

REGION OF PEEL

PUBLIC WORKS DESIGN, SPECIFICATIONS & PROCEDURES MANUAL

LINEAR INFRASTRUCTURE

GUIDELINES FOR HYDROGEOLOGIC ASSESSMENT AND REPORTING REQUIREMENTS

NEW DEVELOPMENTS ON MUNICIPAL SERVICES

REVISED JULY 2009

**Guidelines for Hydrogeologic Assessment and Reporting Requirements
New Developments on Municipal Services**

TABLE OF CONTENTS

1. GENERAL	1
1.1 Rationale	1
2. DEVELOPMENT AND ENVIRONMENTAL ISSUES	2
3. OBJECTIVES FOR HYDROGEOLOGIC ASSESSMENTS AND REPORTING	3
4. RECOMMENDED STUDY APPROACH.....	4
5. SITE SPECIFIC HYDROGEOLOGIC ASSESSMENT	5
5.1 Investigation and Monitoring.....	5
5.2 Recommended Components of Hydrogeologic Assessment, Monitoring.....	6
6. IMPACT RESOLUTION AND MANAGEMENT	10

APPENDIX A

APPLICATION(S) OF GUIDELINES FOR CLEARANCE OF STANDARD DRAFT CONDITIONS, NEW DEVELOPMENTS ON MUNICIPAL SERVICES	11
--	-----------

1.0 GENERAL

In order to guide new developments in Peel through hydrogeologic data acquisition and reporting, the Region developed guidelines that set out the recommended study components and information requirements to help assess and mitigate potential impacts of developments on groundwater and surface water resources at and in the vicinity of the development area.

This guideline applies to developments on municipal services and should be used concurrently with the Guidelines, Policies and Regulations of other agencies.

1.1 Rationale

The Region of Peel and developers recognize that developments may impact groundwater and surface water resources. If developments are allowed to proceed, we all need to have a clear understanding of baseline water conditions and potential impacts and have appropriate mitigation measures in place to minimize these impacts. It is also recognized that, where a significant consideration to environmental protection and impact reduction is given at the planning stage of the development, a balance within the ecosystem components can be maintained and/or enhanced and potential negative effects on water users can be mitigated.

The following constitutes recommended approach and information requirements for hydrogeological assessment, monitoring, reporting, and contingency planning in support of development proposals in the Region of Peel.

2.0 DEVELOPMENTS AND ENVIRONMENTAL ISSUES

Developments in the Region of Peel have both urban and rural characteristics. Each development brings a land use change that can affect water resources and ecosystem components that rely on them. Regrading and underground services can affect local groundwater flow conditions. Buildings, roads and driveways are essentially impermeable surfaces that can hinder water infiltration into the ground.

The effects of developments are a cause for concern to many private well owners in the Region. It is generally recognized that developments may potentially affect water supplies (both quality and quantity) to local wells. In the Region of Peel, the groundwater-based drinking water supplies derive from overburden or bedrock water-bearing formations that represent significant regional aquifer systems from **localized** or from fractured shale bedrock that underlies most of the Region's areas. The groundwater quality and yields within these formations vary widely. The susceptibility to impacts also vary depending on natural and anthropogenic factors affecting groundwater occurrence and movement in the area.

3.0 OBJECTIVES FOR HYDROGEOLOGIC ASSESSMENTS AND REPORTING

The purpose of the hydrogeologic assessment and reporting in association with new developments in the Region of Peel is to establish that:

- The development(s) will not cause unacceptable groundwater quality impacts which may affect the potability of the groundwater;
- The development(s) will not impact the quantity of groundwater or lower groundwater levels (i.e., reduced infiltration or water table dewatering) such that unacceptable impacts on the local groundwater table and groundwater availability in existing wells occur; and
- Appropriate measures are in place to reduce or mitigate impacts to water resources and supply wells.

4.0 RECOMMENDED STUDY APPROACH

In order to address the above noted objectives, the Region developed a recommended approach and study components for undertaking a hydrogeologic assessment in proposed new development areas in Peel. Although the final details of the investigation will vary depending on the complexity of the hydrogeologic setting, site and area sensitivity, site designation, size and proposed development density, the overall approach should sufficiently assess baseline conditions and potential impacts due to anticipated land use changes, and develop mitigative measures to minimize these impacts.

The aim is to develop, at the earliest stages of the process, an approach that can help to estimate potential impacts and define steps to address concerns that may arise in the future. This approach is designed to reduce high costs associated with impact management and problem resolutions during- and post-development. In this way, all the involved parties will be aware in the early stages what the development/construction related implications and concerns might be, and how they may affect the size, density and engineering requirements of the development or the type of studies required for determining appropriate designs to mitigate certain impacts.

The assessment of an individual development parcel (i.e., a site-specific study) will be undertaken by each Developer within an approved development area. Each Developer will be required to retain a qualified hydrogeologist (i.e., recognized members of the Association of Professional Geoscientists of Ontario or Association of Professional Engineers of Ontario) to complete an appropriate site-specific study within the approved Plan. The site-specific study will be required as part of the development approval process. The Region, and in some instances local municipalities, will review and comment on the results of these studies.

5.0 SITE SPECIFIC HYDROGEOLOGIC ASSESSMENT

Site-specific assessments will be undertaken for each development parcel within the approved Plan and will comprise a background study report that will be required as part of the development approval process, and update monitoring reports that will be required as a condition of development acceptance by the Region. The extent of the background hydrogeologic investigation will depend on the level of detail of existing information and the level of confidence in understanding of hydrogeologic setting for the site and the surrounding area. The background report will address existing pre-development conditions based on the site-specific investigation. The update monitoring reports will present monitoring data generated during and following the development, and evaluate them with respect to the background information.

5.1 Investigation and Monitoring

The following outlines the site-specific investigative process. The listing of specific report components is provided in Section 5.2:

- 5.1.1 As part of the site-specific investigation, an assessment of subsurface conditions, including soil and groundwater, will be undertaken for each development parcel. If no existing on-site wells are available, groundwater monitors are to be installed. The monitors would be utilized to assess groundwater levels, quality and flow, to carry baseline and long-term monitoring, and as “early warning” wells in the event that significant seepages or dewatering become an issue during the subsurface work at the site.
- 5.1.2 It is mandatory that a private well survey and monitoring be undertaken within an estimated zone of influence (ZOI) of the development or within 500 m of the development boundaries, whichever is greater. The monitoring should include measurements of water levels and baseline water quality testing. The water level monitoring should be initiated one year prior to construction or within such period that allows assessing seasonal variations in water levels in the area and water uses at each property. For baseline water quality testing, the list of analytical parameters should reflect existing land uses and potential future contaminant sources. As a minimum, parameters such as nitrate, total coliform and E.coli should be tested in the wells located upgradient and downgradient of the site. Contingency plans are to be developed during the background study stage. The baseline hydrogeologic report will provide the proposed contingency plan for replacement of adversely affected private water supplies. The report will be submitted to the Region

prior to the pre-servicing or registration of the plan (whichever occurs first).

5.1.3 The monitoring will continue throughout the duration of construction and will include the groundwater level measurements in all private and observation wells within the ZOI or 500 m (whichever is greater) and at adequate frequencies; representative water quality testing; observation of trenches for seepages; record dewatering activities and contingency actions; and observing/monitoring surface water conditions including sediment loading to local watercourses (*). Progress monitoring reports will be submitted to the Region on a regular basis to keep the Region informed about the on-site and off-site conditions during the construction activities.

5.1.4 The post construction monitoring will continue for a period of one year from the completion of the works or until acceptance by the Region. The monitoring should sufficiently address seasonal variations in water levels and local water uses. A summary monitoring report will need to be submitted to the Region prior to final acceptance of the development by the Region.

() When significant alterations or impacts to watercourses or other surface water bodies are expected, the Conservation Authority's comments and/or approvals are required.*

5.2 Recommended Components of Hydrogeologic Assessment, Monitoring, Reporting, and Contingency Planning

The site-specific background report will utilize available information from other available technical studies, databases and mapping for the area, and will include details obtained through the site-specific investigation. The information requirements for the site-specific hydrogeologic assessment and reporting are listed below. Each report should demonstrate a good understanding of the existing conditions and potential impacts and should provide sufficient scientific evidence supporting the report conclusions and recommendations.

Hydrogeologic Setting:

- Legal description of the site (Address, Lot, Concession, Plan);
- Description of site physiographic and hydrogeologic setting;
- Topographic relief and local drainage pattern;
- Distribution of aquifers and aquitards underlying the site and the general area;

- Description of site-specific hydraulic properties of local soils (conductivities/percolation rates of native soils), and (vertical) hydraulic gradients;
- Assessment of groundwater flow for shallow and deep groundwater systems;
- Preliminary assessment of development setting in relation to local and regional flow system;
- Baseflow contribution to local watercourses (upstream, downstream and within the study area) (*); and
- How the local aquifers are replenished (i.e., locally/regionally) and what are average local and regional infiltration rates.

() When significant alterations or impacts to watercourses or other surface water bodies are expected, the Conservation Authority's comments and/or approvals are required.*

Assessment of Water Uses in the Area:

- Description of local groundwater uses in the area including: estimated well yields, well depths, age of wells, aquifers utilized by local private and municipal wells; and potential well interference issues; and
- A door-to-door inventory of water supply wells within an estimated zone of influence of the development (or 500 m, whichever is greater) from the site boundaries; the survey will determine conditions and details of local wells, including the method of construction, water level, pump intake and well depths, water use practices, general water quality and suitability of the well for future monitoring; the results of this survey will determine the number of wells that could potentially be impacted by the development; in addition, the survey will provide baseline of data for future groundwater interference resolution if a complaint arises.

Surface Water;

- Any significant surface water issues should be addressed in consultation with Conservation Authorities.

Impact Assessment:

- Which areas within the development plan/parcel are most sensitive to impacts with respect to both water quality and quantity;
- Assessment of existing impacts within the study area (due to on-site or off-site influences);
- Assessment of potential impacts to water resources due to increase in impervious surfaces and resulting reduction in groundwater recharge;

- Assessment of water quality of the upper shallow aquifer or surficial aquifer to determine existing groundwater conditions in the shallow flow system in relation to any adjacent sensitive areas such as wetlands and watercourses, if present, to assess potential development impacts, positive or negative (*); and
- Where development is being undertaken in phases, the developer may be required to demonstrate that the impact of previous phases is acceptable prior to approval of future phases.

() Any significant surface water issues should be addressed in consultation with Conservation Authorities.*

Monitoring Program:

- Design a suitable pre-, during, and post-development monitoring plan that will encompass all accessible private and observation wells within the estimated zone of influence of the development and will include representative water quality testing (as required), observation of trenches for seepages, recording of dewatering activities and any contingency work, and monitoring of surface water flow and sediment loading in local watercourses;
- Groundwater quality monitoring should include, but not be limited to, the following: nitrate, total coliform, and E-coli (;).

Management:

- If high upward gradients/artesian conditions are present at the site, what would be safe excavation depths and what contingency steps would be required to manage uncontrolled flows, if encountered;
- What steps should be undertaken to limit sediment loading in streams during the construction stage;
- Phasing development approach options based on hydrogeologic conditions.

Contingency Plans:

- Contingency plans must address short-term, long-term, and cumulative effects of a development with respect to both water quality and quantity.

Supporting Information:

- MOE water well records and on-site borehole logs; the MOE water well records cross-referenced with the wells confirmed during the survey; and

- Maps, cross-sections, tables and graphics, copies of field survey sheets, correspondence with residents, other information documenting the study process and results.

The site-specific background assessment report will be subject to a comprehensive review by the Region and other relevant review parties, as applicable. Approval for development will be provided if the report is deemed to meet the primary requirements of the review parties. The approval may be subject to a series of conditions that may relate to the on-going monitoring, contingency plans and implementation; update monitoring reports or in terms of addressing issues raised by various parties.

Update Monitoring Reports:

- All update monitoring reports should be referenced to background (baseline) conditions and should sufficiently address variations between natural (i.e. seasonal, climatic) and artificial (i.e. land use/water use related) changes to the water conditions in the area.

6.0 IMPACT RESOLUTION AND MANAGEMENT

Environmental impact assessment, implementation of protective measures, and impact management/resolution in relation to new development(s), are a responsibility of the Landowner(s)/Developer(s).

In the case that significant impacts with respect to water quality or quantity occur in relation to the subject development(s), the proponent(s) will undertake, at their cost, corrective measures to restore the environmental conditions and functions of the affected ecosystems and their components.

In the event that private wells in the area become irrevocably affected by the subject development(s), the proponent(s) will cover the costs of the provision of replacement wells or municipal services to all affected well owners.

**APPLICATION OF GUIDELINES FOR CLEARANCE OF STANDARD DRAFT CONDITIONS
NEW DEVELOPMENTS ON MUNICIPAL SERVICES
REGIONAL MUNICIPALITY OF PEEL**

Typical Region of Peel conditions which must be satisfied prior to registration or pre-servicing of the subdivisions, major site plans or miscellaneous projects:

- Provision will be required in the Subdivision Agreement for the following clause:
“An amount shall be held in the Letter of Credit until final acceptance of the subdivision by the Municipality to serve as protection for the private wells in the zone of influence of the subdivision plan. The amount shall be based on the anticipated cost of replacing water supplies within the zone of influence as shown in the schedules of the agreement. The minimum amount shall be \$20,000.00. If the private well systems in the zone of influence deteriorate due to the servicing of the plan of subdivision the developer will provide temporary water supply to the residents upon notice by the Region and it will continue supplying the water to the effected residents until the issue is resolved to the satisfaction of involved parties. If the quantity of water in the existing wells is not restored to its original condition within a month after first identification of the problem, the developer will engage the services of a recognized hydrogeologist to evaluate the wells and recommend solutions including deepening the wells or providing a permanent water service connection from the watermain to the dwelling unit.”

Developer shall inspect, evaluate and monitor all wells within the zone of influence prior to, during and after the construction has been completed. Baseline and Progress Reports should be submitted to the Region as follows:

1. **Baseline hydrogeologic report defining site conditions, well conditions and baseline monitoring results shall be submitted to the Region prior to the preservicing or registration of the plan (whichever occurs first) and shall include as a minimum requirement the following tests:**
 - **Groundwater level measurement below existing grade**
 - **Bacteriological Analysis - Total coliform and E-coli counts**
 - **Chemical Analysis - Nitrate Test**

NOTE: In the event that the test results are not within the Ontario Drinking Water Standards, the Developer shall notify in writing the Homeowner, the Region of Peel's Health Department (Manager - Environmental Health) and Public Works Department (Manager - Engineering Development) within 24 Hours of the test results.

The hydrogeological report will provide the proposed contingency plan for replacement of private water supplies that could potentially be affected by the development.

For further directions on hydrogeologic assessments refer to Sections 5.1.1 and 5.1.2 of the Guidelines (i.e.” Guidelines for Hydrogeologic Assessment, and Reporting Requirements; New Developments on Municipal Services, Regional Municipality of Peel”). More details on reporting are provided in Section 5.2 of the Guidelines.

2. **Well monitoring shall continue during construction and interim reports shall be submitted to the Region of Peel for records** (refer to Section 5.1.3 of the Guidelines).
3. **Well monitoring shall continue for one year after the completion of construction and a summary report shall be submitted to the Region of Peel prior to final acceptance** (refer to Section 5.1.4 of the Guidelines).