

**VDH ODW Workgroup 4 Meeting**  
November 10, 2014 10:00 a.m. – 12:30 p.m.  
Web Conference and Teleconference

**Meeting Summary**

**RAP Members Present**

Vincent Day, P.G.—VA Section, American Institute of Professional Geologists  
Ignatius Mutoti, P.E.—Virginia Society of Professional Engineers  
Craig Nicol—VA DEQ  
Jesse L. Royall, Jr., P.E.—Private Utility, Class 4-6, Sydnor Hydro Inc.

**ODW Staff Present**

Angie McGarvey - Meeting Leader  
Susan Douglas - Director of Technical Services  
Jim Moore - Field Director Lexington Office  
Ray Weiland - District Engineer, Danville Field Office

**Other Participants**

Jason Early - Clear Creek Associates (Public Participant)  
Scott Bruce, VA DEQ (Invited Guest)

**Agenda**

**General Comments on Section 840, Subsection I**

GENERAL COMMENT 1 We suggest deleting "yield and drawdown" [and replacing] with "Pumping". "Pumping test" is an acceptable term used in the groundwater sciences. "Yield and drawdown" is a consequence of pumping the well.

DEQ – One reason for the difference in wording is caused by the difference in the main objective of the testing. With the Health Department, they are trying to test the ability of the system to provide water through its distribution system. In my view, the Health Department is looking at the safe yield of the well. 'well yield and drawdown' is an applicable term. As oppose to DEQ, we are looking at developing information and testing on the aquifer. The terminology has been the Health Department wants to pump a well to exhaustion to see what it will do. DEQ wants to test the aquifer. There are differences in the goals that the two agencies are trying to get out of pumping the well.

Member – From the waterworks owner point of view, this is sometimes a little confusing. The well permit is being managed by DEQ, and then VDH having oversight of the water system. Can something be done to manage the two objectives so that the owners can do something once?

ODW – When we get to section 845 we try to be clear on how the two agencies are going to work together.

Member – Earlier statement was a point of clarity for suggestion. There is a difference between a pumping test and a pump test. The pump test is where you test the pump and a pumping test is where you test the well. If you are pumping the well and collecting water levels at the interval that VDH is requesting and spelling out and then you're collecting recovery information, you are collecting all the data you need to make judgment about the aquifer in the future. You can also answer the question about yield. Our primary focus is to collect the data in a methodical way and following a protocol.

ODW – There are two types of pumping test, the yield and drawdown test and the aquifer test. We can clarify this. However, there is also a pumping test where we are looking at how the locality pumps into an elevated storage tank or a pressurized tank. If you are just looking at the well alone and you call it a pumping test that would be kind of confusing; especially for engineers who are looking at differences between what the well is capable of and what the pump is capable of within the distribution system.

ODW – We are going to stick with yield and drawdown.

**GENERAL COMMENT 2.** In general, we believe that the results of the aquifer testing (or Yield and Drawdown Testing-more about that below)-should be subjected to at least some level of interpretation (via a report) with graphs, specific capacity and recommended pump depth setting (above the main water bearing zone), recommended pumping rate and a withdrawal schedule. A schedule that matches the sustainable capacity of the aquifer and eliminates over-pumping of the well. This is especially important in a fractured bedrock setting (mostly west of RT 95). The number one cause of well failure is over-pumping; that is why wells diminish output over time- it's often caused by oxygenation of the water bearing zone and the onset of bio-fouling and the clogging of sediment and silt (that rushes into the open borehole from the exposed water bearing zone and gets caught in the gelatinous glop produced by the iron reducing bacteria)- this can be avoided by a little bit of good science and planning. Ideally we would like to see the data and reporting conducted by a Certified Professional Geologist and/or a PE (both of which would have demonstrated experience in groundwater science).

Member – for wells west of I-95 located in fractured bedrock, data is currently submitted to VDH with no recommendations on how the well should be managed. This information can be provided from the data collected during the yield and drawdown test. Number one reason of well failure is over pumping. I think it's important that the some level of recommendations be provided on how to manage the withdrawals.

Member – I've always used a pump or pumping test to indicate the ability of the equipment to get the water out of the ground and into the system. In with that you get some information on the ability of the ground to yield to water. A yield and drawdown test gives you information that characterizes the ability of the aquifer to produce that water at that time. It is sort of a snapshot. I do not consider it to provide the information for the long-term yield of the well. An aquifer test is a more involved analysis that gives you what you think is a long-term of the well. In our industry, all three of the terms end up being used interchangeably. For the level we are doing here, we can use any of the first two. I wouldn't use aquifer test. Historically the Health Department has been focused on a snapshot and the ability to reasonably get the water out of the ground into the system based on the fact that they are making an assumption that the water will always be there. Since that assumption is wrong, we created groundwater management districts that take the approach at looking at the long-term sustainable yield of that aquifer. That is why we defer to DEQ and groundwater management district areas for that. The analysis of pump test data has been pretty basic. Very little has been done with graphing and analyzing the data. I don't believe that

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this is the role of the Health Department. That's the role of the PE or PG when they submit the information to the Health Department. If we want to bump up our review of this groundwater data, I think the Health Department needs to be able to have in the Regulations the ability to direct whether you want a constant capacity or an exhausted test and the duration of the test.

DEQ – It is my opinion at DEQ, if the Health Department has the regulatory authority and need to require analysis of test data west of I-95, DEQ would be in 100% support of the Health Department obtaining that information on well sources west of I-95.

ODW – Certainly share the concern on fractured rock wells that experience declining yield over time. We've tried to address that in the fact that we added language about the yield and drawdown test and not dropping the water level any lower than the main fracture bearing zone. We have to be concerned about the many wells that go in for small systems. Many times the well driller goes in drill the well, estimate the yield, put the pump in the well, do an abbreviated yield and drawdown test. When we don't have to determine the maximum that the well can produce, it is not needed and necessary for those particular smaller well applications. Smaller systems, in most cases, are noncommunity wells.

ODW-We can put some language that gives us the authority to provide a more extensive evaluation for certain situations. Maybe something like - the commissioner may require a report to be submitted by a PG or a PE. Many localities already require these standards. I don't want us to put a global requirement that every yield test has to be submitted by PG or PE. I think that it is unnecessary and is not needed in a lot of the situations we deal with.

Member – I agree it is important to have the flexibility for many different situations - especially the simple ones where cost is a factor. Recovery is very important. Recently ran a test that took 4 days to return to the 90% recovery level.

DEQ - In order to have flexibility, you are opening up yourself to a little bit of criticism. As long as we have a way to do that fairly and somewhat consistently, then I am all for the flexibility. When you give yourself flexibility in regulations, you got to figure out how to be fair and that's not always easy.

DEQ – Regarding PG or PE, that could be a “may”. That language might be beneficial if you put it in as a “may be required”. If you did require it at some point for particular scenarios, it would give you some regulatory authority that we have the right to request that actually be done through a certified venue. We keep referring to the difference between the coastal plain and fractured bedrock. The one thing to remember that whatever we draft needs to have flexibility for both because at some point we are going to have management areas not just east of I-95 but west of I-95. We need make sure the language isn't solely focused on coastal plain initiative.

Member – Does DEQ have suggestions on how to analyze well yield and drawdown data west of I-95?

DEQ - Not in the permitting program. It depends on an open discharge exhaustive type test or some type of constant rate. For DEQ side, we would be interested in the constant rate type test because you can apply different aquifer models to constant rate data. Whereas on variable rate data, it gets much more difficult, maybe impossible to analyze that data. At a minimum a constant rate would give some level of consistency between testing in fractured rock systems. The problem is using a constant rate test is not necessarily pumping a well at its absolute highest potential. There are some disadvantages of constant rate tests west of I-95.

Member – Unless you are in the fractured shale zones up in the Manassas area, the constant capacity analysis works very poorly on those rock wells because you are dealing with storage effects. Until you get rid of the storage, you do not have a true yield of the well. The topic is very complex.

Member - Section 840, subsection 1, item 2 - Achieving a stabilized water level for at least the last six hours of the test that gives you a constant rate that is define (rate of decline of the water level is less than 0.1 ft/hr). A constant rate test should be the method that is used.

Guest - If you want to do a constant rate test in a fractured bedrock system, typically you need to do a step drawdown test first then you come back and do the constant rate test.

DEQ - No analysis procedures allow you to have a variable pumping rate and then say it is constant for last 6 hours. If you want to analyze, you can't vary pumping rates. Transitivity and storage coefficient require constant rate.

#### **Specific Comment 5**

Suggested new wording: The pumping test shall be run at a rate sufficient to stress the aquifer without lowering the water level below the primary water bearing zones. The pumping rate shall not vary more than 10% during the test and a stabilized water level shall be achieved for at least the last six hours of the test. This applies to constant rate testing- which is, by far, the most common way to conduct a pumping test.

Member - Suggestion to remove exhaustive capacity and not vary pumping level more than 10% during the test and a stabilized water level shall be achieved for the last six hours.

DEQ: In management area, a criterion is 5% during the test. The goal is 0 % variation in the pumping rate but that is not easily achievable in the field.

Member - Rock fractures aquifers create a large amount of storage and if you conduct a constant rate test for 48 hours then you will not deplete the storage and it will give you a false indication of the well yield. Recommend an exhaustive test to quickly determine the natural yield of the aquifer recognizing that it does not address long-term yield concerns. Not sure we have methods available to address the long-term yields without very expensive and complex pumping tests and modeling.

ODW and DEQ - Agree with member's comment.

Member - I disagree. There are protocols that establish how to run a constant rate test. It would help here to use a step test in advance of the constant rate test.

Member - The assumption of those tests do not apply in a fractured bedrock system. The exhaustive test should be run until a stabilized water level and pumping rate is achieved.

ODW - Most wells are only used for 4-5 hours per day. Only a few wells are running at a constant pumping rate over 24 hours for 7 days a week.

**Proposed Regulations Text - Section 845**

Member - Exhaustive capacity only applies to rock aquifers. Sand and gravel aquifers in the coastal plain do not use an exhaustive capacity test. What type of test is proposed for these types of wells?

ODW - For wells located in a groundwater management area that are sand and gravel, they would apply the alternative yield and drawdown procedure specified in subsection E of Section 845 if they do not require a groundwater withdrawal permit. .

DEQ -If or when DEQ expands the groundwater management area to outside the existing boundaries, the regulations need to be generic enough to apply to different types of aquifer systems. In Section 845, you could incorporate the requirements for constant rate tests with possible step down approach. Within a management area you may be required to do a different style of test.

Member - Can we remove the word Section 840 B "additional" requirements.

ODW - Agree, remove the word "additional". Also remove additional in Section 845, Subsection A. We did not intend Section 845 to apply to future groundwater management areas west of I-95. This section should be limited to the Eastern Virginia and Eastern Shore groundwater management areas.

Member - There are a couple of wells under the management area that are rock wells. Do those wells fall within the requirements of the groundwater management area?

DEQ - Yes. Anything east of I-95 is considered part of the management area. There are a few examples (Rich Foods) that may have fallen under an exception at one time. DEQ will confirm this response. The way the regulations are written, it is about the management area, not the type of aquifer.

**Section 845. Wells located within a Groundwater Withdrawal Management Area (GWMA), Subsection D, items 3 d & e**

3. The commissioner may allow an alternative yield and drawdown test procedure described as follows.

d. Calculations shall be submitted to the district engineer with the 24 hour yield data which projects the maximum available drawdown (based on pumping times of 2880 minutes and 100,000 minutes) and the maximum predicted well yield. The maximum predicted well yield shall be limited to the more stringent of the following criteria:

(1) Twice the 24 hour pump test rate; or,  
(2) Eighty percent of the available drawdown [specific capacity (gpm/ft) x drawdown (ft) x 0.8].

e. The specific capacities of the well at 500, 1000, and 1440 minutes shall be within 10% of each other.

ODW - Does anyone have any specific comments on Subsection E of Section 845 alternative yield and drawdown test?

Member - This alternative methodology uses the standard pump test to project the rate out. If you ran the test at 50 gallons per minute then VDH would give you the credit for 100 gallons per minute. Is this

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applicable to wells in a groundwater permit area? Text should also state that this is a constant rate test. This criteria will only apply to lower yield wells (<10,000 gallons per day). This methodology gives the ability to set the well yield at twice the 24 hour pumping rate. DEQ will tell me how many gallons per month I can withdraw. How is this amount translated into what ODW will allow in their permit? DEQ does not give you gallons per minute.

ODW - We want DEQ's test work for us to provide a gallons per minute well yield. What kind of numbers are we going to get from the aquifer tests and how can VDH use it for our well yield number?

Member -- DEQ will give you a max month and an average annual withdrawal rates. Annual rate is not 12 times the maximum month. Max month does not correlate into a gallons per minute. Given the low volumes, the extrapolation is not really worth it. I do not see a benefit of putting this alternative test procedure in this section. If no permit is required and <10,000 gallons per day usage equates to a well yield of 12.5 gallons per minute or less. These systems are low flow and applying these alternative extrapolations are not worth the effort.

ODW - If you want to reduce the pump rate down in half (24 hours), then you will be required to do the extrapolation. Otherwise, you will have to do the 48-hour test as standard. Are you okay with that? This is a side track. First Question is fractured rock - everything west of I-95. We are hearing that the language is okay as long as we add a provision to allow additional evaluation.

Member - DEQ aquifer test will give VDH the data that will be acceptable to determine well yield. The only issue will be if there are multiple wells. DEQ requires that the observation well is only observing the drawdown while VDH has typically asked to test the wells drawdown at the same time. Image effects applied under these conditions. If I am looking to get 250,000 gallons a day, would DEQ require to pump at  $250,000 \div 1440 \text{ minutes}$  equal to 173 gal per minute or  $250,000 \div 800 \text{ min}$  which is 312 gallons per minute which is the size of the pump that the Health Department would require me to put in. We need to understand how DEQ is going to apply this regulation. We need to know what will be put in the Engineering description sheet.

Member - Back to pumping rates that should not vary more than 10%. Source is USGS and Fetter. Easy to achieve in 24 hour test pump.

DEQ - Says that a constant rate test is not easy to achieve in the coastal plain especially during the early time of the test when you have the most drawdown. At the end of the test, it is easy.

Member -- Agree. That is why the step test is important.

ODW -- it is the last 6 hours that we want the pumping rate to not vary more than 10% in the fractured bedrock (outside GWMA).

**Specific Comment 6:** Suggested revision - Discharge from the pumping well shall be conveyed a minimum of 200 feet from the wellhead into a ditch, a stream or swale in order to reduce the chances of recharge back to the aquifer.

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Member -- Concern that if a well lot is 100 x 100 ft then this requirement will force you to put pipe on neighboring property. I would say 50 ft into a ditch, a stream or swale in order to reduce the chances of recharge back to the aquifer.

ODW -- We will keep the statement general to avoid property issues.

**Specific Comment 10.** All of the equipment produced for collecting water levels measure within (at least) 0.01 feet. Automatic data loggers measure to .001 feet.

Member - Accuracy for air line and pressure gage are not to 0.01ft. I know the typical instruments used show a reading to the nearest 0.01 ft but I do not believe that the accuracy is to that level

**Specific Comment 12.** What does it mean, "Where multiple wells are used, the location and geology of each well in the vicinity shall be evaluated."

Member - 2 wells for the source, if difference in geology, across groundwater divides, too close. Added requirement that they should be evaluated by a geologist.

ODW - We can add a new statement that requires additional evaluation by a qualified professional.

**Specific Comment 15.**

RAP members recommended Section 845, Subsection C 3 b be deleted. The GWMA regulations do not allow for multiple aquifer screenings. Where multiple screen intervals are used on a well, installing bentonite plugs between the screens intervals is costly and not necessarily more protective.

DEQ - Changing the "shall" to a "should" is acceptable. Multiple fans in the Potomac aquifer may require bentonite plugs to isolate the fans in a big production well.