April 2014

Technical Bulletin

Wells Regulation – Site Considerations & Initial Planning for Test Holes & Dewatering Wells

This technical bulletin is one in a series of seventeen [1] on well issues created for a person who:

- may have a new test hole [2] or dewatering well [3] constructed in the future, or
- currently owns a test hole or dewatering well.

The purpose of this technical bulletin is to summarize the information found in the *Test Holes and Dewatering Wells – Requirements and Best Management Practices* manual published by the Ministry of the Environment, April 2014 **(hereon in referred to as the "Manual")** regarding initial considerations for locating test holes and dewatering wells and the legislation for siting a test hole or dewatering well.

Test holes and dewatering wells are used in projects such as:

- assessing groundwater conditions for property transfers,
- assessing groundwater conditions for proposed waste disposal applications,
- assessing groundwater conditions for large and small drinking water systems,
- delineating wellhead protection areas,
- assessing the presence or absence of contamination and its extent,
- creating, refining and verifying a three-dimensional, conceptual site model,

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[1] A list of the seventeen technical bulletins is shown in the Additional Information Sources section near the end of this technical bulletin.

[2] A "test hole" means a well that, (a) is made to test or to obtain information in respect of ground water or an aquifer, and (b) is not used or intended for use as a source of water for agriculture or human consumption, subsection 1(1) of the Wells Regulation, e-laws: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900903_e.htm

[3] A "dewatering well" means a well that is not used or intended for use as a source of water for agriculture or human consumption and that is made, (a) to lower or control the level of ground water in the area of the well, or (b) to remove materials that may be in the ground water, subsection 1(1) of the Wells Regulation, e-laws: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900903_e.htm

- lowering and controlling groundwater levels, and
- remediating contaminated sites using techniques such as vapour extraction, and pump and treat systems.

Before the drill, auger or excavator goes in the ground, a comprehensive planning process is key to identify the right location for the test hole or dewatering well.

Inexact or incomplete characterization of the geology or hydrogeology, poor definition of the contaminant distribution on contaminated sites or waste disposal sites, or inadequate collection of data can result in:

- the improper placement of monitoring wells,
- an inadequate number of monitoring wells
- improper chemical analyses,
- ineffective remediation methods, and
- an improper dewatering system design (e.g., ineffective dewatering system, overburden collapse or unanticipated interference problems).

It is important to adequately assess the physical conditions of the overburden and bedrock geology and the hydrogeological characteristics of the formations to define contaminant sources, pathways and receptors. This determines the proper site monitoring for long-term exposure risks and site remediation. Wells play an important part in all aspects of initial site characterization, long-term monitoring and remediation.

The determination of the physical conditions of the overburden and bedrock geology and the hydrogeological characteristics of the formations will also help a project team to design a dewatering system to lower and control groundwater levels around a construction excavation or to collect contaminated groundwater at a contaminated site.

Improperly constructed and located wells create a high potential for cross-contamination by mobilizing the contaminant plume or by creating a pathway for contaminants to move. It is important that the well location and the construction be such that there is a reduced risk of surface water or contaminants entering the well and reaching the groundwater or of contaminants moving between water bearing zones.

Cradle to Grave Approach to Test Holes and Dewatering Wells

Test holes or dewatering wells are commonly found on sites where there are problematic and sometimes hazardous environmental conditions. The Ministry of the Environment frequently encounters sites where the person constructing the well, project manager and owner of the land have failed to meet their responsibilities and the well degrades and become pathways for contaminants. Therefore, as a best management practice, it is

important for a person involved in well design or construction to take a "cradle to grave" approach with every well installed for an environmental investigation, groundwater research project, remediation project or dewatering project. The cradle to grave approach means that the entire life cycle of a well is considered and properly managed from initial design and construction to maintenance and ultimately abandonment.

See Chapter 5 of the Manual: *Siting Considerations and Initial Planning* for further information on the Cradle to Grave best management practice.

Considerations for Test Holes Constructed as Part of Preliminary Data Collection Systems

It is important that data collection systems include the construction of preliminary test holes to obtain groundwater information such as groundwater levels, hydraulic conductivity, formation transmissivity and concentrations of parameters of interest from water samples. In addition, the test holes may be used to collect overburden, bedrock, gas, or free product samples. Many different considerations should be taken into account before choosing the well construction equipment and location of the well. These different considerations are listed in Chapter 5 of the Manual: *Siting Considerations and Initial Planning*.

Considerations of Ministry of the Environment Legislated Approval Instruments

Permit to Take Water

If groundwater is anticipated to be taken (e.g. pumped) or is anticipated to be discharging from a well during construction at a volume of more than 50,000 litres (11,000 Imp gal) on any one day, a Permit to Take Water (PTTW) under the *Ontario Water Resources Act* may be required.

If it is anticipated that a PTTW will be required during well construction, an application for a PTTW should be submitted well in advance of the undertaking. Presently, an application may require scientific reports to support the application. The application, once submitted with sufficient supporting documentation, typically takes up to 90 days but may be longer depending on consultation and other factors, for the Ministry to process and make a decision on whether or not to issue a permit.

If an unanticipated flow of groundwater occurs at more than 50,000 Litres (11,000 imperial gallons) on any one day, contingencies should be in place to deal with this issue including immediately reporting the situation to the nearest Ministry of the Environment office and taking measures to control or stop the flow of water.

More information on PTTW approvals can be found on Ontario.ca.

Discharges

During well construction, it is important that the discharges of any groundwater, drill cuttings and other material from the well do not cause environmental impacts such as erosion, impairment of surface water bodies or off-site flooding. This may require the use of settling ponds on the property. A sewage works environmental compliance approval under the *Ontario Water Resources Act* may be required if the person constructing the well discharges the water, drill cuttings or other material off the well owner's property or if the discharge capacity exceeds 10,000 litres (or 2,200 imperial gallons) per day on the property. It is important for the person to determine if an environmental compliance approval is required before discharging the water, drill cuttings or other material from the well. A guide to explain the sewage works process can be found on Ontario.ca.

Waste Generation & Characterization

During well construction, it is important to consider any approvals or legislation related to the generation of any groundwater, drill cuttings and other material that may be contaminated and deemed hazardous waste. Ontario has a comprehensive legislative and regulatory framework to help manage hazardous wastes in an environmentally safe manner. Through the Environmental Protection Act (EPA) and accompanying regulations, the Ministry of the Environment (MOE) has established a cradle to grave management system, which includes the systematic control of collection, storage, transportation, treatment, recovery and disposal of this waste.

More information on hazardous waste identification, generation, storage and disposal, can be found on Ontario.ca.

Considerations for Long-Term Monitoring Wells & Remediation Wells

Based on the preliminary data collection, management and interpretation, a three-dimensional conceptual site model (CSM) can be validated or if necessary revised. The validated or revised CSM can be used to develop long term monitoring and remediation plans, which include considerations related to test holes such as the proper location, design and instrumentation needed to meet the project objectives. A more comprehensive list of considerations is presented in Chapter 5 of the Manual: *Siting Considerations and Initial Planning*.

Considerations for Test Holes and Monitoring Wells Constructed as Part of an Environmental Site Assessment for a Record of Site Condition

One of the objectives of the planning of the site investigation component of a phase two environmental site assessment is to develop a sampling and analysis plan that will adequately assess all areas of the phase two property where contaminants may be present in land or water on, in or under a property. Anyone working on a phase two property should consult O. Reg. 153/04 prior to beginning any work (http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_040153_e.htm).

This section provides an overview of the requirements related to initial planning of test holes and monitoring wells for a phase two environmental site assessment (ESA) under the Records of Site Condition (RSC) regulation starting on July 1, 2011. Requirements that are not related to test holes and monitoring wells are not included.

Starting on July 1, 2011, amendments to O. Reg. 153/04 came into force and apply to phase two environmental site assessments (ESAs) conducted in support of records of site conditions (RSCs). For any such RSC submitted on or after this date, a qualified person must:

- ensure that the sampling and analysis plan includes a quality assurance and quality control program, data quality objectives, standard operating procedures and a description of any physical impediments that interfere with or limit the ability to conduct sampling and analysis
- develop standard operating procedures for the field investigation methods including:
    - hole drilling,
    - excavating,
    - monitoring well installation,
    - monitoring well development,
    - field measurement of water quality indicators, including calibration procedures,
    - soil sampling, and
    - groundwater sampling
- ensure the sampling and analysis plan includes identification of, and rationale and procedures for:
    - the choice of sampling system, such as a judgmental, random or grid sampling system,

    - sampling depth intervals, including the screened intervals of the monitoring wells, and
    - other field information to be obtained, including water levels, field measurements, and elevation surveying

- ensure the groundwater sampling method to be used to characterize contamination or determine if the concentration of a contaminant is above, at or below an applicable site condition standard or standard specified in a risk assessment for the contaminant, meet the following:

    - sampling depth intervals, including the screened intervals of monitoring wells must be positioned, within the geologic formation in which a contaminant may be present so as to:
        - isolate the zones where contaminants may be present, and
        - delineate both dissolved and separate phase contaminants

- ensure that where petroleum hydrocarbons or light non-aqueous phase liquids may be present on, in or under the phase two property, sampling depth intervals, including screened intervals of monitoring wells, are positioned to intersect the water table
- ensure that where a monitoring well is being used, monitoring well screens do not exceed 3.1 m (10') in length, based on the saturated length of the screen
- determine the groundwater flow direction during the site investigation. This includes:

    - determining a reference elevation for each monitoring well reported to the nearest centimetre relative to a geodetic or permanent and recoverable benchmark, and
    - installing a minimum of three monitoring wells, not placed in a straight line, in each aquifer to be investigated, at locations and in a manner appropriate to interpret horizontal flow directions.

There are additional obligations for plans and procedures. For further details please refer to O. Reg. 153/04 for RSC requirements (http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_040153_e.htm).

For clarification on the term "monitoring well" [4] in the Records of Site Condition regulation, see Chapter 2 of the Manual: *Definitions & Clarifications*, Table 2-2.

[4] A "monitoring well" means a well that is a test hole as defined in Regulation 903 of the Revised Regulations of Ontario 1990 (Wells) made under the Ontario Water Resources Act, subsection 22(1) of Ontario Regulation 153/04 as amended made under the Environmental Protection Act,

Considerations for Dewatering Wells used to Lower or Control the Groundwater Level

Based on the preliminary data collection, management and interpretation, a three-dimensional conceptual site model can be validated or if necessary revised. The validated or revised CSM can be used to develop a dewatering plan to lower or control the area's groundwater level to the needed elevation which includes considerations related to the dewatering well such as appropriate depth, construction method and discharge line characteristics. A more comprehensive list of considerations is presented in Chapter 5 of the Manual: *Siting Considerations and Initial Planning*.

Exemption from Set Back Distances

Persons constructing test holes and dewatering wells are exempt from the setback distance requirements in the Wells Regulation to allow for groundwater testing, monitoring and rehabilitation projects near sources of contamination.

Even though a test hole or dewatering well can be constructed on land that is an agricultural operation with a nutrient management plan, starting on January 1, 2011, the General regulation (Regulation 267/03 as amended made under the Nutrient Management Act) prohibits a person from applying:

- an agricultural or non-agricultural source material [5] to land within 15 metres of a test hole or dewatering well if the well has a depth of at least 15 metres and a watertight casing from the ground surface to at least 6 metres below the ground surface,
- a non-agricultural source material that is both CM1 [6] and CP1 [5] or an agricultural source material to land within 30 metres of the test hole or dewatering well that does not meet the casing and depth requirements of the first bullet,
- a non-agricultural source material that is CM2 [5] or CP2 [5] to land within 90 metres of the test hole or dewatering well that does not meet the casing and depth requirements of the first bullet, and

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R.S.O. 1990, c. E. 19, E-laws - http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_040153_e.htm

[5] Definitions section and section 46 of Ontario Regulation 267/03 (General) as amended made under the Nutrient Management Act, 2002, S.O. 2002, c. 4 (www.e- laws.gov.on.ca/html/source/regs/english/elaws_regs_0300267_e.htm)

[6] Definitions section and section 46 of Regulation 267/03 (General) as amended made under the Nutrient Management Act, 2002, S.O. 2002, c. 4 (www.e-laws.gov.on.ca/html/source/regs/english/elaws_regs_0300267_e.htm)

- a commercial fertilizer or compost that meets the Compost Guidelines to land within 3 metres of the test hole or dewatering well.

See the Definitions section and section 46 of Regulation 267/03 (General) as amended made under the Nutrient Management Act, 2002, S.O. 2002, c. 4 (http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_030267_e.htm) for further information.

Best Management Practice [7] – Setback Distance of a Test Hole or a Dewatering Well to Water Supply Wells

As a preventative measure, the following separation distances between a test hole or dewatering well and water supply wells are recommended:

- The test hole and any existing water supply wells should be separated by at least 15 m (50′). This will reduce the risk of contamination of the existing water supply well if the test hole inadvertently becomes a pathway for contamination.

- The dewatering well and any existing water supply wells should be separated by at least 15 m (50') or a distance that is outside of a predicted radius of influence, whichever is greater. The location should reduce the risk of a quantity interference problem with an existing water supply well due to the pumping of the dewatering well and reduce the risk of contamination of the existing water supply well if the dewatering well inadvertently becomes a pathway for contamination.

[7] Best management practices are recommended actions or steps that exceed the minimum regulatory requirements to better protect the groundwater and the natural environment but are not enforceable.

Best Management Practices - Accessibility and Low-Lying Areas

The site of a test hole or dewatering well should be chosen so that the well is:

- accessible for cleaning, treatment, repair, testing, inspection and visual examination at all times before, during and after completion of construction of the well, and
- not placed in any low-lying area of a site where surface water could accumulate. Care should be taken to ensure that test holes or dewatering wells are not installed in locations that are subject to periodic flooding.

Exempted Wells & Shallow Works

The Wells Regulation exempts certain types of wells, such as a pond or trench, from the Wells Regulation and from the sections on licensing of the Ontario Water Resources Act that pertain to wells [8].

A person who constructs, maintains or abandons a shallow works that meets the conditions set out in section 1.1 of the Wells Regulation:

- is exempt from the sections on licencing of the Ontario Water Resources Act that pertain to wells [6], and
- need only meet the requirements found in section 1.1 of the Wells Regulation.

The shallow works exemption contained in section 1.1 of the Wells Regulation does not apply to a monitoring well that is constructed as part of a phase one or two environmental site assessment for a record of site condition [9].

See the *Wells Regulation – Understanding a Well, Test Hole and Dewatering Well* and *Wells Regulation – Shallows Works* technical bulletins for further information.

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[8] Sections 36 to 50 of the Ontario Water Resources Act, R.S.O. 1990, c. O. 40, e-laws: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm

[9] Ontario Regulation 153/04 as amended made under the Environmental Protection Act, R.S.O. 1990, c. E. 19, e-laws: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90e19_e.htm

Water Supply Wells

Certain licensing and construction requirements for water supply wells are different from the requirements for test holes and dewatering wells as defined by the Wells Regulation. For further information on the requirements for water supply wells see the *Water Supply Wells – Requirements and Best Management Practices* manual, published by the Ministry of the Environment, December 2009 and the Wells Regulation.

Further Information on Initial Planning

Further detailed information on environmental site characterization and initial planning for test holes and dewatering wells can be found in the *Practical Handbook of Environmental Site Characterization and Groundwater Monitoring*, 2nd Edition, Edited by D. Nielson, 2006.

Further detailed information on groundwater lowering or control can be found in *Construction, Dewatering and Groundwater Control New Methods and Applications 3rd Edition*, Powers, J. Patrick et al. 2007.

Additional Information Sources

The seventeen technical bulletins on test holes and dewatering wells are:

- Wells Regulation – Understanding the Meaning of Well, Test Hole and Dewatering Well
- Wells Regulation – Shallow Works Test Holes & Dewatering Wells
- Wells Regulation – Exempted Activities Performed on Wells, Including Test Holes & Dewatering Wells
- Wells Regulation – Test Hole and Dewatering Well Licensing
- Wells Regulation – Licensing (Class 5) for Individuals who Perform Tests on Wells
- Wells Regulation – Site Considerations & Initial Planning for Test Holes & Dewatering Wells
- Wells Regulation – Constructing New Uncased Test Holes & Dewatering Wells in Operation for No Longer than 30 Days
- Wells Regulation – Constructing New Test Holes & Dewatering Wells in Operation for No Longer than 180 Days
- Wells Regulation – Constructing New Test Holes & Dewatering Wells
- Wells Regulation – Constructing New Multi-level Monitoring Test Holes
- Wells Regulation – Completing the Structure of the New Test Hole or Dewatering Well
- Wells Regulation – Flowing Test Holes & Dewatering Wells

- Wells Regulation – Test Hole & Dewatering Well Maintenance
- Wells Regulation – Well Record, Reporting & Tagging for a Test Hole & Dewatering Well
- Wells Regulation – Test Hole & Dewatering Well Repairs & Alterations
- Wells Regulation – Well Abandonment - When to Plug & Seal a Test Hole or Dewatering Well
- Wells Regulation – Well Abandonment - How to Plug & Seal a Test Hole or Dewatering Well

These technical bulletins are available on Ontario.ca.

Further information on site considerations and initial planning can be found in Chapter 5 of the Manual: *Siting Considerations and Initial Planning*.

A copy of the *Test Holes and Dewatering Wells – Requirements and Best Management Practices* manual can be obtained on Ontario.ca.

A copy of the Ontario Water Resources Act, Wells Regulation and other regulations can be obtained from the e-Laws website at www.e-laws.gov.on.ca.

The publications are also available by calling the Publications Information Centre at 1-800-565-4923 or (416) 325-4000.

For further information about wells, contact the Wells Help Desk at 1-888-396-9355 (Well) or the nearest Ministry of the Environment office listed in the blue pages of the telephone directory.

Notice: This bulletin is being provided for information purposes only and is not intended, nor should it be construed as providing legal advice in any circumstances. The applicable environmental legislation, including the following, should be consulted.

- ***Ontario Water Resources Act, R.S.O. 1990, c. O. 40***
- ***R.R.O. 1990, Regulation 903 (Wells) as amended made under the Ontario Water Resources Act, R.S.O. 1990, c. O. 40***
- ***Ontario Regulation 153/04 as amended made under the Environmental Protection Act, R.S.O. 1990, c. E. 19***

Legislation and regulations change from time to time so it is essential that the most current versions be used.

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