(1) the number, yield and location of existing wells in the system;

~~(B)~~(2) the ~~design~~ designed capacity of the proposed well(s);

(3) for wells to be screened in multiple zones or aquifers, measurement of the static water level and measurements of pH, specific conductance, and concentrations of sodium, potassium, calcium, magnesium, sulfate, chloride, and carbonates from each aquifer or zone from which water is proposed to be withdrawn;

(4) a copy of any water use permit required pursuant to G.S. 143-215.15; and

~~(C)~~(5) any other well construction information or site specific information deemed necessary by the ~~Director~~ Department for the protection of human health and the environment.

~~(3)~~(i) For those monitoring wells with a design deviation from the specifications of 15A NCAC 2C .0108 of this Section, in addition to the information required in ~~Subparagraph (e)(1)~~ Paragraph (g) of this Rule:

~~(A)~~(1) a description of the subsurface conditions sufficient to evaluate the site. Data from test borings, ~~wells~~ wells, and pumping ~~tests, etc.,~~ tests may be required as necessary;

~~(B)~~(2) a description of the quantity, character and origin of the contamination;

~~(C)~~(3) justification for the necessity of the design deviation; and

~~(D)~~(4) any other well construction information or site specific information deemed necessary by the ~~Director~~ Department for the protection of human health and the environment.

~~(4)~~(j) For those recovery wells with a design deviation from the specifications in 15A NCAC 2C .0108 of this Section, in addition to the information required in ~~Subparagraph (e)(1) and Parts (e)(3)(A), (B) and (C)~~ Paragraphs (g) and (i) of this Rule, the application shall describe the disposition of any fluids recovered if the disposal of those fluids will have an impact on any existing wells other than those installed for the express purpose of measuring the effectiveness of the recovery well(s).

~~(f)~~(k) In the event of an emergency, monitoring wells or recovery wells may be constructed after verbal approval is provided by the ~~Director or delegate.~~Director. After-the-fact applications shall be submitted by the ~~driller~~ well contractor or owner within ten days after construction begins. The application shall include construction details of the monitoring well(s) or recovery well(s) and include the name of the person who gave verbal approval and the time and date that approval was given.

~~(g)~~(l) ~~It shall be the responsibility of the~~The well owner or his agent ~~to~~ shall see that a permit is secured prior to the beginning of construction of any well for which a permit is required under the rules of this Subchapter.

History Note: *Authority G.S. 87-87; 143-215.1;*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; March 1, 1985; September 1, 1984; April 20, 1978.

15A NCAC 02C .0107 is proposed for amendment as follows:

15A NCAC 02C .0107 STANDARDS OF CONSTRUCTION: WATER-SUPPLY WELLS

(a) Location.

~~(1) The well shall not be located in an area generally subject to flooding. Areas which have a propensity for flooding include those with concave slope, alluvial or colluvial soils, gullies, depressions, and drainage ways;~~

(1) A water supply well shall not be located within a wetland as defined in 15A NCA 2B .0202 or any area where surface water or runoff will accumulate around the well.

(2) The minimum horizontal separation between a ~~well, intended for a single family residence or other non-public water system,~~ water supply well and potential sources of groundwater contamination, ~~which exists~~ for which a permit has been issued or which exists at the time the well is constructed, ~~shall be~~is as follows unless otherwise specified:

(A)	Septic tank and drainfield, including drainfield repair area	100 ~~ft.~~feet
(B)	Other subsurface ground absorption waste disposal system	100 ~~ft.~~feet
(C)	Industrial or municipal ~~sludge spreading~~ residuals disposal or wastewater-irrigation sites	100 ~~ft.~~feet
(D)	~~Water tight sewage~~Sewage or liquid-waste collection or transfer facility constructed to water main standards in accordance with 15A NCAC 02T .0305(g)(2) or 15A NCAC 18A .1950(e), as applicable	50 ~~ft.~~feet
(E)	Other sewage and liquid-waste collection or transfer facility	100 ~~ft.~~feet
(F)	Cesspools and privies	100 ~~ft.~~feet
(G)	Animal feedlots or manure piles	100 ~~ft.~~feet
(H)	Fertilizer, pesticide, herbicide or other chemical storage areas	100 ~~ft.~~feet
(I)	Non-hazardous waste storage, treatment or disposal lagoons	100 ~~ft.~~feet
(J)	Sanitary landfills, municipal solid waste landfill facilities, incinerators, construction and demolition (C&D) landfills and other disposal sites except Land Clearing and Inert Debris landfills	500 ~~ft.~~feet
(K)	~~Other non-hazardous solid waste landfills, such as~~ Land Clearing and Inert Debris (LCID) landfills	100 ~~ft.~~feet
(L)	Animal ~~barns~~barns, watering troughs, or animal feeding areas	100 ~~ft.~~feet
(M)	Building foundations, excluding the foundation of a structure housing the well head	25 ~~ft.~~feet
(N)	Surface water bodies which act as sources of groundwater recharge, such as ponds, lakes and reservoirs	50 ~~ft.~~feet
(O)	All other surface water bodies, such as brooks, creeks, streams, rivers, sounds, bays and tidal estuaries	25 ~~ft.~~feet
(P)	Chemical or petroleum fuel underground storage ~~tanks~~ tank systems regulated under 15A NCAC 02N:	

(i) with secondary containment .... 50 ~~ft.~~feet

(ii) without secondary containment ....100 ~~ft.~~feet

(Q) Above ground or underground storage tanks which contain petroleum fuels used for heating equipment, boilers or ~~furnaces~~ furnaces, except tanks used solely for storage of propane, natural gas, or liquefied petroleum gas 50 ~~ft.~~feet

(R) Underground tanks used solely for storage of liquefied petroleum gas, propane, or natural gas 25 feet

(S) Gravesites 50 feet

~~(R)~~(T) All other potential sources of groundwater contamination 50 ~~ft.~~feet

(3) For a well serving a single-family dwelling where lot size or other fixed conditions preclude the separation distances specified in Subparagraph (a)(2) of this Rule, the required horizontal separation distances shall be the maximum possible but shall in no case be less than the following:

(A) Septic tank and ~~drainfield~~ drainfield, including drainfield repair areas, except saprolite systems as defined in 15A NCAC 18A .1956(6) 50 ~~ft.~~feet

(B) ~~Water-tight sewage~~ Sewage or liquid-waste collection or transfer facility constructed to water main standards in accordance with 15A NCAC 02T .0305(g)(2) or 15A NCAC 18A .1950(e), as applicable 25 ~~ft.~~feet

(C) Animal ~~barns~~barns, watering troughs, or animal feeding areas 50 ~~ft.~~feet

~~(D) Cesspool or privies 50 ft.~~

Minimum separation distances for all other potential sources of groundwater contamination shall be those specified in Subparagraph (a)(2) of this Rule.

~~(4) A well or well system, serving more than one single-family dwelling but with a designed capacity of less than 100,000 gpd, must meet the separation requirements specified in Subparagraph (a)(2) of this Rule;~~

(4)~~(5)~~ In addition to the minimum separation distances specified in Subparagraph (a)(2) of this Rule, a ~~A~~ well or well system with a designed capacity of 100,000 gpd or greater ~~must~~ shall be located a sufficient distance from known or anticipated sources of groundwater contamination so as to prevent a violation of applicable groundwater quality standards, resulting from the movement of contaminants, in response to the operation of the well or well system at the proposed rate and schedule of ~~pumping;~~ pumping.

~~(6) Actual separation distances must conform with the most stringent of applicable federal, state or local requirements;~~

~~(7) Wells drilled for public water supply systems regulated by the Division of Environmental Health shall meet the siting and all other requirements of that Division.~~

[Note: More stringent separation distances and siting requirements may be specified in other federal, state, or local regulations]

(b) Source of water.

(1) The source of water for any well intended for domestic use shall not be from a water bearing zone or aquifer that is known to be contaminated;

(2) In designated areas described in 15A NCAC 02C .0117 of this Section, the source shall be greater than 35 feet below land surface;

(3) In designated areas described in 15A NCAC 02C .0116 of this Section, the source may be less than 20 feet below land surface, but in no case less than 10 feet below land surface; ~~and~~

(4) For wells constructed with separation distances less than those specified in Subparagraph (a)(2) of this Rule based on lot size of other fixed conditions as specified in Subparagraph (a)(3) of this Rule, the source shall be greater than 35 feet below land surface except in areas described in Rule .0116 of this Section; and

~~(4)~~(5) In all other areas the source shall be at least 20 feet below land surface.

(c) Drilling Fluids and Additives. Drilling Fluids and Additives shall not contain organic or toxic substances or include water obtained from surface water bodies or water from a non-potable supply and may be comprised only of:

(1) the formational material encountered during drilling; or

(2) materials manufactured specifically for the purpose of borehole conditioning or water well construction.

(d) Casing.

(1) If steel casing is used: ~~used, then:~~

(A) The casing shall be new, seamless or electric-resistance welded galvanized or black steel pipe. Galvanizing shall be done in accordance with requirements of ~~ASTM A 120;~~ ASTM A53/A53M-07;

(B) The casing, threads and couplings shall meet or exceed the specifications of ~~ASTM A 53, A 120 or A589;~~ ASTM A53/A53M-07 or A589/A589M-06;

(C) The minimum wall thickness for a given diameter shall equal or exceed that specified in Table 1;

TABLE 1: MINIMUM WALL THICKNESS FOR STEEL CASING:

Nominal Diameter ~~(in.)~~(inches)	Wall Thickness ~~(in.)~~(inches)
For ~~3 1/2"~~3.5 inch or smaller pipe, schedule 40 is required	
4	0.142

5	0.156
~~5 1/2~~ 5.5	0.164
6	0.185
8	0.250
10	0.279
12	0.330
14 and larger	0.375

(D) Stainless steel casing, threads, and couplings shall conform in specifications to the general requirements in ~~ASTM A 530~~ ASTM A530/A530M-04a and also shall conform to the specific requirements in the ASTM standard that best describes the chemical makeup of the stainless steel casing that is intended for use in the construction of the well;

(E) Stainless steel casing shall have a minimum wall thickness that is equivalent to standard schedule number 10S; and

(F) Steel casing shall be equipped with a drive shoe if the casing is driven in a consolidated rock formation. The drive shoe shall be made of forged, high carbon, tempered seamless steel and shall have a beveled, hardened cutting edge. ~~A drive shoe shall not be required for wells in which a cement or concrete grout surrounds and extends the entire length of the casing.~~

(2) If Thermoplastic Casing is used:~~used, then:~~

(A) the casing shall be new;

(B) the casing and joints shall meet or exceed all the specifications of ~~ASTM F 480-81~~ ASTM F480-06b, except that the outside diameters shall not be restricted to those listed in ~~F 480;~~ ASTM F480-06b; and

(C) the maximum depth of installation for a given SDR or Schedule number shall not exceed that listed in Table 2 unless the well ~~drilling~~ contractor ~~can provide~~ provides the ~~Division,~~Department, upon request, with written documentation from the manufacturer of the casing stating that the casing may safely be used at the depth at which it is to be installed.

~~TABLE 2: Maximum allowable depths (in feet) of Installation of Thermoplastic Water Well Casing~~

~~Nominal Diameter (in inches)~~													
~~Schedule number~~	~~2~~	~~2.5~~	~~3~~	~~3.5~~	~~4~~	~~5~~	~~6~~	~~8~~	~~10~~	~~12~~	~~14~~	~~16~~
~~40~~	~~485~~	~~635~~	~~415~~	~~315~~	~~253~~	~~180~~	~~130~~	~~85~~	~~65~~	~~65~~	~~50~~	~~50~~
~~80~~	~~1460~~	~~1685~~	~~1170~~	~~920~~	~~755~~	~~550~~	~~495~~	~~340~~	~~290~~	~~270~~	~~265~~	~~255~~

~~SDR Number~~	~~All Diameters (in inches)~~
~~SDR 41~~	~~20~~
~~SDR 32.5~~	~~50~~

~~SDR 27.5 100~~

~~SDR 26 95~~

~~SDR 21 185~~

~~SDR 17 355~~

~~SDR 13.5 735~~

TABLE 2: Maximum allowable depths (in feet) of Installation of Thermoplastic Water Well Casing

Nominal Diameter (inches)	Maximum Depth (in feet) for Schedule 40	Maximum Depth (in feet) for Schedule 80
2	485	1460
2.5	635	1685
3	415	1170
3.5	315	920

4	253	755
5	180	550
6	130	495
8	85	340
10	65	290
12	65	270
14	50	265
16	50	255

	Maximum Depth (in feet) for SDR 21	Maximum Depth (in feet) for SDR 17	Maximum Depth (in feet) for SDR 13.5
All Diameters	185	355	735

(D) Thermoplastic casing with wall thickness less than that corresponding to SDR 21 or Schedule 40 shall not be used.

~~(D) The top of the casing shall be terminated by the drilling contractor at least twelve inches above land surface.~~

(E) For wells in which the casing will extend into consolidated rock, thermoplastic casing shall be equipped with a coupling, or other device approved by the manufacturer of the casing, that is sufficient to protect the physical integrity of the thermoplastic casing during the processes of seating and grouting the casing and subsequent drilling operations.

(F) Thermoplastic casing shall not be driven into ~~consolidated rock.~~any formation.

(3) In constructing any well, all water-bearing zones that are known to contain ~~polluted~~contaminated, saline, or other non-potable water shall be ~~adequately~~ cased and ~~cemented off~~ grouted so that ~~pollution~~contamination of overlying and underlying groundwater zones shall not occur.

(4) Every well shall be cased so that the bottom of the casing extends to a minimum depth as follows:

(A) Wells located within the area described in ~~15A NCAC 02C~~Rule .0117 of this Section shall be cased from land surface to a depth of at least 35 feet.

(B) Wells located within the area described in ~~15A NCAC 02C~~Rule .0116 of this Section shall be cased from land surface to a depth of at least 10 feet.

(C) Wells constructed with separation distances less than those specified in Subparagraph (a)(2) of this Rule based on lot size of other fixed conditions as specified in Subparagraph (a)(3) of this Rule shall be cased from land surface to a depth of at least 35 feet except in areas described in Rule .0116 of this Section.

~~(C)~~(D) Wells located in any other area shall be cased from land surface to a depth of at least 20 feet.

(5) The top of the casing shall be terminated by the ~~drilling~~ well contractor at least 12 inches above land ~~surface.~~ surface, regardless of the method of well construction and type of pump to be installed.

(6) The casing in wells constructed to obtain water from a consolidated rock formation shall meet the requirements specified in Subparagraphs (d)(1) through (d)(5) of this Rule and shall be:

(A) adequate to prevent any formational material from entering the well in excess of the levels specified in Paragraph (h) of this Rule; and

(B) firmly seated at least five feet into the rock.

(7) The casing in wells constructed to obtain water from an unconsolidated rock formation (such as gravel, sand or shells) shall extend at least one foot into the top of the water-bearing formation.

(8) Upon completion of the well, the well shall be sufficiently free of obstacles including formation material as necessary to allow for the installation and proper operation of pumps and associated equipment.

(9) Prior to removing his equipment from the site, the well contractor shall seal the top of the casing with a water-tight cap or well seal to preclude the entrance of contaminants into the well.

(e) Allowable Grouts.

(1) One of the following grouts shall be used wherever grout is required by a Rule of this Section. Where a particular type of grout is specified by a Rule of this Section, no other type of grout shall be used.

(A) Neat cement grout shall consist of a mixture of not more than six gallons of clear, potable water to one 94 pound bag of Portland cement. Up to five percent, by weight, of bentonite may be used to improve flow and reduce shrinkage. If bentonite is used, additional water may be added at a rate not to exceed 0.6 gallons of water for each pound of bentonite.

(B) Sand cement grout shall consist of a mixture of not more than two parts sand and one part cement and not more than six gallons of clear, potable water per 94 pound bag of Portland cement.

(C) Concrete grout shall consist of a mixture of not more than two parts gravel or rock cuttings to one part cement and not more than six gallons of clear, potable water per 94 pound bag of Portland cement. One hundred percent of the gravel or rock cuttings must be able to pass through a one-half inch mesh screen.

(D) Bentonite slurry grout shall consist of a mixture of not more than 20 gallons of clear, potable water to one 50 pound bag of commercial sodium bentonite. Non-organic, non-toxic substances may be added to bentonite slurry grout mixtures to improve particle distribution

and pumpability. Bentonite slurry grout may only be used in accordance with the manufacturer's written instructions.

(E) Bentonite chips or pellets shall consist of pre-screened sodium bentonite chips or compressed sodium bentonite pellets with largest dimension of at least one-fourth (1/4) inch but not greater than one-fifth (1/5) of the width of the annular space into which they are to be placed. Bentonite chips or pellets shall be hydrated in place. Bentonite chips or pellets may only be used in accordance with the manufacturer's written instructions.

(F) Specialty grout shall consist of a mixture of non-organic, non-toxic materials with characteristics of expansion, chemical-resistance, rate or heat of hydration, viscosity, density or temperature-sensitivity applicable to specific grouting requirements. Specialty grouts may not be used without prior approval by the Secretary. Approval of the use of specialty grouts shall be based on a demonstration that the finished grout has a permeability less than 10^{-6} centimeters per second and will not adversely impact human health or the environment.

(2) With the exception of bentonite chips or pellets, the liquid and solid components of all grout mixtures shall be thoroughly blended prior to emplacement below land surface.

(3) No fly ash, other coal combustion byproducts, or other wastes may be used in any grout.

~~(e)~~(f) ~~Grouting.~~ Grout emplacement.

(1) Casing shall be grouted to a minimum depth of twenty feet below land surface except that:

(A) In those areas designated by the Director to meet the criteria of ~~15A NCAC 02C~~Rule .0116 of this Section, grout shall extend to a depth of two feet above the screen or, for open end wells, to the bottom of the casing, but in no case less than 10 feet.

(B) In those areas designated in ~~15A NCAC 02C~~Rule .0117 of this Section, grout shall extend to a minimum of 35 feet below land surface.

~~(C) The casing shall be grouted as necessary to seal off, from the producing zone(s), all aquifers or zones with water containing organic or other contaminants of such type and quantity as to render water from those aquifers or zones unsafe or harmful or unsuitable for human consumption and general use.~~

~~(2) For large diameter wells cased with concrete pipe or ceramic tile of a pipe diameter equal to or greater than 20 inches, the following shall apply:~~

~~(A) The diameter of the bore hole shall be at least six inches larger than the outside diameter of the casing;~~

~~(B) The annular space around the casing shall be filled with a cement type grout to a depth of at least 20 feet, excepting those designated areas specified in 15A NCAC 02C .0116 and 15A NCAC 02C .0117 of this Section. The grout shall be placed in accordance with the requirements of this Paragraph.~~

(2) In addition to the grouting required by Subparagraph (f)(1) of this Rule, the casing shall be grouted as necessary to seal off all aquifers or zones that are known to contain contaminated, saline, or other non-potable water so that contamination of overlying and underlying aquifers or zones shall not occur.

(3) Bentonite slurry grout may be used in that portion of the borehole that is at least three feet below land surface. That portion of the borehole ~~above the bentonite grout, up to land surface,~~ from land surface to three feet below land surface shall be filled with a concrete or cement-type ~~grout.~~ grout, or bentonite chips or pellets that are hydrated in place.

(4) Grout shall be placed around the casing by one of the following methods:

(A) Pressure. Grout shall be pumped or forced under pressure through the bottom of the casing until it fills the annular ~~area~~ space around the casing and overflows at the surface; or

(B) Pumping. Grout shall be pumped into place through a hose or pipe extended to the bottom of the annular space which can be raised as the grout is applied. The grout hose or pipe shall remain submerged in grout during the entire application; or

(C) Other. Grout may be emplaced in the annular space by gravity flow in such a way to ensure complete filling of the ~~space to a maximum depth of 20 feet below land surface.~~ space. Gravity flow shall not be used if water or any visible obstruction is present in the upper 20 feet of annular space at the time of grouting.

(5) If a Rule of this Section requires grouting of the casing to a depth greater than 20 feet below land surface, the pumping or pressure method shall be used to grout that portion of the borehole deeper than 20 feet below land surface.

~~(5)~~(6) If an outer casing is installed, it shall be grouted by either the pumping or pressure method.

~~(6)~~(7) The liquid and solid components of all ~~grout mixtures~~cement grouts, concrete grouts, and bentonite slurry grouts shall be thoroughly blended prior to emplacement below land surface.

(8) Bentonite chips or pellets shall be used in compliance with all manufacturer's instructions including pre-screening the material to eliminate fine-grained particles, installation rates, hydration methods, tamping, and other measures to prevent bridging.

(9) Bentonite grout shall not be used to seal zones of water with a chloride concentration of 1,500 parts per million or greater.

~~(7)~~(10) The well shall be grouted within ~~five working~~ seven days after the casing is set.

~~(8)~~(11) No additives which will accelerate the process of hydration shall be used in grout for thermoplastic well casing.

~~(9)~~(12) Where grouting is required by the provisions of this Section, the grout shall extend outward in all directions from the casing wall to a minimum thickness equal to either one-third of the diameter of the outside dimension of the casing or two inches, whichever is greater; excepting, however, that ~~large diameter bored wells shall meet the requirements of Subparagraph (e)(2) of this Rule.~~ in wells with casing diameters of 20 inches or greater, the grout shall extend outward in all directions from the casing wall a minimum of three inches.

~~(f)~~(g) Well Screens.

(1) The well, if constructed to obtain water from an unconsolidated rock formation, shall be equipped with a screen that will prevent the entrance of formation material into the well after the well has been developed and completed by the well contractor.

(2) The well screen shall be of a design to permit the optimum development of the aquifer with minimum head loss consistent with the intended use of the well. The openings shall be designed to prevent clogging and shall be free of rough edges, irregularities or other defects that may accelerate or contribute to corrosion or clogging.

(3) Multi-screen wells shall not connect aquifers or zones which have differences in water quality which would result in contamination of any aquifer or zone.

~~(g)~~(h) Gravel-and Sand-Packed Wells.

(1) In constructing a gravel-or sand-packed well:

(A) The packing material shall be composed of quartz, granite, or similar mineral or rock material and shall be clean, of uniform size, water-washed and free from clay, silt, or other deleterious material.

(B) The size of the packing material shall be determined from a grain size analysis of the formation material and shall be of a size sufficient to prohibit the entrance of formation material into the well in concentrations above those permitted by Paragraph (h) of this Rule.

(C) The packing material shall be placed in the annular space around the screens and casing by a fluid circulation ~~method, preferably through a conductor pipe~~method to ensure accurate placement and avoid bridging.

(D) The packing material shall be disinfected.

(E) Centering guides ~~must~~ shall be installed within five feet of the top packing material to ensure even distribution of the packing material in the borehole.

(2) The packing material shall not connect aquifers or zones which have differences in water quality that would result in ~~deterioration~~ contamination of ~~the water quality in~~ any aquifer or zone.

~~(h) Well Development.~~

(i)~~(1)~~ All water supply wells shall be developed by the well ~~driller;~~ contractor. Development shall include removal of formation materials, mud, drilling fluids and additives such that the water contains no more than:

~~(2) Development shall include removal of formation materials, mud, drilling fluids and additives such that the water contains no more than~~:

(1)~~(A)~~ five milliliters per liter of settleable solids; and

(2)~~(B)~~ 10 NTUs of turbidity as suspended solids.

~~(3)~~ Development ~~shall~~ does not require efforts to reduce or eliminate the presence of dissolved constituents which are indigenous to the ground water quality in that area. ~~Typical dissolved constituents include, but are not limited to, aluminum, calcium, chloride, iron, magnesium, manganese, sodium and sulphate.~~

~~(i)~~(j) Well Head Completion.

(1) Access Port. Every water supply well ~~and such other wells as may be specified by the Commission~~ shall be equipped with a usable access port or air line. The access port shall be at least one half inch inside diameter opening so that the position of the water level can be determined at any time. ~~Such~~ The port shall be installed and maintained in such manner as to prevent entrance of water or foreign material.

(2) Well Contractor Identification Plate.

(A) An identification plate, showing the ~~drilling~~ well contractor and certification number and the information specified in Part (i)(2)(E) of this Rule, shall be installed on the well within 72 hours after completion of the drilling.

(B) The identification plate shall be constructed of a durable weatherproof, rustproof metal, or ~~equivalent material approved by the Director.~~ other material approved by the Department as equivalent.

(C) The identification plate shall be ~~securely~~ permanently attached to either the aboveground portion of the well casing, surface grout pad or enclosure floor around the casing where it is readily ~~visible.~~ visible and in a manner that does not obscure the information on the identification plate.

(D) The identification plate shall not be removed by any person.

(E) The identification plate shall be stamped or otherwise imprinted with permanent legible markings to show the:

(i) total depth of well;

(ii) casing depth ~~(ft.)~~(feet) and inside diameter ~~(in.):~~(inches);

(iii) screened intervals of screened wells;

(iv) packing interval of gravel-or sand-packed wells;

(v) yield, in gallons per minute (gpm), or specific capacity in gallons per minute per foot of drawdown (gpm/ft.-dd);

(vi) static water level and date measured; ~~and~~

(vii) date well ~~completed.~~completed; and

(viii) the well construction permit number or numbers, if such a permit is required.

(3) Pump Installer Identification Plate.

(A) An identification plate, showing the name and registration number or well contractor certification number of the pump installation contractor, and the information specified in Part (i)(3)(D) of this Rule, shall be ~~securely~~ permanently attached to either the aboveground portion of the well casing, surface grout pad or the enclosure ~~floor~~ floor, if present, where it is readily visible and in a manner that does not obscure the information on the identification plate within 72 hours after completion of the pump installation;

(B) The identification plate shall be constructed of a durable waterproof, rustproof metal, or ~~equivalent material approved by the Director;~~ other material approved by the Department as equivalent;

(C) The identification plate shall not be removed by any person; and

(D) The identification plate shall be stamped or otherwise imprinted with ~~permanent legible,~~ permanent, legible markings to show the:

(i) date the pump was installed;

(ii) the depth of the pump intake; and

(iii) the horsepower rating of the pump.

(4) Valved flow. Every artesian well that flows under natural artesian pressure shall be equipped with a valve so that the flow can be completely stopped. Well owners ~~shall be~~are responsible for the ~~installation,~~ operation and maintenance of the valve.

(5) Pitless adapters or pitless units ~~shall be~~are allowed as a method of well head completion under the following conditions:

(A) The pitless device ~~shall be~~is manufactured ~~specifically~~ for the purpose of water well construction;

(B) Design, installation and performance standards ~~shall be~~are those specified in ~~PAS-1 (Pitless Adapter Standard No. 1)~~ PAS-97(04) as adopted by the Water System Council's Pitless Adapter Division;

(C) The pitless device ~~shall be~~is compatible with the well casing;

(D) The top of the pitless ~~device~~ unit ~~shall extend~~ extends at least ~~eight~~ twelve inches above land surface;

(E) The excavation surrounding the casing and pitless device is filled with grout from the top of the casing grout to the land surface;

~~(E)~~(F) The pitless ~~device~~ unit ~~shall have~~has an access port.

(6) All openings for piping, wiring, and vents shall enter into the well at least 12 inches above land surface, except where pitless adapters or pitless units are used, and shall be adequately sealed to preclude the entrance of contaminants into the well.

History Note: *Authority G.S. 87-87; 87-88;*
Eff. February 1, 1976;
Amended Eff. May 14, 2001; December 1, 1992; March 1, 1985; September 1, 1984; April 20, 1978;
Temporary Amendment Eff. August 3, 2001;
Amended Eff. January 1, 2009; August 1, 2002.

15A NCAC 02C .0108 is proposed for amendment as follows:

15A NCAC 02C .0108 STANDARDS OF CONSTRUCTION: WELLS OTHER THAN WATER SUPPLY

(a) No well shall be located, constructed, operated, or repaired in any manner that may adversely impact the quality of groundwater.

(b) Injection wells shall conform to the standards set forth in Section .0200 of this Subchapter.

(c) Monitoring wells and recovery wells shall be located, designed, constructed, operated and abandoned with materials and by methods which are compatible with the chemical and physical properties of the contaminants involved, specific site conditions and specific subsurface conditions. ~~Specific construction standards will be itemized in the construction permit, if such a permit is required, but the following general requirements will apply:~~

~~(1) The borehole shall not penetrate to a depth greater than the depth to be monitored or the depth from which contaminants are to be recovered.~~

~~(2) The well shall not hydraulically connect:~~

~~(A) separate aquifers; or~~

~~(B) those portions of a single aquifer where known or suspected contamination would occur in separate and definable layers within the aquifer.~~

~~(3) The well construction materials shall be compatible with the depth of the well and the contaminants to be monitored or recovered.~~

~~(4) The well shall be constructed in such a manner that water or contaminants from the land surface cannot migrate along the borehole annulus into any packing material or well screen area.~~

~~(5) Packing material placed around the screen shall extend at least one foot above the top of the screen. Unless the depth of the screen necessitates a thinner seal; a one foot thick seal, comprised of bentonitic clay or other material approved by the Director, shall be emplaced directly above and in contact with the packing material.~~

~~(6) Grout shall be placed in the annular space between the outermost casing and the borehole wall from the land surface to the top of the bentonite clay seal above any well screen or to the bottom of the casing for open end wells. To provide stability for the well casing, the uppermost three feet of grout below land surface must be a concrete or cement type grout.~~

~~(7) All wells shall be secured, with a locking well cap, to reasonably ensure against unauthorized access and use.~~

~~(8) All wells shall be afforded reasonable protection against damage during construction and use.~~

~~(9) Any wells that would flow under natural artesian conditions shall be valved so that the flow can be regulated.~~

~~(10) The well casing shall be terminated no less than 12 inches above land surface datum unless both of the following conditions are met:~~

~~(A) site-specific conditions directly related to business activities, such as vehicle traffic, would endanger the physical integrity of the well; and~~

~~(B) the well head is completed in such a manner so as to preclude surficial contaminants from entering the well.~~

~~(11) Each well shall have securely affixed an identification plate constructed of a durable material and shall contain the following information:~~

~~(A) drilling contractor, or pump installation contractor, name and applicable certification or registration numbers;~~

~~(B) date well completed;~~

~~(C) total depth of well;~~

~~(D) a warning that the well is not for water supply and that the groundwater may contain hazardous materials; and~~

~~(E) depth(s) to the top(s) and bottom(s) of the screen(s).~~

~~(12) Each well shall be developed such that the level of turbidity or settleable solids does not preclude accurate chemical analyses of any fluid samples collected.~~

(d) Monitoring well and recovery well boreholes shall not penetrate to a depth greater than the depth to be monitored or the depth from which contaminants are to be recovered. Any portion of the borehole that extends to a depth greater than the depth to be monitored or the depth from which contaminants are to be recovered shall be grouted completely to prevent vertical migration of contaminants.

(e) The well shall not hydraulically connect:

(A) separate aquifers; or

(B) those portions of a single aquifer where known or suspected contamination would occur in separate and definable layers within the aquifer.

(f) The well construction materials shall be compatible with the depth of the well and any contaminants to be monitored or recovered.

(g) The well shall be constructed in such a manner that water or contaminants from the land surface cannot migrate along the borehole annulus into any packing material or well screen area.

(h) In non-water supply wells, packing material placed around the screen shall extend at least one foot above the top of the screen. Unless the depth of the screen necessitates a thinner seal; a one foot thick seal, comprised of chip or pellet bentonite or other material approved by the Department as equivalent, shall be emplaced directly above and in contact with the packing material.

(i) In non-water supply wells, grout shall be placed in the annular space between the outermost casing and the borehole wall from the land surface to the top of the bentonite seal above any well screen or to the bottom of the casing for open end wells. The grout and method of emplacement of the grout shall comply with Paragraphs (e) and (f) of Rule .0107 of this Section except that the upper three feet of grout shall be concrete or cement grout.

(j) If the well penetrates any water-bearing zone that is known to contain contaminated or saline water, the well shall be grouted within one day after the casing is set but in no case shall any well remain ungrouted for more than seven days after the casing is set.

(k) All non-water supply wells, including temporary wells, shall be secured with a locking well cap to ensure against unauthorized access and use.

(l) All non-water supply wells shall be equipped with a steel outer well casing or flush-mount cover, set in concrete, and other measures sufficient to protect the well from damage by normal site activities.

(m) Any well that would flow under natural artesian conditions shall be valved so that the flow can be regulated.

(n) In non-water supply wells, the well casing shall be terminated no less than 12 inches above land surface unless all of the following conditions are met:

(1) site-specific conditions directly related to business activities, such as vehicle traffic, would endanger the physical integrity of the well; and

(2) the well head is completed in such a manner so as to preclude surficial contaminants from entering the well.

(o) Each non-water supply well shall have permanently affixed an identification plate. The identification plate shall be constructed of a durable waterproof, rustproof metal, or other material approved by the Department as equivalent and shall contain the following information:

(1) well contractor name and certification number;

(2) date well completed;

(3) total depth of well;

(4) a warning that the well is not for water supply and that the groundwater may contain hazardous materials;

(5) depth(s) to the top(s) and bottom(s) of the screen(s); and

(6) the well identification number or name assigned by the well owner.

(p) Each non-water supply well shall be developed such that the level of turbidity or settleable solids does not preclude accurate chemical analyses of any fluid samples collected or adversely affect the operation of any pumps or pumping equipment.

~~(d)~~(q) Wells constructed for the purpose of monitoring or testing for the presence of liquids associated with tanks regulated under 15A NCAC 02N (Criteria and Standards Applicable to Underground Storage Tanks) shall be constructed in accordance with 15A NCAC 02N .0504.

~~(e)~~(r) Wells constructed for the purpose of monitoring for the presence of vapors associated with tanks regulated under 15A NCAC 02N shall:

(1) be constructed in such a manner as to prevent the entrance of surficial contaminants or water into or alongside the well casing; and

(2) be provided with a lockable cap in order to reasonably ensure against unauthorized access and use.

~~(f)~~(s) Temporary wells and all other non-water supply wells shall be constructed in such a manner as to preclude the vertical migration of contaminants within and along the borehole channel.

~~(g)~~(t) For ~~monitoring,~~ sand-or gravel packed wells, centering guides ~~must be evenly distributed in the borehole.~~ shall be installed within five feet of the top packing material to ensure even distribution of the packing material in the borehole.

History Note: *Authority G.S. 87-87; 87-88;*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; September 1, 1984; April 20, 1978.

15A NCAC 02C .0109 is proposed for amendment as follows:

15A NCAC 02C .0109 PUMPS AND PUMPING EQUIPMENT

(a) The pumping capacity of the pump shall be consistent with the intended use and yield characteristics of the well.

(b) The pump and related equipment for the well shall be ~~conveniently~~ located to permit easy access and removal for repair and maintenance.

(c) The base plate of a pump placed directly over the well shall be designed to form a watertight seal with the well casing or pump foundation.

(d) In installations where the pump is not located directly over the well, the annular space between the casing and pump intake or discharge piping shall be closed with a watertight seal. ~~seal preferably designed specifically for this purpose~~.

(e) The ~~well shall be properly vented at the~~ well head shall be equipped with a screened vent to allow for the pressure changes within the well except ~~when~~ if a suction lift ~~type~~ pump or single-pipe jet pump is ~~used.~~ used or if the well flows under natural pressure. For wells located within the 100-year floodplain, the vent opening shall be located at least 12 inches above the base flood elevation and reinforced or attached to a structure to prevent damage by floodwaters or the vent opening shall be downturned and equipped with a check valve to prevent the entrance of floodwaters but allow venting of the well when not flooded.

(f) ~~A hose bibb shall be installed at the well head by the~~The person installing the pump in any private drinking water well shall install a threadless sampling tap at the wellhead for obtaining water ~~samples.~~ samples except:

(1) In the case of suction pump or offset jet pump installations the ~~hose bibb~~ threadless sampling tap shall be installed on the return (pressure) side of the ~~jet~~ pump ~~piping.~~piping, and

(2) In the case of pitless adapter installations, the threadless sampling tap shall be located immediately upstream of the water storage tank.

The threadless sampling tap shall be turned downward, located a minimum of twelve inches above land surface, floor, or well pad, and positioned such that a water sample can be obtained without interference from any part of the wellhead.

(g) A priming tee shall be installed at the well head in conjunction with offset jet pump installations.

(h) Joints of any suction line installed underground between the well and pump shall be tight under system pressure.

(i) The drop piping and electrical wiring used in connection with the pump shall meet all applicable underwriters specifications.

(j) Contaminated water shall not be used for priming the pump.

(k) If the wellhead is equipped with a threaded hose bibb in addition to the threadless sampling tap, the hose bibb shall be fitted with a backflow preventer or vacuum breaker.

History Note: *Authority G.S. 87-87; 87-88;*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, December 1, 1992; April 20, 1978.

15A NCAC 02C .0110 is proposed for amendment as follows:

15A NCAC 02C .0110 WELL TESTS FOR YIELD

(a) Every ~~water supply~~ domestic well shall be tested for capacity by ~~a method and for a period of time as specified in this Rule.~~ one of the following methods:

~~(b) The permittee may be required as a permit condition to test any well for capacity by a method stipulated in the permit.~~

~~(c) Standard methods for testing domestic well capacities include:~~

(1) Pump Method

(A) select a permanent measuring point, such as the top of the casing;

(B) measure and record the static water level below or above the measuring point prior to starting the pump;

(C) measure and record the discharge rate at intervals of 10 minutes or less;

(D) measure and record water levels using a steel or electric tape at intervals of 10 minutes or less;

(E) continue the test for a period of at least one hour; and

(F) make measurements within an accuracy of plus or minus one inch.

(2) Bailer Method

(A) select a permanent measuring point, such as the top of the casing;

(B) measure and record the static water level below or above the measuring point prior to starting the bailing procedure;

(C) bail the water out of the well as rapidly as possible for a period of at least one hour; determine and record the bailing rate in gallons per minute at the end of the bailing period; and

(D) measure and record the water level immediately after stopping bailing process.

(3) Air Rotary Drill Method

(A) measure and record the amount of water being injected into the well during drilling operations;

(B) measure and record the discharge rate in gallons per minute at intervals of one hour or less during drilling operations;

(C) after completion of the drilling, continue to blow the water out of the well for at least 30 minutes and measure and record the discharge rate in gallons per minute at intervals of 10 minutes or less during the period; and

(D) measure and record the water level immediately after discharge ceases.

(4) Air Lift ~~Method~~ Method. Measurements shall be made through a pipe placed in the well. The pipe shall have a minimum inside diameter of at least five-tenths of an inch and shall extend from top of the well head to a point inside the well that is below the bottom of the air line.

~~(A) Measurements shall be made through a pipe placed in the well;~~

~~(B) The pipe shall have a minimum inside diameter of at least five-tenths of an inch and shall extend from top of the well head to a point inside the well that is below the bottom of the air line~~;

(A)~~(C)~~ Measure and record the static water level prior to starting the air compressor;

(B)~~(D)~~ Measure and record the discharge rate at intervals of 10 minutes or less;

(C)~~(E)~~ Measure and record the pumping level using a steel or electric tape at intervals of 10 minutes or less; and

(D)~~(F)~~ Continue the test for a period of at least one hour.

(b) ~~(d)~~ Public, Industrial and Irrigation Wells. Every ~~public,~~ industrial ~~and~~ or irrigation well or well serving a public water supply system upon completion, shall be tested for capacity by the ~~drilling~~ well contractor (except ~~when~~ if the owner specifies another agent) by the following or equivalent method:

(1) The water level in the well to be pumped and any observation wells shall be measured and recorded prior to starting the test.

(2) The well shall be tested by a pump of sufficient size and lift capacity to ~~satisfactorily~~ test the yield of the well, consistent with the well diameter and purpose.

(3) The pump shall be equipped with sufficient throttling devices to reduce the discharge rate to approximately 25 percent of the maximum capacity of the pump.

(4) The test shall be conducted for a period of at least 24 hours without interruption. ~~interruption and shall be continued for a period of at least four hours after the pumping water level stabilizes (ceases to decline).~~ ~~When~~If the total water requirements for wells ~~other than public, community or municipal supply wells~~ not serving a public water supply system are less than 100,000 gpd, the well shall be tested for a period and in a manner to ~~satisfactorily~~ show the capacity of the well, or that the capacity of the well is sufficient to meet the intended purpose.

(5) The pump discharge shall be set at a constant rate or rates that can be maintained throughout the testing period. If the well is tested at two or more pumping rates (a step-drawdown test), pumping at each pumping rate shall continue to the point that the pumping water level ~~shall be stabilized~~ declines no more than 0.1 feet per hour for a period of at least four hours for each pumping rate.

(6) The pump discharge rate shall be measured by an orifice meter, flowmeter, weir, or equivalent metering device. The metering device shall have an accuracy within plus or minus five percent.

(7) The discharge rate of the pump and time shall be measured and recorded at intervals of 10 minutes or less during the first two hours of the pumping period for each pumping rate. If the pumping rate is relatively constant after the first two hours of pumping, discharge measurements and recording may be made at longer time intervals but not to exceed one hour.

(8) The water level in each well and time shall be measured and recorded at intervals of five minutes or less during the first hour of pumping and at intervals of 10 minutes or less during the second hour of pumping. After the second hour of pumping, the water level in each well shall be measured at such intervals that the lowering of the pumping water level does not exceed three inches between measurements.

(9) A reference point for water level measurements (preferably the top of the casing) shall be selected and recorded for the pumping well and each observation well to be measured during the test. All water level measurements shall be made from the selected reference points.

(10) All water level measurements shall be made with a steel or electric tape or equivalent measuring device.

(11) All water level measurements shall be made within an accuracy of plus or minus one inch.

(12) After the completion of the pumping period, measurements of the water level recovery ~~rate,~~ rate in the pumped ~~well,~~ well shall be made for a period of at least two hours in the same manner as the drawdown.

History Note: *Authority G.S. 87-87; 87-88;*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; September 1, 1984; April 20, 1978.

15A NCAC 02C .0111 is proposed for amendment as follows:

15A NCAC 02C .0111 DISINFECTION OF WATER SUPPLY WELLS

(a) Any person constructing, repairing, testing, or performing maintenance, or installing a pump in a water supply well shall disinfect the well upon completion of construction, repairs, testing, maintenance, or pump installation. ~~All water supply wells shall be disinfected upon completion of construction, maintenance, repairs, pump installation and testing as follows:~~

(b) Any person disinfecting a well shall perform disinfection in accordance with the following procedures:

(1) Chlorination.

(a) ~~Chlorine~~ Hypochlorite shall be placed in the well in sufficient quantities to produce a chlorine residual of at least 100 parts per million (ppm) in the well. ~~A chlorine solution may be prepared by dissolving high test calcium hypochlorite (trade names include HTH,~~

~~Chlor-Tabs, etc.) in water. Do not use stabilized~~ Stabilized chlorine tablets or hypochlorite products containing fungicides, algaecides, or other ~~disinfectants.~~ disinfectants shall not be used. Chlorine test strips or other quantitative test methods shall be used to confirm the concentration of the chlorine residual. ~~Follow manufacturers directions with storing, transporting, and using calcium hypochlorite products.~~

[Note: About three ounces of hypochlorite containing 65 percent to 75 percent available chlorine is needed per 100 gallons of water for at least a 100 ppm chlorine residual. As an example, a well having a diameter of six inches, has a volume of about 1.5 gallons per foot. If the well has 200 feet of water, the minimum amount of hypochlorite required would be 9 ounces. (1.5 gallons/foot x 200 feet = 300 gallons at 3 ounces per 100 gallons; 3 ounces x 3 = 9 ~~ounces.)~~ ounces.)]

(b) The ~~chlorine~~ hypochlorite shall be placed in the well by one of the following or equivalent methods:

(i) ~~Chlorine tablets~~ Granular hypochlorite may be dropped in the top of the well and allowed to settle to the bottom; or

(ii) ~~Chlorine~~ Hypochlorite solutions shall be placed in the bottom of the well by using a bailer or by pouring the solution through the drill rod, hose, or pipe placed in the bottom of the well. The solution shall be flushed out of the drill rod, hose, or pipe by using water or air.

(c) ~~Agitate the~~The water in the well shall be agitated or circulated to ensure thorough dispersion of the chlorine.

(d) The well casing, pump column and any other equipment above the water level in the well shall be thoroughly rinsed with the chlorine solution as a part of the disinfecting process.

(e) The chlorine solution shall stand in the well for a period of at least 24 hours.

(f) The well shall be pumped until there is no detectable total chlorine residual in water pumped from the well ~~the system is clear of the chlorine~~ before the ~~system~~ well is placed in use.

(2) Other materials and methods of disinfection, at least as effective as those in Item (1) of this Rule, may be used upon prior approval by the ~~Director.~~ Department.

History Note: *Authority G.S. 87-87; 87-88;*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; July 1, 1988; September 1, 1984.

15A NCAC 02C .0112 is proposed for amendment as follows:

15A NCAC 02C .0112 WELL MAINTENANCE: REPAIR: GROUNDWATER RESOURCES

(a) Every well shall be maintained by the owner in a condition whereby it will conserve and protect the groundwater resources, and whereby it will not be a source or channel of contamination or pollution to the water supply or any ~~aquifer.~~aquifer, or the well shall be permanently abandoned in accordance with the requirements of 15A NCAC 02C .0113(b).

(b) Dewatering wells shall be permanently abandoned in accordance with the requirements of 15A NCAC 02C .0113(b) within 30 days of completion of the dewatering activity.

(c) The well owner shall not place new potential sources of groundwater contamination closer to the well than the separation distances specified in Subparagraph .0107(a)(2) or .0107(a)(3) of this Section, as applicable.

(d)~~(b)~~ All materials used in the maintenance, replacement, or repair of any well shall meet the requirements for new installation.

(e)~~(c)~~ Broken, punctured or otherwise defective or unserviceable casing, screens, fixtures, seals, or any part of the well head shall be repaired or replaced, or the well shall be permanently abandoned pursuant to the requirements of ~~15A NCAC 02C .0113.~~ Paragraph .0113(b) of this Section.

(f)~~(d)~~ ~~National Science Foundation~~NSF International (NSF) approved PVC pipe rated at 160 PSI may be used for liner ~~casing.~~pipe. The annular space around the liner casing shall be at least five-eighths inches and shall be completely filled with ~~neat cement~~ a cement-type grout. The well liner shall be completely grouted within 10 working days after collection of water samples or completion of other testing to confirm proper placement of the liner or within 10 working days after the liner has been ~~installed.~~ installed if no sampling or testing is performed.

(g) All well repairs shall be completed with the wellhead, or the top of the pitless unit, if so equipped, terminating at least twelve inches above land surface. Any grout excavated or removed as a result of the well repair shall be replaced in accordance with Paragraph .0107(f) of this Section.

History Note: *Authority G.S. 87-87; 87-88;*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, August 1, 2002; April 1, 2001; December 1, 1992; September 1, 1984.

15A NCAC 02C .0113 is proposed for amendment as follows:

15A NCAC 02C .0113 ABANDONMENT OF WELLS

(a) Any well which is temporarily removed from service ~~has been temporarily abandoned,~~ shall be temporarily abandoned in accordance with ~~one of~~ the following procedures:

(1) Upon temporary removal from service or prior to being put into service, the well shall be sealed with a water-tight cap or seal compatible with the casing and installed so that it cannot be removed ~~easily by hand.~~ without the use of hand tools or power tools.

(2) The well shall be maintained whereby it is not a source or channel of contamination during temporary abandonment.

~~(3) Every temporarily abandoned well shall be protected with a casing.~~

(b) Permanent abandonment of wells other than bored or hand dug wells shall be performed in accordance with the following procedures:~~Any well which has been abandoned permanently shall be abandoned in accordance with the following procedures:~~

~~(1) Procedures for permanent abandonment of wells, other than bored and hand dug wells:~~

~~(A)~~(1) All casing and screen materials may be removed prior to initiation of abandonment procedures if such removal will not cause or contribute to contamination of the groundwaters. ~~Any casing not grouted in accordance with 15A NCAC 2C .0107(e) of this Section shall be removed or properly grouted.~~

(2) Any casing installed after January 1, 1972 and not grouted in accordance with Paragraph .0107(f) of this Section shall be removed or grouted prior to abandonment.

(3) Any casing installed prior to January 1, 1972 and not grouted in accordance with Paragraph .0107(f) of this Section shall be either:

(A) removed or grouted prior to abandonment; or

(B) the uppermost three feet of casing shall be removed and the surrounding materials excavated down to the top of the remaining well casing, including the material extending to a width of at least 12 inches outside of the well casing. Cement-type grout or bentonite slurry grout shall be pumped into any open annular space around the remaining casing.

~~(B)~~(4) The entire depth of the well shall be sounded before it is sealed to ensure freedom from obstructions that may interfere with sealing operations.

~~(C)~~(5) ~~Using a hypochlorite solution (such as HTH), disinfect the well~~ Except in the case of temporary wells and monitoring wells, the well shall be disinfected in accordance with ~~15A NCAC 2C .0111.~~ Parts .0111(b)(1)(a) through .0111(b)(1)(c) of this Section if the well is contaminated with coliform or pathogenic microorganisms. ~~Do not use a common commercial household liquid bleach, as this is too weak a solution to ensure proper disinfection.~~

(6) Wells constructed prior to January 1, 1972 in which the casing has not been removed or grouted shall be completely filled with cement or bentonite slurry grout. Following filling of the well and removal of the upper three feet of casing in accordance with Part (3)(B) of this Paragraph, a six-inch thick concrete or cement grout plug shall be placed on top of the remaining casing such that it covers the entire excavated area above the top of the casing, including the area extending to a width of at least 12 inches outside the well casing. The remainder of the excavation above the concrete or cement plug shall be filled with grout or soil.

~~(D)~~ (7) In the case of gravel-packed wells in which the casing and screens have not been removed, neat-cement, or ~~bentonite grout~~bentonite slurry grout shall be injected into the well completely filling it from the bottom of the casing to the top.

~~(E)~~ (8) ~~Wells, other than "bored" wells,~~ Wells constructed in unconsolidated formations shall be completely filled with ~~cement grout, or bentonite~~ grout by introducing it through a pipe extending to the bottom of the well which can be raised as the well is filled.

~~(F)~~ (9) Wells constructed in consolidated rock formations or that penetrate zones of consolidated rock may be filled with ~~cement grout, bentonite~~ grout, sand, gravel or drill cuttings opposite the zones of consolidated rock. The top of ~~the cement grout, bentonite grout,~~ any sand, gravel or cutting fill shall terminate at least 10 feet below the top of the consolidated rock or five feet below the bottom of casing. ~~Cement grout or bentonite grout~~ Grout shall be placed beginning 10 feet below the top of the consolidated rock or five feet below the bottom of casing and extend ~~five feet above the top of consolidated rock. The remainder of the well, above the upper zone of consolidated rock, shall be filled with cement grout or bentonite grout~~ up to land surface. For any well in which the depth of casing or the depth of the bedrock is not known or cannot be confirmed, ~~then~~ the entire length of the well shall be filled with ~~cement grout or bentonite~~ grout up to land surface.

~~(G)~~ (10) Temporary ~~wells~~ wells, ~~or~~ monitor ~~wells:~~ wells or test borings:

(A) ~~(i)~~ less than 20 feet in depth and which do not penetrate the water table shall be abandoned by filling the entire well up to land surface with ~~cement~~ grout, dry clay, ~~bentonite grout,~~ or material excavated during drilling of the well and then compacted in place; and

(B) ~~(ii)~~ greater than 20 feet in depth or that penetrate the water table shall be abandoned by completely filling with a bentonite or cement - type grout.

~~(2) For bored wells or hand dug wells, constructed into unconsolidated material.~~

~~(A) For wells that do not have standing water in them at any time during the year:~~

~~(i) Remove all plumbing or piping entering the well, along with any obstructions in the well;~~

~~(ii) Remove as much of the well casing as possible and then fill the entire well up to land surface with cement grout, concrete grout, bentonite grout, dry clay, or material excavated during drilling of the well and then compacted in place.~~

~~(B) For wells that do have standing water in them during all or part of the year:~~

~~(i) Remove all plumbing or piping into the well, along with any obstructions inside the well; and~~

~~(ii) Remove as much of the well tile casing as possible, but no less than to a depth of three feet below land surface;~~

~~(iii) Remove all soil or other subsurface material present down to the top of the remaining well casing, and extending to a width of at least 12 inches outside of the well casing on all sides;~~

~~(iv) Using a hypochlorite solution (such as HTH), disinfect the well in accordance with 15A NCAC 2C .0111 of this Subchapter. Do not use a common commercial household liquid bleach, as this is too weak a solution to ensure proper disinfection;~~

~~(v) Fill the well up to the top of the remaining casing with cement grout, concrete grout, bentonite grout, dry clay, or material excavated during drilling of the well and then compacted in place;~~

~~(vi) Pour a one foot thick concrete grout or cement grout plug that fills the entire excavated area above the top of the casing, including the area extending on all sides of the casing out to a width of at least 12 inches on all sides; and~~

~~(vii) Complete the abandonment process by filling the remainder of the well above the concrete or cement plug with additional concrete grout, cement grout, or soil.~~

(c) For bored wells or hand dug wells, constructed into unconsolidated material:

(1) The well shall be disinfected in accordance with Rule .0111(b)(1)(a) through .0111(b)(1)(c) of this Section if the well is contaminated with coliform or pathogenic microorganisms.

(2) All plumbing or piping in the well and any other obstructions inside the well shall be removed from the well.

(3) The uppermost three feet of well casing shall be removed from the well.

(4) All soil or other subsurface material present down to the top of the remaining well casing shall be removed, including the material extending to a width of at least 12 inches outside of the well casing;

(5) The well shall be filled to the top of the remaining casing with grout, dry clay, or material excavated during drilling of the well. If dry clay or material excavated during construction of the well is used, it shall be emplaced in lifts no more than 5 feet thick, each compacted in place prior to emplacement of the next lift.

(6) A six-inch thick concrete grout plug shall be placed on top of the remaining casing such that it covers the entire excavated area above the top of the casing, including the area extending to a width of at least 12 inches outside the well casing; and

(7) The remainder of the well above the concrete plug shall be filled with grout or soil.

(d) ~~(c)~~ Any well which acts as a source or channel of contamination shall be repaired or permanently abandoned within 30 days of receipt of notice from the ~~department.~~Department.

(e) ~~(d)~~ The ~~drilling~~ well contractor shall permanently abandon any well in which the casing has not been installed or from which the casing has been removed, prior to removing his equipment from the site.

(f) ~~(e)~~ The owner ~~shall be~~is responsible for permanent abandonment of a well except that:

(1) the well ~~driller~~ contractor is responsible for well abandonment if abandonment is required because the ~~driller~~ well contractor improperly locates, constructs, repairs or completes the well; or

(2) the person who installs, repairs or removes the well pump is responsible for well abandonment if that abandonment is required because of improper well pump installation, repair or removal.

History Note: *Authority G.S. 87-87; 87-88;*
Eff. February 1, 1976;
Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; September 1, 1984; April 20, 1978.

15A NCAC 02C .0114 is proposed for amendment as follows:

15A NCAC 02C .0114 DATA AND RECORDS REQUIRED

(a) Well Cuttings.

(1) Samples of formation cuttings shall be collected by the well contractor and furnished to the Division from any well when such samples are requested by the Division prior to completion of the drilling or boring activities.

(2) Samples or ~~representatives~~ representative cuttings shall be obtained for depth intervals of 10 feet or less beginning at the land surface. Representative cuttings shall also be collected at depths of each significant change in formation.

(3) Samples of cuttings shall be placed in containers furnished by the Division and such containers shall be filled, sealed and ~~properly~~ labeled with indelible-type markers, showing the well owner, well number if applicable, and depth interval the sample represents.

(4) Each set of samples shall be placed in a ~~suitable~~ container(s) showing the location, owner, well number if applicable, ~~driller,~~ well contractor, depth interval, and date.

(5) Samples shall be retained by the ~~driller~~ well contractor until delivery instructions are received from the Division or for a period of at least 60 days after the well record form (GW-1), indicating said samples are available, has been received by the Division.

(6) The furnishing of samples to any person or agency other than the Division ~~shall~~ does not constitute compliance with the department's request and shall not relieve the ~~driller~~ well contractor of his obligation to the ~~department.~~ Division.

(b) Reports.

(1) Any person completing or abandoning any well shall submit to the Division a record of the construction or abandonment. For ~~public~~ water supply wells, a copy of each completion or abandonment record shall also be submitted to the Health Department responsible for the county in which the well is located. The record shall be on forms provided by the Division and shall include certification that construction or abandonment was completed as required by ~~these Rules~~this Section, the owner's name and address, ~~well location,~~ latitude and longitude of the well with a position accuracy of 100 feet, diameter, depth, yield, and any other information the Division may ~~reasonably~~ require as necessary to depict the location and construction details of the well.

(2) The certified record of completion or abandonment shall be submitted within a period of thirty days after completion or abandonment.

(3) The furnishing of records to any person or agency other than the Division ~~shall~~ does not constitute compliance with the reporting requirement and shall not relieve the ~~driller~~ well contractor of his obligation to the ~~Department.~~ Division.

History Note: *Authority G.S. 87-87; 87-88;*

Eff. February 1, 1976;

Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; September 1, 1984; April 20, 1978.

15A NCAC 02C .0116 is proposed for amendment as follows:

15A NCAC 02C .0116 DESIGNATED AREAS: WATER SUPPLY WELLS CASED TO LESS THAN 20 FEET

(a) In some areas the best or only source of potable water supply exists between ten and twenty feet below the surface of the land. In consideration of this, ~~the Director may designate areas of the state where~~ water supply wells may be cased to a depth less than twenty ~~feet.~~ feet in the following areas: ~~To make this determination, the Director will find:~~

~~(1) that the only or best source of drinking water exists between a depth of ten and twenty feet below the surface of the land;~~

~~(2) that utilization of said source of water is in the best interest of the public.~~

(1) in Currituck County in an area between the sound and a line beginning at the end of SR 1130 near Currituck Sound, thence north to the end of SR 1133, thence north to the end of NC 136 at the intersection with the sound;

(2) on the Outer Banks from the northern corporate limit of Nags Head on Bodie Island, south to Ocracoke Inlet;

(3) all areas lying between the Intracoastal Waterway and the ocean from New River Inlet south to New Topsail Inlet;

(4) all areas lying between the Intracoastal Waterway and the ocean from the Cape Fear River south to the South Carolina line.

(b) The Director may designate additional areas of the state where water supply wells may be cased to a depth less than twenty feet. To designate such areas, the Director shall find:

(1) that the only or best source of drinking water in the area exists between a depth of ten and twenty feet below the surface of the land; and

(2) that utilization of this source of water in the area is in the best interest of the public.

~~(b) The following areas are so designated:~~

(1) ~~in Currituck County on Terres Quarter Island and in an area between the sound and a line beginning at the end of SR 1130 near Currituck Sound, thence north to the end of SR 1133, thence north to the end of NC 3 at the intersection with the sound;~~

~~(2) on the Outer Banks from the northern corporate limit of Nags Head on Bodie Island, south to Ocracoke Inlet;~~

~~(3) all areas lying between the Intercoastal Waterway and the ocean from New River Inlet south to New Topsail Inlet;~~

~~(4) all areas lying between the Intercoastal Waterway and the ocean from the Cape Fear River south to the South Carolina line.~~

(c) In all other areas, the source of water shall be at least 20 feet below land surface, except when adequate quantities of potable water cannot be obtained below a depth of twenty feet, and at sites not within areas designated in ~~Subparagraph~~ Paragraphs (b) or (c) of this Rule the source of water may be obtained from unconsolidated rock formations at depths less than twenty feet provided that:

(1) the well ~~driller~~ contractor can show to the satisfaction of the ~~Division~~Department, that sufficient water of acceptable quality for the intended use is not available to a minimum depth of fifty feet; ~~and~~

(2) the proposed source of water is the maximum feasible depth above fifty feet, but in no case less than ten ~~feet.~~ feet; and

(3) the regional office of the ~~department shall be~~ Department is notified prior to the construction of a well obtaining water from a depth between 10 and 20 feet below land surface.

History Note: *Authority G.S. 87-87;*
Eff. April 20, 1978;
Amended Eff. January 1, 2009, December 1, 1992; July 1, 1988; September 1, 1984.

15A NCAC 02C .0117 is proposed for amendment as follows:

15A NCAC 02C .0117 DESIGNATED AREAS: WATER SUPPLY WELLS CASED TO MINIMUM DEPTH OF 35 FEET

(a) Water supply wells ~~Wells drilled in~~ constructed in the following areas or within 400 feet of the following areas ~~underlain by metavolcanic rocks identified on the 1985 State Geologic Map as bedded argillites of the Carolina Slate Belt~~ shall be cased to a minimum depth of 35 ~~feet.~~ feet: ~~These areas are generally described as follows:~~

(1) Anson County generally west of a line beginning at the intersection of the runs of the Pee Dee River and Buffalo Creek, thence generally northeast to SR 1627, thence generally south along SR 1627 to the intersection with SR 1632, thence generally west along SR 1632 to the intersection with US 52, thence generally south along US 52 to the intersection with SR 1418, thence generally southwest along SR 1418 to the intersection of NC 218, thence south along NC 218 to the intersection with US 74, thence generally west along US 74 to the intersection of SR 1251, thence generally southwest along SR 1251 to the intersection with SR 1240, thence generally southeast along SR 1240 to the intersection with SR 1252, thence generally south along SR 1252 to the intersection with SR 1003, thence generally west along SR 1003 to the Union County line;

(2) Cabarrus County generally east of a line beginning at the intersection of SR 1113 and the Union County line, thence generally northeast along SR 1113 to the intersection with SR 1114, thence generally east along SR 1114 to the Stanly County line, thence generally northeast along the county

line to the intersection with SR 1100, thence generally northeast along SR 1100 to the intersection of with SR 2622, thence generally southeast along SR 2622 to the intersection with SR 2617, thence generally northeast along SR 2617 to the intersection with SR 2611, thence generally north along SR 2611 to the intersection with NC 73, thence generally east along NC 73 to the intersection with SR 2453, thence generally northeast along SR 2453 to the intersection with SR 2444, thence generally northeast along SR 2444 to the Rowan County line;

(3) Davidson County generally east of a line starting at the intersection of the runs of Abbotts Creek and the Yadkin River in High Rock Lake, thence generally north along Abbotts Creek to NC 8 bridge, thence generally north along NC 8 to the intersection with Interstate 85, thence generally northeast along Interstate 85 to the intersection with US 64, thence generally southeast along US 64 to the Randolph County line;

(4) Montgomery County generally west of a line beginning at the intersection of SR 1134 with the Randolph County line, thence generally south along SR 1134 to the intersection with SR 1303, thence generally south along SR 1303 to the intersection with NC 109, thence generally southeast along NC 109 to the intersection with SR 1150, thence generally south along SR 1150 to the intersection with NC 73, thence generally southeast along NC 73 to the intersection with SR 1112, thence generally east along SR 1112 to the intersection with SR 1130, thence generally northeast along SR 1130 to the intersection with SR 1132, thence generally southeast along SR 1132 to the intersection with SR 1174, thence generally east along SR 1174 to the intersection with NC 109, thence generally north along NC 109 to the intersection with SR 1546, generally southeast along SR 1546 to the intersection of SR 1543, thence generally south along SR 1543 to the intersection with ~~NC 73~~ NC 731, thence generally west along ~~NC 73~~ NC 731 to the intersection with SR 1118, thence generally southwest along SR 1118 to the intersection with SR 1116, thence generally west along SR 1116 to the intersection with NC 109, thence generally south along NC 109 to the intersection with the Richmond County line;

(5) Randolph County generally west of a line beginning at the intersection of US 64 with the Davidson County line, thence generally east along US 64 to the intersection with NC 49, thence generally southwest along NC 49 to the intersection with SR 1107, thence generally south along SR 1107 to the intersection with SR 1105, thence southeast along SR 1105 to the intersection with the Montgomery County line;

(6) Rowan County generally east of a line beginning at the intersection of SR 2352 with the Cabarrus County line, thence generally northeast along SR 2352 to the intersection with SR 2353, thence generally north along SR 2353 to the intersection with SR 2259, thence generally northeast along SR 2259 to the intersection with SR 2142 ~~with the Cabarrus County line~~, thence north along SR 2142 to the intersection with SR 2162, thence generally northeast along SR 2162 to the intersection with the run of the Yadkin River in High Rock Lake;

(7) Union County generally east of a line beginning at the intersection of SR 1117 with the South Carolina-North Carolina State line, thence generally north along SR 1117 to the intersection with SR

1111, thence generally northwest along SR 1111 to the intersection with NC 75, thence generally northwest along NC 75 to the intersection with NC 16, thence generally north along NC 16 to the intersection with SR 1008, thence generally northeast along SR 1008 ~~to the intersection with SR 1514, thence generally north along SR 1514~~ to the intersection with SR 1520, thence generally northeast along SR 1520 to the intersection with NC 218, thence generally east along NC 218 to the intersection with US 601, thence generally north along US 601 to the intersection with SR 1600, thence generally northeast along SR 1600 to the intersection with the Cabarrus County line; and

(8) Stanly County -- all.

~~(b) The roads describing the boundaries of the designated areas do not necessarily coincide with the rock unit boundaries. Therefore, any well drilled within 400 feet of a road described as a boundary of a designated area shall be cased to the same minimum depth as those within the described area.~~

History Note: *Authority G.S. 87-87;*
Eff. April 20, 1978;
Amended Eff. January 1, 2009, April 1, 2001.

15A NCAC 02C .0118 is proposed for amendment as follows:

15A NCAC 02C .0118 VARIANCE

(a) The ~~Director~~ Secretary may grant a variance from any construction standard under the rules of this Section. Any variance ~~will~~ shall be in writing, and ~~may~~ shall be granted upon oral or written application to the ~~Director~~Secretary, by the person responsible for the construction of the well for which the variance is sought, if the ~~Director~~ Secretary finds facts to support the following conclusions:

(1) that the use of the well will not endanger human health and welfare or the groundwater;

(2) that construction in accordance with the standards was not technically feasible in such a manner as to afford a reasonable water supply at a reasonable cost.

(b) The ~~Director~~ Secretary may require the variance applicant to submit such information as ~~he~~ the Secretary deems necessary to make a decision to grant or deny the variance. The ~~Director~~ Secretary may impose such conditions on a variance or the use of a well for which a variance is granted as he deems necessary to protect human health and welfare and the groundwater resources. The findings of fact supporting any variance under this Rule shall be in writing and made part of the variance.

(c) The ~~Director~~ Secretary shall respond in writing to a request for a variance within 30 days from the receipt of the variance request.

(d) A variance applicant who is dissatisfied with the decision of the ~~Director~~ Secretary may commence a contested case by filing a petition under G.S. 150B-23 within 60 days after receipt of the decision.

History Note: *Authority G.S. 87-87; 87-88; 150B-23;*
Eff. April 20, 1978;
Amended Eff. January 1, 2009, April 1, 2001; December 1, 1992; September 1, 1988; September 1, 1984.

15A NCAC 02C .0119 is proposed for amendment as follows:

15A NCAC 02C .0119 DELEGATION

(a) The ~~Director~~ Secretary is delegated the authority to grant permission for well construction under G.S. 87-87.

(b) The ~~Director~~ Secretary is delegated the authority to give notices and sign orders for violations under G.S. 87-91.

~~(c) The Director is delegated the authority to request the Attorney General to institute civil actions under G.S. 87-95.~~

(c)~~(d)~~ The ~~Director~~ Secretary is authorized to subdelegate, to an official of the ~~Division~~ Department, the granting of a variance from any construction standard, or the approval of alternate construction methods or materials, specified under the Rules of this Section.

(d) The Secretary may delegate, through a Memorandum of Agreement, to another governmental agency, the authority to permit wells that are an integral part of a facility requiring a permit from the agency. Provided, however, that the permittee comply with all provisions of this Subchapter, including construction standards and the reporting requirements as specified in 15A NCAC 2C .0114.

History Note: *Authority G.S. 143-215.3(a)(1);*
Eff. March 1, 1985;
Amended Eff. January 1, 2009, December 1, 1992.