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Protocol for Decentralised Water and Wastewater Systems in First Nations Communities

(Decentralised Systems Protocol)

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This document will evolve based on feedback from users and other stakeholders. Comments on the document and questions on departmental policy on which this document is based may be forwarded to normes-standards@ainc-inac.gc.ca.

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Canada

Table of Contents

Table of Appendices

Acknowledgements

This protocol was developed with support and advice provided by First Nations technical representatives, regional and headquarters staff of Indian and Northern Affairs Canada, regional and headquarters staff of Health Canada, and regional and headquarters staff of Environment Canada.

1.0 Introduction

The process of developing water and wastewater services for a community includes several stages beginning with a feasibility study and progressing to the design, construction, and operational stages.

At the feasibility stage, decision-makers must identify the level of service appropriate for a particular community. Thus, during the execution of any feasibility study for water or wastewater services in First Nations communities for which any part of project funding is provided by Indian and northern Affairs Canada (INAC), the selection process outlined in the INAC reference document entitled: *Corporate Manual System* (CMS) must be followed.

The CMS sets out the parameters to be considered in identifying and approving funding for an appropriate and viable level of service for water or wastewater services, from relatively simple and inexpensive on-site systems to more complex and expensive centralised (piped) systems. A copy of the most current version of the CMS can be downloaded from INAC's web site: http://www.ainc-inac.gc.ca/ih/ci/pubs/wat/wat-eng.pdf.

1.1 Purpose of this Protocol

The purpose of the *Protocol for Decentralised Water and Wastewater Systems in First Nations Communities* (the Protocol), is to set minimum standards and codes that must be followed for the design, construction, operation, and maintenance of on-site water and wastewater systems that are to be funded in whole or in part by INAC. The term decentralized system refers to a group or groups of band-managed (as opposed to individually-managed) on-site water or wastewater systems.

1.2 When to use this Protocol

This document is to be adhered to by system designers whenever a feasibility study recommends on-site water or wastewater treatment and disposal as the most appropriate and viable level of service. This document will also be adhered to by managers tasked with the operations and maintenance of decentralized systems.

The standards set out by this Protocol (for the design, installation, and ongoing operations and maintenance of on-site installations) must be adhered to in order for a group or groups of on-site systems to qualify for INAC funding. To qualify for funding from INAC, on-site systems must be band managed. A band-managed system is one that is managed and operated by a band, by a band-owned utility, or by a qualified third party operating under contract to the band.

INAC's regional Professional and Technical Services Units will provide advice related to the application of this Protocol to the design, installation, operation, maintenance, and monitoring by First Nations of centrally managed on-site water and wastewater systems. For information, contact the INAC office in your region. A list of regional INAC offices is available at INAC's web site:
http://www.ainc-inac.gc.ca/ai/scr/rmcdr-eng.asp

A printed version of this document can be obtained from INAC headquarters or from an INAC regional office. This Protocol will be updated continuously as required to reflect feedback from field practitioners as well as changes in policies or regulations. The most up to date version of this Protocol will be available on INAC's website at:
http://www.ainc-inac.gc.ca/enr/wtr/index-eng.asp

2.0 Application

This Protocol and its requirements applies to band-managed on-site water or wastewater systems or groups of systems for which installation and ongoing operations and maintenance are to be funded in whole or in part by INAC, including:

- On-site water systems – On-site water systems (wells or surface water intakes) that supply potable water (water destined for human consumption) to residences or public facilities.
- Cisterns – Cisterns that supply potable water (water destined for human consumption) to residences or public facilities.
- Drinking Water Treatment Units (DWTUs) – DWTUs that supply potable water (water destined for human consumption) to residences or public facilities where treatment is necessary for health reasons (treatment units that treat water for aesthetic parameters will not be funded by INAC nor will they be subject to the requirements of this Protocol).
- On-site wastewater systems – On-site wastewater systems (septic systems, on-site wastewater treatment systems) that are designed for collecting, storing, treating, or discharging wastewater from residences or public facilities.

This protocol does not apply to privately-owned or individually-managed on-site water or wastewater systems.

In order to be eligible for ongoing funding, on-site systems covered by this Protocol must be designed, installed, and continuously operated, maintained, and monitored as per the requirements of this Protocol. Systems covered by this Protocol must comply with this Protocol's requirements or Provincial requirements, whichever are more stringent. In the case where a particular element in a Provincial standard (e.g.: sampling frequency) is more stringent than the same element in this Protocol, then that higher objective will be adhered to for that element.

Continuous uninterrupted compliance with the operations and maintenance requirements of this Protocol is mandatory for a group or groups of on-site systems to continue to qualify for ongoing funding from INAC.

In cases where system managers opt out of the requirements of this Protocol, the systems in question will not be funded for ongoing operations and maintenance.

Groups of on-site systems installed before inception of this Protocol may still be eligible for funding as band-managed on-site systems if they comply with the requirements of this Protocol. Such systems will be considered on a case-by-case basis.

3.0 On-Site Water Systems

To remain in compliance with this Protocol, band-managed on-site water systems that employ individual groundwater wells or surface water intakes to supply potable water to individual residences or public facilities must comply with the provisions outlined in Sections 3.1 to 3.6. Supplementary information on on-site drinking water systems is provided in Appendix A.

3.1 Materials, Planning, and Design Requirements

The materials, planning, and design of on-site water systems must be in conformance with the following provisions:

- All materials used in an on-site water supply system (pumps, pipes, foot valves, and pressure tanks) must be certified to NSF/ANSI Standard 60 and NSF/ANSI Standard 61 for material safety. Information on NSF certification is provided in Appendix B.
- Individual groundwater wells and surface water intake structures and associated structures and appurtenances must be designed and located in conformance with all applicable provincial, municipal, or local-authority (ex: conservation authority) regulations and standards. Guidance on Provincial and Territorial standards for individual water supplies is provided in Appendix C.
- The location and layout of wells or of surface water intake structures must be based on a site assessment by a licensed installer or a professional engineer.
- The location of surface water intakes must take into account current conditions in the water body (depth, sedimentation characteristics, currents, and ice formation, etc.).
- System capacity will be designed to meet the projected population for the dwelling (at a minimum the population will be assumed to be two persons per bedroom).
- It is recommended but not mandatory that the water supply system for the house will be fitted with a water meter at a point downstream of any water treatment device for which a water waste line is required. The meter will be configured to measure and log peak load data. The water meter and its read-out will be located so as to be readily accessible, secure, and tamper-proof. Alternatively, it is recommended but not mandatory that pumps employed in a water supply system for a residence be fitted with a device to record run time.
- All required permits and approvals for on-site water systems will be obtained in conformance with provincial, municipal, or local-authority regulations for design, location, and water taking allowances.

- The design, materials, and capacity of on-site water systems must meet or exceed the more stringent of either this Protocol's requirements or provincial standards.

3.2 Construction/Installation Requirements

The construction/installation of on-site water systems must be in conformance with the following provisions:

- Groundwater wells and surface water intake structures and associated structures and appurtenances must be constructed/installed in conformance with all applicable provincial, territorial, municipal, or local-authority standards.
- Construction/installation of groundwater wells or surface water intakes must be undertaken by a certified installer taking into account site conditions.
- Applicable testing and inspections must be carried out during construction, development, and commissioning of the water supply system by a qualified individual.
- Water well development records must be created by the well installer and a copy kept by the system manager. If possible, copies of well development records should also be filed with an appropriate Provincial or Territorial authority.
- Wells will be registered with the province where possible. Once registered, the registration number of the well will be recorded and kept. The registration number of the well, inscribed on a durable material, will be attached to the well.
- All site plans, approvals, inspection reports, and as-built drawings related to all on-site water systems will be kept on file permanently by the system manager.
- Each on-site water system in a group of centrally managed systems will be indicated on a system map and identified thereon with GPS co-ordinates and an identification number. The system map will be updated as required and kept on file permanently.
- The installation and workmanship of on-site water systems will meet or exceed this Protocol's requirements or provincial standards.

3.3 Operations and Maintenance Requirements

The operations and maintenance practices employed for on-site water systems must be in conformance with the following provisions:

- Drinking water provided by on-site drinking water systems must at minimum meet the health-related water quality criteria set out in the latest

edition of Health Canada's "*Guidelines for Canadian Drinking Water Quality*" (GCDWQ).

- Decentralised water systems will be operated and maintained by a fully qualified band employee under the supervision of a central authority (such as a band council or tribal council), or it will be operated and maintained by a fully certified third party operating under contract to the band (the term fully certified means that the party is fully licensed and/or certified to perform all work related to operations and maintenance of the on-site water systems to be managed).
- The operation and maintenance of the on-site water systems must meet or exceed the requirements of this Protocol or provincial standards or regulations, whichever is more stringent.

3.4 Monitoring and Corrective Action Requirements

The monitoring and corrective action practices employed for on-site water systems must be in conformance with the following provisions:

- Water samples must be collected from each well and tested for microbiological parameters, specifically *E. coli* and *Total coliforms*, at least three (3) times annually (roughly corresponding with spring, mid-summer, and fall) by the system operator.
- Required periodic sampling and testing must be done according to the appropriate Provincial standards or regulations by the system operator.
- Monitoring and inspections must be conducted by a qualified band employee or a qualified contractor.
- Water samples should be collected and tested for microbiological and chemical contaminants when there is a change in the source or treatment process, or every 3 years, or when there is some other cause for concern due to a new or worsening problem with the water (a list of common contaminants in drinking water can be found in Section 2.3 of Health Canada's *Procedure Manual for Safe Drinking Water in First Nations Communities South of 60°*). An electronic copy of this document can be found at:
  http://www.watertraining.ca/drinkingwater/pdf/DW_English.pdf
- Available water consumption data (from a water meter or pump run-time recorder if installed) since the last inspection must be recorded in a permanent record.
- The practices related to monitoring and corrective actions for on-site water systems must meet or exceed the requirements of this Protocol or provincial standards or regulations, whichever is more stringent.

3.5 Decommissioning Requirements

Decommissioning practises for on-site systems must be in conformance with the following provisions:

- Decommissioning of wells must be done according to Provincial regulations. When a well is decommissioned, a well abandonment report must be generated. A sample well abandonment report is provided in Appendix D).
- Drawings of installed systems (as-built drawings) must be provided to the system manager to be retained permanently for future reference. The set of as-built drawings should be complete and include information on the components of the system (e.g., pump manufacturing details, pipe type and size, etc.).

3.6 Recordkeeping and Reporting Requirements

The following records must be kept permanently:

- Recordkeeping must include water quality test results, all records related to system problems or deficiencies, all records related to DWAs, and all records related to corrective actions to correct system problems/deficiencies or DWAs.
- All records indicated in the above bullet must be kept permanently.
- Record keeping and reporting for decentralised water systems will meet or exceed the requirements of this Protocol or provincial standards or regulations, whichever is more stringent.

4.0 Cisterns

To remain in compliance with this Protocol, band-managed on-site systems that employ cisterns for the temporary storage of drinking water must meet either federal requirements where they exist or provincial standards or regulations for cisterns, whichever is more stringent.

In the case where a particular element in a provincial standard on cisterns (ex: materials) is more stringent than the same element in this Protocol, then that higher objective should be adhered to for that element. In the case where sizing requirements differ between regulations, the more generous (larger) sizing requirement is recommended.

Health Canada is in the process of developing guidance materials on the installation, operation, and maintenance of cisterns. When completed, these materials will be referenced in this Protocol.

A list of supplementary information sources on cisterns is provided in Appendix E.

5.0 Drinking Water Treatment Units

To remain in compliance with this Protocol, any band-managed on-site system which employs drinking water treatment units (DWTUs) for the treatment of potable water destined for human consumption (where treatment is necessary for health reasons) must comply fully with the provisions outlined in Sections 5.1 to 5.3. Supplementary information on DWTUs is provided in Appendix F.

5.1 Materials Requirements

All components of drinking water treatment units that come into contact with drinking water must be certified by an accredited certification body as meeting the appropriate NSF/ANSI drinking water materials standard. More information on NSF/ANSI standards is provided in Appendix B.

5.2 Installation Requirements

The installation of the system must be in conformance with the following provisions:

- Devices that are permanently attached to plumbing or electrical systems must be installed by certified plumbers and electricians and will comply with CSA Standard B-483.
- Flow restrictors must be installed immediately upstream of all DWTUs and sized so as to restrict flow through the DWTU to the maximum treatable flow indicated in manufacturers' instructions and recommendations.
- DWTUs will be located in an area that is secure from tampering, yet readily accessible for inspection and maintenance.
- The installation of DWTUs will be as per the manufacturer's instructions.

5.3 Operations and Maintenance Requirements

The operation and maintenance of DWTUs must be in conformance with the following provisions:

- Drinking water provided by on-site drinking water systems should meet health-related water quality criteria set out in the latest edition of Health Canada's *Guidelines for Canadian Drinking Water Quality* (GCDWQ).
- A functioning inspection and maintenance program must be in place to conduct periodic inspections of DWTUs; to replace consumables (filter cartridges, ion exchange resins, salts, etc.) as per manufacturers' recommendations and to clean, repair, or replace DWTUs as per manufacturers' recommendations.

- DWTUs will be operated and maintained by a trained band employee under the supervision of a band council, or they will be operated and maintained by a fully qualified third party working under contract with the band (the term fully qualified means that the party is trained, or licensed, or both in all work related to operations and maintenance of on-site water systems and DWTUs).

6.0 Centrally Managed On-Site Wastewater Systems

To remain in compliance with this Protocol, any centrally managed on-site wastewater system for storing, treating, or disposing of wastewater from individual residences or public facilities must comply with all provisions outlined in Sections 6.1 to 6.6. A list of sources of general information on the design, installation, maintenance, and decommissioning of on-site wastewater systems is provided in Appendix G.

6.1 Materials, Planning, and Design Requirements

The materials, planning, and design of on-site wastewater systems must be in conformance with the following provisions:

- Septic systems and leaching fields must be designed and located in conformance with CSA B65 – National Installation Standard for Decentralised Wastewater Systems. This standard is under development and until it is completed, on-site wastewater systems will comply with the design requirements of applicable provincial, municipal, or local-authority standards or regulations. Guidance on Provincial and Territorial standards for on-site wastewater systems is provided in Appendix H.
- The location and layout of septic systems and leaching fields will be based on a site assessment by a licensed installer or a professional engineer.
- No in-sink garbage disposal units are permitted. This requirement notwithstanding, the design should accommodate the possibility that such units could be retrofitted in the future. Thus, the septic systems should be sized to accommodate the increase water and organic load created from these devices.
- Septic systems will incorporate two-stage septic tanks sized to meet the projected population for the dwelling (at a minimum the population will be assumed to be two persons per bedroom).
- Septic tanks must be sized to allow a sludge storage volume sufficient for not less than three (3) years of accumulation without affecting the working capacity of the tank.
- A distribution box, or flow splitter, shall be incorporated into the system design upstream from the absorption field. The distribution box or flow splitter will be designed to ensure even distribution of effluent across the entire absorption field.
- Septic system absorption fields will be sized to meet anticipated peak flow rates for the total projected population for the dwelling (at a minimum the population will be assumed to be two persons per bedroom).
- It is recommended that demand management be practiced to reduce septic system loading. Thus, all water fixtures, devices, and appliances installed in the household must be water-efficient and accompanied by public educational programs that increase awareness of the need for

water conservation. It is recommended that flapperless toilets be installed. More information on water-efficient fixtures is provided in Appendix I.

- Septic tank discharges must be fitted with an effluent filter that is certified to comply with the requirements of NSF/ASTM 46 and sized to the flow rate as per the manufacturer's instructions (the minimum allowable filtration area will be 600 cm^2).
- Where a septic system incorporates a pump, it is recommended that a level alarm be installed on the effluent filter and connected to a cut-out switch to cut power to the pump.
- All components requiring inspection, regular servicing, or maintenance must be readily accessible.
- The septic tank must incorporate a separate access hatch for each chamber of the septic tank.
- All access points to the septic system must be child-proof.
- All access points to the septic tank chambers, effluent filter, and downstream sampling point must be fitted with sealed risers to raise the access point to grade as well as be equipped with sealed hatches/covers to prevent exfiltration and infiltration.
- All access points as well as the tops and sides of the tank must be insulated to provide appropriate protection from freezing.
- Water treatment devices that require a water waste line (e.g.: iron filters, R/O filters, water softeners) must not discharge to the septic system.
- For any installations where large day-to-day fluctuations in calculated daily flow rate are expected (ex: a church), a balancing tank will be installed upstream of the septic system. The balancing tank will be fitted with an ejector pump controlled by a timer.
- All required permits for on-site wastewater systems will be obtained in conformance with applicable provincial, municipal, or local-authority regulations for design, location, and water taking allowances.
- The design, materials, capacity, monitoring, and management of on-site wastewater systems will meet or exceed the more stringent of either this Protocol's requirements or provincial standards or regulations.

6.2 Construction/Installation Requirements

The construction/installation of on-site wastewater systems must be in conformance with the following provisions:

- Septic tanks and leaching fields must be constructed/installed in conformance with all applicable provincial, territorial, municipal, or local authority (e.g. conservation authority) standards or regulations. In the future, the installation of on-site systems will comply with the requirements of CSA B65 – National Installation Standard for Decentralised Wastewater Systems.

- Pre-fabricated septic tanks must meet the requirements of CSA-B66 - Prefabricated Septic Tanks and Sewage Holding Tanks.
- Construction/installation of septic tanks and leaching fields must be undertaken by a certified installer taking into account site conditions.
- Applicable testing and inspections must be carried out during construction and commissioning of the wastewater system by a qualified inspector or an appropriate inspection agency.
- All site plans, approvals, inspection reports, and as-built drawings related to all on-site systems must be kept on file permanently.
- Each wastewater system in a group of centrally managed systems will be indicated and identified with GPS co-ordinates and an identification number on a system map. The system map will be updated as required and kept on file permanently.
- The installation and workmanship of on-site wastewater systems will meet or exceed the more stringent of either this Protocol's requirements or provincial standards and regulations.

6.3 Operations and Maintenance Requirements

The operations and maintenance practices employed for on-site wastewater systems must be in conformance with the following provisions:

- To reduce abuse to the septic system (excessive loading, toxic discharges, etc.) the water system manager will maintain an ongoing public education program to increase awareness of the need for water conservation as well as the need to avoid discharging high concentrations of substances known to be deleterious to septic systems (exs: bleach, salt, phosphorous, fats, oils, and grease).
- The on-site wastewater system will be operated and maintained by a qualified band employee under the supervision of a central authority such as a band council, or it will be operated and maintained by a qualified third party operating under contract with the band (the term qualified means that the party is fully licensed to perform all work related to operations and maintenance of on-site wastewater systems).
- Septic systems and related appurtenances will be inspected annually.
- Grease interceptors and effluent filters will be cleaned out according to the manufacturer's instructions.
- Septic tanks will be pumped out according to the manufacturer's instructions or at least once every two years.
- The operation and maintenance of on-site wastewater systems must meet or exceed the more stringent of either this Protocol's requirements or provincial standards and regulations.

6.4 Monitoring and Corrective Action Requirements

The monitoring and corrective action practices employed for on-site wastewater systems must be in conformance with the following provisions:

- Monitoring and inspections must be conducted by a qualified band employee or a qualified contractor.
- It is recommended that the depth of the sludge layer in the primary chamber be measured annually.
- If available, data from water supply meters or pump run-time recorders will be collected and recorded in permanent records.
- The monitoring and corrective actions for on-site wastewater systems will meet or exceed the more stringent of either this Protocol's requirements or provincial standards and regulations.

6.5 Decommissioning Requirements

Decommissioning practises for on-site systems must be in conformance with the following provisions:

- Decommissioning of septic systems, treatment systems, and leaching fields must be completed according to Provincial regulations.
- Drawings of the installed systems (as-built drawings) must be kept on record permanently by the system manager. As-built drawings should be complete and include information on the components of the system (e.g., pump manufacturing details, pipe type and size, etc.).

6.6 Recordkeeping and Reporting Requirements

The following records will be kept permanently by the system operator:

- Recordkeeping will include effluent quality test results where applicable, all records related to system problems or deficiencies, and all records related to corrective actions to correct system problems.
- The record keeping and reporting for on-site wastewater systems will meet or exceed this Protocol's requirements or provincial standards and regulations, whichever is more stringent.

7.0 Quality Assurance and Compliance

To remain in compliance with this Protocol, centrally managed on-site systems serving individual residences or public facilities must comply with all provisions outlined in Sections 7.1 to 7.3.

7.1 Annual Inspections

Operators of centrally-managed on-site systems must arrange for annual inspections by a qualified third party as per either Annual Inspection Guide for Drinking Water Wells (provided in Appendix J) or the Annual Inspection Guide for Septic Systems (provided in Appendix K).

7.2 Record keeping

Operators of a centrally-managed on-site system must keep historical records (e.g. as-built drawings, permits, and approvals) and annual inspections reports and operational records (as mentioned in Sections 3, 4, and 6.) permanently.

7.3 Reporting Requirements

Operators of a centrally-managed on-site system must submit the results of the annual inspection(s) to the appropriate INAC regional office. A sample Annual Report for these purposes is provided in Appendix L.

8.0 Public Reporting

To inform the community as to the quality of drinking water provided by centrally managed on-site systems, the operating authority responsible for the systems will make available to their customers a copy of the most recent annual report (for a template of this report, see Appendix L) for the system as well as copies of up-to-date annual summaries of water quality monitoring results.

These records must be made available, in printed format, in accessible on-reserve locations such as the band offices.

Appendix A

On-site Drinking Water Systems

Groundwater Wells

All provincial and territorial jurisdictions, except the Northwest Territories, regulate wells in some form. Typically, well-drillers and well-drilling are regulated, as well as protection of groundwater from infiltration into the well. In some provinces wells must be licensed, and well reports are sometimes required upon the installation of a well. Many well regulations include source protection measures such as minimum set-backs from agricultural operations.

Surface spills of contaminants like fuel can infiltrate the soil and contaminate groundwater. The risk of contamination is greatest where the ground surface is highly water permeable, e.g., in areas with coarse soils or fractured bedrock at or near the surface.

Groundwater can also be contaminated by underground sources, such as leaking fuel storage tanks or malfunctioning septic systems. Poorly constructed or deteriorating wells can act as a direct pipeline for surface pollutants to contaminate the aquifer. Unused and un-maintained wells are a special concern if they haven't been safely plugged and sealed. Depending on the type of soil or rock, groundwater may be filtered and very clean. But once an aquifer is contaminated, it can take a very long time to recover, if ever.

It is impossible to determine the exact direction of groundwater flow based on surface features alone. However, we know that water in the aquifer near a pumping well will flow toward the well. The danger of groundwater contamination is greatest when the contaminant source is close to a well. However, on rare occasions contaminants have been known to spread over several kilometres

Wellheads for groundwater wells must be located on a higher point of land so that run-off and contaminants drain away from the well head rather than toward it. The area nearby can be landscaped and contoured to help direct run-off away from the well.

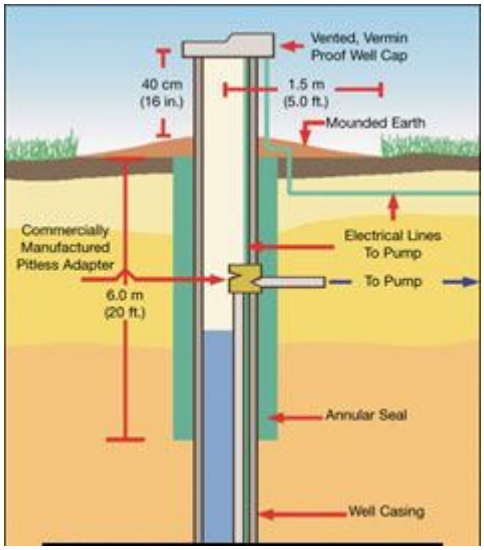
Wells and well-related equipment should be sited so they can be easily accessed at all times for cleaning, treatment, repair, testing, and visual examination.

Wells should be located a safe distance from potential sources of contamination such as fuel storage tanks, stockpiles of chemicals like pesticides or road salt, septic systems, gardens, manure piles, livestock, roads, and driveways.
It is good practice that wells should be separated from potential contaminant sources as follows:

- At least 15 metres (50 feet) for drilled wells with watertight casings that extend 6 metres (20 feet) or more below ground level.
- At least 30 metres (100 feet) for all other wells

These minimum distances do not guarantee safety. Increase the separation wherever possible, and eliminate or reduce sources of contamination.

Groundwater Well Construction



A properly constructed well forms an effective barrier against surface run-off that may enter and contaminate the well.

Water must infiltrate and pass downward through the soil and/or rock before it can reach the aquifer from which your well gets its water.

Over the years, well design has improved to reflect advances in technology and our understanding of potential pathways of contamination.

Always hire a contractor who is licensed in the province in which the work will be completed and who is familiar with that province's standards.

New wells should be lined with a watertight casing designed to keep out contaminants.

To be effective, this casing must extend to the appropriate depth, i.e., to the part of the aquifer from which the well draws water, or into the bedrock. In Ontario it must normally extend at least 6 metres (20 feet) below grade. The well casing must also extend at least 40 centimetres (16 inches) above the finished grade to help prevent contamination by surface water and run-off.

On new wells the well casing must extend above ground level and a pitless adapter is used to provide a sealed waterline entry at depth so that water lines are protected from freezing.

When a well is drilled the hole in the ground is bigger than the well casing. The resulting gap - the annular space - must be filled with a watertight sealant such as bentonite that does not shrink or crack under the ground. For maximum protection, the sealant should extend the full length of the casing. See Regulation 903 for prescribed minimum depths.

The annular seal serves as a barrier to run-off, surface water, and near-surface waters that could otherwise travel down the outside of the casing and contaminate the aquifer.

Drilled wells must be capped with a commercially manufactured vermin-proof well cap. Modern caps have rubber gaskets and screened vents inside to prevent entry of "foreign material" such as vermin, insects, and decaying plant material. Loose-fitting caps found on older wells make these wells a comfortable home for insects and vermin.

Appendix B

Certification of Products and Materials that Come into Contact with Drinking Water

Through its treatment and distribution, drinking water comes into contact with many products and materials that can have an impact on its quality. Treatment additives are used to make the water safer (e.g., disinfectants to inactivate microorganisms), drinking water system components are used to carry the water to the consumer (including pipes and fittings), and drinking water treatment devices are used to treat the water, often at the point of consumption (e.g., pitcher-type water filters, reverse osmosis units). Some of these products and materials are used and/or installed by municipalities, while others are purchased by the general public.

Although these products and materials are not currently regulated at the national level, Health Canada recognizes the importance that they be effective and safe. To that effect, Health Canada works with national and international standard-setting organizations to develop health-based standards for materials that come into contact with drinking water.

Health-based standards

Some standards for drinking water materials are health-based, while plumbing standards focus on installation requirements. Health Canada is primarily involved in the development of health-based standards for all types of drinking water materials and of health-based performance standards for drinking water treatment devices.
Health-based standards have been designed to safeguard drinking water by helping to ensure the material safety and performance of products that come into contact with drinking water. These types of standards are primarily developed by NSF International/American National Standards Institute, and include:

- Health-based standards:
  - NSF 60 - Drinking water treatment additives - Health effects
  - NSF 61 - Drinking water system components - Health effects
- Health-based performance standards:
  - NSF 53 - Drinking water treatment units - Health effects
  - NSF 55 - Ultraviolet microbiological water treatment systems
  - NSF 58 - Reverse osmosis drinking water treatment systems
  - NSF 62 - Drinking water distillation systems

Certification organizations provide assurance that a product or material is safe by testing them to ensure they meet the applicable standards. In Canada, the following organizations have been accredited by the Standards Council of Canada to certify drinking water devices and materials as meeting NSF/ANSI standards:

- Canadian Standards Association International
- NSF International
- Water Quality Association
- Underwriters Laboratories Inc.
- Quality Auditing Institute; and
- International Association of Plumbing & Mechanical Officials

Health Canada does not recommend specific brands of drinking water treatment devices, but it strongly recommends that consumers look for a mark or label indicating that the device has been certified by an accredited certification body as meeting the appropriate NSF International (NSF)/American National Standards Institute (ANSI) standards.

For more information on the certification of products and materials that come into contact with drinking water, please visit Health Canada's web site at: http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/mater/index-eng.php

Appendix C

Provincial and Territorial Regulatory Requirements for On-Site Drinking Water Supplies

Groundwater Wells

Information on the proper design, installation, and maintenance of groundwater wells can be obtained from several information sources that are readily available to the public, including:

Newfoundland:
- SNL2002 Chapter W-4.01 Water Resources Act, Section 18. (1) *Well Drilling Regulations*: http://www.assembly.nl.ca/Legislation/sr/statutes/w04-01.htm

Nova Scotia:
- Well Construction Regulations made under Sections 66 and 110 of the *Environment Act* S.N.S. 1994-95, c. 1 O.I.C. 2007-483 (September 7, 2007), N.S. Reg. 382/2007: http://www.gov.ns.ca/just/regulations/regs/envwellc.htm

New Brunswick:
- New Brunswick regulation 90-79, *Water Well Regulation,* under the Clean Water Act: http://www.gnb.ca/0062/regs/90%2D79.htm

Prince Edward Island:
- Water Well Regulations: http://www.gov.pe.ca/law/regulations/pdf/E&09-17.pdf

Ontario:
- Regulation 903: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900903_e.htm http://www.odwac.gov.on.ca/reg_903/reg903.htm
- Well Aware http://www.wellaware.ca
- Ontario Water Resources Act: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm

Yukon:
- Rural Domestic Water Well Program Description: http://www.community.gov.yk.ca/pdf/rdww_program.pdf
- Waters Act Tab No. 89 Waters Regulation O.I.C. 2003/58 25 Mar 2003: http://www.gov.yk.ca/legislation/acts/waters.pdf

Manitoba:
- Well Drilling Regulation: http://web2.gov.mb.ca/laws/regs/pdf/g110-228.88r.pdf#page=1
- Water Supplies Regulation: http://web2.gov.mb.ca/laws/regs/pdf/p210-330.88r.pdf#page=1

Saskatchewan:
- Groundwater Regulations: http://www.qp.gov.sk.ca/documents/English/Regulations/Regulations/SR172-66.pdf

Alberta:
- Water Well Driller Trade Regulation, Alta. Reg. 310/2000: http://www.canlii.org/ab/laws/regu/2000r.310/20080818/whole.html
- Water Ministerial Regulation: http://www.qp.gov.ab.ca/Documents/REGS/1998_205.CFM
- Drilling water wells in Alberta: http://environment.alberta.ca/documents/WaterAct_Drilling_Water_Well_FS.pdf

British Columbia:
- BC W [RSBC 1996] Chapter 483 Part 5 — Wells and Ground Water Protection**:** http://www.qp.gov.bc.ca/statreg/stat/W/96483_01.htm

Surface Water Intakes

Information on the proper design, installation, and maintenance of surface water intakes can be obtained from several information sources that are readily available to the public, including:

Federal
- Guidance for Providing Safe Drinking Water in Areas of Federal Jurisdiction - Version 1 Part 2 - Application of The Federal Framework Section 5.3 Surface water intakes: http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/guidance-federal-conseils/framework-app-cadre-3-eng.php#footnote5

Newfoundland and Labrador:
- Water Resources Act http://assembly.nl.ca/Legislation/sr/statutes/w04-01.htm

Nova Scotia:
- Guide to Surface water Withdrawal and Approvals: http://www.gov.ns.ca/nse/water/docs/guideToSurfaceWaterWithdrawalApprovals.pdf

New Brunswick:
- New Brunswick Surface water Protection Program: http://www.gnb.ca/0009/0373/0001/0002-e.asp

Ontario:

- Health Protection and Promotion Act O.Reg. 319/08 Small Drinking Water Systems: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_080319_e.htm#BK25
- Ontario Water Resources Act: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm

Yukon:

- Yukon Water Board: http://www.yukonwaterboard.ca/

Manitoba:

- Recommendations on Selection of an Engineer for a Water System Assessment: http://www.gov.mb.ca/waterstewardship/odw/reg-info/operations-monitor/recommendations_on_selection_of_engineer2004-04.pdf

Saskatchewan:

- Surface Water Quality Objectives: http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=768,760,253,94,88,Documents&MediaID=332&Filename=Surface+Water+Quality+Objectives.pdf

Alberta:

- Surface Water Quality Objectives for Use in Alberta, http://environment.gov.ab.ca/info/library/5713.pdf

British Columbia:

- B.C. Reg. 204/88 O.C. 889/88 *Water Act* WATER REGULATION [includes amendments up to B.C. Reg. 147/2006, May 18, 2006]: http://www.qp.gov.bc.ca/statreg/reg/W/Water/204_88.htm#part2
- Ministry of Environment Water Stewardship _ A Users Guide to Working in and Around Water: http://www.env.gov.bc.ca/wsd/water_rights/cabinet/working_around_water.pdf
- Guidelines for Minimum Standards in Water Well Construction, Province of British Columbia — June 1982 Part 2 — Technical Information Appendices Appendix 8: Permanent Well, Test Well, and test Hole Abandonment: http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/library/standards/Guidelines_1982/standr15.html
- Drinking Water Protection Act (SBC 2001) Chapter 9, Part 2 – Drinking Water Supply: http://www.qp.gov.bc.ca/statreg/stat/D/01009_01.htm#section7

Appendix D

Well Abandonment Report

Use this form to record and report plugging and sealing of water supply wells, monitoring wells, and other holes.

Band: _____ Region: _____

Well identification number: _____

Installation certificate number: _____

1.0 Well location: _____

To provide well location via GPS co-ordinates, well location information must be provided in UTM format. Check GPS unit for required settings as follows: Format = UTM, units = meters, north = true.

Easting: _____ Northing: _____

2.0 Well type and site data: (If stating no, please explain)

2.1 Type of well: drilled / dug / spring / infiltration gallery / Other _____

2.2 Distance to nearest septic tank/sewer line (approximate) _____ metres

2.3 Distance to nearest leaching field (approximate) _____ metres

3.0 Individual/Company responsible for plugging and sealing the well:

Name(s): _____
Mailing address: _____
_____
_____

Phone ( ) _____ - _____

I (we) report the existing well (hole) was plugged and sealed on the date of _____ for the following reason(s):

____ The well was plugged and sealed as required under Well Permit Number _____.

____ The well was not in use and was plugged and sealed.

____ Other (please explain)_____
_____
_____

The well was plugged with the following materials placed at the indicated intervals:

Amount and type of material		Method of Placement	Interval
_____	_____	_____	from _____ m to _____ m
_____	_____	_____	from _____ m to _____ m
_____	_____	_____	from _____ m to _____ m
_____	_____	_____	from _____ m to _____ m

Intervals of casing removed/ripped in metres: from _____ m to _____ m

This report must be signed by person who performed the well plugging work or by the band manager if this person is unknown or not reachable.

I(we) have read the statements made herein, know the contents thereof, and that they are true to my (our) knowledge.

1. _____
Signature

2. _____
Signature

_____
Name and title (print)

_____
Name and title (print)

Appendix E

Information on Drinking Water Cisterns

Guidance, from a public health perspective, on the design, installation, maintenance, and decommissioning of water cisterns and on the safe collection, transport, and supply of drinking water by drinking water haulers in First Nations communities is being developed Health Canada. Once completed, these materials will be posted at Health Canada's web site.

Until the above-mentioned guidance material is developed, field practitioners seeking information on the design, installation, maintenance, and decommissioning of water cisterns are encouraged to consult available information sources, some of which are listed here:

Issuing Department/Agency	**Title**
Agriculture and Agri-Food Canada	Water Quality Matters – Maintaining Safe Domestic Water Quality with On-Farm Cisterns and Water Tanks (February 2006)
David Thompson Health Region - Alberta	Cleaning and Disinfecting Water Cisterns
Yukon *Guidelines for Bulk Delivery of Drinking Water Regulation*	*Bulk Delivery of Drinking Water Regulation (Feb. 22, 2004)*
Nova Scotia – Environment and Labour	Potable Water Hauler Guidelines
ON Ministry of Health and Long-Term Care – Public Health Division	DRAFT Drinking Water Haulage Guidelines (Oct. 2003)
First Nations and Inuit Health Branch – Alberta Region	Fact Sheet 6.6 – Tips for Home Owners with Water Cisterns Fact Sheet 6.7 – Cistern cleaning and disinfection procedure – For persons trained in confined space entry
Government of the Northwest Territories – Public Works and Services	*Good Engineering Practice for Northern Water and Sewage Systems – (Apr – 04)*
Department of Justice NW Territories	Water Haulage Tanks (21)

Appendix F

Drinking Water Treatment Units

TREATMENT OPTIONS FOR TYPICAL WATER QUALITY PROBLEMS

Before purchasing a drinking water treatment unit (DWTU), the water to be treated should first be analysed by a provincially certified laboratory.

1.0 ON-SITE WELL WATER SOURCE

Stained aluminum cookware
Staining of aluminum cookware can result when water used in the cookware has a high dissolved mineral content and high alkalinity.

Tarnishing, blackening of metal sinks and utensils
Tarnishing and blackening of metal sinks and utensils can be caused by water that contains high amounts of salt (i.e. chlorides and sulphates) or high amounts of hydrogen sulphide gas.

Preventing Suspended matter in water
Suspended matter in water, such as fine sand, clay or other sediments can be removed using mechanical filtration (fine screen filtration) or sand filtration.

Hardness Removal
Hardness minerals (such as dissolved calcium and magnesium) are typically removed from water using a common water softening system.

Removing Nitrates and Nitrites
Nitrates and nitrites can be removed from water by a number of water treatment systems, including ion exchange filtration, reverse osmosis filtration, and distillation.

Removing Heavy Metals
Heavy metals (such as lead and copper) can be removed from water by reverse osmosis filtration or distillation.

Preventing Low-pH (Acidic) Water
Acid water (water with a pH lower than 5.0 can be treated using a neutralising filter which adds small doses of ordinary calcium carbonate to the water.

Preventing High-pH (Basic) Water

Basic water (water with a pH higher than 9.0) can be treated by injecting a weak acid (such as acetic acid or vinegar) into the water.

Removing Tannins (Humic Acids)

Tannins (humic acids) can be removed using an oxidation system (employing an oxidant such as chlorine) or by ion exchange filtration (employing an anion exchange resin).

Rotten egg odours from hot water tap

A sulphur odour (rotten egg smell) in only water taken from the hot water tap is caused by sulphates in the water reacting with the magnesium anode on the hot water heater, which causes the formation of hydrogen sulphide gas in the water. This problem can be corrected by replacing the anode with one made from aluminum.

The ability of various techniques to remove hydrogen sulphide from well water depends on the concentration present. Potassium permanganate can be effective but the concentration of hydrogen sulphide in your well water is approaching 6 ppm, the upper limit of its usefulness. Aeration is effective but requires prolonged contact times and a re-pressurisation tank. Chlorination is effective and fast-acting on high concentrations of hydrogen sulphide and has the added benefit in that it can disinfect the water, inactivating the sulphate-reducing bacteria and any disease-causing bacteria or viruses that may be present. In all three methods the hydrogen sulphide is converted (oxidised) from a soluble form to a particulate form (elemental sulphur) that can be removed via filtration. Excess chlorine can also be removed through a carbon filter

Once a unit is selected and installed, the tap water should be tested periodically to ensure that the unit is functioning properly. I would also suggest that you obtain a written money-back guarantee in case the unit is not as effective as indicated by the supplier.

Removing Ammonia Odours

Odours in well water often occur after the well has been unused for an extended period of time, following a flood or a drought, or after maintenance work. If this is the case then the problem may be temporary. Ammonia (NH_3) is produced naturally by the biological degradation of organic matter present in wastes or soils. It is also produced in the human body and easily metabolized. The risk to individuals at levels normally seen in drinking water is low. Until your water is tested, it is impossible to rule out ammonia, however, because the odour threshold of this compound is relatively high (higher than levels normally seen in wells), it is possible that the smell is due to something else. More information on ammonia in drinking water can be obtained from our web site at: http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/ammonia/ammonia-eng.pdf.

2.0 ON-SITE SURFACE WATER SOURCE

Bacterial Contamination

Water contaminated with any bacteria should be treated using chlorine or some other form of disinfection (UV filter, steam distillation, boiling) until the source of contamination is found and corrected or removed.

Preventing Fishy, Musty, or Earthy Smells

In water derived from a surface water source such as a lake or river, a fishy, musty, or earthy smell is usually caused by harmless organic matter. This is a common trait of surface water supplies. Many people assess the quality of their drinking water by its odour, taste, and appearance. Although these are important aspects of water quality, it is important to note that a glass of water may not look, taste, or smell good, yet still be safe to drink. Conversely, water can appear to be pure yet contain trace contaminants.

Preventing Suspended matter in water

Suspended matter in water, such as fine sand, clay or other sediments can be removed using mechanical filtration (fine screen filtration) or sand filtration.

Aesthetic water quality parameters

Removing Volatile Organic Compounds

Volatile organic compounds can be removed from water by a number of water treatment systems, including activated carbon filtration, reverse osmosis filtration, and distillation.

Removing Disinfection By-Products

Disinfection by-products such as trihalomethanes can be removed from water by a number of water treatment systems, including activated carbon filtration, reverse osmosis filtration, and distillation.

Removing Pesticides

Certain pesticides can be removed from water by a number of water treatment systems, including activated carbon filtration, reverse osmosis filtration, and distillation.

Total Dissolved Solids

Total Dissolved Solids (TDS) can be removed from water by reverse osmosis filtration or by distillation.

Appendix G

On-Site Wastewater Systems

On-site wastewater systems are generally cheaper to install and maintain than centralised services but they do require care and attention by the parties responsible for their care and maintenance. When properly installed and looked after, on-site systems can reliably dispose of household sewage in a way that will protect groundwater supplies, public health, and the environment. Improperly designed, selected, installed, or maintained systems can fail. Repair or replacement of a failed on-site system is expensive. When a tank is allowed to fill near or past its capacity, sludge or excess solids can migrate into the disposal field and block the pipes. The tank inlet may also get blocked, and cause sewage back up into the home. Repairs can range from clearing a few lines to replacing entire disposal fields and landfilling of contaminated soil. Costs can vary from a few hundred to a few thousand dollars.

Conserving Water Will Extend the Life of a Septic System

Homes with larger than average occupancies or with water fixtures that use large amounts of water (such as hot tubs) need a septic system that is designed to receive more wastewater, otherwise problems can result. For example:

- The excess flow can wash out solids from the septic tank before they are treated or removed. This will damage or clog the leaching field.
- If excess flow is more than the field can disperse, the ground surface or your plumbing system may flood

What Should **Not** Go Down the Drain

An on-site system can handle all normal household wastes, including body wastes, wash water and laundry wastewater (including some bleach). However, some materials should not go down the drain because:

- An on-site system cannot treat them and they may contaminate water supplies or the environment.
- They will affect or slow down the performance of the system and result in extra maintenance or require system replacement.

Some materials that should not go down the drain are listed in the following table.

Use commercial household and bathroom cleaners in moderation. They can damage your system. Many people clean their toilets, sinks, showers and tubs with a mild detergent or baking soda. Do not use caustic drain openers for a clogged drain. Instead, use boiling water or a drain snake to open clogs.

Septic tank additives are not needed for proper operation of the tank. In fact, they may damage the system and contaminate groundwater. Some additives cause solids to wash from the septic tank into the disposal field. This is not recommended because the solids could clog the field.

Garbage grinders should not be used. It is not recommended to discharge backwash water from water treatment devices, such as water softeners, to a septic system.

A problem or malfunction usually shows up in one of two ways:

- Sewage backs up into the household plumbing.
- Sewage or wet spots appear on top of the ground.

Troubleshooting usually begins in the household plumbing and proceeds towards the disposal field.

The House and Sewer Line

Sewage backup into the house or even fixtures that drain slowly may indicate a physical blockage exists in the plumbing. If you have a toilet that won't flush properly or a drain that refuses to empty, start there. A plunger may free the toilet, or cleaning a drain trap may free the sink.

If these simple measures do not work, check for a physical blockage in the house. Common culprits include rags, diapers, children's toys, plastic bottles, and a combination of lint from the washing machine and congealed grease from dish washing.

If there is no blockage in the household plumbing, the next step is to check the building sewer line between the house and the tank. Common problems in the line include the culprits listed above, as well as frost heave and settling, and broken piping. Frost heave and settling may have altered the original slope on the sewer line, creating low spots where liquid can puddle and freeze during the winter months. This will result in a partial restriction or blockage. Alternatively, the pipe may have broken off completely due to settling after installation.

The Tank

If fixtures and the sewer line are clear, the next step is usually to have a certified installer or certified septic tank cleaner inspect and pump the septic tank. Key trouble spots for blockage in the septic tank are the inlet and the outlet baffles or tees. It is important to check that the tank still has baffles. If these have broken down or broken off, scum and solids may have moved into the field and clogged it.

If the problem is a blocked or crushed line leading to the tank, or blocked tank inlet or outlet, it will usually show up when the tank is inspected or pumped. If pumping the tank does not solve the problem for more than a few days, or if raw sewage is discharging, the problem is likely in the disposal field. If pools of water are noticed in the field area, use water sparingly for a few days and check for improved performance.

The Leaching Field

Some common problems related to the leaching field include overloading with water, clogging of some part of the filed, or physical damage to the field. Check if any of these apply:

An increase in the water load, possibly resulting from:

- Using fixtures such as hot tubs, Jacuzzis, and spas
- Concentrating water use, such as multiple washes in one day
- Increasing family numbers or entertaining groups or visitors
- Leaking plumbing fixtures
- Running faucets to prevent freezing of pipes
- Piping sink and laundry wastes directly to the field and bypassing the tank
- Directing water from roofs, driveways and foundation drains into the system
- Flooding by high groundwater table seasonally
- Overloading of part of the field, or ponding and infiltration of surface water over part of the field
- Poor design (too small a tank for the actual flow)

Problems related to leach field pipes or underlying soil layers can result from:\

- Poor design (system inadequately sized for the soil conditions)
- Poor location with respect to the surrounding land or groundwater table such that the effluent cannot escape readily
- Too much or too little slope on the distribution pipe within the field
- Use of improper or inferior materials, such as imported sand fill or filter sand that does not meet specifications (usually permeability of soil is too low
- Construction during wet conditions, leading to smearing and reduction of natural soil permeability on the infiltrative surfaces

Physical damage to the leaching field system can result from:

- Compaction from vehicle traffic or landscaping activities
- Paving, building, or storage of objects on top of the field
- Tree roots invading the field
- Carryover of scum and solids from the tank into the leaching field

The sod cover over a leaching field should be maintained to prevent erosion and reduce the amount of rainfall that enters the field. Large trees should be removed from the immediate area of the field to prevent roots from clogging the pipes, short-circuiting effluent to the surface or damaging the system (if the tree is uprooted).

It is important not to cover the field with a hard surface, such as concrete or asphalt or heavy clay material. Vehicles (cars, machinery, ATV's, snowmobiles) must not be allowed to drive over any part of a leaching field; soil compaction, crushed distribution pipes, and damage to the field can result. Do not stack wood or build a shed or raised garden over a leaching field or septic system.

How to Make a Septic System Work Better

Some ways to avoid failures and minimize malfunctions, in new and existing systems, include:

- Check and fix or replace leaking or slow draining plumbing fixtures regularly. Call a plumber if you cannot find the problem yourself.
- Spread out water use, do laundry (full loads) once a day or over the week rather than partial loads or several loads a day. Do dishwashing as the machine is full and spread out the loads. Use water-saving machines.
- When guests or parties will produce an extra load on the system, pump the tank before guests arrive. Use off-site facilities for excess laundry.
- Consider a timed-dose system. If the extra load is regular, you may need to expand the system.
- Reduce normal water use in showers and sinks: take short showers and turn off the water while brushing teeth.
- Use heat tape to prevent freezing of pipes rather than running water continuously.
- Install water conserving fixtures, such as low flow toilets
- Make sure that the septic tank is watertight so groundwater does not leak into it.
- Make sure that the system is located and protected to avoid unnecessary extra water from groundwater, surface water, roof, and foundation drains, interceptor drains, sumps, treatment unit backwash, and other sources.

Managers of on-site systems should consider two extra components that can improve system performance, make inspection of on-site systems easier, and help diagnose problems. These components are not required but they are inexpensive compared with the cost of the system, or with the cost of repairing or replacing it.

- Septic tank effluent filters installed on the outflow from the tank are designed to intercept solids that might otherwise escape from the tank and clog the leaching field. Filters need regular cleaning usually when the

septic tank is inspected or pumped. If they require more frequent cleaning, it is probable that the materials that blocked the filters would have reached the disposal field, causing potentially serious and expensive damage.

- A water meter will record your water use. One can compare use with the design flow of the system and detect leaking fixtures. The record will help to make decisions about water conservation.

Remember that if water use is greater than the design flow rate, untreated effluent will likely surface down gradient of the field.

A well-maintained septic system can run for decades. An abused or neglected one can fail tomorrow. Practitioners seeking general information on the design, installation, maintenance, and decommissioning of on-site wastewater systems are encouraged to consult available information sources, some of which are listed here:

References and Training Materials for On-Site System Operators

Prince Edward Island:
- Sewage Disposal - Owner's Guide, http://www.gov.pe.ca/infopei/index.php3?number=20017

British Columbia:
- BC On-Site Sewage Association: http://www.bcossa.com/

Public Awareness Materials

Canada Mortgage and Housing Corporation:
- Your Septic System http://www.cmhc-schl.gc.ca/en/co/maho/gemare/gemare_009.cfm

Newfoundland and Labrador:

Prince Edward Island:
- Sewage Disposal - Owner's Guide, http://www.gov.pe.ca/infopei/index.php3?number=20017

Nova Scotia:
- Introduction to Septic Systems (Public Awareness Brochure) http://www.halifax.ca/pollutionprevention/documents/SepticBrochure.pdf
- Before You Construct an On-Site Wastewater System – Facts for Homeowners: http://www.gov.ns.ca/nse/water/docs/OnSiteSewageConstruction.pdf

Appendix H

Provincial and Territorial Regulatory Requirements for On-Site Wastewater Systems

Operators are required by law to report any problem to local authorities before proceeding with repairs or replacement. A final inspection will need to be carried out and a Use Permit granted before a new or altered septic system can legally be used. The contractor and/or local authorities can also determine the required size of septic system. A larger system than currently in place may be required. When repairing, replacing or installing a new septic system, it is important to be aware of the legal limitations imposed on where septics system can be located with respect to residences, wells, and nearby bodies of water. These distances are required to help ensure that wastewater from septic systems cannot reach and contaminate nearby water supplies. Depending upon the province, the leaching bed is usually located at least 1.5 – 9 m from a property line, 3 – 1 m from a building, 15 – 30.5 m from a well, and 15 – 75 m from a body of water.

The agency responsible for onsite septic system permits varies depending on the province or territory. Information on the proper design, installation, and maintenance of on-site wastewater systems can be obtained from various sources including:

- Local municipal offices or public health offices
- Licensed septic system installers (check the Yellow Pages™)
- Provincial and territorial ministries responsible for septic systems (e.g. environment, health)

Newfoundland and Labrador:

- Guidelines for the Design, Construction and Operation of Water and Sewerage Systems, Section 5 – Sewerage Works: http://www.env.gov.nl.ca/env/Env/waterres/CWWS/Guidelines_Water_Sewerage/section5.pdf

Nova Scotia:

- Environment Act, Statutes of Nova Scotia, 1994-95, Chapter 1: http://www.gov.ns.ca/legislature/legc/statutes/envromnt.htm
- Nova Scotia On-site Sewage Disposal Systems Regulations: http://www.gov.ns.ca/just/regulations/regs/ENV-On-siteSewageDisposalSystems.htm
- Qualified persons in Nova Scotia: http://www.gov.ns.ca/nse/water/onsitesewage.asp
  List of qualified persons – Level 1 http://www.gov.ns.ca/nse/water/docs/QualifiedPersonsI.pdf
- List of qualified persons – Level 2

http://www.gov.ns.ca/nse/water/docs/QualifiedPersonsII.pdf

- Nova Scotia Environment – On Site Sewage Disposal Approval (Permit): http://www.gov.ns.ca/snsmr/paal/nse/paal178.asp
- Nova Scotia Environment – Septic Tank Installer Licence: http://www.gov.ns.ca/snsmr/paal/nse/paal177.asp

New Brunswick:

- New Brunswick regulation 88-200 under the Health Act http://app.infoaa.7700.gnb.ca/gnb/Pub/EServices/ListServiceDetails.asp?ServiceID1=3015&ReportType1=All

Prince Edward Island:

- *Environmental Protection Act* - Sewage Disposal Systems Regulations http://www.gov.pe.ca/law/regulations/pdf/E&09-15.pdf

Quebec:

- Règlement sur l'évacuation et le traitement des eaux usées des résidences isolées http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/Q_2/Q2R8.HTM
- Rôle et pouvoirs des municipalités concernant l'installation de fosses septiques http://www.mamrot.gouv.qc.ca/publications/muni_expr/2007/MX2007_No4_role_pouvoirs_fosses_septiques.asp

Ontario:

- Building Code Act, 1992 S.O. 1992, CHAPTER 23: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_92b23_e.htm#BK2
- Ontario regulation 350/06 Building Code Division B Part 8 Sewage Systems: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_060350_e.htm

Manitoba:

- The Environment Act (C.C.S.M. c. E125) – On-site Wastewater Management Systems Regulation: http://web2.gov.mb.ca/laws/regs/pdf/e125-083.03.pdf

Saskatchewan:

- SASKATCHEWAN ONSITE WASTEWATER DISPOSAL GUIDE, http://www.health.gov.sk.ca/wastewater-disposal-guide

Alberta:

- PRIVATE SEWAGE INSTALLER ELIGIBILITY TO OBTAIN PSDS PERMITS, http://www.municipalaffairs.alberta.ca/documents/ss/PSDScertificationNOTICEApril_2008_comm.pdf
- Alberta Private Sewage Systems Standard of Practice Handbook, http://www.municipalaffairs.alberta.ca/Handbook_index.cfm
- ALBERTA REGULATION 229/97 PRIVATE SEWAGE DISPOSAL SYSTEMS REGULATION, http://www.qp.gov.ab.ca/documents/Regs/1997_229.cfm?frm_isbn=9780779721030
- Private Sewage Codes & Standards, http://www.municipalaffairs.alberta.ca/cp_private_sewage_codes_&_Standards.cfm

British Columbia:

- BC On-Site Sewage Association: http://www.bcossa.com/
- B.C. Reg. 326/2004O.C. 701/2004 *Health Act- Sewerage System Regulation:* HTTP://WWW.BCLAWS.CA/RECON/DOCUMENT/FREESIDE/--%20P%20--/PUBLIC%20HEALTH%20ACT%20%20SBC%202008%20%20C.%2028/05_REGULATIONS/22_326_2004.XML
- Sewerage System Standard Practice Manual: http://www.hls.gov.bc.ca/protect/lup_standards.html

Table 1: Provincial/territorial septic system regulations

Province/Territory	**Department/Ministry**	**Act — Regulation**
Prince Edward Island	Department of Technology and Environment	*Environmental Protection* — Act Sewage Disposal Regulation
Newfoundland and Labrador	Department of Health	*Public Health Ac*t — Sanitation Regulation
Nova Scotia	Department of the Environment	*Environment Act* — On-site Sewage Disposal Regulation
New Brunswick	Department of Health and Community Services	*Health Act* — Regulation 88-200
Quebec	Department of Environment	*Environmental Quality Act* — Regulation Respecting Wastewater Disposal Systems for Isolated Dwellings
Ontario	Ministry of Municipal Affairs and Housing	Ontario Building Code Part 8
Manitoba	Department of the Environment	*Environment Ac*t — Private Sewage Disposal Systems and Privies Regulation
Saskatchewan	Department of Health	*Public Health Act* — Plumbing and Drainage Regulation
Alberta	Ministry of Labour	*Safety Codes Act* — Alberta Private Sewage Systems Standards of Practice
British Columbia	Ministry of Health Services	*Health Act* — Sewerage System Regulation
Northwest Territories	Department of Health and Social Services	*Public Health Act* — General Sanitation Regulations
Yukon Territory	Department of Health	*Public Health and Safety Act* — Sewage Disposal System Regulations

Appendix I

Water-Efficient Fixtures and Demand Management Programs

Every time water goes into a septic tank, that same amount of water moves into the leaching bed. The longer the wastewater is retained in the septic tank, the more the effluent has less suspended solids and organic matter. Conversely, if the water moves too quickly through the septic system (through excessive water use in the household), the solids may not have time to settle out and then could flow into the leaching bed. Therefore, whenever possible, the amount of water entering the septic system should be regulated; for instance, laundry can be spread out over several days during the week. Water usage can be reduced by installing water saving features in plumbing fixtures and by only running the washer or dishwasher when it is full. Fix leaky faucets and watch out for running toilets — a running toilet can waste a huge amount of water and can wash out a septic tank. Foundation drainage (sump pump) and furnace condensate should be excluded from the septic tank. The amount and timing of wastewater put into the leaching field can also be controlled by using a discharge pump package to dose the leaching bed.

The Canada Mortgage and Housing Corporation (CMHC) consulted with municipalities across Canada to produce a handy reference for using water efficiently. This publication, entitled *Household Guide to Water Efficiency* was designed for use by consumers but it is also used by municipalities to educate residents on this increasingly important topic. The only national publication with comprehensive water saving information for residential consumers, the user-friendly Guide shows how to test for and repair leaks, make the most efficient use of water when doing daily chores, and plan residential landscapes with water efficiency in mind. Municipalities are encouraged to use this affordable Guide as an awareness tool for local water conservation promotion. To order, go to the Order Desk at the CMHC web site and order Household Guide to Water Efficiency – CMHC catalogue number 61924.

Appendix J

Annual Inspection Guide for Drinking Water Wells

Band: _____ Region: _____

Well identification number: _____

Installation certificate number: _____

Well location: _____

To provide well location via GPS co-ordinates, well location information must be provided in UTM format. Check GPS unit for required settings as follows: Format = UTM, units = meters, north = true.
Easting: _____ Northing: _____

1. 0 Well site and visual conditions: (If stating no, please explain)

1.1 Type of well: drilled / dug / spring / infiltration gallery / Other _____

1.2 Distance to nearest septic tank/sewer line (approximate) _____ metres

1.3 Distance to nearest leach field (approximate) _____ metres

1.4 Is the well in a clean and sanitary location? _____ (Y/N)
_____

1.5 Is the well maintained in a clean and sanitary condition? _____ (Y/N)
_____

1.6 Is the ground at the surface sloped from the well for proper drainage? _____ (Y/N)
_____

1.7 Is the surface surrounding the well firm and stable? _____ (Y/N)
_____

1.8 Is the well situated in a well house or vault? _____ If so, is the well house or vault in good repair and condition? _____ (Y/N)
_____

2.0 Well construction and materials: If stating no, please explain

2.1 Is the well equipped with a sanitary well seal/cap? _____ (Y/N)
_____

2.2 Is the well constructed with steel casing at the surface? _____ (Y/N)
_____

2.3 Does the casing extend at least one (1) foot above the surface? _____ (Y/N)

_____

2.4 Casing size _____ (cm) 2.5 Estimated well depth _____ (metres)

2.6 Who constructed well? _____

_____

2.7 Number of houses served by the well: _____

2.8 Estimated date well constructed _____

3.0 Pump Information:

3.1 Who installed the pump? _____

3.2 Date pump installed _____ 3.3 Date pump first used _____

3.4 Estimated flow rate _____ (Litres/min)

4.0 Inspection Details:

4.1 Inspected by (print): _____ __

4.2 Inspector Signature: _____ Date: _____

4.3 Inspector's phone number: _____

4.4 Additional comments or information: _____

_____

_____

Attach photo(s) if available or needed for further evaluation

For Office Use Only:

Has information above been verified? _____ If not, please note accordingly.

_____

_____

List any problems you have identified: (if none, please state so)

_____

_____

Appendix K

Annual Inspection Guide for Septic Systems

Band: _____ Region: _____

Septic system identification number: _____

Installation certificate number: _____

1.0 Septic System location: _____

Measure and record the location of the tank covers with reference to the corners of the house. To provide septic system location via GPS co-ordinates, septic system location information must be provided in UTM format. Check GPS unit for required settings as follows: Format = UTM, units = meters, north = true.
Easting: _____ Northing: _____

2.0 Installation:

Year septic system installed: _____

Date septic tank last pumped out: _____ (YY/MM/DD)

Previous date septic tank was pumped out: _____ (YY/MM/DD)

How many times has the tank been pumped since installation? _____

3.0 Signs of failure:

Have any of the following signs of system failure occurred? If yes, seek additional information and summarise it here:

- Plumbing backups or sewage backups in the house (toilets, drains, etc.)
  _____
  _____
- Toilets take longer to flush; showers and sinks take longer to drain. Flush each toilet to observe whether it drains quickly or not. Run water in every sink and observe whether it drains freely or sluggishly. If only one fixture is slow, the problem is likely related to that individual fixture.
  _____
  _____
- Gurgling in the plumbing
  _____

_____

- Breakouts or discharge of raw sewage to the ground surface, especially after a heavy rainfall. Breakouts are often indicated by wet spots or ponding or grey or black liquids or black soil areas in the area of the leaching field or nearby ditches.

  _____
  _____

- Noticeable unpleasant or sewage odours around the yard, or in the vicinity of the leaching field especially after a rainfall.

  _____
  _____

- Lush green growth over the leaching field. Grass over the system becomes unusually green or spongy to walk on, even during dry weather.

  _____
  _____

- Build-up of aquatic weeds or algae in lakes or ponds or ditches adjacent to the site

  _____
  _____

- The presence of nitrates or bacteria in nearby wells.

  _____
  _____

4.0 Tank Design:

4.1 Difference in elevation between inflow invert and outflow invert: _____ mm
Note: Typical septic systems are designed to have the outflow level approximately 75 mm below the inflow level. If the distance between the bottom of the pipe coming from the house and the liquid level is greater than this, then the liquid in the tank is leaving the tank somewhere other than the pipe leading to the disposal field.

4.2 Has the grease trap reached half full? _____ (Y/N)
Note: If the grease chamber is half-full, the tank should be pumped by a certified septic tank cleaner. Summer and early fall are the best times to pump out a regularly used septic tank. This will leave time before winter for the tank to refill and for bacterial action to re-establish. Do not pump tanks in late fall; the ground will not be frozen and a high water table can create buoyancy problems for septic tanks.

4.3 Does the system incorporate pumps or siphons? ___ (Y/N)

4.4 Date that the operation of pumps and siphons was last checked by a certified person: _____ (YY/MM/DD)

4.5 Depth of tank lid below grade: _____ m

Note: If access hatch is more than 100 mm below grade, a riser with watertight joint should be installed over the manhole of the tank to bring the access to, or near, the surface to make regular inspections, monitoring, and maintenance easier.

Note: Do not enter an empty septic tank. An open flame or flashlight with more than two cells should not be used in or near a septic tank because of danger from explosive gases.

5.0 Inspection Details:

5.1 Date of this inspection: _____

5.2 Inspected by (print): _____

5.3 Inspector Signature: _____ Date: _____

5.4 Inspector's phone number: _____

5.5 Additional comments or information: _____
_____
_____

Attach photo(s) if available or needed for further evaluation

For Office Use Only:

Has information above been verified? _____ If not, please note accordingly.
_____
_____

List any problems you have identified: (if none, please state so)
_____
_____

Appendix L

Annual Report

Name of band: _____

Band number: _____ Region: _____

Band address: _____
_____

1.0 Centrally Managed On-Site Drinking Water Systems

1.1 Number of centrally managed on-site drinking water systems:
Groundwater wells: _____
Surface water intakes: _____

1.2 Number of centrally managed drinking water treatment units: _____

1.3 Number of centrally managed cisterns: _____

1.4 Number of centrally managed on-site wastewater systems: _____

2.0 Individual(s)/Company(ies) responsible operating and maintaining centrally-managed on-site drinking water systems:
Name(s): _____
Mailing address: _____
_____
_____
Phone ( ) _____ - _____

3.0 Individual(s)/Company (ies) responsible operating and maintaining centrally-managed drinking water treatment units:
Name(s): _____
Mailing address: _____
_____
_____
Phone ( ) _____ - _____

4.0 Individual(s)/Company (ies) responsible operating and maintaining centrally-managed cisterns:
Name(s): _____
Mailing address: _____
_____
_____
Phone ( ) _____ - _____

5.0 Individual(s)/Company(ies) responsible operating and maintaining centrally-managed on-site wastewater systems:
Name(s): _____
Mailing address: _____
_____
_____
Phone ( ) _____ - _____

6.0 Annual Summaries of Water Quality Monitoring Results.

- Attach copies of summaries of results for drinking water quality test of on-site drinking water supplies.

Appendix M

Stakeholder Roles and Responsibilities

Provision of water services to First Nations communities is a shared responsibility between three groups:

First Nations

First Nations responsibilities outlined in this Protocol as they relate to managing decentralised systems are divided between two main groups: a.) band councils, and b.) system operators:

a. Band Councils (chiefs, councillors, utility directors, infrastructure managers, and public works supervisors) are responsible for ensuring that decentralised water and wastewater systems are designed, constructed, and upgraded in accordance with this Protocol.
b. System operators are responsible for maintaining and operating decentralised water and wastewater systems and for implementing effective sampling and testing programs to periodically monitor drinking water quality (or treated effluent quality) as well as for keeping all records required by this Protocol and provincial regulations.

Indian and Northern Affairs Canada

INAC provides First Nations with financial assistance for designing, constructing, upgrading, operating, maintaining, and monitoring decentralized systems that comply fully with this Protocol. INAC also assists in the provision of training as well as with services shared between reserves and municipalities through municipal-type agreements. Compliance with this Protocol is monitored by INAC regional offices via annual inspection reports submitted by First Nations.

Health Canada

Health Canada may sample and test water at a private residence when requested by the occupant of an individual residence. Otherwise, Health Canada has no involvement in the sampling and testing requirements to be performed by the operators of decentralised systems under this Protocol.

Environment Canada

Environment Canada's roles and responsibilities with respect to wastewater include the administration and enforcement of federal acts and/or regulations and the provision of information related to federal regulatory and environmental protection requirements. The existing federal regulatory requirements applicable to the wastewater sector include but are not limited to:

- The general pollution prevention provisions of the Fisheries Act;
- CEPA 1999 Notice requiring the preparation and implementation of pollution prevention plans for in organic
- chloramines and chlorinated wastewater effluents (2004);
- CEPA 1999 Guideline for the release of ammonia dissolved in water found in wastewater effluents (2004); and
- Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments.

Appendix N

Drinking Water and Wastewater Definitions

Absorption field: Also called a leeching or seeping field, an absorption field consists of a series of shallow trenches in which drain tiles (pieces of perforated pipe) are placed. If the permeability of the soil, established by a percolation test is exceptional, then the pipes can be laid directly on it. In most cases the trenches must be underlain with a layer of gravel to help the effluent absorb properly into the soil.

Aesthetic objective (AO): Aesthetic objectives are set for drinking water quality parameters such as colour or odour, where an exceedance may make the water less pleasant, but not unsafe.

Alkalinity: Alkalinity is a measure of the capacity of water to resist changes in pH. Alkalinity is usually expressed as the equivalent concentration (mg/L) of calcium carbonate (CaCO3).

Aquifer: A natural an underground geological formation or group of formations, often of sand or gravel, which contain water. An aquifer is a source of groundwater for wells and springs.

Aquifer (confined): A confined aquifer is a layer of soil or rock below the land surface that is saturated with water. There are layers of impermeable material both above and below it and it is under pressure so that when the aquifer is penetrated by a well, the water will rise above the top of the aquifer.

Aquifer (unconfined): An unconfined aquifer is one whose upper water surface (water table) is at atmospheric pressure, and thus is able to rise and fall.

Bacteria (plural) bacterium (singular): bacteria are microscopic living organisms usually consisting of a single cell. Bacteria can aid in pollution control by consuming or breaking down organic matter in sewage and or other water pollutants. Some bacteria may also cause human, animal and plant health problems. Bacteria are predominantly found in the intestines and feces of humans and animals. The presence of *coliform* bacteria in water indicates the contamination of water by raw or partially treated sewage.

Band-Managed System: A band-managed system is one that is managed and operated by a band, a band-owned utility, or a qualified third party operating under contract to the band.

Coliform: A group of related bacteria whose presence in drinking water may indicate contamination by disease-causing microorganisms.

Contaminant: A contaminant is anything found in water (including microorganisms, minerals, chemicals, radionuclides, etc.) that may be harmful to human health.

Cryptosporidium: *Cryptosporidium* are protozoic microorganisms commonly found in lakes and rivers. It is highly resistant to disinfection processes and can cause diarrhoea, nausea, and/or stomach cramps.

Decentralized System: The term decentralized system refers to a group or groups of communal (as opposed to private) on-site water or wastewater systems.

Disinfectant: A disinfectant is a chemical (commonly chlorine, chloramines, or ozone) or physical process (e.g., ultraviolet light) that inactivates or kills microorganisms such as bacteria, viruses, and protozoa.

Distribution System: A distribution system is a network of pipes leading from a drinking water treatment plant that delivers finished drinking water to customers' plumbing systems.

Escherichia coli: *Escherichia coli* (E. coli) are commonly found in the lower intestine of warm-blooded animals. E. coli are not always confined to the intestine, and their ability to survive for brief periods outside the body makes them an ideal indicator organism to test environmental samples for fecal contamination
Fecal coliforms: Fecal coliforms include the genera that originate in feces; Escherichia as well as genera that are not of fecal origin; *Enterobacter*, *Klebsiella*, and *Citrobacter*. In general, increased levels of fecal coliforms (fecal bacteria) provide a warning of failure in water treatment, a break in the integrity of the distribution system, or possible contamination with pathogens. When levels are high there may be an elevated risk of waterborne gastroenteritis.

Giardia lamblia: *Giardia lamblia* are protozoic microorganisms frequently found in rivers and lakes, which, if not treated properly, may cause diarrhoea, fatigue, and cramps after ingestion.

Groundwater: Groundwater is any water that is obtained from a subsurface water-bearing soil unit (called an aquifer). 1) Water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper surface of the saturate zone is called the water table. 2) Water stored underground in rock crevices and in the pores of geologic materials that make up the Earth's crust.

Groundwater, confined: Groundwater that is under pressure significantly greater than atmospheric, with its upper limit the bottom of a bed with hydraulic conductivity distinctly lower than that of the material in which the confined water occurs.

Groundwater, unconfined--water in an aquifer that has a water table that is exposed to the atmosphere.

Hardness: Hardness is a measure of calcium and magnesium in water. These elements precipitate with carbonate in boilers and pots to form scale. Hardness also makes it difficult to form lather, requires more soap, and creates a soap scum.

Microorganisms: Microorganisms, also known as microbes, are tiny living organisms that can be seen only with the aid of a microscope. Some microbes can cause acute health problems when consumed in drinking water.

Pathogen: Pathogen is a term applied to any disease-causing organism.

Potable water: Potable water is water that is destined for human consumption. For the purposes of this Protocol, water destined for human consumption is water that is consumed directly as drinking water, water that is used in cooking, water that is used to wash food, and water that is used for bathing infants (individuals under 1 year in age).

pH: pH is a measure of water's acidity or alkalinity. Water with a pH of 0 to less than 7 is acidic. A pH of 7 is neutral, neither acidic nor alkaline. Water with a pH greater than 7 to 14 is termed alkaline. In Canada, recommended pH for drinking water is between 6.5 and 8.5.

Public Facility: A public facility is a non-commercial facility that is owned or operated by Chief and Council and serves a public function, such as a school, band office, or community centre. Facilities funded by other government departments are not covered by this Protocol.

Qualified Band Employee: A qualified band employee is a band employee (a person on the band's pay roll), or a third party operating under contract to the band, who is fully licensed to perform the work in the province in which the work will be performed.

Radionuclides: Any man-made or natural element that emits radiation.

Raw Water: The term raw water refers to water that is in its natural state, prior to any treatment for drinking.

Reverse osmosis--(1) (Desalination) The process of removing salts from water using a membrane. With reverse osmosis, the product water passes through a fine membrane that the salts are unable to pass through, while the salt waste (brine) is removed and disposed. This process differs from electrodialysis, where the salts are extracted from the feed water by using a membrane with an

electrical current to separate the ions. The positive ions go through one membrane, while the negative ions flow through a different membrane, leaving the end product of freshwater. (2) (Water Quality) An advanced method of water or wastewater treatment that relies on a semi-permeable membrane to separate waters from pollutants. An external force is used to reverse the normal osmotic process resulting in the solvent moving from a solution of higher concentration to one of lower concentration.

Runoff: The term runoff refers to: (1) That part of the precipitation, snow melt, or irrigation water that appears in uncontrolled surface streams, rivers, drains or sewers. Runoff may be classified according to speed of appearance after rainfall or melting snow as direct runoff or base runoff, and according to source as surface runoff, storm interflow, or ground-water runoff. (2) The total discharge described in (1), above, during a specified period of time. (3) Also defined as the depth to which a drainage area would be covered if all of the runoff for a given period of time were uniformly distributed over it.

Septic tank: A septic tank is a tank used to detain domestic wastes to allow the settling of solids prior to distribution to a leach field for soil absorption. Septic tanks are used when a sewer line is not available to carry them to a treatment plant. A settling tank in which settled sludge is in immediate contact with sewage flowing through the tank, and wherein solids are decomposed by anaerobic bacterial action.

Source Water: Water in its natural state, prior to any treatment for drinking.

Surface Water: Surface water is any water that is obtained from sources, such as lakes, rivers, and reservoirs that are open to the atmosphere.

System Designer: A system designer is a person, such as an engineer, who is qualified to design a water or wastewater systems.

System Operator: A system operator is a band employee or a third party under contract to a band who is tasked with the operation and maintenance of a water or wastewater system.

System Manager: A system manager is a band employee or a third party under contract to a band who is tasked with managing a water or wastewater system.

Trihalomethanes: Trihalomethanes (THMs) are formed when chlorine (and or chlorine-based disinfectants) used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water. They have been shown to cause negative effects in lab animals but their effect on human health is unknown.

Turbidity: Turbidity is the cloudy appearance of water caused by the presence of suspended matter or particles in the water. High levels of turbidity may interfere with proper water treatment and monitoring. In Canada, the maximum acceptable concentration (MAC) for turbidity in drinking water entering a distribution system is 1 NTU (Nephelometric Turbidity Unit). An aesthetic objective of 5 NTU has been set for samples taken in the distribution system. Turbidity levels higher than 5 NTU in samples collected in the distribution system can indicate severe local corrosion of the water pipes.

Water destined for human consumption: Water destined for human consumption is water that is consumed directly as drinking water, water that is used in cooking, water that is used to wash food, and water that is used for bathing infants (individuals under 1 year in age).

Watershed: The land area from which water drains into a stream, river, or reservoir.

Water quality: The term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Water use: The term water use refers to water that is used for a specific purpose, such as for domestic use, irrigation, or industrial processing. Water use pertains to human's interaction with and influence on the hydrologic cycle, and includes elements, such as water withdrawal from surface- and ground-water sources, water delivery to homes and businesses, consumptive use of water, water released from wastewater-treatment plants, water returned to the environment, and in-stream uses, such as using water to produce hydroelectric power.