
TRCA staff review the ecological impacts associated with projects which require dewatering¹ to facilitate construction. Where it is identified such dewatering could impact surface features such as fish and fish habitat, forests and wetlands, we will request hydrogeological studies be conducted at various stages of the project. At the detailed design stage and Environmental Management Plan (EMP) will be required. We will review the EMP to ensure that the following criteria are addressed:

- Criteria 1: Impacts to fish or fish habitat shall be avoided, or as applicable mitigated and monitored
Criteria 2: Impacts to forests and wetlands shall be avoided, or as applicable mitigated and monitored
Criteria 3: Permits in association with Section 28 of the Conservation Authorities Act shall be obtained

Permit requirements shall be confirmed by TRCA staff once Criteria 1 and 2 have been satisfied.

Stage 1: Requirements for Master Plans or Master Servicing Plans:

1. Determine baseline groundwater conditions and identify potential environmental receptors
2. Undertake pump test (s) to define the zone of influence of significant dewatering projects (greater than 200,000 L/day)
3. Screen for environmental impacts at a conceptual level
4. Plan underground servicing and building foundations away from major aquifers
5. Design underground servicing and building foundations with regard to local aquifer conditions
6. Avoid interference with aquifers by locating structures as shallow as possible, notwithstanding other engineering and environmental factors, and in the least sensitive areas
7. Incorporate sustainable community planning

Stage 2: Required Information for Environmental Assessments or Block Plans:

The information collected through Stage 1² should be refined to:

1. Undertake pump tests to confirm the conceptual hydrogeologic conditions from the master planning stage
2. Provide detailed baseline conditions for all natural features within and adjacent to the zone of influence
3. Complete a hydrogeological study for the project area that includes
 - a) surficial geology in the study area with identification of all existing shallow, perched and deep aquifers
 - b) cross-sectional drawings with location of underground services or building foundations, and groundwater levels
 - c) mapping of groundwater levels and flow patterns across the study area and in the vicinity
 - d) Assessment of hydrogeological coefficients, especially hydraulic conductivity ("k") based on pump test results. Hydraulic conductivity calculations based on Grain Size Distribution Curves are not sufficient for aquitards. Slug tests provide more accurate estimates of bulk hydraulic conductivity, particularly for fractured till units. Hydraulic conductivity for aquifers should be determined from a pump test, or at least slug tests. Both tests provide estimates of bulk permeability and are therefore more appropriate to use in further dewatering calculations. Multiple pump/slug tests may be required, depending on the local hydrogeologic complexity and the overall scope of the project.
 - e) Groundwater chemistry should be confirmed, including feasibility of groundwater discharge to a surface water system. This is particularly important for withdrawals from the Thorncliffe and Scarborough Aquifer systems, because of elevated iron concentrations

- f) identification of significant groundwater discharge/recharge zones across the study area
 - g) study of surface/groundwater interactions and baseflow evaluation across the study area
4. Identify all environmental receptors based on a review of the baseline conditions within the zone of influence. All potential impacts should be identified at both surface and subsurface levels as related to dewatering and discharge
 5. Select horizontal and vertical footprints and alignments based on a review of the above
 6. Select construction technologies to eliminate or minimize dewatering requirements
 7. Develop adaptive management, mitigation and monitoring strategies, if required, which includes dewatering discharge rates, timing of maximum discharge, fisheries windows and construction phasing

Stage 3: Required Information for Detailed Design, TRCA and *Fisheries Act* Approvals

The information collected through the Stage 2² should be refined to include:

1. Detailed dewatering information, including approximate rates and timing. The maximum rate should be calculated based on conservative assumptions
2. Additional pump tests and selection of construction methodology
3. Confirmation of the groundwater model parameters
4. Refined zone of influence and identify buffer zone, if required
5. Cumulative impact assessment, if required
6. Addressing outstanding data gaps in the baseline information, if required
7. Estimation or confirmation of dewatering and construction methods and equipment
8. Confirmation of dewatering schedule, including estimations of maximum pumping rates and duration
9. Evaluation of aquifer recovery rates
10. Calculations and mapping of zones of influence for each aquifer that may be affected by the project (i.e., shallow, intermediate, deep)
11. Identification of all potential groundwater discharge receptors, and assessment of their baseline conditions (i.e., temperature, velocity, erosion thresholds, aquatic community)
12. Proactive mitigation for all groundwater receptors across the study area and the buffer zone
13. A groundwater monitoring program
14. Details of any outfalls, channel modifications, shaft locations, mitigation and monitoring plans, discharge rates and location (s), and timing together with a permit application (s) in accordance with Ontario Regulation 97/04

¹ Dewatering in excess of 50,000 L/day requires a permit to take water (PTTW) from the Ministry of the Environment (MOE), TRCA permit requirements and *Fisheries Act* approvals are independent of the MOE process and are not restricted to the 50,000 L/day limit. All construction activities which require dewatering of shallow or deep aquifers could have significant impacts on the aquatic and terrestrial resources of the watershed, TRCA review of an Environmental Management Plan (EMP) is required to confirm that all issues have been effectively addressed, mitigated and monitored.

² For projects initiated prior to January 2006, if detailed hydro geological information was not requested during previous TRCA review then the gaps in information which should have been provided are still required. More specifically, for projects currently in Stage 2, the requirements for in Stage 1 are still required. For projects currently in Stage 3, the requirements for Stage 1 and 2 are still required.