



“Inspiring a Healthy Environment”

**Hydrogeological Assessment and Feature-based Water Balance Analysis Checklist**

The following checklist has been compiled by the Upper Thames River Conservation Authority (UTRCA) to assist applicants in the preparation of technical studies needed to form part of a complete application. This checklist is required to be reviewed with UTRCA staff prior to preparation or submission of this study.

**Internal Technical Review Team**

Date Prepared: \_\_\_\_\_  
 UTRCA File Handler: \_\_\_\_\_  
 UTRCA Technical Reviewer: \_\_\_\_\_

**Applicant Information** (signed landowner authorization form may be required)

Landowner: \_\_\_\_\_ Email: \_\_\_\_\_  
 Applicant: \_\_\_\_\_ Email: \_\_\_\_\_  
 Consultant: \_\_\_\_\_ Email: \_\_\_\_\_

**Lands Subject To Application**

Address: \_\_\_\_\_ Municipality: \_\_\_\_\_  
 Lot: \_\_\_\_\_ Concession: \_\_\_\_\_ Property Size: \_\_\_\_\_  
 Proposed Project Works: \_\_\_\_\_

**Important Dates**

Scoping Meeting\*: \_\_\_\_\_  
 Site Visit (if required): \_\_\_\_\_

\*Prior to scheduling a scoping meeting, please provide a brief summary of the proposed work plan and borehole/monitoring well location map (overlaid on aerial imagery) to staff one week in advance of meeting date to allow time to appropriately prepare.

## Administrative Considerations

Initiation of Fieldwork/Study: Should fieldwork be initiated prior to the agreement on the scope of required for a project, we caution that additional studies may be required (at the applicant's expense) to address any outstanding concerns.

Terms of Reference (ToR): A ToR may be submitted to the UTRCA in conjunction with this scoping checklist and shall include all components deemed to be required by the UTRCA.

Qualifications: All fieldwork and the report must be completed/authored by qualified professionals with experience in the appropriate discipline.

## Checklist

### Report Introduction

- 1. Objective(s): purpose of the report and proposed development
- 2. Location of Subject Lands: municipal address and legal description
- 3. Physical Environment: description of soils and geology, surface water and drainage, groundwater conditions, and topography
- 4. Regulated Features: describe any natural hazards present on the subject or adjacent lands (floodplain, watercourse, erosion, valleylands, and wetlands)
- 5. Description of existing and proposed conditions, including basements, underground parking and overall site servicing
- 6. Referenced documentation: description of referenced background studies, reports, documents, EAs, watershed/sub-watershed studies, etc.
- 7. Professional Geoscientist Approval: report and all drawings to be signed, sealed and dated by a qualified Professional Geoscientist of Ontario

### Detailed Site Description

- 8. Geology/Physiography: description of study area and regional physiography. Characterization of soil stratigraphy and detailed cross sections showing boreholes, site features and block boundaries (a min. of two (2) sections, as detailed below)
- 9. Topography: description of proposed site alteration that clearly outlines ground elevations
- 10. Drainage Pattern: description of existing and proposed drainage pattern, including external drainage areas (if any)
- 11. Boreholes and Test Pits:
  - a. Description of boreholes/test pits on site, including date of installation and abandonment; and,
  - b. Provide grain size analysis and logs within the appendix of the report

- 12. Source Water Protection Planning:
  - a. Identification of any designated vulnerable areas on subject or adjacent lands (Wellhead Protection Areas with vulnerability scores, Highly Vulnerable Aquifers, and Significant Groundwater Recharge Areas); and,
  - b. Description of relevant policies for lands located in or adjacent to the vulnerable areas

#### Hydrogeological Setting

- 13. MECP and Private Well Surveys (within 500 metres): description of local wells and water use; tabulated well data for MECP and private wells within used for site geology, hydrogeology and impact assessment; map of well locations
- 14. Hydrogeology/Hydro-stratigraphy:
  - a. Description of monitoring wells(MW)/piezometers(PZ) with date on installation and abandonment
  - b. Tabulation of well construction particulars for each MW/PZ
  - c. Characterization of hydro-stratigraphic units, and local and regional aquifers and aquitards
  - d. Description and characterization of site-specific hydraulic properties of local soils such as hydraulic conductivity, percolation rates of native soils and hydraulic gradients
  - e. Groundwater levels and flow characteristics for shallow and deep groundwater systems including seasonal fluctuations and highest water table evaluation
  - f. Augmentation of the hydrogeological conceptual model for the site with the generation and discussion on high (December to April) and low (May to mid-October) water table elevations maps and interpreted groundwater flow directions
  - g. Description of groundwater discharge areas
  - h. Description of headwater features, seeps, and springs on subject and adjacent lands
  - i. Summary of infiltration and recharge rates associated with site materials
  - j. Summary of surface water levels and flow direction
  - k. Description of water quality (groundwater and surface water) for establishing baseline conditions as well as surface water and groundwater interactions
  - l. Baseflow contribution to local watercourses (upstream, downstream and within study area)
- 15. Permit To Take Water Details: details regarding water taking considerations and calculations (general and worse-case scenario); identification of the area of influence

## Feature-Based Water Balance

- 16. Estimation of the pre- and post-development water balance components (precipitation, infiltration, runoff, evapotranspiration), infiltration factor, surplus water, and analysis of catchment areas to feature(s)
  - a. A table of values and calculations demonstrating input are equal to output on an annual and monthly basis

## Construction and Post-Development Impact Assessment

- 17. Development Impact on Groundwater/ Surface Dependent Features:
  - a. addresses impacts to all potable wells within 500 metres; and,
  - b. addresses assessment of impacts to regulated features on subject and adjacent lands due to increase in imperviousness, reduction in groundwater recharge and infiltration, and increase runoff.
- 19. Hydrogeological Properties: assessment of impacts due to changes in water table elevation, groundwater flow direction, base flow contribution, and infiltration/recharge/discharge rates and volumes
- 20. Source Water Protection Plan: assessment of impact on source water protection including but not limited to reduction of infiltration or proposed post-development use
- 21. Watercourse Realignment:
  - a. Assessment of potential impacts to surface/groundwater interactions related to watercourse relocation/lowering, enclosure, dewatering, and discharge activities; and,
  - b. Provide adaptive management, mitigation and monitoring strategies with considerations for discharge, construction phasing, etc.

## Mitigation

- 22. Mitigation Strategies and Rationale: description of mitigation strategies to maintain the groundwater infiltration, maintain surface water features, and consideration of LID measures to meet water balance requirements for quantity
- 23. Water Balance Calculations: tabulated water balance based on mitigation measures to maintain appropriate pre-development infiltration and runoff values

## Wetland Water Balance Risk Evaluation

- 24. The required steps to evaluate risk include:
  - a. Step 1: identify retained wetland(s) that could be affected by the proposed development
  - b. Step 2: evaluate extent of potential hydrological alterations
  - c. Step 3: assess sensitivity of the wetland ecosystem and its associated flora and fauna to changes in hydrology
  - d. Step 4: integrate information from steps 1-3 to assign level of risk

## Monitoring and Design Mitigation Plan

- 25. Wetland Water Balance Monitoring Plan: description of monitoring strategy to maintain the water balance in wetlands during construction and post-development, including:
  - a. Location of proposed monitoring stations
  - b. Description of monitoring locations
  - c. Monitor surface water and groundwater levels, and other parameters
  - d. Indicate frequency of specific data collection
  - e. Indicate frequency of monitoring and reporting
- 26. Watercourse Realignment: description of adaptive management/monitoring plan outlining elements of the works to be monitored, and the methodology, frequency, and duration of monitoring and reporting
- 27. Design Mitigation Plan:
  - a. Description of contingency plans when adverse impact(s) are noted throughout monitoring plan;
  - b. Include specific thresholds to be included in the plan to determine triggers for adaptive management; and,
  - c. Include how successful mitigation will be ensured for both the temporary construction phase impacts and the permanent protection of the features and their hydrological function

## Recommendations and Conclusions

- 28. Recommendations: description of best management practices and recommendations for erosion and sediment control, vegetation cover, imported fill materials, construction equipment, landscaping activities
- 29. Summary and Conclusions: brief summary of project findings and conclusions
- 30. Connection to Other Technical Reports: ensure that the details provided are cross-referenced for consistency across other technical reports that have been identified as a requirement for a complete application (Environmental Impact Study, Stormwater Management, etc.)

## Figures/Drawings/Appendices

- 31. Site/Concept Plan: general layout of subject lands and proposed development
- 32. Subsurface Geology Maps: surficial geology, bedrock geology, etc.
- 33. Feature Delineation:
  - a. Boundary of wetland features shall be determined using Ecological Land Classification and Ontario Wetland Evaluation System as appropriate; and,
  - b. GIS shapefiles may be requested

- 34. Conservation Authority Regulation Limit: can be provided by UTRCA staff, however the text of the regulation prevails and a feature determined to be present on the landscape may be regulated by the Conservation Authority
- 35. Source Water Protection Maps: can be provided by UTRCA staff
- 36. Borehole/Monitoring Location Map: general configuration of boreholes, test pits, groundwater monitoring wells, surface water monitoring stations, piezometers, and cross-sections overlain on survey and aerial imagery; determined and reviewed with UTRCA staff during pre-consultation
- 37. Cross Sections: minimum of two (2) cross sections, determined and reviewed with UTRCA staff during pre-consultation
- 38. Groundwater Flow Direction Map: a map for high and low groundwater conditions, determined and reviewed with UTRCA staff during pre-consultation to confirm how many maps may be needed
- 39. Borehole/Test Pits/Monitoring Well Logs
- 40. Servicing Plan: general configuration of proposed storm sewer network
- 41. Grain size and Hydraulic Conductivity calculations
- 43. Construction Dewatering Calculations: tabulated calculations (if applicable) with a map of water taking points and radius of influence (if applicable)
- 44. Feature-Based Water Balance Calculations:
  - a. Pre- and post-development catchment drawings supported by contour information with catchment areas and IDs; and,
  - b. Tabulated water balance calculations

## Other Comments

## Disclosure

Please note that each technical submission is different, and local characteristics of each site may change the scope of work. This checklist is intended to ensure that some of the more critical information required for the preparation of a Hydrogeological Assessment has been considered. Please refer to "Hydrogeological Assessment Submissions: Conservation Authority Guidelines for Development Applications" for additional details on these requirements.

The purpose of this checklist is to outline the requirements specific to the Conservation Authority. A separate, standalone report is not required to be prepared for the Conservation Authority versus other agencies. This checklist does not preclude the applicant/author from including requirements of other agencies within the report.

Please ensure this form is enclosed as an appendix to the submitted report, and/or provided to UTRCA upon submission of a planning and/or permit application. As this application is still in the pre-consultation stage, the UTRCA requirements are subject to change pending further consultation and revisions to the proposed development. If any omissions are noted to these basic items, the submission will not be deemed complete, and will be returned to the applicant/consultant for revisions.