



NATURAL RESOURCES DEFENSE COUNCIL

December 12, 2011

Via Electronic Mail to “minerals@dnr.state.oh.us” and U.S. Mail

Ohio Department of Natural Resources
Division of Oil and Gas Resources Management
2045 Morse Rd.
Building H-3
Columbus, OH 43229-6693

Re: Comments on Proposed Amendments to Well Construction Rules to Implement Revised Code Section 1509.17

Dear Director Zehringer and Division members:

Please accept these comments on the Division’s draft Oil and Gas Well Construction Rules dated October 28, 2011, amending Ohio Adm. Code Sections 1501:9-1-01 and 1501:9-1-08. These comments are submitted on behalf of the Natural Resources Defense Council, Sierra Club, Ohio Environmental Council, Earthjustice, Buckeye Forest Council, Concerned Citizens of Portage County, Center for Health, Environment, and Justice, Green Environmental Coalition, Guernsey County Citizens Support on Drilling Issues, Progress Ohio, Fracking Interest Group, Carroll Concerned Citizens, Inc., Concerned Citizens Ohio, Environment Ohio, Network for Oil & Gas Accountability & Protection, and the undersigned concerned citizens of Ohio. Thank you for providing this opportunity to comment.

We write to raise our shared concerns that the draft rules require substantial revision as the standards proposed therein are less protective in important ways than those of other states experienced in deep shale gas drilling and lag behind the state of the art. Further, the rules excessively incorporate undefined industry jargon and need to be redrafted in a more specific fashion in order to give reasonable notice of the rule requirements and to allow effective enforcement.

COMMENTS

1. 1501:9-1-01: Additional Definitions Needed

The rules incorporate numerous terms that, while they may have some common usage within industry parlance, require specific rule definitions as their usage may not be uniform, do

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not supply clear notice of anticipated requirements, and will greatly complicate, if not prevent, effective enforcement. The terms needing specific definitions added to rule 1501:9-1-01 include:

- A) Shoe test
- B) “Shallow” as used to modify both the terms “aquifer” and “naturally occurring, natural gas.” The term “shallow” should at a minimum include the depth of any unconsolidated formation extending from the surface.
- C) Blow-out Prevention
- D) Cellar
- E) Formation Integrity Test
- F) Mouse and/or Rat Hole
- G) Reserve Pit
- H) Flow Ditch
- I) Cement Basket
- J) “Volume Extenders” used in cement
- K) Exempted Aquifer
- L) Guide Shoe
- M) Unconsolidated Formation
- N) Unconsolidated Sediment
- O) Potable Water Supplies
- P) Drinking Water

We recommend that these phrases be separately defined in additional paragraphs to 1501:9-1-01.

2. 1501:9-1-01(5): Intermediate Casing Definition

The definition for “Intermediate casing” is too limited and excludes several critical functions served by intermediate casing in relation to several specific drilling hazards. The definition should add that its function include “the sealing off of anomalous pressure zones, lost circulation zones, and other drilling hazards.”

3. 1501:9-1-01(10): Underground Sources of Drinking Water (USDW)

This definition contemplates no protection for smaller potable groundwater sources unless those sources are currently supplying water for human consumption. The proposed definition would allow contamination of these potentially valuable groundwater resources needed for future domestic use and economic growth, and would conflict with other state water protection laws, such as R.C. 6111.04 that prohibits groundwater pollution without the issuance of a permit designed to minimize contamination. This approach is particularly inappropriate in Ohio where many areas contemplated for deep shale gas drilling are located in southeastern Ohio where groundwater is limited, but its economic value can be substantial to the individual inhabitants of the region.

We urge Ohio to adopt the position adopted earlier this year in this identical context by our sister state of Pennsylvania that: “Fresh groundwater must be protected regardless of whether it is currently being used as a source of drinking water nearby.” See p. 44 of Comment & Response

Document, Oil & Gas Cementing and Casing Standards, Environmental Quality Review Board Regulation #7-549, available at: <://files.dep.state.pa.us/PublicParticipation/Public%20Participation%20Center/PubPartCenterPort alFiles/> (hereinafter “Pa. Comments”).

We recommend that the currently proposed definition be discarded entirely and replaced with the properly descriptive definition for “deepest fresh groundwater” adopted by Pennsylvania in its Oil and Gas rules, Title 25, Chapter 78, Sec. 78.1 that: “The deepest fresh groundwater bearing formation penetrated by the wellbore as determined from drillers logs from the well or from other wells in the area surrounding the well or from historical records of the normal surface casing seat depths in the area surrounding the well, whichever is deeper.” This scientifically appropriate and neutral definition does not contain any veiled exemptions for groundwater similar to that in the current proposal.

The Division’s proposed definition is also dependent upon the term “drinking water” which is not defined anywhere in this rule package. This lack of definition results in vagueness while encouraging inappropriate claims to be raised by operators that certain groundwater is exempt from protection. Rather than use the limiting term “drinking water,” we recommend that the rules instead utilize the term “fresh groundwater” which should be neutrally defined as: “Water in that portion of the generally recognized hydrologic cycle which occupies the pore spaces and fractures of saturated subsurface materials.” It should be noted that this definition has been adopted by our sister state of Pennsylvania, see PA Sec. 78.1.

4. 1501:9-1-01(14): Revise Definition for “Potential Flow Zone”

The proposed definition for “potential flow zone” needs revised in order to include fluids in addition to hydrocarbons. The currently proposed definition is too narrow in that uncontrolled flow of either hydrocarbons or formation fluids can result in loss of well control or integrity.

We recommend that the proposed definition be replaced with the definition for “potential flow zone” contained in API Standard 65-Part 2, Second Edition, December, 2010: “Any zone in a well where flow is possible when wellbore pressure is less than pore pressure.”

5. 1501:9-1-01(1): Delete Definition for “Drive Pipe” & Redefine “Conductor Casing”

The rules make a distinction between “drive pipe” and “conductor casing” that is unnecessarily cumbersome. In order to clarify and simplify the rules, the following revisions should be made:

- a. Eliminate all references to “Drive pipe,” including the definition.
- b. Re-define “Conductor casing” as “casing used for one or more of the following purposes: to support unconsolidated sediment, protect shallow groundwater from contamination, provide a conduit for drilling fluids when drilling the next section of the well, and to provide structural support for a gas diverter system.”

c. Delete subsection (M)(1) and amend subsection (M)(3) as follows:

(3) Conductor casing:

f. Conductor casing setting depth must be based on regional geologic, hydrologic, and engineering data and be sufficient to support unconsolidated sediment, isolate shallow groundwater, and provide solid structural anchorage.

(a) When an annular space is present between the borehole and the casing, conductor casing shall be cemented to surface.

(b) If cement is not circulated to surface, remedial cementing must be performed to ensure a complete cement bond.

6. 1501:9-1-08(A): General Construction Standard

The proposed rule allows an operator to use any “sound design and effective industry practice” whenever the rules fail to specify a construction standard or method. This phrase is inherently vague and could readily lead to inappropriate results as it could justify use of practices that are outdated or that do not achieve reasonable environmental or public safety goals.

The final sentence in this standard should be amended to require use of designs and standards that are “contemporary” or “up to date” and that “give appropriate consideration to local and regional geologic and engineering data and have been approved as constituting Good Engineering Practice (GEP) or Best Available Technology (BAT).”

7. 1501:9-1-08(D): Casing Standards; Prohibit Use of Old Casing

This rule expressly allows the use of old, previously used and reconditioned casing in new wells, irrespective of the nature of the well. Allowing reuse of old casing is appropriate only for shallow, oil producing wells, see p. 56 of Pa. Comments, cited above in Comment 4, that: “The Board considers used casing to be acceptable in certain applications, notably in low pressured shallow oil wells that do not produce gas.”

These same standards should be utilized in Ohio by amending the rule to prohibit used casing in all but shallow oil wells that do not produce gas. At a minimum, in no circumstances should used casing be allowed for any casing string in deep shale gas wells into the Marcellus or Utica formations; only new casing should be allowed in these demanding circumstances. Regardless of whether casing is new or used, all casing must meet or exceed API standards for new casing.

8. 1501:9-1-08(D): Casing Standards; Use of Old Casing

In any circumstance where old casing is utilized in a new well, the Well Construction Records provisions in 08(O) should be amended to require reporting on the casing’s age, condition, location of prior use, and prior service history.

9. 1501:9-1-08(D): Casing Standards; Additional Criteria

The rule should be amended to include the following four additions:

a) The rule should be expanded from requiring that all new casing meet the standards in API 5CT to also including the application of all API casing specifications and recommended practices, including those governing design, manufacturing, testing and transportation.

b) The rule should require that casing must not only be designed to withstand the anticipated hydraulic fracturing pressure to which it will be subjected, but also production pressures, corrosive conditions, and all other conditions that may reasonably be anticipated, given the applicable geology and all relevant circumstances.

c) The pressure testing requirement for cemented casing strings set forth in paragraph (3) should be improved as follows:

(i) The timing of the testing, i.e., “upon landing of the wiper plug,” is problematic. To obtain a more accurate result, such testing should not occur until the cement has cured and hardened.

(ii) The testing should be more rigorous by requiring testing to a surface pressure of 0.22 psi per foot of casing string length or 1500 psi, whichever is greater, but not to exceed 80% of API rated minimum internal yield of the casing.

(iii) The test pressure should be held for a full 30 minutes instead of the 5 minutes proposed in the rule.

(d) The rule should clearly state that any casing that fails the test is prohibited from use.

10. 1501:9-1-08(E): Formation Integrity Tests

This paragraph should be amended to include the two following requirements:

a) The rule should require formation integrity tests after drilling out below the surface casing and/or the intermediate casing seat, subject to a waiver by the Chief based on depth and site-specific circumstance.

b) The rule should require that remedial measures approved by the Chief must be taken if test results are inadequate to verify either that (i) pressure containment establishes that no flow path exists to formations above the casing shoe, or (ii) the casing shoe is competent to handle an influx of formation fluid or gas without failure.

11. 1501:9-1-08(G): Mouse and Rat Holes

In addition to the need to define “mouse and rat holes,” see Comment 1 above, this rule should specify circumstances when this option is permissible for use. The current lack of any standards governing the use of this method is inappropriate.

12. 1501:9-1-08(H): Wellbore Diameters; Mandatory Wellbore Diameter

The requirement specified in this rule that the wellbore diameter be one inch greater than the outside diameter of the casing collar should be mandatory in all circumstances and the

authority given to the chief to permit lesser diameters should be removed. One half inch of equally distributed cement is a well established minimum standard for safety and environmental protection and should not be compromised. Rather, the chief should be given express authority to increase the space available for cementing to accommodate formations with a potential for hazardous conditions, such as elevated pressure.

Further, these Commenters believe the minimum diameter specified in this rule is inadequate and unsafe. We support a minimum wellbore diameter of 2.5 inches greater than the outside diameter of the casing collar, which when casing is properly centralized will result in a uniform, concentric 1.25 inch thick cement sheath. This should be required for all deep shale gas wells to allow for additional cementing protection in these demanding circumstances.

13. 1501:9-1-08(H): Wellbore Diameters; Additional Criteria for Setting Minimum Diameter

In addition to the factors specified in paragraph (2), the rule should also specify in a new paragraph (3) that there should be a sufficiently sized diameter drilling hole (i) to allow complete circulation of cement, and (ii) to obtain a uniformly concentric cement bond in the annulus of at least 0.5 inches in thickness on all sides, taking into account the casing collar diameter.

14. 1501:9-1-08(I): Borehole Conditioning; Conditioning the Borehole to Ensure Adequate Bond Between Casing and the Formation

One of the principal dangers presented by gas wells is the potential for migration of natural gas along the juncture between the well and the geologic formation. The draft rules give inadequate consideration to this critical safety issue.

The rule should be amended to incorporate the safeguard adopted in the analogous Pennsylvania rule requiring operators “to condition the wellbore to ensure an adequate cement bond between the casing and the formation,” prior to cementing, see PA 78.83(c). Proper wellbore cleaning and conditioning techniques must be used to remove drilling mud and ensure good cement placement. This basic requirement is critical to addressing the gas migration problem along the outside of the wellbore.

In addition to this basic conditioning requirement, it is recommended that to achieve proper conditioning, the rule should require that the casing be rotated or reciprocated during mud conditioning and cementing, unless the well is very deep or directionally drilled and pipe rotation subjects the casing to unacceptable stresses.

15. 1501:9-1-08(I): Borehole Conditioning; Alternate Methods Allowable

The current rule unnecessarily forecloses the use of better technologies through requiring in paragraph (3) that the operator “must install a cement basket as close as possible above the top of the void or thief zone.” The rule should be revised to provide that the Chief may approve an alternative technology or equipment that is functionally equivalent or superior to a cement basket.

16. 1501:9-1-08(J): Cementing Standards; Minimum Static Time Interval for Curing

For the purpose of this comment and the succeeding comments regarding paragraph (J) on Cementing Standards, these Commenters wish to emphasize their belief that the quality of a cement job at a well site is a critical factor in the prevention of gas or fluid movement from deeper zones into groundwater. To effectively seal off all production horizons and isolate freshwater aquifers, the cement must be set continuously and evenly throughout the annular space to preclude the formation of any gaps, channels or other malformations. Unfortunately, the current rules do not meet this standard.

It is critical that, after being poured, the cement be allowed sufficient time to cure before being subjected to any stresses that may compromise its integrity. The current rule, in paragraphs (J)(2) and (J)(3) utilizes a standard that the cement remain static until it reaches a compressive strength of 500 psi. This requirement should be reinforced in a common sense fashion by specifying a minimum amount of time that the cement must be undisturbed while curing. Such a standard is easy to apply and enforce and is highly practical.

We recommend that Ohio adopt the minimum 8 hour wait time to allow cement to cure adopted in Pennsylvania, see PA 78.85(c). This wait time interval should be in addition to the already included standard that the cement remains static until it reaches a specific compressive strength standard (expressed as psi).

17. 1501:9-1-08(J): Cementing Standards; Minimum Cement Quality

We recommend that Ohio adopt a standard stating that all cement mixtures must have a 72-hour compressive strength of at least 1200 psi.

Both Texas and Pennsylvania require a 72-hour 1,200 psi minimum compressive strength limit for “critical cement.” See PA 78.85(b). This standard is applied in those two states to the bottom 300 feet of the surface casing. It is well established that the bottom of the casing seat is where the highest pressures and stresses are likely to be encountered and thus, is where the highest potential for well failure and water contamination is presented.

It is worth noting that Pennsylvania initially considered a 500 psi standard in its cementing standards but specifically rejected it in favor of the 1,200 psi standard identified in the preceding paragraph. See Pa Comments, p. 61. We believe that a greater compressive strength is especially appropriate for all deep shale wells due the huge pressures placed on the wells by the hydraulic fracturing process.

In addition, while the free water separation standard of no more than six milliliters of water per 250 milliliters of cement referenced in 1501:9-1-08(J)(4) is acceptable, the proper API reference document for cement testing is API Recommended Practice 10B-2, Recommended Practice for Testing Well Cements.

18. 1501:9-1-08(J): Cementing Standards; Chief's Discretion to Improve Cement Quality

Notwithstanding the rule's other requirements, the Chief should be specifically authorized to require a better or different type of cement as needed to prevent ground water pollution, prevent vertical migration of fluids or gasses in the wellbore, or provide safe conditions in the well area.

19. 1501:9-1-08(K) & (M): Centralizer Standards; Minimum Requirements for Centralizers

An obvious deficiency in the rule package is the inadequate attention given to the use of centralizers to ensure that the casing is properly centered prior to cementing in order to assure a uniformly concentric thickness of cement. Paragraph K sets no minimum requirements for utilizing centralizers while Paragraph (M)(2)(c) on mine casing requires only a single centralizer; Paragraph (M)(4)(e) on surface casing requires as few as 3 centralizers and "as necessary" only when in proximity to aquifers; Paragraph (M)(6)(e) on intermediate casing has only the vague standard that "intermediate casing shall be centralized" and Paragraph (M)(7)(a)(iv) on production casing provides merely that it "must be centralized in a manner that provides for proper zonal isolation by the cement."

These provisions for centralizers are vague and therefore are likely to be difficult to enforce. The Division can do better than simplistic phrases such as "as necessary" or "shall be centralized." These phrases are avoidable as a technical matter because clearer, more appropriate standards can be devised and should be avoided as statements of public policy as they give unbridled operational discretion to operators on critical matters of public safety to which the public is justified in expecting the Division to supply a clear standard.

The centralizers must be spaced sufficiently to ensure adequate room for cement to pass evenly throughout the cased interval and that the casing is centered in the hole. We strongly urge that Ohio adopt the minimum requirement from Pennsylvania's cementing rules that there be a minimum of one centralizer placed in every 150 feet of casing in standard locations, see PA 78.83(c). We believe that placement of centralizers at every 120 feet in deeper shale gas wells is appropriate. These minimum distance requirements should be in addition to requiring a centralizer at both the top and the bottom of each casing.

Further, for surface, intermediate, and production casing, a sufficient number of casing centralizers must be used to ensure that the casing is centered in the hole and is in accordance with API Spec 10D (Specification for Blow-Spring Casing Centralizers) and API RP 10D-2 (Recommended Practice for Centralizer Placement and Stop Collar Testing).

20. 1501:9-1-08(K) & (M): Centralizer Standards; Additional Requirements for Centralizers at the Base of the Surface Casing

In addition to the previous comment, the critical need for effective cementing at the base of the surface casing requires a substantially closer spacing of centralizers in that location. We note that Federal Onshore Order No. 2, Section III.B.1.f., addresses this need by requiring that "Surface casing shall have centralizers on the bottom 3 joints of the casing (a minimum of 1

centralizer per joint, starting with the shoe joint)." We urge that this same standard be incorporated into the draft rules.

21. 1501:9-1-08(L): Notification; Requirement that Inspector be Available.

The draft rules place extreme, even excessive, reliance on the availability of a Division inspector during drilling and cementing by making a large variety of anomalous events subject to that inspector's approval; see, e.g. 08(M)(6)(d) providing that in the event of potentially catastrophic failures in the cementing operation, the inspector can approve additional cementing on the spot. However, the rule does not require the presence of an inspector during these critical activities and only requires that notice of drilling be provided to the Division as few as 24 hours before it commences.

The question of what is to occur in the event that an inspector is not in attendance is never addressed in these rules and forms a major question mark as to whether the regulatory scheme will break down entirely in that circumstance. Indeed, the rules are very sparse in required content and long on discretion to the operator and inspector in apparent reliance on the presence of the inspector to address any unforeseen or hazardous circumstance.

Due to the critical role given to the Division's inspector, the rule should explicitly provide that no drilling or cementing can occur at a site if a Division inspector is not present. If such a restriction is not adopted, then the rules must be comprehensively revised to reduce operator discretion and narrowly define the steps that are required to be taken in the absence of an inspector when difficulties are encountered.

Because of the need for these rules to more directly address the authority of the Division's inspector in the drilling and well construction process, the title of this rule should be expanded from simply "Notification" to a broader title such as "Role and Authority of Division Inspectors."

22. 1501:9-1-08(L): Notification; 24 Hour Notice Inadequate

In light of the considerations expressed in the previous comment on the heavy reliance in the proposed regulatory scheme on the presence of a Division inspector, the provision for a mere 24 hours notice of the need for the inspector in advance of drilling is insufficient and likely to exacerbate the likelihood of an inspector being unavailable to witness critical safety functions at new well sites. This period should be extended to 72 (seventy-two) hours to accommodate better scheduling and availability of the Division's limited number of inspectors.

23. 1501:9-1-08 (L): Inspector Authority to Force Cessation of Drilling/Well Construction

The draft rules provide the on-site inspector with broad latitude in approving remedial steps when difficulties or unanticipated circumstances arise during well construction. The rule contemplates that this broad discretion can uniformly be applied in a reliable fashion by the inspector immediately and on the spur of the moment, when problems arise. While this will usually not pose problems, the rule neglects those circumstances where spur of the moment

decision-making is inappropriate due to lack of critical information that only additional site investigation or technical review can provide. In this important situation, the rule is silent.

This problem is severely exacerbated by the fact that, in Ohio, very little substantive information is made available to the Division in the well permit application prior to the initiation of drilling.

The real world implications of this regulatory design are that, in the event of unexpected circumstances arising during drilling, a power struggle is likely to ensue at the well site between the operator and drilling crew, who are highly motivated to minimize expense in the well construction process and complete the well as soon as possible, and the solitary inspector who is responsible for making the best decision to ensure public safety. For these situations, the rules should leave no doubt that the final say is with the inspector by authorizing him or her to order that all well construction activities cease until the necessary information can be compiled and the most appropriate remedy designed.

It would be appropriate to allow this oral cessation order to expire after 72 hours unless it is formally ratified by an administrative order issued by the Chief after the Division has had an opportunity to review the situation that gave rise of the initial cessation order.

24. 1501:9-1-08(L): Inspector Training Requirements

In light of the considerations expressed in the previous three comments on the heavy reliance in the proposed regulatory scheme on the presence of a Division inspector, the absence of any mandatory minimum educational and training requirements for Division inspectors is a concern. The International Association of Drilling Contractors provides well control courses and has a certification process. The rules should require that Division inspectors meet this minimum training standard or a similar standard by any other organization approved by the Department. Having minimum training requirements for state inspectors should increase public confidence in the program.

25. 1501:9-1-08(M)(3)(ii): Conductor Casing to Isolate Shallow Aquifers

This provision requires conductor casing to isolate shallow aquifers only if they “provide ground water for water wells or springs in the vicinity.” In other words, no protection is to be provided to shallow aquifers, however valuable, that are not currently in use. For the same reasons stated in Comment 4 above, this approach of exempting useable groundwater from protection has been rejected in other states and should be rejected in Ohio as well.

26. 1501:9-1-08(M)(4)(a): Surface Casing, Minimum Buffer Distance to Aquifers

This provision requires only a 50 foot distance (buffer) between the bottom of the surface casing and the base of the deepest USDW while giving unlimited discretion to the Chief to alter this inadequate buffer. This minimum buffer distance is one of the most critical protections to Ohio ground water and 50 feet is inadequate.

Michigan and Wyoming have adopted a 110 foot buffer for these purposes and we urge Ohio to adopt at least this same, more protective standard. The rule should be amended to provide that the surface casing must be set and permanently cemented at least 110 feet, but not more than 200 feet, below the deepest aquifer (or USDW), unless shallow hydrocarbons or abnormally pressured zones may be encountered in this zone, in which case the setting depth must be shallower than such hydrocarbons or abnormally pressured zones.

Also, this protective zone should be considered a uniform minimum standard and not subject to being diminished by the Chief except for the sole situation where surface casing must be set shallower if deeper drilling would expose the aquifer to a specific source of contamination.

Finally, it is important that the final two sentences of this subsection (M)(4)(a) be struck. Drilling into any hydrocarbon-bearing zone prior to setting surface casing should be prohibited regardless of whether the zone in question has or may have commercial quantities of hydrocarbons.

27. 1501:9-1-08(M)(4)(b): Surface Casing, “Sufficient Cement”

This provision merely provides that the amount of cement to be prepared for cementing the surface casing be “sufficient.” Other states require that a set percentage of additional cement be prepared to address the contingencies of an inaccurate determination of cement volume, encountering unanticipated void spaces along the wellbore, and where there is lost circulation of cement. We recommend that the state require that a minimum of 20% excess cement be used. See PA. 78.83b.

This comment is relevant to all other casing strings in addition to the surface casing.

28. 1501:9-1-08(M)(4)(g): Surface Casing, Unmapped USDW Contingency

This provision authorizes the Chief to set the depth of the USDW at the deepest local stream base in any location where USDW’s are currently unmapped with an alternative allowing conductor casing to be set 50’ below certain existing wells or “useable water zone(s)” and surface casing to be set through brackish or brine bearing zones. The rule appears applicable to all regional settings across the state.

The use of the local stream base or wells in this context is arbitrary. Furthermore, conductor casing should not be used to isolate useable water as, in general, this string does not provide pressure control. Because accurate assessment of the depth of a USDW is critical to the proper setting of an environmentally protective surface casing, this provision should be revised to require the Chief to set a minimum surface casing depth at a level to provide adequate environmental protection based on local conditions and to require the Chief to justify his decision by including an order setting forth the basis for his decision in the permit file for the well. There is no justification for the one-size-fits-all approach in the draft rule and no excuse for negating the standard practice by which only careful professional consideration of all site-specific, local conditions can be relied upon to provide a reasonably determined casing depth worthy of public confidence.

In instances where the depth to USDWs is not known, operators should estimate this depth and provide the estimate with the application for a permit to drill. This depth should then be verified by running petrophysical logs, such as resistivity logs, after drilling to the estimated depth. Surface casing, not conductor casing, should then be used to isolate all usable water. If the depth to the deepest USDW is deeper than estimated, an additional string of casing must be required. Surface casing must be of sufficient diameter to allow the use of one or more strings of intermediate casing.

29. 1501:9-1-08(M)(6): Intermediate Casing; Set at Discretion of Operator

The determination of whether intermediate casing is necessary for protection of aquifers or to address hazardous drilling conditions is critical to the integrity of any gas well. There is a serious concern presented in the draft rules that the determination on whether to install intermediate casing is to be made primarily at the discretion of the operator. While we support the provision that intermediate casing can be required by permit condition (which should be useful primarily in light of regional settings), this provision is inadequate in site specific applications where the question of whether intermediate casing is necessary arises only during the drilling or construction process when unexpected conditions are encountered.

In this circumstance, the Division should be in a position to require the installation of intermediate casing even though the operator, for obvious financial considerations, may be disinclined to do so. Accordingly, this provision should be revised to authorize the on-site inspector to require the use of intermediate casing where warranted by local or newly discovered conditions. It is appropriate that this decision be reviewed by the Division and ratified or overturned by a formal order within 72 hours of the inspector's order to require use of intermediate casing.

30. 1501:9-1-08(M)(6)(b) and (M)(7)(a)(i): Cementing Intermediate and Production Casing

To insure adequate groundwater protection, we recommend that the Intermediate and Production Casing and Liner be fully cemented by the pump and plug method rather than the more limited requirements in the draft rule.

Where this is not possible or practical, the cement must extend from the casing shoe to 600 feet above the top of the shallowest zone to be isolated (e.g. productive zone, abnormally pressured zone, etc). Where the distance between the casing shoe and shallowest zone to be isolated makes this technically infeasible, multi-stage cementing must be used to isolate any hydrocarbon- or fluid-bearing formations or abnormally pressured zones and prevent the movement of fluids.

31. 1501:9-1-08(M)(6) and (M)(7): Additional Cementing Requirements for the Intermediate and Production Casing

These paragraphs should be amended to include the following requirements:

- a) The cement mixture must have a compressive strength of 500 psi after 24 hours and 1,200 psi after 72 hours.

b) Prior to drilling out below the intermediate casing shoe, the intermediate casing must be pressure tested to 0.22 psi per foot of casing string length or 1,500 psi, whichever is greater, but not to exceed 80% of the minimum internal yield to determine if the casing integrity is adequate to meet the well design and construction objectives. If the pressure declines more than 10% in a 30-minute test or if there are other indications of a leak, corrective action must be taken.

c) Prior to cementing the production casing, the drilling fluid shall be circulated and conditioned with a minimum of two hole volumes, and the drilling fluid shall be adjusted to optimize conditions for displacement of the drilling fluid and to ensure that the wellbore is static.

d) Throughout the cementing process, the cement mixing shall be monitored and recorded to ensure compliance with all cement design and cement density parameters during the mixing and pumping process. During placement of the cement, pump rates shall be monitored and recorded to verify that they achieve all relevant design parameters.

32. 1501:9-1-08(N): Annular Pressure; Requirements for Blow-out Prevention

Another major deficiency in the rules is the failure to address the installation of blow-out prevention equipment irrespective of whether circumstances are encountered during well construction where such equipment would be clearly warranted.

Blow-out prevention equipment is not necessary in each and every well, but there are certain classes of wells where it should be required in all instances. We recommend that Ohio utilize the same circumstances requiring installation of blow-out equipment adopted in Pennsylvania, see PA 78.72a, which are:

(1) When drilling a well that is intended to produce natural gas from an “unconventional formation.” (Pennsylvania deems the Marcellus Shale to be such an “unconventional formation” requiring blow-out prevention to be installed on every well; both the Marcellus and Utica Shale should be given this status in the Ohio regulation).

(2) When drilling out solid core hydraulic fracturing plugs to complete a well.

(3) When well head pressures or natural open flows are anticipated at the well site that may result in a loss of well control.

(4) When the operator is drilling in an area where there is no prior knowledge of the pressures or natural open flows to be encountered.

(5) When drilling within 200 feet of a building.

Pennsylvania also requires blow-out prevention equipment to be uniformly installed on all wells regulated by that state’s Oil and Gas Conservation Law, at 58 P.S. §§ 401-419. A similar requirement would be appropriate for this rule-making.

The rules should provide a definition for “blow-out prevention equipment,” require that blow-out prevention equipment must be tested immediately after its installation and before its use, require periodic testing thereafter, and require that records of such tests must be kept on file by the operator and made accessible to the Division for at least five years after the testing.

The rules should require that:

(a) Wellhead assemblies shall be used on wells to maintain surface control of the well. Each component of the wellhead shall have a pressure rating equal to or greater than the anticipated pressure to which that particular component might be exposed during the course of drilling, testing, or producing the well, and

(b) A blowout preventer or control head and other connections to keep the well under control at all times shall be installed as soon as surface casing is set. This equipment shall be of such construction and capable of such operation as to satisfy any reasonable test which may be required by the Chief.

33. 1501:9-1-08(N): Annular Pressure; Additional Requirements for Hydraulic Fracturing

The rule should be specifically amended to include the following requirements regarding the recording of annular pressure and contingency procedures during the hydraulic fracturing process:

(a) The operator must monitor all wellbore annuli during the hydraulic fracturing treatment and must report to the Chief within 24 hours (i) any surface casing change that is 20% or greater than the calculated pressure increase due to pressure and/or temperature expansion; or (ii) a pressure that exceeds 80% of API rated minimum internal yield on any casing string in communication with the hydraulic fracturing treatment.

(b) The operator must continuously monitor and record the following parameters during any hydraulic fracturing treatment:

(i) surface injection pressure (psi);

(ii) slurry rate (bpm);

(iii) proppant concentration (ppa);

(iv) fluid rate (bpm); and

(v) all annuli pressures.

(c) With regard to the monitoring of the surface casing annulus, when possible, the surface casing annulus should be open to atmospheric pressure and visually monitored throughout the hydraulic fracturing treatment. The hydraulic fracturing treatment should be terminated if a volume of fluid circulates to surface that is in excess of a volume that could reasonably be expected due to pressure and/or temperature expansion. If the fracturing treatment

design does not allow the surface casing annulus to be open to atmospheric pressure, then the surface casing pressures shall be monitored with a gauge and pressure relief device.

The maximum set pressure on the relief device shall be the lower of (i) a pressure equal to: 0.70 times 0.433 times the true vertical depth of the surface casing shoe (expressed in feet), (ii) 70% of the API rated minimum internal yield for the surface casing or (iii) a pressure change that is 20% or greater than the calculated pressure increase due to pressure and/or temperature expansion.

The hydraulic fracturing treatment shall be terminated if any of these excessive pressures are observed in the surface casing annulus. Pressures on any casing string other than the surface casing should not be allowed to exceed 80% of the API rated minimum internal yield pressure for such casing string throughout the hydraulic fracturing treatment.

(d) If during a hydraulic fracturing treatment, an operator has reason to suspect any potential failure of the production casing, the production casing cement, or the isolation of any sources of protected water due to excessive fracture height growth or the intersection of the hydraulically induced fracture with a transmissive fault or offset wellbore, then the operator must immediately discontinue the hydraulic fracturing treatment and notify the Chief within 24 hours of the occurrence of any such event and perform diagnostic testing on the well as is necessary to determine whether such a failure has actually occurred. The diagnostic testing shall be done as soon as is reasonably practical after the operator has reasonable cause to suspect any such failure, and if the testing reveals that a failure has occurred, the operator shall shut-in the well and isolate the perforated interval as soon as is reasonably practical and notify the Chief of these actions within 24 hours.

34. 1501:9-1-08(O): Well Construction Records; Certification that Records Are Accurate

The regulatory structure created by the draft rules places extremely high reliance on the submission of well construction records to establish that the regulatory requirements have been met. Because of the fundamental flaw in the Ohio permitting system that only a minimal amount of information need be supplied in the initial permit application, with no substantive detail regarding the casing and cementing plan to be applied at the well, the post construction records form the only means of public accountability for the entire program.

In light of this structure, every effort must be made to insure that the well construction records are accurate and provide all information necessary to assess compliance with all regulatory requirements and document the public safety consequences of the well construction. This is the only means accorded to the people of Ohio to compensate for the program's profoundly weak permitting structure. Unfortunately, the rules are seriously deficient in meeting these goals.

The rule should require a certification of the accuracy of the records submitted under penalty of the laws of perjury and falsification and notarized signatures of the individuals making the certification.

Further, the person making this certification must be a senior management official of the operator, such as its president, chief executive officer, or board chairperson, if the operator is a corporation, and a partner if the operator is a partnership.

Additional items that should be reported follow.

35. 1501:9-1-08(O): Well Construction Records; Deepest USDW Determination.

The rule should be amended to require the operator to identify how the deepest USDW or fresh groundwater bearing zone was determined, the precise depth to which such zone was determined to exist, and the depths to which the relevant casings were cemented in relation to the USDW.

36. 1501:9-1-08(O): Well Construction Records; Pre-Drilling Survey of Local Water Quality

Prior to any surface disturbance, all oil and gas operators should be required to compile a baseline inventory of the quantity and quality of all surface and ground waters within one-half mile of any surface drilling site. If a problem arises, this data base will allow the operator to restore the quantity and quality of all surface waters and ground waters to pre-drilling conditions. The survey should be provided to the Division as part of the Well Construction Records.

37. 1501:9-1-08(O): Well Construction Records; Amount of Cement Circulated to Surface

Because lost circulation is an important indicator of well integrity, it should be specifically documented in these rules, including by requiring the amount of cement returned to surface to be recorded.

38. 1501:9-1-08(O): Well Construction Records; Information on Chemicals used in Hydraulic Fracturing.

Hydraulic fracturing of any gas well is part and parcel of the well construction process and should therefore be addressed in this rule making effort. The hydraulic fracturing process is referred to in only the most cursory manner in these draft rules. We anticipate another imminent rule-making from the Division that will address specific restrictions on the hydraulic fracturing process.

In the meantime, it is appropriate that the Well Construction Rules adopted in this rule-making incorporate basic information about the hydraulic fracturing process. To this end, Paragraph (O) should be amended to require inclusion of a “well stimulation record” (we would also accept this document being referred to as a “hydraulic fracturing record” or a “fracking record”) that would include the following information:

- Pump rates
- Pressure rates

- Total volume of stimulation fluids injected;
- List of hydraulic fracturing chemicals used by name, Chemical Abstract Number, and by inclusion of MSDS sheets;
- Volume of each individual hydraulic fracturing chemicals used or, in the alternative, the percent by volume of the chemical additive used;
- Volume of water used;
- Identification of water source used;
- Identification of the place of disposal for all fluid returns;
- Identification of the amount of fluids recycled;
- Volume and Identification of any other Fluids or Materials utilized in the stimulation process.

39. 1501:9-1-08(O): Well Construction Records; Minimum Records Retention Period.

In addition to all records retention requirements applicable to the Well Construction Records in the Division's possession pursuant to Ohio's Public Record Laws in R.C. Chapter 149, the rules should further specify that the Division will retain the Well Construction Records during the operating life of the well, or five years, whichever is longer. The operator shall also be required to maintain a copy of the Well Construction Record for the same period.

40. New Provision: Cement Evaluation Logs

The rules are silent on the topic of cement evaluation logs. A poor cement job, in which the cement contains air pockets or otherwise does not form a complete bond between the rock and casing or between casing strings, can allow fluids to move behind casing from the reservoir into ground water. Verifying the integrity of the cement job is crucial to ensure no unintended migration of fluids.

New provisions should be added to this rule making to require the use of cement evaluation logs after setting casing. Cement integrity and location must be verified using cement evaluation tools that can detect channeling in 360 degrees.

41. New Provision: "Close Proximity Wells" when utilizing Hydraulic Fracturing.

New provisions should be added to this rule-making package addressing the potentially hazardous situation of "close proximity wells."

A new paragraph to the definitional rule, 01, should define a "close proximity well" as:

"a well that will utilize well stimulation involving hydraulic fracturing in any hydrocarbon strata determined to contain commercial quantities of hydrocarbons that (i) has less than 1,000 vertical feet of "intervening zone" consisting of those geological formations (or part of a formation) located between the top boundary of the productive horizon that is being hydraulically fractured and the base of the deepest stratum or zone that contains protected water, or (ii) has more than 1,000 vertical feet of intervening zone, but which the Chief determines should nevertheless be classified as a close proximity well because the intervening zone does not

contain an adequate confining layer. Notwithstanding the foregoing, an operator may be granted an exemption from the “close proximity well” classification when there is less than 1,000 vertical feet of intervening zone if the Chief determines that such intervening zone contains an adequate confining layer.

A new paragraph should then be added to 08 requiring the following restrictions on “close proximity wells”

“(a) Close proximity wells may not utilize open hole, open hole packer or other non-cemented completions.

(b) Prior to beginning a hydraulic fracturing treatment on a close proximity well, an operator must perform the following additional actions and provide the results thereof to the Chief:

(i) The operator shall undertake an analysis of the intervening zone to determine the ability of the intervening zone to contain the hydraulic fracturing treatment and prevent the vertical migration of the fracturing fluids or hydrocarbons to strata that contain protected water. In performing its analysis of the intervening zone, the operator shall utilize a 3D model approved by the Chief that will simulate the projected frac height growth within the design limits submitted to the Chief. The operator’s analysis of the intervening zone must include a review of abandoned hydrocarbon production wells, water wells and known geologic faults and natural fracture zones in the area of the close proximity well to verify that such wells, faults and natural fracture zones will not permit the vertical migration of the fracturing fluids or hydrocarbons into a strata that contains protected water;

(ii) Using the results of the analysis described in (i) above, the operator shall design the hydraulic fracturing treatment so as to ensure that the fracturing fluids or hydrocarbons do not migrate vertically and come in contact with any strata that contains protected water;

(iii) The operator shall run a radial cement evaluation log or such other cement evaluation tool capable of identifying a cement channel as may be approved by the Chief to determine the quality of the cement outside of the production casing. If the quality of the cement outside of the production casing is not sufficient to isolate strata containing protected water, then the operator must develop a plan of remediation and receive approval from the Chief for the plan of remediation before the operator may proceed; and

(iv) In the event that (a) the productive horizon to be hydraulically fractured is within a protected water interval, or (b) the results of the analysis in section (i) above indicate that the intervening zone does not contain an adequate confining layer, the operator shall take measures to ensure that all fluids and materials pumped outside of the casing during the relevant completion operations are not of a nature or composition that could endanger an underground source of protected water by introducing chemical additives that may result in the presence of contaminants that exceed national primary drinking water standards, or

may otherwise adversely affect the health of persons.”

Finally, the records provisions of Paragraph O of Rule 08 should be amended to include the records required above for close proximity wells.

42. New Provision: Requiring Qualified Contractors for all Critical Functions.

A new paragraph should be added to Rule 08 establishing minimum requirements and qualifications for contractors that will conduct cementing, hydraulic fracturing, perforation and logging activities at well sites and requiring that operators can only utilize contractors that meet those criteria.

43. Additional Comments in Expert Report of Susan L. Harvey of Harvey Consulting, LLC, dated March 13, 2011.

Attached to these comments is a 21 page report prepared by engineering expert Susan L. Harvey, dated March 13, 2011, regarding issues presented by Ohio’s oil and gas law and regulations for well construction that are highly relevant to this rule-making package. We incorporate this report and its recommendations into these comments as if fully rewritten herein. The recommendations made in the Harvey Report are in addition to the specific comments stated above.

We appreciate the opportunity to provide the Division with these comments on this rule-making of critical importance. If you have any questions about these comments, please contact Richard Sahli at (614) 428-6068 or rsahli@columbus.rr.com.

Sincerely,

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