CLEARVIEW
TOWNSHIP

Appendix C – Hydrogeological Report TOR

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C1.00 Introduction

A Hydrogeological Report is a review of the subsurface hydrogeological conditions to identify development suitability, constraints, and mitigation measures to be implemented.

A Hydrogeological Report must be completed by a licensed, professional geoscientist or exempted engineer as set out in the *Professional Geoscientist Act* and Professional Engineers of Ontario. All reports and drawings must be stamped, signed, and dated by a qualified professional, licensed in the province of Ontario.

If the proposed development is revised, the study / report shall reflect the revisions by an updated report and/or letter from the author indicating the changes and whether or not the recommendations and conclusions are the same (Note: this is subject to the extent of the revisions).

The study area should include the land surface area covering the largest possible area of influence that could result from the proposed groundwater taking. This may include potential influences on water levels, flow direction, and water quality.

The level of detail required in the hydrogeological report is normally expected to align with the level of risk posed by the groundwater taking, and level of uncertainty of the available information.

C1.01 Required by Legislation

The following regulations apply:

Ontario Water Resources Act, R.S.O., 1990, c. O.40

For Environmental Activity and Sector Registry:

Environmental Protection Act (Part II.2)

Ontario Regulation 245/11 (Part II.2 – General)

Ontario Regulation 63/16

For Permits to Take Water:

Ontario Regulation 387/04

Ontario Water Resources Act, (Sections 34 and 98)

For Source Water Protection:

Clean Water Act

Ontario Regulation 284/07

C2.00 Hydrogeological Report Scope (Minimum Requirements)

- Groundwater occurrence (unconfined and confined aquifers, aquitards, water table depth) and associated subsurface geology.
- Surface water / groundwater interactions.
- Groundwater infiltration or recharge, when water balances are required.
- Groundwater baseflow and discharge.
- Seasonal groundwater elevations and groundwater flow direction.
- Availability of groundwater to support individual wells (if required) in accordance with MECP Guideline D-5-5.
- Groundwater quality.
- Groundwater impacts from use of individual on-site sewage systems in accordance with MECP Guideline D-5-4 (if required).
- Temporary and / or permanent dewatering volumes, discharge locations, and zone of influence.
- Dewatering impacts, including contaminant migration and impacts to existing and proposed private water wells (quality and quantity), and surface water features.
- Mitigation measures and monitoring requirements of dewatering impacts.
- Dewatering impacts to building foundations and road structural stability (potential settlement) associated with dewatering.
- Evaluate dewatering and development impacts on the Township drinking water sources (if applicable).
- Identify potential impacts to groundwater discharge which supports cold-water fisheries, if required.
- Compliance with applicable requirements from the MECP, for Permits to Take Water or Environmental Activity and Sector Registry.

The review area shall encompass the land area covering the largest possible zone of influence that could result from the proposed groundwater taking and / or source of contamination.

C3.00 Hydrogeological Report Contents (Minimum Requirements)

C3.01 Introduction

- Address of the subject property.
- General site location of the subject property.
- Project name (if applicable).
- Developer and Owner's contact information.
- Author name, title, qualifications, company name, and appropriate stamp.
- Brief description of the proposed development.
- Overview of the study area.
- Purpose of the study.
- Location and context map.

C3.02 Proposal Description and Context

- A description of the proposal, development statistics (such as number of units, site area), type of development proposed, building height, parking areas, access points, location of amenity areas, proposed phasing.
- A description of the existing hydrogeological conditions on the Site and within a 500 m study area as well as surrounding areas, roads, natural areas, buildings, and parking areas.
- Concept Drawing for the development including building location, parking, access, amenity areas, grading and natural features, and any natural hazards.

C3.03 Minimum Investigation / Evaluation

- Include a description of existing regional and local geology and hydrogeology including surficial and bedrock geology, lithology, and hydrostratigraphic units.
- Include a description of topography and drainage (surface water features and functions), physiography, existing land use, and soils.
- Overlap of the Site and / or the study area with regulated area(s) from NVCA.
- Use test pits / boreholes to establish local geology and prepare test pits / boreholes logs that include water table elevations and lithology.
- Install enough monitoring wells to establish groundwater flow direction, vertical gradients, and groundwater quality.
- Complete single well response tests or pumping test(s) to establish hydraulic conductivity.

- Plot the location of water wells within 500 m of the Site using data from the MECP water well database and complete private well surveys (as required).
- Confirm aquifer properties, groundwater levels (including areas of flowing artesian conditions), groundwater flow direction(s), hydraulic conductivity, and calculate vertical and / or horizontal gradients.
- Collect sufficient samples to establish pre-development groundwater quality.
- Complete water quantity and quality testing in compliance with Township Sewer Use By-law (as required) and MECP Guideline D-5-5 (Water Supply).
- Identify Source Protection Plan (SWPP) policies and vulnerable areas pertaining to the development.
- Identify Ecologically Significant Groundwater Recharge Areas.
- Complete water balance for sites as required by SWPPs (i.e., sites located within Wellhead Protection Area (WHPA).
- Complete infiltration testing for locations where LIDs are being considered and rely on design guidance for LIDs.

C3.04 Impacts and Potential Short / Long-term Impact Assessment

- Assess potential impacts to groundwater levels / groundwater flow.
- Establish seasonally / historically high groundwater levels (HGWLs).
- Complete four-season monitoring using automatic water level recorders (AWLRs).
- Assess surface water system, other groundwater users, and land stability.
- Quantify potential impacts to groundwater recharge, baseflow, and discharge to natural heritage features.
- Identify potential impacts to water supply wells.
- Identify potential impacts to settlement of existing structures.
- Calculate pre-development and post-development water balance with and without mitigation.
- Complete nitrate and phosphorous impact assessment in accordance with MECP Guideline D-5-4 (On-site Sewage Systems).
- Address Source Water Protection: WHPA, Highly Vulnerable Aquifer (HVA), Significant Groundwater Recharge Areas, Creation of a Transport Pathway, Significant Drinking Water Threats, Existing Conditions / Issues.
- Quantity and quality of an aquifer used for drinking water supply.
- Temporary and permanent dewatering, if required.
- Contaminant migration flowing conditions, if required.

C3.05 Mitigation Measures and Monitoring Plan for Dewatering (if Required)

C.3.05.1 If Required, the Plan Needs to Identify Methods to:

- Mitigate impacts to infiltration / recharge.
- Mitigate impacts associated with groundwater quality.
- Conduct Groundwater Quantity Monitoring Program, for discharge evaluation.
- Assess temporary dewatering needs.
- Eliminate or reduce permanent dewatering needs.
- Design and implement Contingency Plans for dewatering, quantity, and quality concerns.
- Install sentry wells within Township boundaries to assess and monitor impacts associated with dewatering to private / public wells, as applicable.
- Carry out a ground settlement monitoring program during dewatering.
- Conduct surface water quality monitoring (as required).
- Monitor groundwater and / or surface water level fluctuations associated with dewatering activities.
- Monitor groundwater dewatering volumes for compliance with Environmental Activity and Sector Registry / Permits to Take Water or requirements from NVCA and MECP.
- Use engineering measures to reduce / eliminate dewatering volumes (e.g., waterproofing, soldier piles and lagging, caisson walls, sinking shafts, etc.).
- Plan for pre-treating water before discharge in the storm sewer system (as required).

If it has been determined that there will be a negative impact to the natural environment, Township's sewage works, or the land stability because of groundwater taking and discharging, the review shall identify the following:

- The extent of the negative impact.
- Details of the existing or pre-construction state of all the infrastructure, Township sewage works, and natural environment within the affected zone.
- The proposed mitigation and monitoring Plan.

If any potential settlement due to dewatering activities is identified, the Developer will be required to submit a pre-construction survey (including photos) and CCTV of any Township infrastructure identified in the hydrogeology report as potentially susceptible to settlement due to the dewatering activities.

If a proposed mitigation Plan is recommended, subsequently, a follow-up report is required confirming that the affected zone has been returned to its pre-development / existing conditions prior to the groundwater taking and discharge.

C3.06 Recommendations

- Proposal of actions to support the development and any special considerations or conditions that should be imposed.
- Any recommendations or conditions that should form part of the development approval.

C3.07 Drawings and Supporting Information

- Figures supporting the narrative in a report.
- Results of MECP water well records' search.
- Results of water well surveys.
- Borehole logs.
- Hydrogeological cross-sections.
- Groundwater and / or surface water monitoring results.
- Automatic Water Level Recorders (AWLR) plots.
- Results of pumping test analysis and / or single-well response test analysis.
- Laboratory certificates of analysis.
- Dewatering spreadsheets.
- Drawings supporting the application.
- Infiltration test analysis.
- Settlement analysis reports.
- Water balance calculations (as required).
- Correspondence with NVCA or MECP (as required).