HAMILTON WATER

GUIDELINES FOR HYDROGEOLOGICAL STUDIES AND TECHNICAL STANDARDS FOR PRIVATE SERVICES

REPORT
PW14032

NOVEMBER 2013
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Hamilton

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These Guidelines have been developed by considering several existing documents developed in other Ontario Municipalities. The City of Hamilton is indebted to the Regional Municipality of Halton and Regional Municipality of Waterloo for their cooperation and input. This document is consistent with technical standards developed by the Ontario Ministry of the Environment (MOE) regarding private servicing and conforms to the standards established in the Ontario Building Code (2011, as amended).

1. INTRODUCTION

1.1. Applicability

This document provides information to persons proposing to develop lands that will be serviced with private groundwater supplies and/or private on-site sewage disposal systems (septic systems).

It is the responsibility of proponents of all development applications to show, to the satisfaction of the City, that the proposed development will not adversely impact the existing environment through the use of private on-site servicing, and that there is sufficient groundwater to provide an adequate water supply.

It should be noted that where municipal water and wastewater services are not available, the City of Hamilton's Rural Hamilton Official Plan requires all developments to be self-sustaining on private individual water wells and private individual sewage disposal systems.

Generally, the following types of applications will not be deemed complete until a Hydrogeological Study Report has been submitted, though whether a study is required and the specific study requirements will be determined by the City on a case-by-case basis:

- official plan amendments
- zoning by-law amendments
- plans of subdivision, condominium
- all severance applications, with some potential exemptions listed below
- proposals for new agricultural-related uses
- expansions of existing uses that will increase the needs for private water and/or sewage disposal.

On a case-by-case basis, under certain conditions listed below, the City may exempt some development applications from hydrogeological investigation. An exemption may be based dependent upon the satisfactory completion of other investigations such as servicing studies.

The following application types may be exempt from the requirement for hydrogeological investigation:

- development applications that will have no impact on existing private water or sewage disposal systems and do not propose a new private water or sewage disposal system
- severances of an agricultural lot into two agricultural lots that meet the minimum agricultural lot sizes for the relevant designation and zone
- severances to convey lands to an approved authority for the purposes of natural heritage protection where the retained lot is of sufficient size

- severances for the purposes of single detached dwellings either as surplus farm dwellings or within rural settlement areas where all resulting lots for single detached dwellings are a minimum of one (1) hectare and a settlement capability study or other servicing study does not recommend larger lots for the subject lands. Note that residential severances under other conditions are not permitted under the Rural Hamilton Official Plan.

The City reserves the right to request additional studies for any exempted conditions based on criteria that include, but are not limited to, the following:

- areas of significant groundwater recharge
- areas either in proximity to, or within, a wellhead protection area
- areas deemed vulnerable with respect to groundwater, surface water, or the ecological community
- areas with existing groundwater contamination issues
- any other conditions deemed relevant by the City.

The guidelines presented in this document follow the methodology and procedures indicated in the Technical Guideline D-5 (Ministry of Environment, 1996) and the Ontario Building Code (Ministry of Municipal Affairs and Housing, 2011, as amended) for development proposals involving private on-site servicing. These guidelines shall be adhered to, to the satisfaction of the City of Hamilton, prior to the City's approval of the development application.

This document provides guidance to the proponent indicating the items that must be included in a Hydrogeological Study Report to be submitted to support the above types of applications. The information contained in this document provides comprehensive rationale and guidance for site-specific studies that will need to be carried out on a case-by-case basis for individual development applications by the proponents and/or their qualified professional consultants.

1.2. Purpose

The purpose of these guidelines, in keeping with the sustainable private water and wastewater services policies of the City's Rural Hamilton Official Plan, is to ensure that:

i) an adequate and safe supply of potable water for proposed development is available without compromising/impacting existing groundwater and surface water resources or the ecological community;

ii) the on-site and off-site groundwater quality and quantity and its users will not be adversely affected;

iii) site conditions are suitable for on-site sewage disposal and that appropriate accommodation can be made in the event of system failure (i.e. a reserve area);

iv) on-site sewage disposal systems will not impair the use of groundwater or surface water resources.

1.3. Limitations / Other Relevant Requirements

These guidelines should be used in conjunction with the following relevant regulatory requirements.

1.3.1. Water Demand

Section 34 of the *Ontario Water Resources Act* (OWRA) requires anyone (with the exceptions of domestic water use, livestock watering and water taken for firefighting purposes) taking more than a total of 50,000 liters of water in a day from a lake, stream, river, or groundwater source to obtain a Permit to Take Water from the Ontario Ministry of the Environment (MOE).

1.3.2. Sewage Disposal

Section 53 of the OWRA requires that an approval must be obtained to establish, alter, extend or replace any sewage works (sewage works are defined as works used for the collection, transmission, treatment or disposal of wastewater, but not including plumbing to which the *Ontario Building Code Act* (1992) applies). Operations that require such approval include, but are not limited to:

- municipal or private sewage treatment lagoons;
- municipal septage disposal lagoons;
- subsurface sewage disposal systems (with a design capacity of more than 10,000 litres per day);
- municipal or private mechanical sewage treatment plants;
- sewage pumping stations;
- storm water management facilities;
- sanitary and storm sewers.

(For further information check the Ministry of Environment website for the most recent documents: http://www.ene.gov.on.ca/).

"Small" systems are defined as having design flows of 10,000 litres or less per day. A small system is located entirely within the boundaries of the single lot it is intended to serve. The single lot should be identified on a legal survey which has been registered on title to the lands. Approvals for "small" systems are granted by municipalities (or the delegated authority) under the Ontario Building Code (2011, as amended).

The Ontario Building Code requires that any person installing or repairing a **Class 2, 3**, **4** or **5** sewage system obtain a permit issued by the Chief Building Official prior to commencing construction.

1.3.3. Classifications of Private Sewage Systems

Class 1 – a chemical toilet, an incinerating toilet, a recirculating toilet, a self-contained portable toilet and all forms of privy including a portable privy, an earth pit privy, a pail privy, a privy vault and a composting toilet system;

Class 2 – a grey water system;

Class 3 – a cesspool;

Class 4 – a leaching bed system (septic system), or

Class 5 – a system that requires or uses a holding tank for the retention of hauled sewage at the site where it is produced prior to its collection by a hauled sewage system.

1.3.4. Large Systems (Section 53, Ontario Water Resources Act [OWRA])

If the "lot" does not have a survey, and is part of a larger parcel of land on which other septic systems are located or will be located, an approval for a large system will be required if the total flows exceed 10,000 L/day. MOE issues an Environmental Compliance Approval (ECA) under the Environmental Protection Act (EPA) for the treatment and disposal of sewage by large subsurface sewage disposal systems (LSSDS), which are characterized by flows of more than 10,000 L/day. A number of small systems on a campground would also qualify as a large system if their total design flows exceed 10,000 L/day. In addition, if there are a number of residences or cottages occupying one large lot (i.e., all existing within the survey boundaries for the large lot) and each is serviced by an individual septic system (or all are serviced by one or more communal systems), this would constitute a 'large' system if the combined daily flows of all the individual systems exceed 10,000 liters per day. Approval, therefore, would be required from the Ministry for a large system.

If the septic system is not on the same lot as the building that it serves, or if the system serves a number of lots, the system is considered to be a large system regardless of whether the flows are greater than or less than 10,000 L/day, an Environmental Compliance Approval (ECA) is required from the Ministry of the Environment.

Although an ECA is required by the MOE for any large subsurface sewage system, the City must also endorse the system and the MOE will not approve the ECA unless the City has endorsed the system. A copy of the proposal for any large system to be approved by the MOE shall be submitted to the City for review well in advance. The proponent must ensure that the technical reports submitted meet the requirements of the MOE, as these may differ from the requirements of the City.

For industrial/commercial developments the sewage must consist of only domestic waste. No industrial/commercial cooling or process waste water is to be considered for effluence to the septic system.

Applications for approval of the use of groundwater source heat pumps should be included in the draft plan and will be considered on a case-by-case basis.

1.4. Processing Fees

The proponent will be required to pay to the City the costs associated with the assessment of the application. The review process of the Hydrogeological Study includes one day review and associated meetings with the proponent. If additional staff time is required, or if an independent qualified professional is retained by the City, the proponent will be responsible for these additional costs. The proponent will be notified in advance of any additional costs.

All costs associated with preparation of the Hydrogeological Study (including the retaining of private qualified professional services as may be required) are the proponent’s responsibility.

2. BACKGROUND AND RELATED LEGISLATION

The documents are grouped in terms of Provincial Legislation – Provincial Guidelines – Procedures; and City delegated authority and supporting technical documents. In some instances, the City has adopted a more conservative approach to the minimum provincial standards / requirements described in the documents below.

All development proposals, including those considering private servicing, should conform to the following key planning documents:

2.1. Provincial Legislation

- ***Ontario Water Resources Act*** (1990), ***Sections 52 and 53*** provide guidance for applying for approval of municipal and private water and sewage works. Activities that require an Environmental Compliance Approval (ECA), or are exempt, are governed by the Ontario Water Resources Act or the Environmental Protection Act and the regulations under those Acts.
- ***Clean Water Act*** (2006) ensures communities are able to protect their municipal drinking water supplies through the development of collaborative, locally driven, science-based source water protection plans.
- ***Safe Drinking Water Act*** (2002) defines the quality standards for potable water and also establishes the minimum requirements for policy and best practices to protect human health. The standards for drinking water quality in Ontario are prescribed in O. Reg. 169/03 under the *Safe Drinking Water Act* (*2002*).
- ***Ontario Building Code Act*** (1992) is the legislative framework governing the construction, renovation and change of use of buildings. The Building Code is a regulation authorized by the Act, and is updated about every 5 years. The most recent is the 2011 Building Code. The Building Code represents a collection of regulations and requirements which pertain to specific subjects (septic bed design, clearances, etc.) that regulate specific practices (such as designing, constructing or remodeling buildings).
- ***The Planning Act*** (1990) sets out the basic rules for land use planning in Ontario and describes how land uses may be controlled, and who may control them.
- ***Environmental Protection Act*** (Part VIII, 1990) entitles the municipality to conduct inspections of the parcels of land served by a private system and to comment on the suitability of such lands for sewage disposal. The Ministry of the Environment Director's authority to issue an Environmental Compliance Approval (ECA) is set out in the Environmental Protection Act as well.

2.2. Provincial Guidelines and Procedures

The following guidance documents provide various methodologies for undertaking the analysis required for the hydrogeological and technical assessments. These are not meant to be prescriptive, but provide useful approaches to the analysis. Where contradictions are evident, the approach indicated by the most recent document (in keeping with the sustainable private water and wastewater services policies of the Rural Hamilton Official Plan), would prevail.

- ***MOEE Hydrogeological Technical Information Requirements for Land Development Applications*** (1995) provides general administrative and technical guidance to developers applying for subdivision approval, and prescribes a set of minimum requirements for preparing Groundwater Assessment reports;

- ***Guideline D-5. Planning for Sewage & Water Services*** (1996) describes an implementation approach for municipal planning for servicing and infrastructure with a particular focus on sewage and water services. It applies to the development proposal of more than five units but also to residential, commercial and industrial proposals which use individual on-site sewage disposal systems for the treatment of domestic waste;

- ***Procedure D-5-4. Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment*** (1996) describes MOE requirements regarding the assessment of the potential impact on groundwater caused by proposed developments on individual on-site sewage systems;

- ***Procedure D-5-5. Technical Guideline for Private Wells: Water Supply Assessment*** (1996) describes the MOE position regarding the assessment of water supplies for residential developments on individual private wells. The guideline also applies to developments for which a plan of condominium is required and to industrial, commercial or institutional developments where water is used for human consumption;

- ***Wells, Ontario Regulation 903/90 (last amended O.Reg. 468/10)*** that provides direction on the licensing requirements for performing work related to well construction, maintenance and abandonment and the standards by which these operations should be undertaken;

- ***MOE Design Guidelines for Sewage Works, Chapter 22 (2008)*** provides an overview of large subsurface disposal systems and a comparison of these systems to those smaller systems regulated by Part 8 of Division B of the Building Code.

- ***Manual of Policy Procedures and Guidelines for On-Site Sewage Systems*** (1982) was replaced by the Ontario Building Code, but remains a useful tool for technical support for on-site sewage systems; and

- **Guideline B-7 Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities** (MOEE, 1994) establishes the bases for determining the levels of contaminant considered acceptable by the Ministry in the light of groundwater use on properties adjacent to sources of contaminants.

2.3. City of Hamilton and Key Planning Documents/Reports

The City of Hamilton is the approval authority for development applications including: official plan amendments, zoning by-law amendments, draft plans of subdivisions /condominiums, land severances, part-lot control exemptions and site plans. The City evaluates development applications by assessing their conformity with Official Plan policies, zoning regulations and associated guidelines. Plans and applications for development on private services are approved only where the City's private servicing requirements have been successfully fulfilled.

Where municipal water and wastewater services are not available, the Rural Hamilton Official Plan (2012) requires all developments to be self-sustaining on private individual water wells and private individual sewage disposal systems. This Guideline excludes[1] any proposed works or systems deemed communal-based or partial servicing as they are contrary to current Rural Hamilton Official Plan policy.

The Key Planning Documents/Reports include:

- ***Rural Hamilton Official Plan and the Official Plans currently in effect (Regional Official Plan*** *and one for each of the six former area municipalities:* ***Town of Ancaster, Town of Dundas, Town of Flamborough, Township of Glanbrook, City of Hamilton, and City of Stoney Creek)*** provide through the adopted policies, consistency with the Greenbelt Plan and with the Provincial Policy Statement. One of the objectives of the Rural Hamilton Official Plan is to ensure that all new rural developments establish sustainable private services wherever municipal water and wastewater services are not available.

- ***Source Protection Plans.*** Under the Clean Water Act legislation, Source Protection Plans are built on scientific information and public consultation in order to set out

[1] Existing site specific Official Plan / Zoning By-law policies may be in place to permit communal based services.

policies and risk management strategies to address any significant threats to the municipal drinking water supply. Current Source Protection documents relevant to the City of Hamilton include the following:

- Assessment Report Halton Region Source Protection Area (Halton-Hamilton Source Protection Committee, 2012) (approved by the Ministry of Environment 2012),
- Assessment Report Hamilton Region Source Protection Area (Halton-Hamilton Source Protection Committee, 2012) (approved by the Ministry of Environment 2012),
- Assessment Report, Niagara Peninsula Source Protection Area (Niagara Peninsula Source Protection Committee, 2011) (approved by the Ministry of Environment 2011),
- Assessment Report, Grand River Watershed (Lake Erie Region Source Protection Committee, 2012) (approved by the Ministry of Environment 2012),
- Proposed Source Protection Plans developed for the above mentioned Source Protection Areas and Regions.

- ***City of Hamilton Studies*** – various Master Plans, Sub-watershed Studies, Municipal Class Environmental Assessments, specific well supply studies and other pertinent studies that provide background technical information should be reviewed.

- ***Hydrogeological Reports***. The following should be reviewed for pertinent information.
  - Hamilton Groundwater Resources Characterization and Wellhead Protection (SNC Lavalin, 2006),
  - Vulnerability Assessment and Scoring of Wellhead Protection Areas – City of Hamilton (Earth FX, 2010)

- ***Rural Settlement Capability Studies.*** These documents provide a general overview of the development capacity of each settlement area based upon water and sewage constraints. Any development proposal should take into account overall cumulative impact concerns identified in these Settlement Capability studies. The relevant Rural Settlement Capability Studies are listed following.

Settlement Capability Study (SCS) Location	**SCS Name and Date**
Jerseyville, Ancaster	SCS for Jerseyville Area, Gartner Lee, Feb 1983
Copetown, Ancaster/ Flamborough	SCS for Copetown, Underwood McLellan
Flamborough Centre, Flamborough	SCS for Flamborough Centre
Greensville, Flamborough	Greensville, Servicing Studies I & II, Gartner Lee, June 1985
Kirkwall, Flamborough	SCS for Region of Hamilton-Wentworth, Vol. 1, Underwood McLellan Feb., 1976
Millgrove, Flamborough	SCS for the Rural Settlement of Millgrove, Hydrology Consultants, June 1986
Orkney, Flamborough	SCS for Region of Hamilton-Wentworth, Vol. 1, Underwood McLellan Feb., 1976
Rockton, Flamborough	SCS for the Rural Settlement of Rockton, Hydrology Consultants, Nov., 1983
Sheffield, Flamborough	SCS for the Rural Settlement of Sheffield, Hydrology Consultants, Nov., 1983
Strabane, Flamborough	SCS for the Rural Settlement of Strabane, Hydrology Consultants, Nov., 1984
Troy, Flamborough	SCS for the Rural Settlement of Troy, Hydrology Consultants, Nov., 1984
Westover, Flamborough	SCS for Region of Hamilton-Wentworth, Vol. 1, Underwood McLellan Feb., 1976

Woodburn, Glanbrook	SCS for Woodburn Area, Underwood McLellan July 1980
Freelton, Flamborough	SCS for Freelton, Underwood McLellan, July 1980
Binbrook Area	SCS for Binbrook Area, Gartner Lee 1981
Mt. Hope, Glanford	SCS for Mt. Hope Area, Gartner Lee, Feb., 1983

- ***Nature Counts Project: Hamilton Natural Areas Inventory,*** Hamilton Naturalists' Club, 2003, Dwyer, J.K. (ed.) provides background information on significant natural features (wetlands, fish habitat, Areas of Natural and Scientific Interest, Environmentally Significant Areas), physiography and topography, geology, soils, hydrology and surface water drainage.

3. HYDROGEOLOGICAL STUDY AND REPORT

3.1. Approval Process

The assessment process involves the completion of a Hydrogeological Study (HS) and the preparation of a Hydrogeological Study Report (HSR). The purpose of the report is to provide background information on the suitability of the site for development on private services and to confirm site specific information through field work and detailed site specific evaluations.

Table 1 outlines the approval process. A pre-consultation meeting can be arranged between the proponent and the City's Planning & Economic Development Department to assist the proponent in identifying the requirements and any costs associated with their application.

This process will ensure that water and sewage impact assessments will be consistently and comprehensively evaluated by the proponent's qualified professionals and that the report satisfies the City's requirements.

The Hydrogeological Study will be completed by and/or under the direction of ***qualified professionals***. The Hydrogeological Study Report will be prepared by ***qualified professionals***. For the purposes of these guidelines, the City defines qualified professionals as Professional Engineers and Professional Geoscientists with demonstrated training and experience in the field of hydrogeology. Where necessary, preparation of the Hydrogeological Study Report may require input from a professional with experience in the design of private services.

A Hydrogeological Study Report, where applicable, will be a requirement for a complete application under the Planning Act and the Official Plan.

Table 1. Approval Process

Step	Explanation	Responsibility
1	Proponent initiates the approval process.	Proponent
2	Formal consultation and/or application circulation. Planning & Economic Development Department (PEDD) Staff may consult with Public Works (PW) Department Staff to determine the applicability of a Hydrogeological Study and its scope.	PEDD
3	The proponent submits the Hydrogeological Study Report following the Hydrogeological Study Guidelines.	Proponent
4	The Hydrogeological Study Report is submitted to PEDD and reviewed by PW staff.	PEDD and PW
5	If the Hydrogeological Study Report does not fulfil the City requirements, the proponent and/or their consultants **may investigate an alternative technical solution or the project may not be supported.** If the City requirements are fulfilled, go to step 6.	Proponent
6	PW signs off on the requirement for a Hydrogeological Study Report prior to any Planning Act approvals to be issued by PEDD.	PEDD

The Hydrogeological Study Report and its recommendations must be accepted by the City prior to any approval, Official Plan amendments, rezoning, Draft Plan of Subdivision approval, severances and site plans. Once accepted, the proponent will confirm their acceptance through the development agreement with the City and will be obliged to follow the recommendations in the Hydrogeological Study Report as part of the Draft Plan approval.

The Hydrogeological Study Report will form the basis for providing or denying servicing approval.

3.2. Hydrogeological Study Components

3.2.1. Water Supply

An assessment is required to determine and quantify:

a) the availability and sustainability of adequate groundwater supplies with respect to quantity and quality.

For the purposes of these Guidelines, the only exceptions to the use of groundwater for anything other than a drinking water supply shall be reasonable uses that involve

water quality more stringent than defined by the ODWQS (for example: providing baseflow and/or maintaining quality of a cold water trout stream);

b) any potential interference to existing water users and sensitive receptors (i.e., wetlands, watercourses etc.) caused by the proposed development.

The Hydrogeological Study will establish groundwater availability and representative supply quality through a well construction and testing program, the minimum requirements being those described in the MOE Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment. Test well requirements derived from this Technical Guideline are outlined below.

1. The minimum number of test wells will be: 3 for sites up to 15 hectares in area; 4 for more than 15 hectares and up to 25 hectares; 5 for more than 25 hectares and up to 40 hectares; and for more than 40 hectares, one additional test well is required for each additional 20 hectares or portion thereof.

2. In the case of a proposed severance, it is recommended that a test well be constructed on the lot to be severed. The well should be located and constructed in a manner such that the well could be used as a water supply source if the severance application is approved. The proponent will also be required to demonstrate that a potable supply of groundwater, of sufficient quantity, is available from a well located on the lot to be retained.

3. The areal distribution of the wells must be such that the hydrogeological conditions across the site are adequately represented. Consideration should be given to having at least one of the test wells drilled to determine the stratigraphic sequence and the presence of deeper aquifer zones.

4. The test wells should be located and constructed in such a way as to permit the prediction of the quantity and quality of groundwater that domestic wells throughout the development site will extract in the future.

   Any existing and unused wells on the site must be documented. If there are pre-existing wells on the property, the developer may use them as domestic water wells if they comply with the standards set out in O.Reg. 903/90 (as amended) made under the *Ontario Water Resources Act (1990).* If such wells are to be used, the respective water well records must be accurately and fully completed.

5. The wells must be constructed by a licensed water well contractor. Any test wells constructed that are not required for future supply must be abandoned as per O.Reg. 903/90 (as amended).

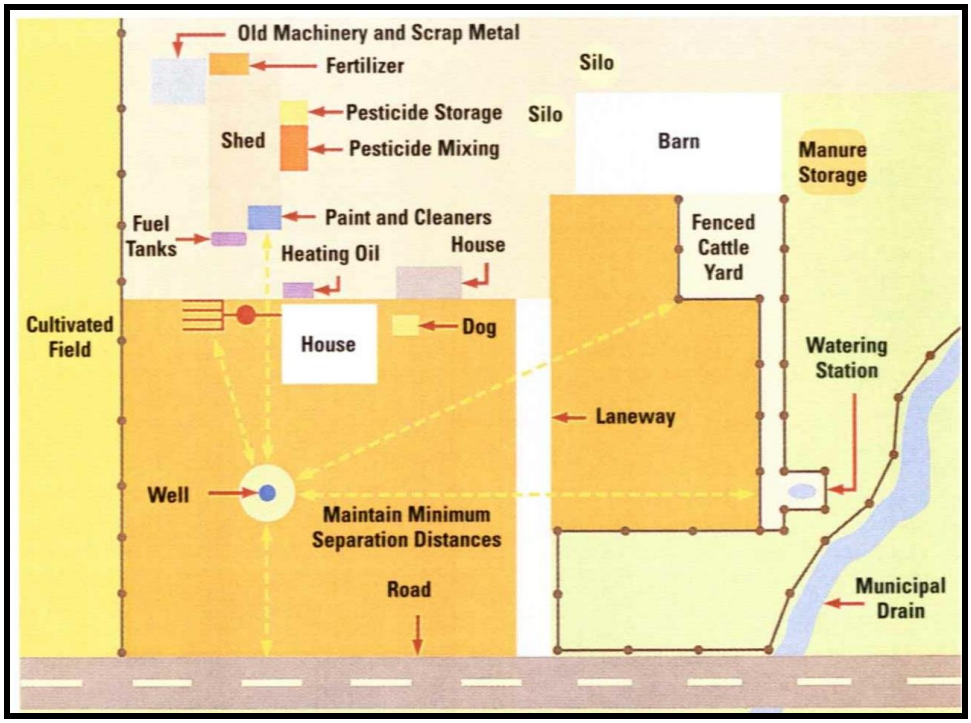
Well Construction

The construction of test wells and future domestic supply wells must comply with O.Reg. 903/90 (as amended) made under the *Ontario Water Resources Act (1990),* and with the City's requirements, where applicable.

Separation distances between wells and any potential contaminants as specified in the relevant regulation must be adhered to. The locations of wells should be so as to minimize the impact from any leaching beds. Potential sources of contamination such as manure storage or handling facilities, waste disposal sites or other sources which can interfere with the drinking water supply shall be identified and documented.

Figure 1 provides some guidance in properly locating a potable water supply well so as to reduce the risk of impact from potential contaminant sources.

Figure 1. Locating a potable water well supply



(From Best Management Practices)

Separation distances between the potable water well and other potential contaminant(s), as provided in regulations and other information sources are to be considered as a minimum requirement. In certain environmental settings these distances may be required

to be greater (e.g., fractured bedrock) to ensure the safety of users, particularly downgradient of the potential contaminant source.

The proponent's qualified professional should work with a planner and/or engineer in producing the development plan. On-site water and sewage systems should be incorporated at an early stage in the site design, thereby optimizing site resources for water supply and sewage treatment. Stormwater management must also be considered when sites for water and sewage systems are identified.

The qualified professional and/or the City may recommend additional site-specific construction criteria and/or supervision of well construction by qualified staff. For example, the qualified professional's initial findings may indicate that water quality or quantity standards cannot be met without special well construction specifications.

Water Quantity

The ability of an aquifer to provide and sustain the anticipated demands of the proposed development will be determined by completing a pumping test program. The minimum requirements for the pumping test program being those described in the MOE Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment. The pumping test program shall be undertaken at all constructed test wells on-site, under the direction of a qualified professional.

Accessible off-site wells within 200 metres from any development well should be monitored during the on-site pumping test(s), provided well owner approval is obtained in response to a formal request.

Water Quality

Water quality sampling should be undertaken at test wells and monitoring wells on-site, and off-site where possible. The water quality parameters for which the analyses must be performed is listed in Tables 1 and 2 of Appendix A. Where there are wells in nearby established developments, information is to be obtained from residents, where possible, and other sources regarding water quality issues.

Water quality may vary between aquifers or with depth in the same aquifer. The qualified professional should recommend appropriate well construction and must assess the potential for cross-contamination between aquifers. This information will then be used in determining the preferred aquifer to ensure sustainability of the water supply.

3.2.2. Sewage Disposal

All proposed development on private services will be reviewed on the basis of its capability to support a primary sewage disposal system and to accommodate a reserve discharge site or leaching bed for the system effluent by maintaining an area of vacant and suitable land in an appropriate location. This will help to ensure that the development proceeds at a density and scale that will not result in exceedance of acceptable limits or cause degradation of groundwater resources.

Although the City may support proposals involving individual on-site sewage systems, it does not assume responsibility for failure of the system(s), for correcting the damage to adjacent properties, or for the construction of new sewage systems. This is the responsibility of the proponent/owner of the system.

The most common on-site investigation components to assess the feasibility for private sewage disposal include:

a) on-site hydraulic testing of saturated soil through groundwater monitors;

b) surficial soil analysis through site specific testing of the proposed primary and reserve bed area. The excavations/boreholes should extend to at least 3.0 metres (below ground surface) or to bedrock refusal, whichever comes first, distributed at one excavation/borehole per lot of the development property;

c) soil percolation estimation through on-site permeameter testing or through laboratory grain size analysis (including hydrometer testing). The City reserves the right to request additional percolation tests as the soil condition may change over the course of the subdivision development as a result of soil compaction, re-grading, infilling etc., where percolation rates vary across the site, or when percolation rates appear inconsistent with grain size analysis.

For the purposes of this guideline, the Ontario Drinking Water Quality Standard (ODWQS) of 10 mg/L of nitrate-nitrogen is used as the maximum allowable boundary conditions respecting groundwater impact (as per MOE Procedure D-5-4). The potential impact from phosphorus (15 mg/L) and other parameters which may be of concern as listed in the MOE Guideline B-1-1 *Water Management - Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy* (MOE, 1995) should be addressed where the proposed sewage system effluent may be discharged to surface water.

Any application for a proposed development should include a water conservation plan based on recommended methods to conserve groundwater and reduce sewage volumes, such as regulating and metering the flow of water.

3.3. Hydrogeological Study Report Details

Following the completion of a Hydrogeological Study, a Hydrogeological Study Report (HSR) shall be prepared by qualified professionals to present the study results that support an assessment of the suitability of the site for development on private services. Summarized below are descriptions of the HSR contents that are required as a minimum.

3.3.1. Physical Setting

a) regional and local maps, showing site location and orientation with Lot and Concession Numbers, area municipal infrastructure, roads and highways. Maps should be of a scale best suited to depicting the site and local features. An air photo base would be appropriate to supplement the identification of local features.

b) present a description of the geological and hydrogeological setting of the site (i.e., site conceptual model). This shall be based on a review of all available geologic and hydrogeologic information. The data review shall include, but not necessarily be limited to, the following:

i) agricultural county soil and aggregate reports;

ii) quaternary & bedrock geology maps and reports (e.g., Ontario Geological Survey publications);

iii) hydrogeologic maps and reports (e.g., watershed studies and source protection technical studies);

iv) reference to water supply and septic suitability reports for existing nearby developments;

v) a well survey, based on a review of MOE water well records, conducted to determine the condition and details of local wells (i.e., to the extent possible within the requirements of O.Reg. 903/90), including the method of construction, water level, pump intake, well depths, water use. The well survey shall be completed with the assistance of well owners and should include all wells within 500-metre radius of site and include, where possible, field confirmation;

vi) where the proposed development is in a rural settlement area, overall settlement capability (cumulative impacts) should be assessed in order to address concerns raised in the Rural Settlement Capability Studies. In some settlement areas, further development may be characterized or placed in context of cumulative impact concerns (e.g., currently elevated nitrate concentrations in groundwater and/or limited available groundwater supplies). In other areas, larger lot sizes may serve to reduce cumulative impacts through less intensive development and the effective use of the soils' attenuating capacities; and,

vii) minimum lot sizes for an area must respect the Official Plans, Secondary Plans, and Rural Settlement Capability Studies;

c) describe local land uses and servicing, surface topography, surface drainage conditions, significant environmental features (i.e., wetlands, watercourses, flood plains) and sensitive receptors (i.e., wellheads, discharge/recharge areas, surface water, lake intakes and drainage outlets) within at least a 500-meter radius of the site; and

d) identify present and previous on-site land uses (i.e., contaminant site inventory, MOE waste site inventory, etc.), and possible contamination sources (i.e., spills, refuse, fertilizers) that may affect water quality or quantity.

3.3.2. Water Supply

a) describe the regional hydrogeological setting (general identifiable units, general characteristics, overburden and bedrock aquifers, groundwater flow direction, recharge/discharge zones, vulnerable zones, high water table areas, municipal wellhead protection areas, aquifer demands, municipal/communal well locations, regulated water taking locations [i.e., PTTWs], existing well yields, etc.). Much of this material can be obtained from Source Protection reports;

b) plot and locate representative water well(s), and observation wells on an appropriate scale (1:10,000 or lower scale maps should be used);

c) tabulate local well depths, static levels, pumping water levels, etc.;

d) prepare at least two cross-sections (orthogonal directions) extending through the development lands and identify preferred aquifer for water supply;

f) assess the susceptibility of the proposed water-supply aquifer to surface-derived contamination;

g) provide the historic well construction particulars for any on-site well (i.e. MOE well logs);

h) provide historic pumping-test particulars for each of the on-site wells; and

i) discuss the historic water quality obtained at each well in regard to the groundwater potability and treatment requirements.

<u>Groundwater Quantity</u>

The details that are to be presented in the HSR to support an assessment of the quantity of groundwater available will include:

a) maps indicating the shallow groundwater system (lateral groundwater gradients and direction of groundwater movement) beneath the site and defining the area down gradient of the property limits;

b) list of well construction particulars for each on-site test well, including:

   i) detailed diagrams showing casing length and wall thickness, screened interval and slot size, borehole depth and diameter, and elevations of ground surface, water found, static level, and top-of-casing;

   ii) MOE water well records;

c) elevation survey (to an accuracy of 2 cm) of all on-site and selected private wells, where possible, depending on the availability of access and land-owner permission, and as limited by O. Reg. 903/90;

d) accurate water-level elevations of selected individual wells to confirm the water table and/or potentiometric surface, and groundwater flow directions within the supply aquifer(s) and provide maps and plans showing groundwater elevations;

e) pumping-test particulars for each on-site well, including:

   i) graphical plots of the step test and the aquifer test (performed at a constant rate for at least six hours);

   ii) analysis of the pumping test results (by Jacob or Theis method, or others with justification of selected methodology). The analysis should discuss and identify the short-duration and sustained (perennial) capabilities of the tested wells with consideration of seasonal fluctuations;

f) estimation of the recoverable on-site recharge and assessment of the sustainability of the groundwater supply source;

g) confirmation that adequate water quantity supplies of potable water are available on each lot of the proposed development based on the MOE Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment. If significant interference is anticipated, provide a mitigative procedure acceptable to the potentially-impacted party(s) and the proponent. The potential for an adverse impact to, or by, the development within a minimum of 500 metres of the site must be addressed when there have been, are, or may be in the foreseeable future significant potential sources of groundwater contamination.

h) existing improperly abandoned wells are to be identified, and a plan proposed for proper abandonment of supply and test wells consistent with O. Reg. 903/90 (as

amended). Wells that are selected for ongoing monitoring must be identified and a maintenance / monitoring plan for these wells must be documented in the HSR.

Groundwater Quality

The details that are to be presented in the HSR to support an assessment of the quality of groundwater available will include:

a) assessment of the susceptibility of the proposed water-supply aquifer(s) to surface-derived contamination (i.e., septic effluent, road salt etc). If there is potential risk to the aquifer(s) from these sources, proposed control measures must be included in the HSR;

b) summary of the water-quality results for each of the water-supply wells and test wells. Complete documentation of sampling times, any on-site analytical methods, field QA/QC program, chain-of-custody and certificates of analyses. The qualified professional must also determine whether conditions specific to the site, or its surrounding area, require the inclusion of additional parameters to those listed in Tables 1 and 2 of Appendix A;

c) Raw groundwater analysis should indicate compliance with the Ontario Drinking Water Quality Standards (ODWQS). Review nitrate concentration analysis for all sampled wells. Where health-related ODWQS criteria are met but aesthetic objectives are exceeded, a qualified professional should recommend methods such as in-home water treatment systems to reduce the values of the aesthetic parameter(s) concentrations to an acceptable level.

   The treatment systems listed in Table 4 of Appendix A are suggested for single parameters. When treatment for more than one parameter is required, the systems suggested may not be appropriate due to treatment process interferences. In this situation, the qualified professional or water treatment specialist must make recommendations regarding the type of treatment required.

   Although the City may support development proposals involving individual home water treatment devices, the City does not assume any responsibility for monitoring the operational effectiveness, maintenance, failure or replacement. This is the responsibility of the proponent / owner of the water treatment device / system.

3.3.3. Sewage

The details that are to be presented in the HSR to support an assessment of the suitability of the site for the operation of sewage disposal systems must include:

a) a plot of the locations of any site specific information points such as test pits/ boreholes and water-table quality monitors;

b) graphical plots of grain-size determinations of representative soil samples for proposed leaching bed locations and, if applicable, graphical plots of grain-size determinations after the re-grading or the infilling of sewage system envelopes;

c) descriptions of major soil types within the development lands based in part upon site specific information. The focus of the soil investigation is to assess:

    i. the hydraulic capabilities of the on-site soils for subsurface sewage effluent disposal;

    ii. the infiltration capacity of the surficial soils;

d) an assessment of the infiltration rate through the surficial sediments, recognizing the distribution of the major soil types and any vertical gradients established between the defined shallow and deeper groundwater systems;

e) provide calculations of the allowable development for the proposed residential or commercial/industrial development by conducting on-site and off-site predictive assessment for nitrate impact, the minimum requirements being those described in MOE Procedure D-5-4, Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment. Examples of on-site and off-site nitrate impact calculations are presented for reference in Appendix B. The nitrate impact calculations shall make use of, and reference, infiltration rates provided in Appendix C. For septic systems that produce more than 4500 L/days, the MOE Design Guidelines for Sewage Works, Chapter 22 (2008) shall represent the preferred methodology for the study.

f) The on-site and off-site assessment is to include the impact of any potential contaminant plumes from leaching beds on the water supply(s) for the development as well as off-site water sources. The assessment should acknowledge that septic system effluence may result in long narrow contaminant plumes in permeable overburden and bedrock;

g) the impact of the on-site discharge of sewage effluent into surface water must be evaluated where the receiving water body occurs on-site, or within 500 metres from the downgradient property boundary;

h) the qualified professional must make recommendations regarding the optimum location and orientation of leaching beds. In general, the attenuation capabilities of a site can be optimized by maximizing separation distances between individual on-site septic systems, on-site wells, downgradient wells, and property boundaries, while having regard for the minimum separation distances;

i) provide site-specific / lot-by-lot documentation on the leaching-bed design and tile-bed area requirements for sewage-disposal systems compliant with the Ontario Building Code / Guidelines requirements. This includes an overall proposed grading / servicing plan with proposed and reserved septic envelopes to be provided. This type of plan allows for an evaluation of the development as a whole.

Additional studies could be required if the proposed development is either in proximity of, or lies within, a wellhead protection area and capture zone of a municipal well.

Tertiary Treatment Units

Reference should be made to Appendix D, which outlines our policy position on advanced treatment units to support water quality impact risk assessments from on-site sewage disposal systems.

3.3.4. Stormwater Management

Stormwater management infrastructure shall be designed in accordance with City of Hamilton, Criteria and Guidelines for Stormwater Infrastructure Design and Stormwater Management Planning and Design Manual, Ministry of Environment (2003).

Where applicable the HSR should identify:

a) requirements for stormwater quantity and quality control measures;

b) suitable outlet for minor and major system flows including external drainage areas;

c) opportunities to provide groundwater recharge through infiltration and other Low Impact Development (LID) components if conditions (existing soil, topography, water quality etc.) permit; and

d) locations of stormwater management facilities, infiltration galleries, and easements.

Submission of Hydrogeological Study Report for Approval

The Hydrogeological Study Report and a sewage system permit application should be submitted to the Planning and Economic Development Department for screening, and to the Public Works Department for review. The timing and submission of reports should be verified with Planning Staff. If all the relevant requirements are fulfilled, a Draft Approval will be issued by the Planning and Economic Development Department.

REFERENCES

City of Hamilton, *Rural Hamilton Official Plan*, March 2012

Ministry of Housing and Municipal Affairs, *Ontario Building Code Act*, Part 8. Sewage Systems, 2006

Ministry of the Environment and Energy, MOEE Guideline B-1-1: *Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy*, 1994

Ministry of the Environment, Guideline B-7 (Formerly Policy 15-08), *Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities*, 1994

Ministry of the Environment, Manual of Policy, *Procedures and Guidelines for Onsite Sewage Systems* (Referring to Ontario Regulation 347/81 under Part VII of the Environment Protection Act), Queen's Printer for Ontario, ISBN 0-7743-7303-2, 1982

Ministry of the Environment, *MOEE Hydrogeological Technical Information Requirements for Land Development Applications*, 1995

Ministry of the Environment, Notice 3/87: *Protection of Ground Water Quality*, 1987

Ministry of the Environment, Ontario Regulation 169 - *Ontario Drinking Water Quality Standards*, 2003

Ministry of the Environment, Procedure D-5: *Planning for Sewage & Water Services*, 1995

Ministry of the Environment, Procedure D-5-: *Technical Guideline Private Wells: Water Supply Assessment*, 1995

Ministry of the Environment, Procedure D-5-4: *Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment*, 1995

Ministry of the Environment, *Procedures for Disinfection of Drinking Water in Ontario*, 2003

Ministry of the Environment, *Technical Guideline for Private Wells: Water supply Assessment*, 1995

Ministry of the Environment, Wells, *Ontario Regulation 903/90* (Amended to O.Reg. ***468/10***)

Regional Municipality of Halton, *Guidelines for Hydrogeological Studies and Standards for Private Services*, May 2000

Regional Municipality of Waterloo, *Guidelines for Hydrogeological Studies for Privately Serviced Developments*, May 1991

GLOSSARY OF TERMS

Accessible Well: A water-supply well in which the water level may be measured by wetted tape or electric depth gauge. Access into the well for such monitoring shall be the responsibility of the well owner, and as regulated by O. Reg. 903/90 (as amended).

Adverse Quality Impact: An increase in the off-site concentration of a chemical parameter above the Ontario Drinking Water Quality Standards, deduced to occur from the proposed sewage loading of a development.

Aquifer: An overburden or bedrock system that either is, or that may be used to provide private and public water supplies.

Combined Impact: Refers to the blended quality impact of all the individual on-site systems on the development site. The effluent impact on groundwater is not assessed on a plume-by-plume basis.

Dry Industrial/Commercial Uses: Those uses in which only the disposal of the domestic waste of employees is permitted and treated. No industrial liquid wastes, wash or cooling water or process wastes are permitted.

Health Department: The Medical Officer of Health of the Regional Health Department and Public Health Inspection staff mandated under the Health Protection Act.

Groundwater Recharge: The entry of infiltrating precipitation into the saturated zone at the water table surface.

Hydrogeologically Isolated: Those areas characterised by strong upward hydraulic gradients; massive, unfractured clay deposits at or near ground surface; or other thick impervious layers of materials over water-bearing formations.

Hydrogeologically Sensitive: Karstic areas, areas of fractured bedrock exposed at surface, areas of thin soil cover, or areas of highly permeable soils.

Highly Vulnerable Aquifer (Clean Water Act definition): An aquifer that can be easily changed or affected by contamination from both human activities and natural processes as a result of (a) intrinsic susceptibility, as a function of the thickness and permeability of overlaying layers, or (b) by preferential pathways to the aquifer.

Low permeability environments: Where it can be shown that the uppermost subsurface unit(s) at have a vertical hydraulic conductivity of 10-5 cm/sec or less, is at least 10 metres (33 feet) thick and extends at least 100 m (330 ft) downgradient of the infiltration area, attenuation calculations may not be required. The assessment would however need to demonstrate the absence of higher permeability pathways in the lower permeability material."

Potable Water: Water that meets the MOE Ontario Drinking Water Quality Standards for the chemical and bacteriological parameters listed in Appendix A, or that contains aesthetic parameters exceeding these objectives at concentrations considered to be reasonably treatable.

Private Services: Individual on-site private sewage disposal system and private water well supply.

Private Sewage Disposal System – Class IV: An on-site septic tank and tile bed system regulated by the Ontario Building Code.

Private Sewage Disposal System – Tertiary system: Sewage system designed with a treatment unit other than a septic tank, commonly featuring advanced treatment units that reduce specific septic system pollutants.

Private Water Supply: Individual On-Site Well constructed in accordance with O.Reg. 903/90 (as amended) under the Ontario Water Resources Act.

Significant Interference: Where the withdrawal of water from one or more water wells causes a reduction in the quantity of water that can be withdrawn from a previously-established water supply well(s).

APPENDIX A

Groundwater Quality Parameters

TABLE 1. MICROBIOLOGICAL STANDARDS

Item	Microbiological Parameter	Standard (expressed as a maximum)
1.	*Escherichia coli* (E. coli)	Not detectable
2.	Total coliforms	Not detectable

O. Reg. 169/03, Sched. 1; O. Reg. 248/06, s. 1.

TABLE 2. CHEMICAL STANDARDS

Item	Chemical Parameter	Standard (expressed as a maximum concentration in milligrams per litre)
1.	Alachlor	0.005
2.	Aldicarb	0.009
3.	Aldrin + Dieldrin	0.0007
4.	Antimony	0.006
5.	Arsenic	0.025
6.	Atrazine + N-dealkylated metabolites	0.005
7.	Azinphos-methyl	0.02
8.	Barium	1.0
9.	Bendiocarb	0.04
10.	Benzene	0.005
11.	Benzo(a)pyrene	0.00001
12.	Boron	5.0
13.	Bromate	0.01
14.	Bromoxynil	0.005
15.	Cadmium	0.005
16.	Carbaryl	0.09
17.	Carbofuran	0.09
18.	Carbon Tetrachloride	0.005
19.	Chloramines	3.0
20.	Chlordane (Total)	0.007
21.	Chlorpyrifos	0.09
22.	Chromium	0.05
23.	Cyanazine	0.01
24.	Cyanide	0.2
25.	Diazinon	0.02
26.	Dicamba	0.12
27.	1,2-Dichlorobenzene	0.2
28.	1,4-Dichlorobenzene	0.005
29.	Dichlorodiphenyltrichloroethane (DDT) + metabolites	0.03
30.	1,2-dichloroethane	0.005
31.	1,1-Dichloroethylene (vinylidene chloride)	0.014
32.	Dichloromethane	0.05
33.	2,4-Dichlorophenol	0.9
34.	2,4-Dichlorophenoxy acetic acid (2,4-D)	0.1
35.	Diclofop-methyl	0.009
36.	Dimethoate	0.02
37.	Dinoseb	0.01
38.	Dioxin and Furan	0.000000015 [a]
39.	Diquat	0.07
40.	Diuron	0.15
41.	Fluoride	1.5
42.	Glyphosate	0.28
43.	Heptachlor + Heptachlor Epoxide	0.003
44.	Lead	0.010
45.	Lindane (Total)	0.004
46.	Malathion	0.19
47.	Mercury	0.001
48.	Methoxychlor	0.9
49.	Metolachlor	0.05
50.	Metribuzin	0.08
51.	Microcystin LR	0.0015

52.	Monochlorobenzene	0.08
53.	Nitrate (as nitrogen)	10.0
54.	Nitrite (as nitrogen)	1.0
55.	Nitrate + Nitrite (as nitrogen)	10.0
56.	Nitrilotriacetic Acid (NTA)	0.4
57.	N-Nitrosodimethylamine (NDMA)	0.000009
58.	Paraquat	0.01
59.	Parathion	0.05
60.	Pentachlorophenol	0.06
61.	Phorate	0.002
62.	Picloram	0.19
63.	Polychlorinated Biphenyls (PCB)	0.003
64.	Prometryne	0.001
65.	Selenium	0.01
66.	Simazine	0.01
67.	Temephos	0.28
68.	Terbufos	0.001
69.	Tetrachloroethylene (perchloroethylene)	0.03
70.	2,3,4,6-Tetrachlorophenol	0.1
71.	Triallate	0.23
72.	Trichloroethylene	0.005
73.	2,4,6-Trichlorophenol	0.005
74.	2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	0.28
75.	Trifluralin	0.045
76.	Trihalomethanes	0.100 [b]
77.	Uranium	0.02
78.	Vinyl Chloride	0.002

Footnotes:

[a] Total toxic equivalents when compared with 2,3,7,8-TCDD (tetrachlorodibenzo-p-dioxin).

[b] This standard is expressed as a running annual average.

O. Reg. 169/03, Sched. 2; O. Reg. 268/03, s. 1; O. Reg. 248/06, s. 2; O. Reg. 242/07, s. 1.

TABLE 3. RADIOLOGICAL STANDARDS

Item	Radiological Parameter	Standard (expressed as a maximum in becquerels per litre)
Natural Radionuclides		
1.	Beryllium-7	4000.0
2.	Bismuth -210	70.0
3.	Lead-210	0.1
4.	Polonium-210	0.2
5.	Radium-224	2.0
6.	Radium-226	0.6
7.	Radium-228	0.5
8.	Thorium-228	2.0
9.	Thorium-230	0.4
10.	Thorium-232	0.1
11.	Thorium-234	20.0
12.	Uranium-234	4.0
13.	Uranium-235	4.0
14.	Uranium-238	4.0
Artificial Radionuclides		
15.	Americium-241	0.2
16.	Antimony-122	50.0
17.	Antimony-124	40.0
18.	Antimony-125	100.0
19.	Barium-140	40.0
20.	Bromine-82	300.0
21.	Calcium-45	200.0
22.	Calcium-47	60.0
23.	Carbon-14	200.0
24.	Cerium-141	100.0
25.	Cerium-144	20.0
26.	Cesium-131	2000.0
27.	Cesium-134	7.0
28.	Cesium-136	50.0
29.	Cesium-137	10.0
30.	Chromium-51	3000.0
31.	Cobalt-57	40.0
32.	Cobalt-58	20.0
33.	Cobalt-60	2.0
34.	Gallium-67	500.0
35.	Gold-198	90.0
36.	Indium-111	400.0
37.	Iodine-125	10.0
38.	Iodine-129	1.0
39.	Iodine-131	6.0
40.	Iron-55	300.0
41.	Iron-59	40.0
42.	Manganese-54	200.0
43.	Mercury-197	400.0
44.	Mercury-203	80.0
45.	Molybdenum-99	70.0
46.	Neptunium-239	100.0
47.	Niobium-95	200.0
48.	Phosphorus-32	50.0
49.	Plutonium-238	0.3
50.	Plutonium-239	0.2
51.	Plutonium-240	0.2
52.	Plutonium-241	10.0
53.	Rhodium-105	300.0
54.	Rubidium-81	3000.0
55.	Rubidium-86	50.0
56.	Ruthenium-103	100.0
57.	Ruthenium-106	10.0
58.	Selenium-75	70.0
59.	Silver-108m	70.0
60.	Silver-110m	50.0
61.	Silver-111	70.0
62.	Sodium-22	50.0
63.	Strontium-85	300.0
64.	Strontium-89	40.0
65.	Strontium-90	5.0
66.	Sulphur-35	500.0
67.	Technetium-99	200.0
68.	Technetium-99m	7000.0
69.	Tellurium-129m	40.0
70.	Tellurium-131m	40.0
71.	Tellurium-132	40.0
72.	Thallium-201	2000.0
73.	Tritium	7000.0
74.	Ytterbium-169	100.0
75.	Yttrium-90	30.0
76.	Yttrium-91	30.0

77.	Zinc-65	40.0

78.	Zirconium-95	100.0

Notes:

Radionuclide concentrations that exceed the standard may be tolerated for a short period, as long as the annual average concentrations remain below the standard and the restriction (see immediately below) for multiple radionuclides is met.

Restrictions for multiple radionuclides: If two or more radionuclides are present, the following relationship, based on International Commission on Radiological Protection (ICRP) Publication 26, must be satisfied and, if not satisfied, the standard shall be considered to have been exceeded:

$$\frac{c_1}{C1} + \frac{c_2}{C2} + \cdots\cdots\cdots\cdots\cdots \frac{c_i}{Ci} \leq 1$$

where

c_1, c_2 and c_i are the observed concentrations, and C_1, C_2 and C_i are the maximum acceptable concentrations for each contributing radionuclide.

O. Reg. 169/03, Sched. 3.

TABLE 4 - COMMON AESTHETIC, ANALYTICAL, AND INDICATOR PARAMETERS

Parameter	ODWQS[6]	Comments	Maximum Concentration Considered Reasonably Treatable	Comments on Treatment
Alkalinity	30 - 500 mg/L	Useful analytical parameter; alkalinity is a measure of the amount of alkaline materials in the water. Excessive alkalinity levels may cause scale formation.		
Ammonia		Contamination Indicator		
Calcium		See hardness		
Chloride	250 mg/L	Associated with salt problems	250 mg/L	
Colour	5 TCU	Associated with certain metal and organic substances	7 TCU	Carbon filter[1] treatment systems
Conductivity		Useful analytical parameter; specific conductivity is a measure of the ability of water to carry an electric current. This ability depends on the presence of ions, which are present with dissolved solids in the water. Waters with high dissolved solids generally don't taste as good and may leave a white film on dishes, etc.		
Dissolved Organic Carbon (DOC)	5.0 mg/L (as C)	Taste, odour, colour, turbidity precursor for harmful contaminants after chlorination.	10 mg/L (as C)	Carbon filter treatment systems
Heterotrophic Plate Count (HPC)		Heterotrophic Plate Counts provide an indication of the bacterial population beyond a measure of the coliform bacteria present; contamination Indicator	500[9] CFU/mL	
Hardness	500 mg/L	Taste, encrustation, and reaction with soap.		Water softener[8]
Iron	0.3mg/L	May cause staining of plumbing fixtures and laundry.	Up to 5.0 mg/L	Water softener or manganese greensand filters
Magnesium		See hardness		
Manganese	0.5 mg/L	May cause staining of plumbing fixtures and laundry	1.0 mg/L	Water softener or manganese greensand filters
pH	6.5-8.5	Associated with corrosion or encrustation or contamination by other substances.		
Sodium	200 mg/L	Taste[10]	200 mgL	Not considered reasonably treatable above the limit
sulphate	500 mg/L	Laxative	500 mg/L	Not considered reasonably treatable above the limit
Total Dissolved Solids (TDS)	500 mg/L	Refers to inorganic substances dissolved in water. Corrosion or encrustation of metal fixtures or appliances.		
Turbidity	5 NTU	see Note 11	5 NTU	
Other parameters		see Note 12		

Notes:

[6] Except for hardness, the Ontario Drinking Water Standards in Table 4 are Aesthetic Objectives under the Ontario Drinking Water Quality Standards. Units of measure and, where required, conversion factors must be provided. For more information on the standards, refer to MOE publication entitled "Ontario Drinking Water Quality Standards".

[7] Higher, iron-related colour may be removed by manganese greensand treatment; however the nature of the constituents causing excessive colour must be determined.

[8] Generally, water with a hardness value of more than 300 mg/L is considered "very hard". The MOE publication entitled "Ontario Drinking Water Quality Standards" states that waters with hardness "in access of 500 mgL are unacceptable for most domestic purposes". A maximum treatable value is not available.

[9] Increases in HPC concentrations above baseline levels are considered undesirable.

[10] Sodium also has a health-related "warning level" of 20 mg/L (see Table 2). Since water softening results in high sodium levels, a separate tap, which supplies unsoftened waters should be installed for drinking purposes.

[11] For the purposes of this guideline, the consultant must note that if turbidity is present, particular care must be taken during testing to ensure that the bacteria requirements of Table 1 are met.

[12] Reference: Section 3 "Water Quality", regarding the responsibilities of the proponent or consultant to add parameters where necessary; the consultant must also provide the relevant information on any drinking water quality limits, including those from other jurisdictions.

CFU = colony forming units
TCU = true colour unit
NTU= Nephelometric turbidity unit

APPENDIX B

On-Site and Off-site Predictive Assessment

APPENDIX B

ON-SITE & OFF-SITE PREDICTIVE ASSESSMENT FOR NITRATE IMPACT

On-Site Predictive Assessment for Nitrate Impact *(as per MOE Procedure D-5-4, Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment, 1996).*

Residential Development:

In the Hydrogeological Study Report, the City requires as a minimum the following considerations and assumptions to be used in assessing the combined nitrate impact of individual on-site sewage systems at/ and downgradient of the development boundary:

(a) Nitrate Source: in most cases total nitrogen (all species) converted to nitrate-nitrogen is considered as the critical contaminant. For the purposes of predicting the potential for groundwater impacts a nitrate loading of at least 40 grams/lot/day per residential dwelling unit shall be used. This is based on minimum sewage flows of 1,000 L/day.

A residential dwelling with up to three bedrooms shall be considered to generate a minimum of 1000L/day of sewage. For each additional bedroom in a residence, the sewage generation shall increase by 200L/day (or an additional loading of 8 grams/day nitrate resulted from the nitrate loading calculations: 40mg/L x Flow).

(b) Nitrate Dilution:

i) in assessing the nitrate impact, only on-site infiltrating precipitation will be accepted by the City as a quantifiable dilution mechanism;

iii) the on-site groundwater infiltration rates acceptable to the City are listed in Appendix C, and are accordant with predominant soil textures;

iv) estimates of the on-site recharge shall consider and account for post-development impermeable areas (including roof tops and paved areas). While the City in some cases may encourage the establishment of infiltration galleries and other Low Impact Development (LID) measures, their real or perceived contribution to infiltration is not to be considered in calculations as a quantifiable dilution mechanism

v) mathematical (computer) models may be used to demonstrate the on-site infiltration potential. Although the model selection will be left to the proponent, the City must be provided with information on the model, reliability, validation, limitations, and assumptions. All model simulations must include appropriate sensitivity analyses.

vi) Appendix B1 exemplifies an on-site nitrate-impact evaluation for a privately serviced residential subdivision. If this example site was located up-gradient of a surface water body, the qualified professional must undertake a similar mass balance loading calculation using phosphorous as the source in the water body at the boundary. Calculations can use only the area of the proposed development that is upgradient of the water body and assume an initial phosphorous concentration of 15 mg/L for the sewage effluent. Setbacks established by regulatory agencies (Conservation Authorities, City's Building Department, etc.) must be maintained.

ii) mixing with (or dilution by) groundwater flowing through the site (i.e., underflow) will normally not be considered in the predictive assessment as it may not be possible to control present or future upgradient land uses. However, where upgradient lands have been fully developed for a considerable period of time (i.e. as defined by City Planning), the quantity and quality of groundwater flow available to dilute the effluent entering the receiving groundwater may be considered. An example calculation of this approach is provided in Appendix B1.

iv) from the on-site investigation and nitrate impact assessment, an estimate of the number of lots which can be accommodated on the property is determined. The minimum lot size must conform to the provisions of the Rural Hamilton Official Plan (2012).

Industrial/Commercial Development:

The nitrate loading from industrial/commercial individual on-site systems can vary greatly depending on the type and intensity of use. The following procedure is to be followed in establishing maximum allowable effluent flow for each lot:

a) Available Infiltration:

i) the groundwater infiltration rates listed in Appendix C must be used unless a detailed water balance and/or on-site soil (particle size analysis, permeameter, etc.) and groundwater studies support a higher rate for the on-site soils, and

ii) estimates of the groundwater recharge must consider the post-development impermeable areas (including roof tops and paved areas).

b) Maximum Allowable Flow:

The maximum allowable flow for each lot or the entire industrial/ commercial development can be calculated by dividing the calculated infiltration by a factor of three.

This is derived by simplifying the equation (40 mg/L × Flow) / (Flow + Infiltration) = 10 mg/L – Background

Alternatively, the projected flow could be estimated from the uses as provided in the Building Code, and then the projected effluent volume could be calculated. This would provide estimated nitrate loading levels and on-site infiltration dilution calculations.

(c) Maximum Number of Users:

To determine the maximum number of persons that can be supported by the calculated allowable flow, reference should be made to the Ontario Building Code. The flow volumes, accordant with the various uses listed in the Building Code, are provided in Appendix B4. Restrictions with respect to the allowable number of users will normally be incorporated as recommendations in the qualified professional's assessment, and the recommendations shall be implemented by provisions in the development agreement between the proponent and the municipality.

Appendix B2 exemplifies an on-site nitrate-impact evaluation for a privately-serviced industrial / commercial development, based on the above considerations.

Off-Site Predictive Assessment for nitrate impact

The off-site predictive assessment is required for the Hydrogeological Study Report.

For both residential and commercial/industrial developments, the City requires an evaluation of the potential nitrate impact that may occur at the proposed development boundary and existing privately serviced areas situated within 500 meters down-gradient.

a) Contaminant Source

In predicting a nitrate increase, all residential dwellings shall be considered to produce 40 grams/lot/day of nitrate-nitrogen and commercial/industrial development shall be considered to produce an effluent flow equivalent to one-quarter of the available on-site infiltration and to contain 40 mg/L nitrate-nitrogen.

b) Nitrate Dilution

In assessing the off-site nitrate impact from the proposed development, the upgradient and downgradient recharge occurring within the groundwater flow channel framing the development is to be utilized to evaluate the quality impact in the existing downgradient groundwater sources. All residences within the flow channel 200 metres upgradient and 500 metres downgradient from the development shall be included in the mass-balance appraisal. The upgradient recharge contribution may be deduced by evaluation of:

i) the soil types and infiltration rates in the defined catchment area, and/or

ii) the prevailing lateral gradient and water-transmitting capacity of the developed aquifer, as appropriate. Ambient nitrate concentrations and impermeable surfaces are to be considered in the mass-balance calculation.

If the calculated nitrate concentration exceeds 10 mg/L across the greater area including the proposed development, additional studies will be required prior to completing and submitting the Hydrogeological Study Report. Where an acceptable nitrate concentration is calculated, the excess groundwater recharge flow-through may not be utilized in determining the development density. The density must be based on available on-site recharge only.

Appendix B3 provides an example of a simplified mass-balance calculation of the off-site nitrate impact to assist in the interpretation of this requirement.

Appendix B1

Example On-Site Nitrate Impact Calculation

for

Privately–Serviced Residential Subdivision

Example
On-Site Nitrate Impact Calculation For Privately –Serviced Residential Subdivision

Evaluation Criteria/ Site Information:

Number of Proposed Lots (P)	20
Daily Effluent Flow / Lot (F)	1,000 L/day
Subdivision Area (A)	20 ha
Infiltration Rate (I) (from Appendix C)	0.2 m/year
Nitrate Loading/ Dwelling (N)	40 grams/day
Impervious Surface (S)	10%

1. **Calculation of On-site Recharge (R)**

   = (A) x (1-S) x (I) + (P) x (F)

   =200,000 m^2 x (1-0.1) x (0.2 m/year) + 20 x 1,000 L/day

   = 36,000 m^3/year + 20,000 L/day

   = 99,000 L/day + 20,000 L/day = 119,000 L/day

2. **Calculation of Nitrate Loading (L)**

   = (N) x (P)

   = 20 lots x 40 g/day

   = 800,000 mg/day

3. **Resultant Nitrate Concentration at Site Boundary**

   = (L) ÷ (R)

   = 800,000 mg/day ÷ 119,000 L/day

   = 6.7 mg/L

Based on the above calculations and considering the given site information, the estimated concentration of nitrate in the receiving groundwater at the site boundary permits the construction of 20 lots on the subdivision area of 20 ha.

Example
On-Site Nitrate Impact Calculation For Privately –Serviced Residential Subdivision Including Dilution From Lateral Groundwater Flow Where Upgradient Lands Are Fully Developed

Evaluation Criteria/ Site Information:

Number of Proposed Lots (P)	20
Daily Effluent Flow / Lot (F)	1,000 L/day
Subdivision Area (A)	20 ha
Infiltration Rate (I) (from Appendix C)	0.15 m/year
Nitrate Loading/ Dwelling (N)	40 grams/day
Impervious Surface (S)	10%
Background Nitrate Concentration in Groundwater at Upgradient Property Boundary (Nb) *	5.0 mg/L
Groundwater flow through the site (Qb)**	L/day (see below)

* Background Nitrate concentration in groundwater at upgradient site boundary established by monitoring program conducted by a qualified professional.

** Groundwater flow through the site, as estimated by a qualified professional, based on values for hydraulic conductivity, average horizontal gradient in direction of flow, and cross-sectional area of groundwater flow regime perpendicular to flow direction.

1. Calculation of Groundwater Flow Through Site

For this example: Hydraulic Conductivity (K) = 1.0×10^{-5} m/sec

Gradient (i) = 0.01

Cross-sectional Area (A) = 3000 m^2

Estimated Groundwater Flow (Qb)

= (K) x (i) x (A)

= 1.0×10^{-5} m/sec x 0.01 x 3000 m^2

= 0.0003 m^3/sec = 26,000 L/day

2. Calculation of On-site Recharge (R)

= (A) x (1-S) x (I) + (P) x (F)

= 200,000 m^2 x (1-0.1) x (0.15 m/year) + 20 x 1,000 L/day

= 27,000 m^3/year + 20,000 L/day = 94,000 L/day

3. Calculation of Nitrate Loading (L)

= (N) x (P)

= 20 lots x 40 g/day

= 800,000 mg/day

4. Resultant Nitrate Concentration at Site Boundary with Groundwater Flow Included

= [L + (Nb x Qb)] ÷ [R + Qb]

= [800,000 + 130,000 mg/day] ÷ [94,000 + 26,000 L/day]

= 930,000 mg/day ÷ 120,000 L/day

= 7.75 mg/L

Based on the above calculations and considering the given site information, the estimated concentration of nitrate in the receiving groundwater at the site boundary permits the construction of 20 lots on the subdivision area of 20 ha. This example also demonstrates the effect of the fully-developed upgradient lands and groundwater flow through a site.

Appendix B2

Example On-Site Nitrate Impact Calculation

for

Privately–Serviced Commercial/ Industrial Development

Example

On-Site Nitrate Impact Calculation for Privately –Serviced Commercial/ Industrial Development

Evaluation Criteria/ Site Information:

Development Area (A)	30 ha
Infiltration Rate (I)	0.15 m/year
Sewage Nitrate Concentration (C)	40 mg/L
Drinking Water Standard (O)	10 mg/L
Impervious Surface (S)	25%

1. **Calculation of On-site Recharge (R)**

   = (A) x (1-S) x (I)

   = 300,000 m^2 x (1-0.25) x (0.15 m/year)

   = 34,000 m^3/year = 93,000 L/day

2. **Required Dilution Ratio (D)**

   = O ÷ C

   = 10 mg/L ÷ 40 mg/L

   = 0.25

3. **Permissible Sewage Effluent Loading (E)**

   = (R) x (D)

   = 93,000 L/day x 0.25

   =23,000 L/day

4. **Number of Lots with maximum allowable 4,500 L/day flows**

   = (E) ÷ (4,500)

   = 23,000 ÷ 4,500

   = 5.1 (round to 5 lots)

Based on the above calculations and considering the given site information, there are a maximum of five (5) commercial / industrial lots possible to be built on the subdivision area of 30 ha.

Appendix B3

Example Off-Site Nitrate Impact Calculation

for

Privately–Serviced Residential Subdivision

Example

Off-Site Nitrate Impact Calculation for Privately –Serviced Residential Subdivision

Evaluation Criteria/ Site Information:

Proposed Number of Lots (P)	15
Number of existing Upgradient and Downgradient Residences within Flow Channel (E)	32
Daily Effluent Flow / Lot (F)	1,000 L/day
Nitrate Loading/Dwelling (N)	40 grams/day
Flow Channel Area (A)	60 ha
Soil Distribution	60% sandy silt till 30% sand 10% impermeable surfaces
Infiltration Rates (I)	See Appendix C

1. **Calculation of Nitrate Loading (L) =**

   = (P + E) x N

   = 47 x 40 grams/day

   = 1,880 grams/day

2. **Calculation of On-site Recharge (R) =**

   = (0.6 x A x I) + (0.3 x A x I) + (P+E) x 1,000 L/day

   = (0.6 x 600,000 m^2 x 0.15 m/year) + (0.3 x 600,000 m^2 x 0.2 m/year) +

   + 47 x 1,000 L/day

   = (54,000 m^3/year) + (36,000 m^3/year) + 47,000L/day

   = 90,000 m^3/year + 47,000 L/day = 294 m^3/day

5. **Resultant Nitrate Concentration =**

   = (L) ÷ (R)

   = 1,880 grams/day ÷ 294 m^3/day

   = 6.4 grams/ m^3

   = 6.4 mg/L

Appendix B4

Ontario Building Code Standards for Septic Systems (Part 8)

Ontario Building Code Standards for Septic Systems (Part 8)

Table 1. Residential Occupancy

Residential Occupancy	**Volume, litres**
Apartments, Condominiums, Other Multi-family Dwellings - per person(1)	275
Boarding Houses	
a) Per person,	
i) with meals and laundry facilities, or,	200
ii) without meal or laundry facilities, and	150
b) Per non-resident staff per 8 hour shift	40
Boarding School - per person	300
Dwellings	
a) 1 bedroom dwelling	750
b) 2 bedroom dwelling	1100
c) 3 bedroom dwelling	1600
d) 4 bedroom dwelling	2000
e) 5 bedroom dwelling	2500
f) Additional flow for(2)	
i) each bedroom over 5,	500
ii) A) each 10 m^2 (or part of it) over 200 m^2 up to 400 m^2 (3) ,	100
B) each 10 m^2 (or part of it) over 400 m2 up to 600 m^2 (3), and	75
C) each 10 m^2 (or part of it) over 600 m^2 (3), or	50
iii) each fixture unit over 20 fixture units	50
Hotels and Motels (excluding bars and restaurants)	
a) Regular, per room	250
b) Resort hotel, cottage, per person	500
c) Self service laundry, add per machine	2500
Work Camp/Construction Camp, semi-permanent per worker	250

Notes to Table 1:

(1) The *occupant load* shall be calculated using ON Building Code, Part 3, Subsection 3.1.17.

(2) Where multiple calculations of sewage volume is permitted the calculation resulting the highest flow shall be used in determining the design daily *sanitary sewage* flow.

(3) Total finished area, excluding the area of the finished *basement*.

Table 2. Other Occupancies

Establishments[1]	**Volume, litres**
Airports, Bus Terminals, Train Stations, Dock/Port Facilities (Food Services excluded)	
a) Per passenger, and	20
b) Per employee per 8 hour shift	40
Assembly Hall - per seat	
a) No food service, or	8
b) Food service provided	36
Barber Shop/Beauty Salon - per service chair	650
Bowling Alleys (Food Service not included) - per lane	400
Churches and Similar Places of Worship - per seat	
a) No kitchen facilities, or	8
b) Kitchen facilities provided	36
Country Club (excluding Food Service)	
a) Per resident,	375
b) Per employee per 8 hour shift, and	50
c) Per member or patron	40
Day Care Facility per person (staff and children)	75
Dentist Office	
a) Per wet service chair, and	275
b) Per dry service chair	190
Doctors Office	
a) Per practitioner, and	275
b) Per employee per 8 hour shift	75
Factory (excluding process or cleaning waters) - per employee per 8 hour shift	
a) No showers, or	75
b) Including showers	125
Flea Markets[2] (open not more than 3 days per week)	
a) Per non-food service vendor space,	60
b) Per food service establishment / 9.25 m^2 of floor space, and	190
c) Per limited food service outlet	95
Food Service Operations	
a) Restaurant (not 24 hour), per seat	125
b) Restaurant (24 hour), per seat	200
c) Restaurant on controlled access highway, per seat	400
d) Paper service restaurant, per seat	60
e) Donut shop, per seat	400
f) Bar and cocktail lounge, per seat	125
g) Drive-in restaurant per parking space	60
h) Take-out restaurant (no seating area)	

i) per 9.25 m^2 of floor area, and	190
ii) per employee per 8 hour shift	75
i) Cafeteria - per meal	12
j) Food outlet	
i) excluding delicatessen, bakery and meat department, per 9.25 m^2 of floor space,	40
ii) per 9.25 m^2 of delicatessen floor space,	190
iii) per 9.25 m^2 of bakery floor space,	190
iv) per 9.25 m^2 of meat department floor space, and	380
v) per water closet	950
Hospitals - per bed	
a) Including laundry facilities, or	750
b) Excluding laundry facilities	550
Nursing Homes, Rest Homes, etc. - per bed	450
Office Building(3)	
a) Per employee per 8 hour shift, or	75
b) Per each 9.3 m^2 of floor space	75
Public Parks	
a) With toilets only per person, or	20
b) With bathhouse, showers, and toilets per person	50
Recreational Vehicle or Campground Park	
a) Per site without water or sewer hook-up, or	275
b) Per site with water and sewer hook-up	425
Schools - per student	
a) Day school,	30
b) With showers,	30
c) With cafeteria, and	30
d) Per non-teaching employee per 8 hour shift	50
Service Stations (no vehicle washing)(3)	
a) Per water closet, and	950
i) per fuel outlet(4), or	560
ii) per vehicle served	20
Shopping Centre (excluding food and laundry) - per 1.0 m^2 of floor space	5
Stadiums, Race Tracks, Ball Parks - per seat	20
Stores(3)	
a) Per 1.0 m^2 of floor area, or	5
b) Per water closet	1230
Swimming and Bathing Facilities (Public) - per person	40
Theatres	
a) Indoor, auditoriums per seat,	20
b) Outdoor, drive-ins per space, or	40
c) Movie theatres per seat	15
Veterinary Clinics	

a) Per practitioner,	275
b) Per employee per 8 hour shift, and	75
c) Per stall, kennel, or cage if floor drain connected	75
Warehouse	
a) Per water closet, and	950
b) Per loading bay	150

Notes to Table 8.2.1.3.B.:

(1) The *occupant load* shall be calculated using ON Building Code, Part 3, Subsection 3.1.17.

(2) Flea markets open more than 3 days per week shall be assessed using the volumes stated under the heading “Stores”.

(3) Where multiple calculations of *sanitary sewage* volume is permitted the calculation resulting in the highest flow shall be used in determining the design daily *sanitary sewage* flow.

(4) The number of fuel outlets is considered the maximum number of fuel nozzles that could be in use at the same time.

APPENDIX C

Groundwater Recharge / Infiltration

APPENDIX C

4. GROUNDWATER RECHARGE/ INFILTRATION

Within the City of Hamilton, the sewage-system impact assessment only allows consideration of on-site groundwater recharge for dilution purposes. In this Guideline, the portion of infiltrating precipitation that reaches the groundwater table is considered groundwater recharge**.**

The available groundwater recharge is determined by reference to the following table, which was previously assembled by MOE regional staff from the results of Ministry drainage basis studies.

The listed rates are consistent with the rates presented in "Ministry of Environment Hydrogeological Technical Information Requirements for Land Development Applications, April 1995".

Table C1 - Typical Groundwater Recharge (Infiltration) Rates

Predominant Soil Textures	**Ground water Recharge (Infiltration) Rate (mm/year)**
Coarse Sand Gravel	**250**
Fine to Medium Sand	**200**
Silty Sand	**175**
Sandy Silt	**150**
Silt	**125**
Clayey Silt	**100**
Clay	**75**

Groundwater recharge within a particular property may be determined by using the above noted values or by more detailed analysis. If proposed, such additional studies may involve lengthy on-site monitoring using infiltrometers and piezometer nests. It will be the consultant's responsibility to determine alternative method used to assess the groundwater recharge and such method should be reviewed with the City prior to commencement of field studies. Any assessment of groundwater recharge will need to consider pre and post development conditions.

APPENDIX D

Tertiary Treatment

APPENDIX D
TERTIARY TREATMENT WITH ADVANCED TREATEMENT UNITS – POLICY POSITION

The City of Hamilton does not support the use of advanced septic system treatment units (also known as Level IV treatment units) as it relates to justifying a development approval on an undersized, privately-serviced lot. A variety of legal and technical issues are evident when an approval is inextricably tied to a specific septic system technology. Until such time that advanced treatment units are formally incorporated into the Ontario Building Code (e.g. similar to OBC Change Number S-B-08-06-06), no development approvals that propose advanced treatment units will be supported by the City of Hamilton unless the lot size can be deemed sustainable with a conventional sewage disposal system.

At present, issues related to advanced treatment units primarily relates to uncertainty over their long-term performance of treating septic system pollution, and the legal enforcement associated with this performance. At this time, advanced treatment units (e.g. nitrate-reducing treatment units) are not incorporated into Ontario Building Code Table 8.6.2.2, which makes monitoring and enforcement of proper functioning of these systems unfeasible.

Proposals for advanced treatment units would normally require a long term, legal monitoring agreement of the private sewage works, with provisions for specific monitoring and reporting to the municipality. Section 23 of the *Municipal Act* allows municipalities to enter into such agreements. However, the existing legislation speaks only to the construction, operation and maintenance of private water/sewage works but does not provide authority to effectively enforce system performance.

Another limitation staff have identified relates to Planning approvals in that, if these advanced systems are proposed to justify a development on an undersized lot, any landowner who later decides to replace an advanced treatment unit with a conventional sewage disposal system could then easily exceed the capacity of the lot to sustainably manage this effluent and its associated pollutants. The City would not have any ability to prevent this if the new system met Ontario Building Code requirements for a conventional system as private monitoring agreements cannot supersede applicable law. This would result in increased public health and water quality risks. Collectively, a specific septic system technology cannot be tied to a property in perpetuity. The best approach to reduce these risks is to ensure, at the planning application stage, that the proposed lot can accommodate all septic system pollution within its property limits regardless of the proposed technology.