DATE: July 6, 1999, April 7, 2004, **Revised April 30, 2008**

TO: Office of Drinking Water Staff

FROM: J. Wesley Kleene, Ph.D., P.E., Director
Office of Drinking Water

SUBJECT: Permits & Project Review – Well Development

RELATED: WM 784 (Permit Application Process),
WM 824 (SDWIS Data Reports and Retrieval Program),
~~WM 879 (Construction Permits and Processing of Reports, Plans and Specifications),~~

SUMMARY STATEMENT:

This memo provides ODW staff with the procedures for processing a well development request, siting a well, development of a well, and approval or rejection of a proposed well. A new document is created which offers information on methods, materials, and procedures in the construction and development of a well to waterworks owners.

Revision Highlights:
Converts and revises Enclosures 1 (Well Site Inspection Form), and Enclosure 3 (Well Site Approval Letter). Revises and reformats Enclosure 2 (Construction of Public Water Supply Wells Information Package) into a new public document for distribution and web posting. Enclosure 4 (Ordering well development Sample Containers) has been eliminated.
This revision adds a new Well Development Activity Checklist, and clarifies the procedure for approving wells located in the Coastal Plain and Groundwater Management Areas.
Sampling and testing procedures for Groundwater Under the Direct Influence of Surface Water (GUDI) determinations are specifically excluded.

The following attachments are referenced in this memo and are posted separately on Y:\03-Memos\301-Active Working Memos\301.02-Forms Letters Manuals:

1. Well Development Activity Checklist
2. Handbook for Developing a Public Water Supply Well
3. Well Site Inspection Form
4. Well Site Approval Letter

I. APPROVAL PROCEDURE

The well approval process is usually initiated when ODW is contacted by the owner of a proposed or existing waterworks about developing a new groundwater source for a public water system. The owner should be directed to the District Engineer initially, and a Preliminary Engineering Conference conducted if the source is for a proposed (new) waterworks. Refer to 12 VAC 5-590-280- Procedure for obtaining a construction permit for well sources and WM 784 for further information on the permit application process and the Preliminary Engineering Conference.

ODW must emphasize to the owner that selection of the best possible water source is our goal. After the meeting with the owner, an inspection of the well site is scheduled by ODW and the owner (or owner's agent.) ODW should receive sufficient information about the proposed well sites *prior* to going out into the field for a well site inspection.

The Well Development Activity Checklist (Attachment 1) should be used by ODW to track the well development process. A copy of this checklist should also be provided to the owner during the preliminary meeting, along with the Handbook for Developing a Public Water Supply Well (Attachment 2).

II. WELL SITE INSPECTION

ODW staff will perform a well site inspection with the owner or owner's agent. Staff will approve selected sites when they do not present a potential threat to public health, after reviewing the available topography, surrounding land use activities, and nearby potential sources of contamination. ODW may suggest an alternative if the well lot is encroaching on any limiting factor (i.e. property line, existing well, easement, etc.). In addition, ODW should inform the owner of well lot building restrictions, and possible restrictions to future property development adjacent to the well lot (to maintain setback requirements to a drainfield, for example). Refer to the Regulations, 12 VAC5-590-660 Site location, -820 General, and -840 Groundwater Sources, for specific well site requirements.

During the inspection ODW staff should:

- Obtain GPS coordinates of the proposed well site(s),
- Develop a well site sketch highlighting distances and any significant boundaries,
- Identify the proposed site(s) on a topographical map,
- Physically mark the proposed well site and the boundaries of the proposed well lot if possible to prevent confusion about these locations,
- Photograph the site in a manner that the markings are clearly visible in relationship to obvious landmarks.

When the well site is located on a proposed land development project which includes industrial, commercial or domestic facilities with on-site storage, processing or disposal of contaminants or waste, ODW may require the owner to provide a site plan identifying such facilities prior to performing the well site inspection. Setbacks substantially greater then the 50 feet minimum may be required from chemical storage areas, waste lagoons, mass drainfields and other facilities which pose an extraordinary risk to the well.

Use the Well Site Inspection Form provided in Attachment 3 to document the information collected at the inspection.

III. WELL SITE APPROVAL / REJECTION

ODW staff will review the well site information and sketches and issue an approval letter if the well site is acceptable. As described in the *Regulations*, this is a "tentative approval...authorizing him *(the owner)* to proceed with drilling of the well…" Well site approvals shall be limited to a 12 month period, starting from the date of the tentative approval letter up to the start of well drilling. Use the Approval Letter template provided in Attachment 4, customizing the letter as appropriate for the proposed well.

If, after a thorough evaluation, no suitable well site can be identified, the owner should be notified as soon as possible verbally, and by a written letter rejecting the proposed sites investigated. This notification should request a preliminary engineering conference with the owner and engineer to discuss water supply alternatives.

IV. WELL YIELD AND DRAWDOWN TESTING

As stated in the *Regulations* 12VAC5-590-840.B.6.: "The yield and drawdown test data over a 48-hour minimum period shall be provided; however, in those areas where geologic conditions warrant, the required test period may be varied by the division." 12VAC5-590-1250.B of the *Regulations* specifically allows noncommunity systems with source requirements less than 3 gpm the option of reducing the 48-hour minimum drawdown test period, with a limit of not less than 8 hours. Caution should be used when reducing the test period, particularly in locations designated (currently or under consideration) as Groundwater Management Areas. Refer to the following section for further information.

V. WELLS IN GROUNDWATER MANAGEMENT AREAS

If the waterworks is located in a Groundwater Management Area, then the Department of Environmental Quality (DEQ) may require the waterworks owner to secure a Groundwater Withdrawal Permit. Further information regarding groundwater management in Virginia and DEQ's permit program can be found at: http://www.deq.virginia.gov/gwpermitting/.

If a groundwater withdrawal permit is required, ODW staff should encourage the waterworks owner to obtain a draft permit from DEQ prior to constructing the well. This is critical because DEQ may specify well construction features that VDH would not otherwise require (to restrict withdrawal from one or more aquifers, for example). However, ODW should not delay issuance of the waterworks' construction permit if DEQ has not completed their evaluation. Note that DEQ's Regulations require a Waterworks Operation Permit prior to issuance of a final Groundwater Withdrawal Permit.

The *Waterworks Regulations* specify a well yield test designed to ascertain the capacity of the *well*; DEQ requires a more elaborate aquifer test plan (usually the subject well and neighboring wells) to test the capacity of the *aquifer*. ODW should work with DEQ on the test plan so that their testing results may be used by ODW to establish the well source capacity, and **not** require a separate well yield and drawdown test. The Well Site Approval Letter template contains language to clearly convey these additional requirements for wells in Groundwater Management Areas to the owner, *prior to* well construction and testing.

VI. RAW WATER SOURCE DEVELOPMENT SAMPLING & TESTING

All new wells, regardless of waterworks type (community, NTNC or TNC), must test for *all* of the parameters listed in the *Waterworks Regulations* Part II, Article 1.Drinking Water Standards, including:

- Inorganic Chemicals
- Volatile Organic Chemicals (VOCs)

- Synthetic Organic Chemicals (SOCs)[1]
- Physical Quality (color, odor, pH, TDS, turbidity)
- Radiological (gross alpha, combined Radium 226 and 228, Uranium)

All groundwater sources shall be tested in order to enable a determination of Groundwater Under the Direct Influence of Surface Water (GUDI). The sampling and testing protocol for making this determination is given in a separate guidance document.

Procedures for ordering development sample test kits from DCLS are given in WM 824. Care should be used when recommending specific sampling test kits, since these are subject to change and may exclude one or more parameters of a class listed in the *Regulations*.

VII. WELL CONSTRUCTION AND DESIGN EXCEPTIONS

Compliance with the minimum construction requirements specified in 12 VAC 5-590-840 of *Manual of Practice for Waterworks Design* (Part III of the *Regulations*) is required for wells. Specific emphasis on casing pipe and grouting requirements should be brought to the owner's attention, since these differ from Virginia Department of Health standards for private wells.

END OF MEMO

[1] If the well is found to be susceptible to contamination by SOCs during the site visit, then development samples for SOCs listed in the *Regulations* will be required. Otherwise, a waiver may be issued for some or all of the SOC parameters. Waiver decisions must be documented in the Well Site Inspection form.

Office of Drinking Water		**Well Development Activity Checklist**
Waterworks name or proposed project name: _____ PWSID: _____ (if known) Well name: _____		
Application Process Overview	Operation / Construction Permit Application received	Date: _____
	Preliminary Engineering Conference held	Date: _____
	Preliminary Engineering Report received	Date: _____
	Waterworks Business Operations Plan required?	☐ Y ☐ N Receipt Date: _____
	Plans received	Date: _____
Site Approval	Well site inspection	Date: _____
	Well site approval letter sent	Date: _____
	Recorded well lot plat and dedication document received*	Date: _____
	DEQ will require withdrawal permit? (GMA localities ONLY)	☐ Y ☐ N ☐ Undetermined
	DEQ withdrawal permit issued (GMA localities ONLY)	Date: _____
Well Drilling	Site approval expired, and no well was drilled at site	☐ Y ☐ N
	Well drilling start	Date: _____
	Request to attend well grouting received	☐ Y ☐ N Date: _____
	Well grouting start Attended well grouting?	Date: _____ ☐ Y ☐ N Name: _____
	Well completion report received*	Date: _____
	Results of yield and drawdown test received*	Date: _____
	Well was drilled/cased/grouted, but will not be used for public water supply	☐ owner advised to abandon ☐ referred to DEQ for use as monitoring well ☐ maintained for possible future development
Water Quality Evaluation	Sample kit request submitted to DCLS	Date: _____
	Bacteriological MPN series all results received*	Date: _____
	GUDI preliminary determination	☐ is GUDI ☐ is not GUDI
	GUDI determination status	☐ is final ☐ is preliminary (mandatory for all Karstian wells)
	Metals results received *	Date: _____
	Inorganic chemical results received*	Date: _____
	Nitrate/Nitrite results received*	Date: _____
	Cyanide results received*	Date: _____
	Radiological results received*	Date: _____
	VOC results received*	Date: _____
	SOC testing required? * results received	☐ Y ☐ N Date: _____

*Preferably part of the Preliminary Engineering Conference

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

Office of Drinking Water
Safe Drinking Water for a Healthy Virginia

Handbook for

Developing a Public Water Supply Well

Issued: April 30, 2008
Revised: November 3, 2014

Preface

STOP! This handbook is not applicable to the development of private wells. For more information on the site and construction criteria for private, non-public wells used for individual residences, small businesses, heat pumps, or irrigation, contact your local health department, or refer to the Commonwealth of Virginia State Board of Health **Private Well Regulations** at http://leg1.state.va.us/000/reg/TOC12005.HTM#C0630

Objective

The Virginia Department of Health, Office of Drinking Water (VDH-ODW) has prepared this handbook to assist prospective or current public water supply owners with the development of new water supply wells. The handbook describes the well site selection considerations, VDH-ODW approval procedures, and methods and materials required to construct a well intended for potable water consumption.

Disclaimer

This document is not intended to be a comprehensive guide on drinking water wells, but it will provide a quick reference to state standards for development of wells to serve public water supplies. **It is the responsibility of the owner to insure that the well driller is licensed and complies with the requirements of the Virginia *Waterworks Regulations*.**

Additional Information

For more information regarding the rules and regulations pertaining to a public water supply system, refer to the Virginia *Waterworks Regulations,* at http://www.vdh.virginia.gov/ODW/RulesRegulations.htm.

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Step 1: Identify Potential Well Sites

The siting, or placement, of a well is a crucial step in the development of a groundwater source. The location of a well should consider property lines, topography, geology and potential sources of contamination resulting from land use, such as waste disposal systems. The following sections describe issues that must be considered during the well siting process.

Well Lot Dimensions

Well lots are typically 100 ft. by 100 ft., centered on the well casing. However, larger dedicated well lots may be required if topography could direct potential contamination toward the well. Well lot dimensions will be discussed and established during the well site inspection.

Future Property Needs When siting a well, it is very important to consider past, current and projected land use in the proposed well area. Once a well is approved for public use, no construction or activity unrelated to the waterworks is allowed on the well lot.

As an owner, you have the right to request specific sites for your proposed well or wells. A VDH-ODW representative will complete an on-site inspection of the proposed well site(s). VDH-ODW staff may suggest more suitable locations, based on the results of the site inspection. If you have concerns or reservations about future land use or development plans, discuss these with VDH-ODW Field Office staff.

Potential Sources Of Contamination (PSCs) When selecting a well site, you should be knowledgeable of the location of nearby PSCs, such as septic tanks, drain fields, and sewage lines. Your Local Health Department may help you obtain information regarding waste disposal and private wells located in the vicinity of a proposed well.

Well Location Standards Wells should not be located in parking areas or inside a 100-year flood plain, unless appropriate protection measures are taken. The following table lists the minimum horizontal distances between the proposed well(s) and specific features.

Feature	Minimum Separation Distance
Barnyard, Animal Feed Lot	50 ft.
Cemeteries	50 ft.
Cesspool, Pit Privy, Septic Tanks	50 ft.
Drain Fields and Purification Fields	50 ft.
Geothermal Well	50 ft.
Paved Roads	50 ft.
Petroleum & Chemical Storage Tanks or Pipes	50 ft.
Power Line & Utility Easements / Rights of Way	50 ft.
Property Lines	50 ft.
Sewage Pipes	50 ft.
All known sources of contamination not shown above*	50 ft.

** Even when identified features are farther than 50 ft away, they remain important items for consideration under a wellhead protection plan.*

Wellhead Protection The quality of groundwater can be seriously impacted by various factors, such as an improperly located or constructed well, failing septic systems, herbicide or pesticide usage, urban stormwater runoff, nearby landfills, and chemical or fuel storage. Wellhead Protection Plans help to eliminate or reduce these potential contamination risks, thus increasing a well source's sustainability. Wellhead Protection Plans are generally developed by following these five steps:

1. Select a planning team
2. Delineate the wellhead protection area
3. Identify potential sources of contaminations
4. Determine actions to mitigate the risks
5. Define contingency measures

Planning for wellhead protection while selecting a site may help to reduce the amount of PSCs associated to the proposed well(s). VDH-ODW may offer additional guidance in developing a Wellhead Protection Plan, as well as funding opportunities to eligible waterworks.

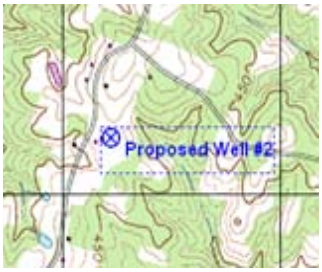
Step 2: Schedule VDH-ODW Well Site Visit

The second step is to contact the VDH-ODW to schedule a well site inspection. During this inspection you should be prepared to provide VDH-ODW with information about the proposed well sites you have selected prior to going out into the field for a well site inspection.

If the proposed project requires a new septic tank and drain field, the Local Health Department should be contacted prior to the well site inspection to avoid conflicts between the placement of the well and waste systems. VDH-ODW personnel will assist in making the determination whether additional state agency involvement is required.

Contacting the VDH-ODW	
Abingdon Field Office 454 East Main Street Abingdon, VA 24210 Phone (276) 676-5650 Fax (276) 676-5659	**East Central Field Office** 300 Turner Road Richmond, VA 23225 Phone (804) 674-2880 Fax (804) 674-2815
Lexington Field Office 131 Walker Street Lexington, VA 24450 Phone (540) 463-7136 Fax (540) 463-3892	**Danville Field Office** 211 Nor Dan Drive Danville, VA 24540 Phone (434) 836-8416 Fax (434) 836-8424
Southeast Virginia Field Office 830 Southampton Ave Norfolk, VA 23510 Phone (757) 683-2000 Fax (757) 683-2007	**Culpeper Field Office** 400 South Main Street Culpeper, VA 22701 Phone (540) 829-7340 Fax (540) 829-7337

Step 3: Obtain Approvals



A representative from your VDH-ODW Field Office will perform an on-site assessment of each proposed well location. The assessment will include an evaluation of the well's susceptibility to contamination. Sketches, maps, measurements, and coordinates will be noted during the well site inspection. If acceptable, tentative approval will be given in a written letter that shall include topographic maps with the proposed site(s) identified, well lot sketches identifying any potential sources of contamination, and significant landmarks.

VDH-ODW's approval of the well site(s) is valid for 12 months. If drilling of the well has not begun within 12 months of the approval date, the proposed sites will need to be re-inspected by VDH-ODW personnel.

Wells located in Groundwater Management Areas (GWMAs) The Virginia Department of Environmental Quality (DEQ) administers a Ground Water Withdrawal Permit Program to manage water resources within two specific geographical regions of Virginia. These geographic regions encompass all of the Coastal Plain geology in Virginia. The following table describes the counties and cities that fall within the GWMA.

Eastern Shore GWMA	**Counties** Accomack and Northampton
Eastern Virginia GWMA	**Counties** Caroline*, Charles City, Chesterfield*, Essex, Fairfax*, Gloucester, Hanover*, Henrico*, Isle of Wight, James City, King George, King William, King and Queen, Lancaster, Mathews, Middlesex, New Kent, Northumberland, Prince George, Prince William*, Richmond, Southampton, Spotsylvania*, Stafford*, Surry, Sussex, Westmoreland, and York **Independent Cities** Chesapeake, Franklin, Hampton, Hopewell, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg
* Only those portions east of I-95 are included in the GWMA	

If you are developing a well within the coastal plain (GWMA), contact DEQ to determine if a Groundwater Withdrawal Permit is required. All persons who withdraw more than 300,000 gallons of groundwater in any month in the designated GWMAs must obtain a groundwater withdrawal permit.

If a Groundwater Withdrawal Permit is required by DEQ, it is crucial to coordinate the permitting requirements of both State agencies. DEQ may require specific construction features if a well is drilled through multiple aquifers (typical of the Coastal Plain region). Also, DEQ's Aquifer Test Plan differs from the well yield and drawdown testing typically required by VDH-ODW. Consult DEQ to determine what construction and testing requirements will apply before drilling and developing a public water supply well.

Further information regarding DEQ's Groundwater Withdrawal Permitting Program can be found at
http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/GroundwaterPermitting.aspx

The DEQ Office of Ground Water Characterization (OGWC) strongly suggests that bore hole geophysical logs be obtained in newly constructed public water supply wells in the Coastal Plain at the time of drilling, since it is impossible to obtain a geophysical log of the well once it is completed. By obtaining a bore hole geophysical log at the time of drilling, you will already have one of the most important pieces of information necessary to obtain a withdrawal permit. The geophysical logs can be used to select accurate well screen placement depths, and can assist in analyzing well yield and water quality issues.

Step 4: Drill, Case, and Grout Well

The proper drilling, casing, and subsequent grouting of a proposed well is essential to maintain water quality and reduce potential susceptibility to contamination. A variety of issues may contribute to the manner in which the well source is developed, including siting requirements, geological conditions, and borehole and casing depths. This step details information that may affect the methods, procedures, supplies, and materials used to develop a groundwater source.

Planning for Sampling

After the well is drilled, a yield and drawdown test of the well is performed, and bacteriological, chemical, and radiological samples are collected. Prior to drilling, it is essential that you discuss with your licensed well driller the sampling requirements in order to have the necessary sample containers on hand. These procedures are described in Step 5.

Certified Water Well Systems Provider Only certified water well system providers are allowed to develop, remediate, or abandon public wells. Contact the Virginia Department of Professional and Occupation Regulation at www.dpor.virginia.gov/dporweb/dpormainwelcome.cfm

Materials, Casing And Grouting All well construction materials and components must meet appropriate specifications and standards stated in the Virginia *Waterworks Regulations*. This includes well casing material (steel or plastic) and grout.

IMPORTANT: Requirements for materials acceptable for use in the installation of PUBLIC WATER SUPPLY WELLS are more stringent than those for PRIVATE WELL construction. Should there be any questions regarding the proper materials to use, contact your VDH-ODW field office.

Six-inch steel well casing. Photo courtesy Dempsey Steel Pipe, Inc.

Well construction classification Your well site approval letter will specify the minimum construction class for your proposed wells. The well construction classifications are described below:

Class I	• Drilled and cased to a depth sufficient to exclude undesirable groundwater, NO LESS THAN 100 feet in depth • Drill hole diameter at least 3 inches greater than the outside diameter of the couplings of the casing • Annular space around the casing grouted to a depth of at least 100 feet
Class II	• Drilled and cased to a depth sufficient to exclude undesirable groundwater, NO LESS THAN 50 feet in depth • Drill hole diameter at least 3 inches greater than the outside diameter of the couplings of the casing • Drill hole terminates in solid rock or other impervious formation (when practical) • Annular space around the casing grouted to a depth of at least 50 feet

Wells In Rock Class II wells constructed in hard rock must have well casing extended to a minimum depth of 50 feet, terminating in rock. If rock is encountered at a depth of less than 50 feet, the casing must still extend to a depth of at least 50 feet. The well must be pressure grouted from the bottom of the annular opening to ground level.

Drilling Documentation The certified water well systems provider must complete a drilling log and submit this to VDH-ODW, using the Water Well Completion Report, Form GW-2, available at http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/GroundwaterPermitting/Documents,FormsandAdditionalResources.aspx

Grouting The annular space around the well casing requires grouting per the Waterworks Regulations. Please note, while bentonite grout is allowed for private wells, is NOT acceptable for public wells. The well driller must notify the appropriate VDH-ODW Field Office of the date and time that the well will be grouted. This information should be provided as soon as possible so that a VDH-ODW representative may be present during grouting.

Proper Well Abandonment Any well, whether intended for production, observation, or study that is not completed in accordance with the construction requirements of the *Waterworks Regulations* must be permanently abandoned (sealed) in a manner that restores the pre-existing geological conditions.

In some instances, the DEQ may want to use the well for research or testing purposes. Therefore, it is a good practice to contact the DEQ's Office of Ground Water Characterization and offer them an opportunity to assume responsibility of the well. Their contact information is available at: http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/GroundwaterCharacterization/Contacts.aspx

Wells that have been drilled should be promptly abandoned once the decision is made to not place the well into service. Wells that are not properly abandoned increase the risk of contamination of the aquifer(s). Information on proper abandonment procedures is given in the *Waterworks Regulations.*

Step 5: Develop Well

Well development consists of conditioning (if warranted), disinfection, yield and drawdown testing, and sampling after the well is drilled. The well *should* be disinfected prior to sampling due to the activities and exposures associated with the drilling process. The well *must* be disinfected after the production pump (if different from the test pump) is installed. Generally, a certified water well system provider is aware of the proper methods required to disinfect a well. The correct disinfection procedures for disinfecting a well with chlorine are given in ANSI / AWWA Standard C654 - Disinfection of Wells.

The well yield and drawdown data are required to determine the capacity of the source, assist in selecting a pump, and verifying that the source will be sufficient for the public water system's needs. The samples are analyzed for bacteriological, chemical and radiological qualities, and are evaluated to determine if water treatment will be required.

Yield & Drawdown Tests The well and pump capacity of a groundwater source must be determined before the well will be approved for public use. The data gathered from the yield test is crucial to the waterworks, since a low yield may mean additional sources or storage will be needed to meet the waterworks' needs, or limit the waterworks' service capacity.

If a new well is within close proximity of an existing well, DEQ or VDH-ODW may require monitoring of the water level of the nearby well during the yield pump test. If the water level in the nearby well drops, a simultaneous pump test may be required. This will provide better information with which to determine the safe yield of both sources.
Wells located in the Coastal Plain should be tested using a procedure acceptable to the DEQ. Generally,

for wells outside of the Coastal Plain, the yield and drawdown test duration is at least 48 hours.[1] VDH-ODW recommends that the pumping rate be controlled throughout the test to maximize the production from the well, and to produce a stabilized pump water level for at least the last six hours of the yield test. Immediately following the yield and drawdown test the water level recovery in the well should be recorded for no less than two hours or until the well returns to its static water level, whichever occurs first. A standard report form is available at

http://www.vdh.virginia.gov/ODW/XLS/well_yield_and_recovery_report_form(excel).xls

Laboratory Selection The Division of Consolidated Laboratories (DCLS), or a laboratory certified by DCLS, must perform all bacteriological, radiological and chemical testing of the water samples from a proposed well. A list of certified labs is available at the DCSL web site:

www.dgs.virginia.gov/DivisionofConsolidatedLaboratoryServices/tabid/453/Default.aspx

If you would like to use DCLS for your well development testing, you can also refer to the DCLS web site for sample kit order forms and sample collection and shipping instructions.

Bacteriological Sampling The bacteriological quality of every proposed groundwater source for a public water supply must be evaluated. The purpose of these tests is to determine if continuous disinfection or additional treatment is required for the waterworks. For a newly constructed well, or a well undergoing modification or reconditioning, a series of 20 bacteriological samples must be collected during the latter portion of the yield and drawdown test. If the well was disinfected with chlorine, the well must be pumped to waste until all of the chlorine residual has been removed from the well before collecting the bacteriological or any other water quality samples. The 20 samples must be analyzed by a Most Probable Number (MPN) method for total coliform bacteria and *E. coli*. The MPN samples should be collected at minimum thirty minute intervals during the last ten hours of the yield and drawdown test. If a different time interval is desired, contact your VDH-ODW Field Office for prior approval. Ensure hygienic methods are used during the collection of these samples in order to avoid accidentally contaminating a sample.

Sampling Challenges

Some of the developmental samples that must be taken at your new well may have special collection or shipping requirements. For example, bacteriological MPN samples must be received by your laboratory for processing within 30 hours of collection. Consult with your laboratory on sampling preservation, holding times, and other special requirements.

If DCLS is used for MPN testing, you should notify DCLS at least 24 hours prior to sampling, to ensure that the samples will be accepted and processed. It is recommended that similar arrangements be made with any private laboratory that you use.

Chemical, Physical and Radiological Sampling In addition to monitoring the microbial characteristics of the well source, a variety of chemical, radiological and physical parameters must be checked during well development in order to ensure adequate water quality. The specific parameters required for testing and the number of samples required will be determined by VDH-ODW. Tests include analysis of metals, inorganic chemicals (including nitrate, nitrite, and cyanide), physical parameters, radiological contaminants, (such as uranium and radium), and volatile organic chemicals (such as fuels and solvents), and synthetic organic chemicals (including pesticides and herbicides).

The chemical and radiological samples should be collected near the end of the yield and drawdown test, prior to the recovery period.

[1] The *Waterworks Regulations* permits a reduction in the well drawdown test duration for Noncommunity waterworks having a production of less than 3 gpm. This reduction must be approved by VDH-ODW prior to conducting the test.

For detailed information regarding water quality standards, potential health effects, and typical sources of contamination, refer to EPA's National Primary Drinking Water Standards at
www.epa.gov/safewater/consumer/pdf/mcl.pdf

Well Development Test Results VDH-ODW will review the well test data upon receipt. The yield and drawdown test results, along with results from the bacteriological and chemical sampling, will be used to determine how much water the well can reliably produce, and whether the water will need to be treated to meet water quality standards. Most laboratories (including DCLS) will report bacteriological and chemical test results directly to VDH-ODW. You will be advised of the results, their interpretation, and any additional or follow-up testing needed.

Step 6: Obtain VDH-ODW Permits

The approval you will have obtained from VDH-ODW by following Steps 1 through 5 is limited to well drilling, casing, grouting, and testing. Steps 1 through 5 of the well development process are designed to answer basic questions about your proposed water supply source:

- Do the well lot and location meet basic requirements for size, clearances to boundaries, and protection from potential sources of contamination?
- Once the well has been drilled and installed, does it produce enough water to meet the waterworks' needs?
- Now that the well has been tested, is the water quality suitable, or is treatment needed to remove contaminants?

Further construction of the waterworks, including installation of the permanent well pump, electrical service, well house, water treatment, storage, or distribution piping, is not authorized until VDH-ODW issues a construction permit. Obtaining the construction permit is your next step. Contact the VDH-ODW Field Office to discuss the project, and schedule a Preliminary Engineering Conference, if necessary.
A Permit Application will need to be submitted to the VDH-ODW Field Office.

NOTE: If you are adding a new well to an existing waterworks with a current Operation Permit, then you only fill the section "For Operation Permit Only". If the well is drilled for a new waterworks, then fill both sections "For Operation Permit Only" and "For Construction Permit Only".

The Preliminary Engineering Conference (PEC) is a meeting held between VDH-ODW staff, the owner, and the design engineer. Depending on the complexity of the project, the meeting may be held in person or a phone call may be appropriate. During this meeting, VDH-ODW staff will discuss the sample results, required and recommended treatment, engineering document submittal requirements, and answer any questions you or your design engineer may have. It will also be determined at this meeting if a Preliminary Engineer Report (PER) is required.

PERs are sometimes necessary for new sources with difficult water quality issues such as arsenic, nitrates, and high dissolved solids. PER's must be completed by a licensed Professional Engineer and the report must be approved by VDH-ODW.

Design Considerations

The Virginia *Waterworks Regulations* provides detailed standards for the design and construction of public water supply wells. Required appurtenances include a sanitary seal for the top of the well casing, a properly screened vent, sampling tap, well pump controls, a concrete floor or apron surrounding the well, and well pump support. A means for measuring water level in the well is also required. All such appurtenances must be detailed in the construction plans and specifications that you and your design engineer must submit to VDH-ODW. However, such features should not be installed until the plans have been approved, and a construction permit issued.

Plans, specifications and design calculations for the project must be developed by a licensed Professional Engineer and submitted to the VDH-ODW Field Office. VDH-ODW staff will review the plans to ensure the design complies with the Waterworks Regulations. Often, VDH-ODW staff will provide comments on the design and require revisions to the plans and specifications.

A well lot plat & dedication / certification document are required for all wells. The intent of these materials is to describe the proposed well lot and record the information to ensure the well lot is only used for waterworks-related activities. Additional buildings, parking lots, or storage may not occur within the well lot. The plat must be signed by the clerk of the respective court, noting the deed book, page number and date. The Well Lot Dedication/Certification Document must be signed by the clerk of the court and notarized. You will be required to submit these documents when you submit plans and specifications to obtain a waterworks construction permit.

Once the final plans and specifications are approved and the well lot plat and dedication document have been recorded by the clerk of the court, a Construction Permit is issued. This is your authorization to complete the construction of your new well system. Your construction permit will provide details to you regarding the items that need to be performed prior to placing your new well into operation. These may include pressure testing, bacteriological testing, letter of substantial completion from the engineer, and final inspection by VDH-ODW staff.

Virginia Department of Health
Office of Drinking Water

Waterworks Operation Permit

Fancy Restaurant is hereby granted permission to operate the Fancy Restaurant waterworks, an unclassified transient noncommunity waterworks located in the Town of Fancy, in accordance with Title 32.1 of the Code of Virginia and 12VAC5-590 et seq. of the Virginia Waterworks Regulations. The waterworks has a capacity of 8,000 gallons per day. This permit is issued with the understanding that this owner shall operate the waterworks in accordance with Part II of the Virginia Waterworks Regulations titled "Operation Regulations for Waterworks". This permit does not suspend, minimize, or otherwise alter this owner's obligation to comply with applicable federal, state, or local laws and regulations or permits. This permit may be revoked at any time upon written notice of revocation by the State Health Commissioner, if it is determined that Fancy Restaurant has failed to comply with this permit, including the Operation Permit Conditions.

Variances or Exemptions issued: (x) None ( ) See Attached

Operation Permit Conditions attached

PERMIT NO.: 4000001

EFFECTIVE DATE: January 1, 2014

APPROVED_____

John J. Aulbach II, P.E., Director, Office of Drinking Water
for the State Health Commissioner pursuant to VA Code § 32.1-170

The final permit you will be issued is the Operation Permit. If you have an existing waterworks and already have an Operation Permit, it may be amended to include the new source. If you will have new waterworks, you will be issued a new Operation Permit. Contact your VDH-ODW Field Office for specific requirements for new permits, monitoring, and reporting.

Your new well may now be used!

WELL SITE INSPECTION FORM

Preliminary Information

Well site selection visit requested by (name) _____ Date: _____

Scheduled for (date/time) _____

Meet at (location) _____

ODW Well Development Handbook ☐ mailed prior to inspection ☐ distributed at inspection ☐ not needed

Owner/agent advised to contact local health department? ☐ Y ☐ N

Will local health department representative be present at site inspection? ☐ Y ☐ N

Proposed development is in Groundwater Management Area ☐ Y ☐ N

Owner/agent advised to contact DEQ? ☐ Y ☐ N

Waterworks is ☐ existing ☐ proposed

Waterworks type: ☐ Community ☐ NTNC ☐ TNC

Waterworks is/will serve _____ population at _____ service connections

Waterworks name: _____ PWSID: _____

City/County: _____

Attendance at Inspection

Inspected by: _____ Date: _____

Name: _____ Affiliation: Owner Address: _____ _____ Phone: _____ Email: _____ Receives correspondence? ☒ Y ☐ N	Name: _____ Affiliation: _____ Address: _____ _____ Phone: _____ Email: _____ Receives correspondence? ☐ Y ☐ N
Name: _____ Affiliation: _____ Address: _____ _____ Phone: _____ Email: _____ Receives correspondence? ☐ Y ☐ N	Name: _____ Affiliation: _____ Address: _____ _____ Phone: _____ Email: _____ Receives correspondence? ☐ Y ☐ N

Site Characterization (prepare a separate form for each marked well site)

Well name: _____ Marked: _____

Latitude: _____ Longitude: _____ Datum:

Geologic conditions: _____
Is wellhead protected from 100-yr flood ☐ Y ☐ N

All-weather access road available: ☐ Y ☐ N Electrical service available: ☐ Y ☐ N

Minimum 50 ft distance: to property lines, rights-of-way ☐ Y ☐ N
from septic tank, pit privy, cesspool, barn yard, hog lot, etc. ☐ Y ☐ N
from petroleum or chemical tank or line ☐ Y ☐ N
from sewer lines ☐ Y ☐ N from sanitary drainfield ☐ Y ☐ N
from well of unknown or inadequate construction ☐ Y ☐ N
from surface runoff ☐ Y ☐ N

Are any of the following located in the wellhead area (1000 ft radius from well)?
☐ none ☐ landfill or dumps ☐ service stations ☐ dry cleaners ☐ machinery repair shops
☐ electronic repair shops ☐ paint shops ☐ light/heavy industry ☐ other wells ☐ sinkholes

Will topography in the wellhead area (1000 ft radius from well) direct contamination toward the well ☐ Y ☐ N

Characterize the general land use in the wellhead area (1000 ft radius from well) as
☐ residential ☐ industrial ☐ livestock ☐ crops ☐ undeveloped
☐ other _____

Is the well site approved? ☐ Y ☐ N If yes, Class and Type:

Well Site Sketch

Topographic maps attached: ☐

Summary (approved sites only)

Well Name	Construction Class	Yield / Drawdown Test Duration (hrs.)	Yield/Drawdown Simultaneous With Adjacent Wells	Dedicated Well Lot Dimensions (specify minimum)	Site Improvements Needed	Dev Testing Required
		☐ ODW Protocol for ______ hours				☐ MPN Qty______ ☐ IOC ☐ Metals ☐ Nitrate ☐ Nitrite ☐ VOCs ☐ Radiological ☐ SOC Carbamates ☐ SOC Chlor Acid Herb ☐ SOC Diquat ☐ SOC Semi-Volatile ☐ SOC Volatile Fumigants ☐ Cyanide
		☐ DEQ Protocol (Groundwater Management Area permittees ONLY)				
		☐ ODW Protocol for ______ hours				☐ MPN Qty______ ☐ IOC ☐ Metals ☐ Nitrate ☐ Nitrite ☐ VOCs ☐ Radiological ☐ SOC Carbamates ☐ SOC Chlor Acid Herb ☐ SOC Diquat ☐ SOC Semi-Volatile ☐ SOC Volatile Fumigants ☐ Cyanide
		☐ DEQ Protocol (Groundwater Management Area permittees ONLY)				
		☐ ODW Protocol for ______ hours				☐ MPN Qty______ ☐ IOC ☐ Metals ☐ Nitrate ☐ Nitrite ☐ VOCs ☐ Radiological ☐ SOC Carbamates ☐ SOC Chlor Acid Herb ☐ SOC Diquat ☐ SOC Semi-Volatile ☐ SOC Volatile Fumigants ☐ Cyanide
		☐ DEQ Protocol (Groundwater Management Area permittees ONLY)				
		☐ ODW Protocol for ______ hours				☐ MPN Qty______ ☐ IOC ☐ Metals ☐ Nitrate ☐ Nitrite ☐ VOCs ☐ Radiological ☐ SOC Carbamates ☐ SOC Chlor Acid Herb ☐ SOC Diquat ☐ SOC Semi-Volatile ☐ SOC Volatile Fumigants ☐ Cyanide
		☐ DEQ Protocol (Groundwater Management Area permittees ONLY)				

<*Date*>

SUBJECT: {*City/County}*
Water-

Dear *{Waterworks Owner}*:

This letter refers to inspection of a well site to serve *{describe service area}*. In accordance with § 12VAC5-590-280 of the Commonwealth of Virginia *Waterworks Regulations*, the proposed well site is tentatively approved by this Department for the construction of a well to be utilized as a public drinking water supply, subject to the following conditions:

Proposed Well No. 1	
Location:	City / County:
	Latitude:
	Longitude:
	Marked: {*Blue Flagging Tape, e.g.*}
Well Construction Class:	{*Class II-A, Class II-B, or Class I*}
Approval Expiration Date:	{*Insert date*}. If drilling of the well has not commenced by this date, re-inspection of the well site will be required.
Well Lot Characteristics:	Minimum distance of 50 feet between the well and all potential sources of contamination, property lines, and rights-of-way or easements on the property. See attached {*sketch, topographic map, photo, etc.*}.
	The well lot must be graded as necessary to divert surface run-off from the well and to prevent ponding on the well lot
	The well lot must be served by an all-weather access road.
	The entirety of the well lot must be located higher than the 100-year flood elevation.
Grouting:	Use cement mortar grout with a maximum 6% bentonite, in accordance with *Waterworks Regulations.* Notify this office of the date and time that the well will be grouted. Provide this information as soon as possible so that a member of our staff may be present during grouting.
Yield and Drawdown Test Duration:	A yield and drawdown test must be run for at least {*48*} hours. We recommended the pumping rate be controlled throughout the test to maximize the production from the well and to produce a stabilized pump water level for at least the last six hours of the yield test. Immediately following the yield and drawdown test the water level recovery in the well should be recorded for no less than 6 hours or until the well returns to its static water level, whichever occurs first. If water will discharge into streams during pumping tests, please contact the Department of Environmental Quality {*office name*} Office to determine if a discharge permit is required.

Simultaneous Testing Required:	Because the proposed well is located within 500 feet of an existing well(s) {*name(s)*}, and both wells will be used, simultaneous pump testing of both should be conducted. At a minimum, the adjacent well(s) must be monitored during the test if they cannot be tested simultaneously. This will assure better information with which to determine the safe yield of both sources.
Well in Groundwater Management Area:	This waterworks is located in a Groundwater Management Area as declared by the State Water Control Board. Contact the Department of Environmental Quality (DEQ) {*office name*} Office for further information on the Groundwater Withdrawal Permit requirements and procedures. It is strongly recommended that you do this prior to drilling and testing the well, since DEQ's requirements may be more restrictive. For more information, please visit DEQ's website http://www.deq.virginia.gov/gwpermitting/.
Required Bacteriological and Chemical Sampling:	A series of twenty bacteriological samples must be collected from the well discharge and submitted to a certified laboratory (DCLS or private laboratory) in order to determine the bacteriological quality of the raw groundwater. One bacteriological sample must be collected {*select one: every 30 minutes / once an hour*} during the last half of the pump test. These samples must be analyzed by the total coliform and *E. coli* Most Probable Number (MPN) test method.
	Water samples must be collected to analyze for cyanide, nitrite, nitrates, inorganic chemicals, metals, radiological, and volatile organic chemicals. The chemical samples should be collected near the end of the pump test, prior to the recovery period.
	The wellhead area has been found to be vulnerable to contamination by synthetic organic chemicals (SOCs) due to {*List potential contamination}*. You will be required to take developmental samples for SOCs tested by EPA Method Number {*insert test method if applicable}*. Contact DCLS in Richmond or a certified private laboratory to arrange for analysis of your samples.
Submittals Required Prior to Issuance of Construction Permit:	Well Completion Report (GW2)
	Plumbness and alignment test report.
	Well yield and drawdown test results
	Results of required bacteriological and chemical sampling (if not reported directly by laboratory)
	Preliminary engineering report
	Construction permit application (for completion of the well installation / waterworks)
	Final construction plans and specifications, including recorded plat of the well lot, and a recorded dedication document for the well lot. The dedication document shall clearly state that the well lot will be used only for the waterworks appurtenances as long as the lot is being used as part of the waterworks.

Upon receipt of the required documentation and after plans and specifications have been approved, a construction permit will be issued by the State Health Commissioner in accordance with § 12VAC5-590-230 of the *Waterworks Regulations*. Construction of the waterworks facilities shall not be started until the construction permit has been issued.

All water well drillers are required to be licensed by the State Board for Contractors. You may contact the State Board for Contractors, Virginia Department of Professional and Occupational Regulation, 9960 Mayland Drive, Suite 400, Richmond, VA 23233 (804/367-8511) to determine if a well driller is licensed.

If you have any questions, please contact me.

Sincerely,

District Engineer

Enclosures:

Cc/w Encl: ODW-Central
Todd A. Beach, DEQ OSGWSP/Ground Water Characterization

Cc: County Administrator
County Health Department, Attn: , MD, MPH, Director

Well Yield and Recovery Report

Office of Drinking Water
Safe Drinking Water for a Healthy Virginia

System Name		**City/County**			
Well Number and Name		**Well Class**		**Well Casing Size**	
Well Depth (ft.)		**Static Water Level (ft.)**		**Depth of Pump (ft)**		**Airline Length (ft.)**	
Test Pump Brand/Model		**Pump HP**			
Name & Address of Company Performing Test					

Well Yield

Date & Time Test Started

Notes: All measurements are from top of casing
(1) Water Above Pump = Air Line Pressure x 2.31ft./psi + (Pump Depth - Air Line Length)
(2) Depth to Water = Air Line Length - (Air Line Pressure x 2.31ft./psi)
(3) Depth to Water = distance from top of casing to water level

Time	Time of Reading	Air Line Pressure (psi)	Water Above Pump (ft.)	Depth to Water (ft.)	Draw Down Rate (ft./hr.)	Meter Reading (gal)	Pump Discharge Rate (gpm)
Start							
5 min							
5 min							
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15 min							
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1 hr							
1 hr							

Well Yield (cont.)

Time	Time of Reading	Air Line Pressure (psi)	Water Above Pump (ft.)	Depth to Water (ft.)	Draw Down Rate (ft./hr.)	Meter Reading (gal)	Pump Discharge Rate (gpm)
1 hr							
1 hr							
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Well Yield table is designed for a 48-hour test. Copy or print additional pages as needed.

Well Recovery

Date & Time Test Started	

Notes:
(1) Well recovery period shall start as the pump test ends
(2) Well recovery period shall be 30-minute intervals for 2-hours

Time of Reading (30 minute interval)	Air Line Pressure (psi)	Water Above Pump (ft.)	Depth to Water (ft.)	Recovery (ft./30 minutes)

Notes

Preparer's Signature	
Date	