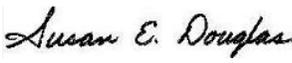


**COMMONWEALTH OF VIRGINIA
DEPARTMENT OF HEALTH
OFFICE OF DRINKING WATER**

Date: March 10, 2016

To: Office of Drinking Water Staff

Through: Drew Hammond, PE, Deputy Director 
Office of Drinking Water

From: Susan E. Douglas, PE, Director 
Division of Technical Services

Subject: **Working Memo 813, Amendment #3**
PERMITS & PROJECT REVIEW – Well Development

Summary:

This memo provides ODW staff with the procedures for processing a well development request, including the approval or rejection of proposed well site(s), well construction, and testing. An updated Handbook for waterworks owners provides information on methods, materials, and procedures in the construction and development of a well.

Note: This working memo replaces Working Memo 813, Amendment #2 dated April 30, 2008.

Electronic Copy:

An electronic copy of this working memo in PDF format is available for staff internally at the following location: <\\odwsrv1\odwshare\03-Memos\301-Active Working Memos\301.01-pdf Active Memos>.

An electronic copy of the working memo attachments is available for staff internally at the following location: <\\odwsrv1\odwshare\03-Memos\301-Active Working Memos\301.02-Forms Letters Manuals\WM813-Well Development>.

Contact Information:

Please contact Susan E. Douglas, PE, Office of Drinking Water, at (804) 864-7490 or Susan.Douglas@vdh.virginia.gov, with any questions regarding the application of this working memo.

Disclaimer:

This document is provided as guidance and, as such, sets forth standard operating procedures for the Office of Drinking Water. However, it does not mandate or prohibit a particular action not otherwise required or prohibited by law. If alternative proposals are made, such proposals will be reviewed and accepted or denied based upon their technical adequacy and compliance with appropriate laws and regulations.

Summary of Revisions:

- Preliminary Source Water Assessment (PreSWA) procedures have been added.
- DEQ coordination procedures for wells located in Groundwater Management Areas have been added.
- Procedures for processing GW-2 forms from 'VA Hydro' website have been included.
- Issuance of SOC waivers has been clarified.
- Three attachments are have been revised:
 1. Handbook for Developing a Public Water Supply Well
 2. Well Site Inspection Form
 3. Well Site Approval/Rejection Letter
- Well Development Activity Checklist has been deleted.
- Mandatory developmental chemical sampling for TNCs has been reduced to nitrates/nitrites only.
- Well lot plat and dedication document requirements have been limited to community waterworks only. NTNCs & TNCs may be granted an exception.

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ATTACHMENTS:

1. Handbook for Developing a Public Water Supply Well
2. Well Site Inspection Form
3. Well Site Approval/Rejection Letter

1. 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 new owner.

Note that the coastal plain region of Virginia is located within two Groundwater Management Areas (GWMA) regulated by the Department of Environmental Quality (DEQ). Owners may be required to obtain a Groundwater Withdrawal Permit from the DEQ for wells located in these areas.

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.

2. PRELIMINARY SOURCE WATER ASSESSMENT

A Preliminary Source Water Assessment (PreSWA) shall be provided to the owner during the well site inspection or with the well site approval letter. The PreSWA will include maps, summaries of geology, soil type, land use and potential sources of contamination. Field Office staff will have the discretion to customize which GIS data layers to print with the maps. For example, the soils layer may be irrelevant for a properly-constructed well located in the coastal plain, when no potential conduits are identified within the assessment area.

If well site location coordinates are available before the well site inspection, the PreSWA should be shared with the owner during the well site inspection. If this information is not known prior to making a site visit, field office staff may use SWAP Service to create a topographical map of the general area of the well site(s) to facilitate their inspection. This service is available at the following location:

https://gis.vdh.virginia.gov/arcgis/rest/services/ODW/SWAP_Service/MapServer.

(Hint: From the 'View In' options, click on 'ArcGIS Online map viewer')

Field Office staff must follow-up with the Central Office to obtain a PreSWA by completing a PreSWA request for each proposed well in the SWAP Tracking Log available at the following location:

\\odwsrv1\odwshare\15-SWAP-Processing\SWAP_TrackingLog.xlsx.

Instructions on how to fill out the tracking log are included in the spreadsheet.

The requestor will be notified by email when the PreSWA has been developed and is subsequently available for viewing at the following location:

\\odwsrv1\odwshare\15-SWAP-Processing\07-PreSWA_Outputs.

3. WELL SITE INSPECTION

ODW will perform a well site inspection with the owner or owner's agent. ODW will approve selected sites when they do not present a potential threat to public health, after reviewing the PreSWA and field-verifying the 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). Setbacks greater than 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. Refer to the Handbook for Developing a Public Water Supply Well included in Attachment 1 for specific well site requirements.

During the inspection ODW staff should also:

- Obtain GPS coordinates of the proposed well site(s) in NAD 83 projection,
- 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.

Use the Well Site Inspection Form provided in Attachment 2 to document the information collected at the inspection.

4. WELL SITE APPROVAL / REJECTION

ODW will review the well site information and sketches and issue an approval letter if the well site is acceptable. As described in the *Waterworks Regulations*, this is a "tentative approval...authorizing him (*the owner*) to proceed with drilling of the well..." Well site approvals are valid for a 12 month period, starting from the date that the tentative approval letter is issued. Use the Well Site Approval/Rejection Letter template provided in Attachment 3, customizing the letter as appropriate for the proposed well(s).

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 (optional statement is included in Attachment 3).

5. WATER WELL COMPLETION REPORT (GW-2 Form)

Procedures for processing GW-2 forms submitted through 'VA Hydro' website are included in the *Project Review and Permit Procedures Manual (Permit Manual)*.

6. WELL YIELD & DRAWDOWN TESTING

The *Waterworks Regulations* state, "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." The *Waterworks Regulations* 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 the coastal plain region of Virginia. Non-transient Non-community (NTNC) systems such as schools and

commercial areas that do not operate 24 hours/day may reduce the yield test to 24 hours (or 12 hours in the Coastal Plain), provided that the well drawdown reaches equilibrium prior to the last 6 hours of the reduced test period. See the *Permit Manual* for additional guidance.

7. WELLS IN GROUNDWATER MANAGEMENT AREAS

If the waterworks is located in a GWMA, (essentially all land east of I-95), then DEQ may require the waterworks owner to secure a Groundwater Withdrawal Permit. Further information regarding DEQ's permit program can be found at the following location:

<http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/GroundwaterPermitting.aspx>.

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. For example, DEQ requires all wells located within the Eastern Virginia or Eastern Shore GWMA's to be constructed in a manner to prevent blending or cross-contamination of the aquifers. Wells cannot be constructed that screen multiple aquifers, and must be constructed with gravel packs and grout in a manner that prevents leakage between aquifers. This is not currently addressed in the existing *Waterworks Regulations*, but will be included in future amendments.

ODW should not delay issuance of a waterworks construction permit if DEQ has not completed their evaluation. Note that DEQ's regulations require a Waterworks Operation Permit prior to the issuance of a final Groundwater Withdrawal Permit.

The *Waterworks Regulations* specify a constant rate well yield test. DEQ's groundwater withdrawal permit may require a more elaborate aquifer test plan (usually the subject well and neighboring wells). The Well Site Approval/Rejection Letter template contains clear language for the owner to contact DEQ *prior to* well construction and testing.

8. RAW WATER SOURCE DEVELOPMENT SAMPLING & TESTING

All new community and NTNC wells must test for *all* of the parameters listed in the *Waterworks Regulations*, including:

- Inorganic Chemicals;
- Volatile Organic Chemicals (VOCs);
- Synthetic Organic Chemicals (SOCs) – unless waiver obtained;
- Physical Quality (color, odor, pH, TDS, turbidity); and
- Radiological (gross alpha, combined Radium 226 and 228, Uranium) – not required for NTNCs.

The only chemical testing requirement for new Transient Non-community (TNC) wells is nitrate/nitrite; however, additional chemical testing may be recommended.

If the well is found to be susceptible to contamination by SOCs after reviewing the PreSWA and performing the initial site visit, then development samples for SOCs listed in the *Waterworks Regulations* are required for community and NTNC waterworks. Otherwise, a "waiver" may be issued to the community or NTNC waterworks for some or all of the SOC parameters. If SOCs are not required, then the decision must be documented in the Well Site Inspection Form.

The PreSWA contains information to facilitate the evaluation process for waiver decisions and also information about SOCs and other contaminants in the *SWAP Typical Contaminants Compendium*. For

example, the Potential Source of Contamination inventory will show identified SOC risks (see “Contaminant Type” field) and the Land Use map provides an idea of areas where SOC’s may be in use (i.e., crop and forest harvest).

All groundwater sources shall be tested in order to enable a determination of Groundwater Under the Direct Influence of Surface Water (GUDI). Twenty (20) bacteriological MPN samples shall be collected for all new wells. In non-karst geology, these samples can be used for a GUDI determination, but karst areas require an additional set of 20 MPNs over a period of time. The sampling and testing protocol for making this determination is given in the *Compliance Sampling and Reporting Guidance Manual for ODW Staff (Sampling Manual)*.

Procedures for ordering development sample test kits from DCLS are given in the *Sampling Manual*. 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 *Waterworks Regulations*.

9. WELL CONSTRUCTION & DESIGN EXCEPTIONS

Compliance with the minimum construction requirements specified in the *Waterworks 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. Note that well construction requirements are further restricted by DEQ if they are located within a GWMA, as described previously.

10. WELL LOT PLATS & DEDICATION DOCUMENTS

A well lot plat and deeded dedication document is required for all new waterworks wells, unless an exception to the *Waterworks Regulations* is approved. Only non-community waterworks may be granted an exception to the well lot plat and dedication document. The owner must request an exception (the request can be submitted via email or on paper). In most cases, the exception request should be granted. Refer to the *Permit Manual* for additional guidance.

END OF MEMO

Handbook for Developing a Public Water Supply Well

Issued: April 30, 2008
Revised: January 5, 2016



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://www.vdh.virginia.gov/EnvironmentalHealth/Onsite/regulations/>.

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/laws_regs.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.

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.

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.

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 underground fuel storage tanks. VDH-ODW can provide you with a preliminary source water assessment identifying potential sources of contamination from available records. 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.
Cesspool, Pit Privy, Septic Tanks	50 ft.
Drain Fields and Purification Fields	50 ft.
Petroleum & Chemical Storage Tanks or Pipes	50 ft. (100 ft. if plastic well casing)
Power Lines & 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 to consider 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

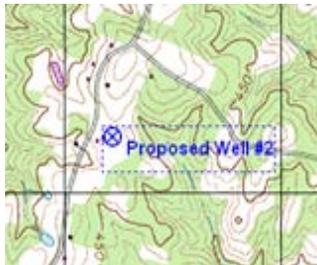
Planning for wellhead protection while selecting a site may help to reduce the amount of PSCs associated to the proposed well(s). VDH-ODW may offer additional guidance in developing a Wellhead Protection Plan, as well as funding opportunities to eligible waterworks. Additional information about Source Water Protection, references and assistance opportunities is available at <http://www.vdh.virginia.gov/ODW/SourceWaterPrograms/SourceWaterProtection.htm>.

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. VDH-ODW service areas map and staff contact information is available at <http://www.vdh.virginia.gov/odw/ContactUs.htm>.

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 a preliminary 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 (GWMA) 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.

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 GWMA must obtain a groundwater withdrawal permit.

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 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.

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 <http://www.dpor.virginia.gov/LicenseLookup/>.

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 the sampling requirements with your licensed water well system provider in order to have the necessary sample containers on hand. These procedures are described in Step 5.

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	<ul style="list-style-type: none"> • 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 IIB*	<ul style="list-style-type: none"> • 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

*Class IIA wells are not typically approved by VDH-ODW.

Wells In Rock Class IIB 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 Water Well Completion Report (GW-2 Form) for all new, rehabilitated, and abandoned wells.

Water well system providers may submit GW-2 Forms through the internet reporting website, VA Hydro: <http://deg2.bse.vt.edu/d.dh/?q=user>. VA Hydro can be used from mobile devices, provided you have access to the internet.

Additional information about background, login credentials, resolving issues and submitting the GW-2 data electronically on VA Hydro can be found on DEQ's website at:

<http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/On-LineDataReporting.aspx>.

A copy of the GW-2 Form is also 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, it 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. Once the decision is made to not place the well into service, it should be promptly abandoned. Wells that are not properly abandoned increase the risk of contamination of the aquifer(s).

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>

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. Generally, the yield and drawdown test duration required by VDH-ODW is at least 48 hours.¹ DEQ may require additional testing procedures for wells located in the Coastal Plain (GWMA). 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

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 no less than two hours or until the well returns to its static water level, whichever occurs first. A standard Well Yield and Recovery Report form is available at <http://www.vdh.virginia.gov/ODW/PermitandDesign.htm>

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 DCLS certified labs is available at <http://www.dgs.virginia.gov/DivisionofConsolidatedLaboratoryServices/Services/LaboratoryCertification/tabid/508/Default.aspx>.

If you would like to use DCLS for your well development testing, the Office of Drinking water can assist with coordinating with DCLS 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



Sampling Challenges

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.

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.

methods are used during the collection of these samples in order to avoid accidentally contaminating a sample.

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 may 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.

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

<http://www.epa.gov/your-drinking-water/table-regulated-drinking-water-contaminants>

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. Additional information regarding permits can be found at <http://www.vdh.state.va.us/ODW/PermitandDesign.htm>.

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.

A PER is necessary for new sources with difficult water quality issues such as arsenic, nitrates, and high dissolved solids. The PER 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 (PE) and submitted to the VDH-ODW Field Office. An exemption to the PE requirement is allowed under specific conditions for Transient Noncommunity waterworks. 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 is required for all waterworks wells, unless an exception has been granted. Under certain circumstances, ODW may grant an exception to the well lot plat and dedication document for non-community waterworks. Exceptions will not be granted for community waterworks 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. Templates are available at <http://www.vdh.virginia.gov/ODW/PermitandDesign.htm>.

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.

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. For a 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!



**DEPARTMENT OF HEALTH
OFFICE OF DRINKING WATER**

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 there any Potential Sources of Contamination (PSCs) within 1000 ft radius from well (from PreSWA and site inspection findings)? Y N

If applicable, describe any PSCs not included in PreSWA:

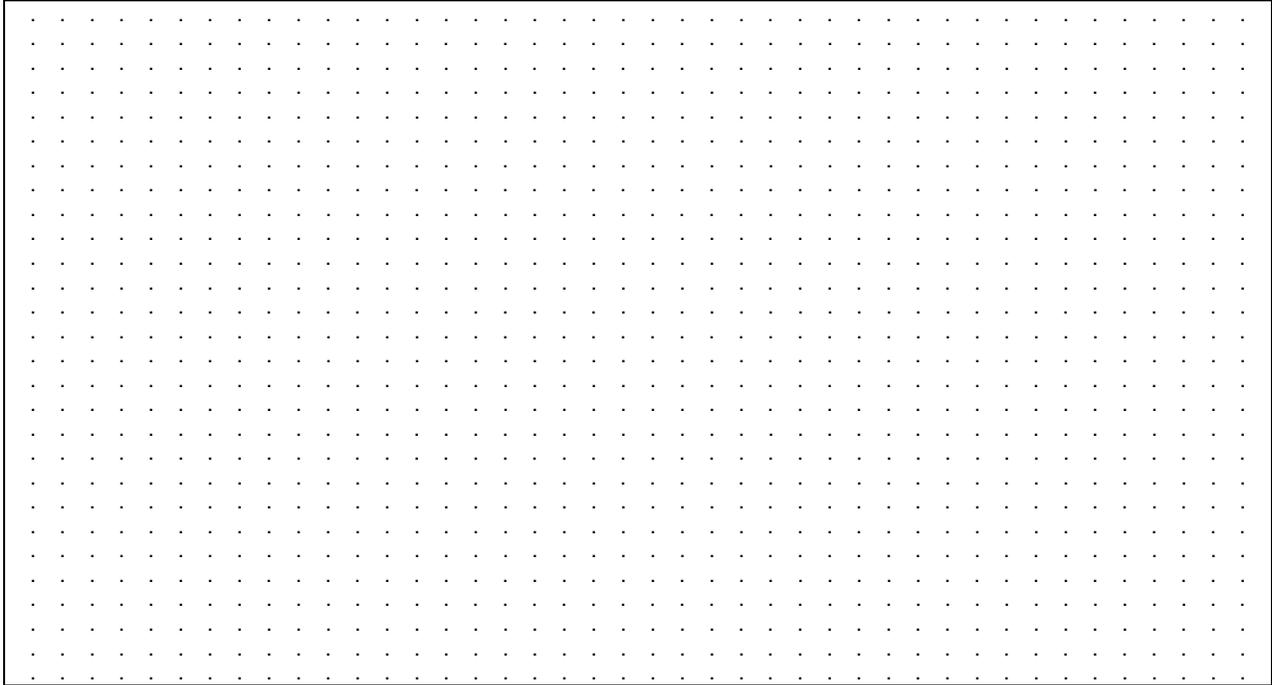
Does the PreSWA or site inspection indicate a risk of SOC contamination? Y N

Will topography within 1000 ft radius from well direct contamination towards the well? Y N

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
		<input type="checkbox"/> ODW Protocol for _____ hours <input type="checkbox"/> DEQ Protocol (Groundwater Management Area permittees ONLY)				<input type="checkbox"/> MPN Qty _____ <input type="checkbox"/> IOC <input type="checkbox"/> Metals <input type="checkbox"/> Nitrate <input type="checkbox"/> Nitrite <input type="checkbox"/> VOCs <input type="checkbox"/> Radiological <input type="checkbox"/> SOC Carbamates <input type="checkbox"/> SOC Chlor Acid Herb <input type="checkbox"/> SOC Diquat <input type="checkbox"/> SOC Semi-Volatile <input type="checkbox"/> SOC Volatile Fumigants <input type="checkbox"/> Cyanide
		<input type="checkbox"/> ODW Protocol for _____ hours <input type="checkbox"/> DEQ Protocol (Groundwater Management Area permittees ONLY)				<input type="checkbox"/> MPN Qty _____ <input type="checkbox"/> IOC <input type="checkbox"/> Metals <input type="checkbox"/> Nitrate <input type="checkbox"/> Nitrite <input type="checkbox"/> VOCs <input type="checkbox"/> Radiological <input type="checkbox"/> SOC Carbamates <input type="checkbox"/> SOC Chlor Acid Herb <input type="checkbox"/> SOC Diquat <input type="checkbox"/> SOC Semi-Volatile <input type="checkbox"/> SOC Volatile Fumigants <input type="checkbox"/> Cyanide
		<input type="checkbox"/> ODW Protocol for _____ hours <input type="checkbox"/> DEQ Protocol (Groundwater Management Area permittees ONLY)				<input type="checkbox"/> MPN Qty _____ <input type="checkbox"/> IOC <input type="checkbox"/> Metals <input type="checkbox"/> Nitrate <input type="checkbox"/> Nitrite <input type="checkbox"/> VOCs <input type="checkbox"/> Radiological <input type="checkbox"/> SOC Carbamates <input type="checkbox"/> SOC Chlor Acid Herb <input type="checkbox"/> SOC Diquat <input type="checkbox"/> SOC Semi-Volatile <input type="checkbox"/> SOC Volatile Fumigants <input type="checkbox"/> Cyanide
		<input type="checkbox"/> ODW Protocol for _____ hours <input type="checkbox"/> DEQ Protocol (Groundwater Management Area permittees ONLY)				<input type="checkbox"/> MPN Qty _____ <input type="checkbox"/> IOC <input type="checkbox"/> Metals <input type="checkbox"/> Nitrate <input type="checkbox"/> Nitrite <input type="checkbox"/> VOCs <input type="checkbox"/> Radiological <input type="checkbox"/> SOC Carbamates <input type="checkbox"/> SOC Chlor Acid Herb <input type="checkbox"/> SOC Diquat <input type="checkbox"/> SOC Semi-Volatile <input type="checkbox"/> SOC Volatile Fumigants <input type="checkbox"/> Cyanide

WM 813 Attachment 3 Well Site Approval/Rejection Letter

INSTRUCTIONS: Complete / select items shown with *italics*, and convert to regular font. Print on VDH letterhead. Pages are 1" top, bottom, and side margins.

SUBJECT: County/City
Waterworks: Waterworks Name
PWSID No: PWSID

Date

Waterworks Owner

Address 1

Address 2

City, State, Zip

Dear Waterworks Owner:

This letter provides the results of our date of inspection inspection of the proposed well site(s) to serve describe service area or state the existing waterworks name. In accordance with the *Waterworks Regulations*, the following well site(s) is(are) tentatively approved by the Virginia Department of Health Office of Drinking Water (VDH-ODW) for the construction of a well to be utilized as a public drinking water supply:

List approved well site(s) or use none

The approval of the well site(s) listed above expires 12 months from the date of this letter, and is subject to the conditions described in the attached Well Site Approval Conditions Form(s). This approval is limited to well drilling, casing, grouting, and testing of the well. If drilling of any well(s) listed above has not commenced by the expiration date, a re-inspection of the well site(s) is required.

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 the *Waterworks Regulations*. Construction of the waterworks facilities shall not be started until the construction permit has been issued.

Waterworks wells must be constructed by a licensed Water Well Systems Provider in Virginia. You may confirm licensure status by contacting the Virginia Department of Professional and Occupational Regulation (DPOR) or using the search tool on DPOR's website at the following address:
<http://www.dpor.virginia.gov/LicenseLookup/>.

A Preliminary Source Water Assessment (PreSWA) has been compiled for the proposed well(s). Attached you will find inventory, maps and summaries of geology, soil type, land use and potential sources of contamination within the assessment area of the proposed well(s). Please take the time to review this information and contact me if you have any questions or corrections. This information may be used to generate a Source Water Assessment and Protection Report if desired.

Upon request, an electronic version of the Preliminary Source Water Assessment information may be emailed to you. If you or your consultant has GIS software, we can also provide a geodatabase to facilitate further work with the data. To learn more about our Source Water Assessment and Protection Programs, as well as eligibility for assistance and funding opportunities to implement source water

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protection measures, we encourage you to visit our website at the following address:

<http://www.vdh.virginia.gov/ODW/SourceWaterPrograms/index.htm>.

If applicable:

The following well site(s) was(were) rejected by VDH-ODW:

List rejected well site(s) and explain why, or use none

Please contact me if you have further questions or need to coordinate a preliminary engineering conference to discuss water supply alternatives as a result of the rejected well site(s).

Sincerely,

Name & Title

Field Office Name

Enclosures:

Well Approval Conditions Form

Preliminary Source Water Assessment(s)

Cc/w Encl: VDH-ODW-Central

Director Name, County Health Department

County Administrator

County Building Official

WM 813 Attachment 3 Well Site Approval/Rejection Letter

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WELL APPROVAL CONDITIONS FORM

Approved Well(s)	{ Well ID }	{ Well ID }	{ Well ID }	{ Well ID }
Location:	Latitude:			
	Longitude:			
	Marked: {e.g., <i>Blue Flagging Tape</i> }			
Well Construction Class:	{ <i>Class II-B or Class I</i> }			
Approval Expiration Date:	{ <i>Insert date</i> } If drilling of the well has not commenced by this date, re-inspection of the well site is 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. { <i>100 foot setback from petroleum or chemical storage tanks or pipes is required if plastic well casing.</i> } See attached (<i>sketch, topographic map, photo, etc.</i>).			
	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, in accordance with <i>Waterworks Regulations</i> . 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.			
Well Capacity Test	A yield and drawdown test must be run for at least { <i>select one:</i> } <ul style="list-style-type: none"> • 48 hours • 24 hours approved reduced time for noncommunity waterworks • approved reduced time (no less than 8 hours) for noncommunity waterworks requiring less than 3 gpm. 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 (<i>name</i>) Regional Office to determine if a discharge permit is required.			

WM 813 Attachment 3 Well Site Approval/Rejection Letter

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<p>Simultaneous Testing Required:</p>	<p>Because the proposed well is located within close proximity of existing well(s) (<i>name</i>), monitoring of the water level of the nearby well(s) should be conducted during the yield pump test. If the water level in the nearby well drops, a simultaneous pump test may be required. This will assure better information with which to determine the safe yield of both sources.</p>
<p>Well in Groundwater Management Area:</p>	<p>This waterworks is located in a Groundwater Management Area as declared by the State Water Control Board. Prior to well construction and testing, contact the Department of Environmental Quality (DEQ) Central Office for further information on the Groundwater Withdrawal Permit requirements and procedures. DEQ may have additional requirements regarding well construction and testing beyond those required by the Office of Drinking Water.</p> <p>For more information, visit DEQ's website at the following address: http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/GroundwaterPermitting.aspx.</p>
<p>Required Bacteriological, Chemical, Physical and Radiological Sampling:</p>	<p>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.</p> <p><i>{For 48 and 24 hour yield testing:}</i> One bacteriological sample should be collected at minimum thirty minute intervals during the last ten hours of the yield and drawdown test.</p> <p><i>{For less than 24 hour yield testing:}</i> One bacteriological sample should be collected at minimum (<i>enter numerical number</i>) minute intervals during the last (<i>enter numerical number</i>) hours of the yield and drawdown test. These samples must be analyzed by the total coliform and <i>E. coli</i> Most Probable Number (MPN) test method.</p> <hr/> <p><i>{For Community and NTNCs:}</i> Water samples must be collected and analyzed for cyanide, nitrate + nitrite (combined), inorganic chemicals, metals, radiological (<i>radiological tests are not required for NTNCs</i>), and volatile organic chemicals. The chemical samples should be collected near the end of the pump test, prior to the recovery period.</p> <p><i>{For TNCs:}</i> Water samples must be collected and analyzed for nitrate + nitrite (combined). It is recommended that samples be analyzed for inorganic chemicals and metals also. (<i>Based on the PreSWA results, ODW staff may also recommend sampling for radiological, VOCs and SOCs</i>)</p> <hr/> <p><i>{For Community and NTNCs:}</i> The wellhead area has been found to be vulnerable to contamination by synthetic organic chemicals (SOCs) due to (<i>list potential contamination</i>). Water samples must be collected to analyze for SOCs. The samples should be collected near the end of the pump test, prior to the recovery period.</p> <p><i>or</i></p> <p>As the wellhead area does not appear to be vulnerable to contamination by synthetic organic chemicals (SOCs), SOC sampling is not required.</p>

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INSTRUCTIONS: Complete / select items shown with *italics*, and convert to regular font. Print on VDH letterhead. Pages are 1” top, bottom, and side margins.

<p>Submittals Required Prior to Issuance of Construction Permit:</p>	<p>Water Well Completion Report (GW-2)</p>
	<p>Well yield, drawdown, and well recovery test results</p>
	<p>Results of required bacteriological and chemical sampling (if not reported directly by laboratory)</p>
	<p>Recorded plat of the well lot, and a recorded deeded 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.</p>
	<p><i>{For applicable non-community system:}</i> You may request, in writing, for an exception to the <i>Waterworks Regulation</i> requirement for a recorded plat of the well lot and deeded dedication document for the well lot.</p>
	<p>Construction permit application</p>
	<p>Final construction plans and specifications, including design calculations, prepared by a licensed professional engineer. A Preliminary Engineering Report may be required prior to submission of final construction documents.</p> <p><i>{For applicable TNCs – See Permit Manual for guidance:}</i> Plans for construction permits for transient non-community waterworks may be exempt from the Professional Engineer licensure requirements under certain conditions.</p>