Dug Well Construction and Maintenance

Planning a Water Supply

A dependable water supply is critical for any farm operation. Groundwater is an important source of water on many farms in Nova Scotia, but the pumping rate, mineral quality and the expense of construction (related to well depth) can vary across the province.

Before investing in new farm infrastructure, it is advised that a plan for the new water supply be developed. A new greenhouse or barn is worth little without an adequate supply of potable water. As part of the plan, determine how much water will be needed in peak periods, what the potential for groundwater withdrawal is in your area, and where the well should be constructed to provide the best water supply and meet regulations, i.e. construction must not alter the bed or bank of a watercourse or impact on the function of an existing wetland. Wetlands and watercourses can be viewed using the Provincial Landscape Viewer.

The Nova Scotia Well Logs Database provides valuable information on more than 125,000 water wells in the province, including information on well type, locations, underlying geology, depth and yield. The database can be searched on-line or downloaded from the Nova Scotia Environment and Climate Change (NSECC) website. Well logs can be searched by community and provide insight into the variability (or consistency) of water sources in the area.

Well Construction

In Nova Scotia, under the *Well Construction Regulations*, anyone constructing or repairing a water well must have a current certificate of qualification from Nova Scotia Environment and Climate Change. A searchable list of certified well drillers, diggers and pump installers is available on the NSECC website.

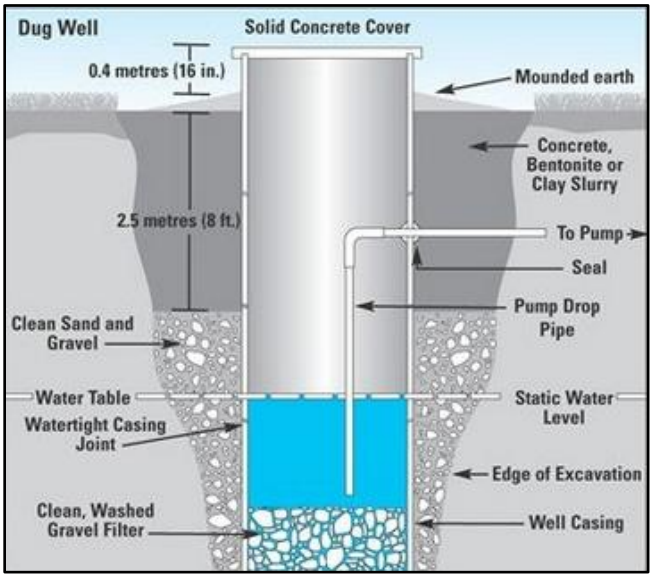

Figure 1: Dug well construction (apron not illustrated)

Dug Wells

A dug well consists of an excavated hole into a shallow aquifer typically 4.5 to 8 m (15 to 25 ft) deep. Dug wells were traditionally lined with rock but now use concrete crocks. The crocks prevent the collapse of the excavated walls and, along with an apron and seal, reduce surface contaminants from entering the water supply.

The hole is either lined with crocks to the bottom, or crocks at the top and rocks at the bottom, and the crocks are backfilled. Once the well is completed, it is bailed or pumped to determine yield. After disinfection (i.e. chlorine bleach), the well is capped to provide sanitary protection until it is hooked into the user's system.

Regulatory requirements for dug wells include the following specifications, although variances may be granted under some conditions:

- The well casing consists of precast concrete rings. It extends at least 152 mm (6 in) above the land surface, and drainage is away from the well. At least the top 1.8 m (6 ft) of casing consists of concrete rings or poured reinforced concrete or brick lining.

- A concrete apron at least 152 mm (6 in) thick is constructed around the well below the frost line, extending a minimum distance of 914 mm (3 ft) from the perimeter of the well. Minimum slope of the apron is 21 mm/m (0.25 in/ft). Above this apron, all joints in the casing are made watertight, either with sand and cement mortar mix, or with a certified non-toxic flexible sealing compound.
- The space between the well casing and the geologic material around it from the bottom of the well to the apron is filled with clean washed gravel, sand, crushed rock, or small boulders. From above the apron to the land surface is backfilled with cement or bentonite grout or equivalent commercial slurry, clay slurry, or puddled clay to prevent the direct entry of surface water into the well.

Figure 2: Dug well

Advantages of Dug Wells

- A dug well is typically less expensive than drilling
- Water from shallow sand and gravel deposits is less likely to have mineral issues associated with bedrock aquifers, e.g. gypsum deposits.
- It may be easier to find a well digger than a well driller as there are usually more well diggers within a community
- Large water storage volume in crocks and gravel reservoir. Two (or more) wells can be constructed and connected to increase storage.

Disadvantages of Dug Wells

- May be more susceptible to contamination from surface and near-surface sources, e.g. bacteria, applied nutrients or septic systems. Water treatment (e.g. UV light) is usually recommended
- Affected by seasonal water table fluctuations
- Well can run dry with high water use
- Depth of well limited by method of installation
- Maximum yields are often low due to geology

Importance of Water Testing

Bacterial contamination of dug wells has the potential to seriously impact the health of livestock and humans who consume the water. Therefore, it is important to test water quality for bacteria on a regular basis to ensure that the water supply is safe to consume. Typically, on-farm food safety programs (i.e. CanadaGAP) only require bacteria testing to be completed. Mineral quality, including nitrate, should also be tested every two years.

NSECC has produced the Drop on Water factsheet series. These factsheets provide information on different water quality parameters, such as bacteria and chemicals, that may be present in well water, as well as general information to protect drinking water supplies.

The Drinking Water Interpretation Tool compares water sample results to Health Canada drinking water quality guidelines and provides links to additional sources of information.

Water Use - Water Withdrawal Approvals

Under the *Environment Act*, a Water Withdrawal Approval is required if water use exceeds 23,000 L (5060 gal) per day from a single water source for a period of more than two weeks.

References:

- Before You Construct a Water Well – NSECC publication
- The Drop on Water – NSECC Fact Sheets
- Analytical Lab - NSDA

For additional information and resources:

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