

Gulf Islands Groundwater Protection

A Regulatory Toolkit

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Islands Trust

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Introduction

Islanders are taking voluntary actions to steward and conserve water, island organizations educate and manage their water resources, and the Islands Trust has a strong focus on the importance of voluntary actions to protect water quality and quantity. A sample can be viewed here: <http://www.islandstrust.bc.ca/trust-council/projects/water-resource-information-for-islanders.aspx>.

This project discussion paper is only about what regulatory options are available if islanders and trustees want to proceed down the regulatory route; it is not the only route to protect groundwater quality and quantity.

The Islands Trust Local Planning Committee (LPC) has on their work program the development of water quality and quantity toolkit and development of a model bylaw. This report includes a toolkit, a model Development Permit Area (DPA) bylaw and a model Development Approval Information Area (DAI) Provisions that will assist all Local Trust Committees (LTC) in addressing the issue of water conservation.

This report addresses options for the islands to consider in order to safe guard their water supplies now and into the future. The protection of a safe adequate water source will remain a priority for the Islands and will become increasingly important as the Islands continue to develop. Reaching the full potential of water conservation requires comprehensive and long-term strategic planning.

There is an ever increasing need to balance the water supply requirements for area growth against future sustainability and environmental needs. The issue of water quality and quantity has been a long standing issue on the Gulf Islands. Local Trust Committees (LTC) have approached the issue differently from no action to developing development permit area guidelines and specific water conservation bylaws or subdivision servicing regulations. However, it is believed that to plan for the future of the Islands is to include the protection of water – groundwater and surface water. Groundwater is inextricably linked to the amount of surface water which many island ecosystems and habitats rely on which is another reason why an island’s groundwater supply should be protected and sustainably used.

Background

In British Columbia, water is owned by the Crown and not by individual land owners. Surface water is regulated by the *Water Act*. British Columbia is the last jurisdiction in Canada without groundwater legislation or licensing (i.e. protection). The intent of the Province in the near future is to integrate groundwater and surface water allocation. The Province is working to finalize the new *Water Sustainability Act* (see: <http://www.livingwatersmart.ca/water-act/>)

which would require all existing and new large groundwater users to apply for and obtain a water licence (e.g. waterworks, community wells, industrial and agricultural users). This proposed legislation will replace the *Water Act*. The proposed legislation would not include individual residential well users, but it would in high risk areas (priority areas) where for instance aquifers are under stress due to over use. To establish the Islands Trust as a priority area would be beneficial, but this cannot be established until the new legislation is in place. This would enable closer evaluation with the province on providing regulation for the protection of aquifers/ground water. Something all islands would benefit from.

An aquifer is the area underground where spaces between gravel, sand, clay, or rock fill with water. Water stored underground is called groundwater. There are different types of aquifers. When water is found in cracks and pores in the rock, we call this a 'bedrock' aquifer. When water is found in the spaces between sand and gravel, we call this a 'sand and gravel', or 'unconsolidated' aquifer.

There are two types of aquifers that exist in the Gulf Islands: sand and gravel layers and fractured bedrock. Fractured bedrock provides the primary source of freshwater for the majority of the island residents. Fractures in the bedrock located below the water table are filled with water and tapped by wells. The density of fractures and proximity to major faults determine the water yield from individual wells.

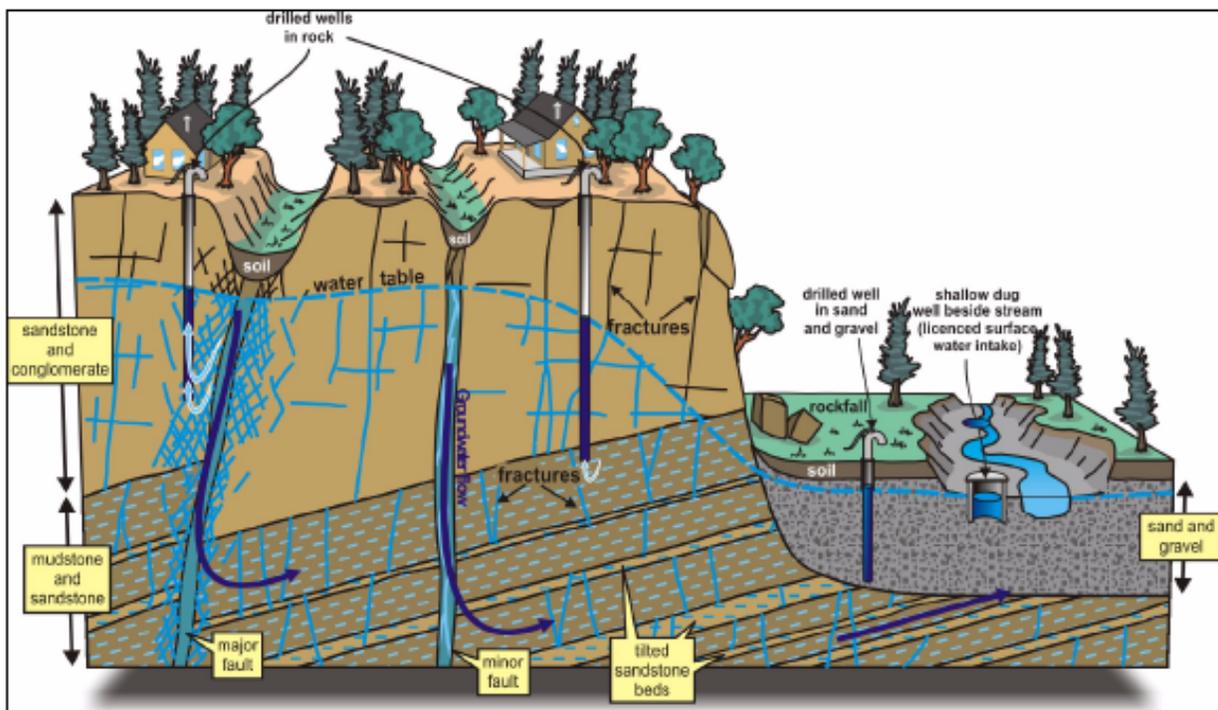


Figure 1. Ground water fills cracks and pores below the water table.

Source: Natural Resources Canada (http://ngwd-bdnes.cits.nrcan.gc.ca/service/api_ngwds/def/en/brief/pr_i03_mj.html)

Development pressures will continue to raise concerns over adequate quantity and quality of water on the Islands. The drinking water in the Gulf Islands comes from a variety of sources – private water systems, improvement districts, regional district water systems, individual wells, surface water all which rely on a safe supply of groundwater from aquifers. There are specialized systems that do not rely on groundwater such as rainwater catchment and desalinization. A few residents rely on bottled/trucked water.

Sustainable practices are required to conserve and protect fresh groundwater sources. There is currently no system to understand the cumulative impacts of individual wells drilled. There are a number of issues that impact the quality and quantity of groundwater such as saline intrusion, land use impacts (i.e. types and amount of uses), well interference, surface contamination, topography, recharge rates, soils, vegetation cover, geology, proximity to the sea, liquid waste (i.e. septic system) and seasonal water shortage. Climate change may also have an impact on groundwater supplies. The protection of existing groundwater supplies is significantly easier than finding alternative water sources on the islands. Groundwater also plays an important role in maintaining base flows in rivers and streams, which are critical in providing wildlife habitat and maintaining fish spawning areas and wetlands.

The Islands Trust has an important role to play in groundwater protection. It controls long-range development (Official Community Plans) and land use planning, zoning, development permit areas, bylaw enforcement, subdivision servicing bylaws. The Regional Districts and the Ministry of Transportation and Infrastructure (MoTI) have jurisdiction for water utilities and subdivision approvals, respectively. Island Health (formerly VIHA) has jurisdiction, through registered installers, for the approval of septic fields.

In addition to land use controls, there are several water conservation practices (e.g. low flow toilets, showers, rainwater collection, etc.) for residential home owners that should be encouraged to promote the sustainable use of water. Much of what will make the difference will not necessarily come from regulations, but from the community and its water use practices.

The Islands Trust decisions about how and where land is developed impacts groundwater quality and quantity. Therefore, the Island communities expect that the Islands Trust will manage land development to protect both water quality and quantity of groundwater. Often local government policy on groundwater is often unmanaged and unmeasured. With improved information, the Islands Trust can improve its impact on water quality and quantity. Even low density development can impact the rate of groundwater extraction through the use of wells and the ability of water to infiltrate into aquifers with development in recharge areas. Islands Trust communities have very few alternative sources of water than what they are currently using. Groundwater protection should be an overarching priority informing all land use decisions.

What is the Islands Trust Doing Currently?

The Islands Trust has recognized the significance of protecting the groundwater. Some islands have addressed water protection through development permit areas such as Salt Spring Island with its Development Permit Area 5 for the protection of Community Well Capture Zones or Galiano Island with its Development Permit Area 4 which addresses the protection Elevated Groundwater Catchment Areas. Some Islands such as Saturna Islands have specific requirements for areas of the island that have gone through studies around their groundwater. On the East Point area of Saturna Island where there is limited water quality and quantity the zoning bylaw requires that the lots contain a cistern for the storage of water. Galiano Island also has a similar bylaw requirement for areas identified as Water Management Areas and the requirement for extra cistern water storage.

In Gabriola's OCP they recognize the importance of groundwater by stating that, "there are known problems with inadequate soil percolation for septic disposal and groundwater supply because of the complex nature of groundwater flow through fractures in the bedrock." Their OCP also "does not support the further creation of small lot residential areas except as permitted through density averaging provisions of this plan." The OCP also has a number of Water Supply Advocacy Policies that present a number of requests to the Ministry of Health and the Ministry of the Environment.

What Information is Available to Islands Trust Staff Currently?

Currently, staff have a number of sources of information that are available to them. In-house, staff have access to mapping (TAPIS) which indicates intrinsic vulnerability mapping for aquifers and various ecosystem mapping. The aquifer mapping relates specifically too how vulnerable the aquifer may be to contaminants primarily and therefore is useful for identifying land uses (industrial vs. residential). In general the islands are rural in nature with primarily large lots (> 1 acre) and therefore the vulnerability mapping has limited applicability. Both of these are valuable in determining areas where some groundwater issues may occur. Some islands as indicated previously may have specific development permits areas that can also be shown on TAPIS as well as specific zoning.

Some islands have also done advanced studies beyond what is available from the Islands Trust in general. Some have done studies for specific areas such as Saturna's East Point which was used to prescribe certain bylaw regulations (i.e. cistern requirement). Gabriola Island being part of the Regional District of Nanaimo has some of the best mapping related to groundwater and aquifers available as a result of programs the RDN has initiated.

There are several other sources of information that are available and can be used in evaluating water quality and quantity. One good source is the provincial well database on the Ministry of

Environment's website: http://www.env.gov.bc.ca/wsd/data_searches/wells/. It should be noted that unless the well is being monitored the information being provide by this well data base is a snapshot in time.

The Trust Area Services (TAS) is currently putting together an Islands Trust Water Resource Education Materials Project which will identify existing education materials by creating an inventory; to identify information gaps and if necessary develop options to address these gaps. There is a great deal of literature available on water conservation initiatives which are as important in the protection of water quality and quantity as protecting the source. Ensuring a sustainable use of the water source is beneficial. Utilizing sustainable practices is no longer a fad, but the norm.

See: <http://www.islandstrust.bc.ca/trust-council/advocacy/groundwater-regulation-advocacy.aspx>

Local Government Jurisdiction

The Islands Trust role in groundwater sustainability is limited to land use powers to:

- Ensure that rainwater is returned to streams and aquifers;
- Protect headwaters, riparian areas and other vulnerable aquifer recharge areas;
- Prevent groundwater contamination by limiting and regulating potentially polluting uses over aquifers and in groundwater recharge areas through zoning;
- Direct development to appropriate locations where the sufficiency of groundwater for domestic or commercial uses has been thoroughly assessed on a watershed scale before development occurs;
- Regulate storage and application of fertilizers and compost;
- Obtain information about the location of existing and new wells (including geothermal wells) when new development occurs; and
- Develop well protection plans.

The following will outline tools that will present some options in addressing the objectives listed in Table 1. The tools are for the development of Official Community Plans (OCP), Land Use Bylaws (LUB), Development Permit Areas (DPA), Development Approval Information (DAI) Bylaws and water conservation tools.

Official Community Plan

(Local Government Act, Part 26, Division 2)

Purpose: to establish a vision and policies for community development.

- Guides how and where new development occurs
- Directs LTCs and staff to undertake groundwater protection measures
- Raise awareness within a community of groundwater issues and areas of concern
- Establishes and contains the guidelines for development permit areas.

To ensure that policies and land use designations are most effective they should be based on data collection and mapping of recharge areas, local aquifers and areas of limited or critical supply. OCPs can contain explicit policies for groundwater protection.

Given that new bylaws cannot be in direct conflict with the OCP, it permits the ability for the OCP to contain policies on groundwater sustainability that will set the foundation for other bylaws (i.e. zoning) to contain specific and enforceable standards. OCPs can also establish policies around groundwater protection that can influence how development applications are reviewed/evaluated, for instance requirements placed on subdivisions.

Some examples of effective OCP policy areas for aquifer and groundwater protection:

- Protect aquifers by establishing development permit areas that require buffer zones and site specific attention through permitting prior to development.
- Designate aquifer protection zone(s) and development permit areas for which studies may be required.
- Commit the Local Trust Committee to an integrated water management planning approach that will coordinate action on the community water supply, rainwater management, green infrastructure and government regulations (e.g. RAR)
- Specify site design that maintains natural hydrologic cycles, including performance based measures such as managing rain water on site and not net increase in post development flows.
- Encourage cluster development that minimizes impervious surfaces and other impacts across the landscape.
- Direct LTCs to encourage communities to practice water conservation and protection.

It is important that OCPs are interpreted such that policy has an impact and considered in all land use decisions. The policies in the OCP are in many instances only as good as the subsequent bylaws.

Land Use Bylaw - Zoning

(Local Government Act, Part 26, Division 7)

Purpose: to regulate what, and where and how much of, activities may occur on specific parcels of land.

- Regulates use and density of property to direct development away from groundwater-limited or aquifer recharge areas
- Can limit lots sizes to reduce density in groundwater scarce areas
- Can prohibit potentially polluting uses in areas where aquifers must be protected.
- Sets standards on aspects of development that will have an impact on the water resources on the site or in an area (e.g. setbacks from riparian areas)
- Can encourage groundwater sensitive development by clustering development through rezoning and possibly utilizing density bonus provisions.
- Can leverage habitat protection or water-efficient amenities when rezoning.

Zoning permits the Local Trust Committee (LTC) to regulate the use and density and development standards (e.g. height, setbacks) through creating specific zones. Zoning for aquifer/groundwater protection would direct specific developments away from groundwater sensitive or aquifer recharge areas or prohibiting potential contaminating uses.

For instance, zoning can protect groundwater by keeping rural aquifer areas as rural zoning with low density and low risk uses. Zoning can regulate development by:

- Directing development to appropriate locations;
- Requiring development to be setback from riparian areas;
- Limiting the total impermeable site coverage;

- Establishing appropriate lot sizes;
- Limiting density;
- Requiring appropriate drainage; and
- Prohibiting potentially polluting uses in areas where aquifers must be protected.

Local Trust Committees (LTC) should review the zoning in areas that are important for aquifer protection and adjacent to riparian areas to ensure that no polluting land uses are permitted. In those areas that require aquifer/groundwater protection a form of aquifer zoning is recommended. The intent being to apply it to aquifer recharge areas, well capture zone areas and watersheds particularly ones that are relied upon for potable water. This zoning could have particular characteristics for:

- Maintaining large lots
- Increased setbacks from watercourses
- Lessened lot coverage requirements to encourage clustering of development and lessening road construction
- Amount of impervious lot coverage

Impermeable Site Coverage

It is not uncommon for zoning bylaws to address the total impermeable site coverage in a zone. This limits the amount of runoff generated. To exceed this site coverage, a development variance permit would be required.

New zoning bylaws increasingly contrast between “actual” and “effective” impermeability of a site.

Actual impermeability means the amount of the site covered by surfaces through which water will not infiltrate. This is what is generally addressed in many zoning bylaws.

Effective impermeability relates to how much of the total rainfall on a site is infiltrated into the ground. This can be enhanced through storm water detention, bio-filtration and ensuring that drainage occurs onsite.

For example where some sites may have 60% actual impervious meaning that water does not penetrate 60% of the site, but by utilizing techniques to ensure that water drainage remains on the site it may be possible to have an effective permeability significantly less than the actual impermeability. This could be achieved by a combination of drainage standards implemented through subdivision servicing bylaws and zoning regulations.

Although tough to measure, there would be benefits to ensuring actual impermeability is lessened and effective impermeability is increased.

Protecting Groundwater

The clustering of development on a portion of a site is a form of groundwater-sensitive development. There is a possibility voluntary amenity provision such as water efficient infrastructure by including it as part of a rezoning or amenity density bonus. The applicant

would have to choose an amenity density bonus zoning option that includes amenities that protect groundwater.

An amenity density bonus would permit an applicant to apply for increased density on a site in return for providing the LTC with an amenity. Some examples of LTC amenities could be:

- Building design that conserves water;
- Water efficient landscaping;
- Enhancement of riparian habitat;
- Dedication of wetlands; and
- Preservation of streams and other unique environmental attributes.

It may also be possible for an LTC to require cash-in-lieu amenity provided that the zoning bylaw specifies which cash-in-lieu contributions are favored (i.e. for what?).

Development Permit Area (DPA) Designation

To require applicants for development to obtain a permit that specifies conditions to protect groundwater/aquifers.

Development Permit Areas (DPAs) are areas designated in an OCP (in some cases a zoning bylaw) to which particular guidelines apply. A DPA may be designated for the protection of the natural environment or to promote water efficiency/conservation that will address watershed health. (see *Local Government Act* s. 919.1(i)) In order for the DPA to be effective it is important for the DPA to integrate surface water along with groundwater considerations. Generally, DPAs prohibit site disturbance before development approval which gives the LTC time to evaluate the development against established DPA guidelines. The DPA may include requirements for such things as landscaping, the siting of buildings, and the type and placement of trees and vegetation.

Some examples of guidelines are:

- Mandate replanting and rehabilitation of disturbed areas
- Erosion and sediment control (site specific plan)
- Environmental impact assessments/hydrologic studies to satisfaction of the Local Trust Committee
- Consistency between pre and post development hydrology
- Vegetation as per landscape plan
- Incorporate standards from other levels of government (e.g. Riparian Areas Regulation)
- Limits as to the amount of impermeable surfaces
- Specify areas that must remain clear of development

It is best to have a DPA as a companion tool with zone-specific requirements for groundwater protection as DPAs cannot be used to limit the amount of development permitted on a site. Nor can they address building construction standards that are addressed through the respective regional district building permit process.

DPAs do permit the LTC to monitor environmental conditions as the development progresses and for a limited amount of time post development. This is done through the collection of a security to ensure that works to complete permit conditions are finalized. If this is not done, then the intent is to use the funds/security to complete the conditions. Therefore, the security is returned only if the conditions are met.

See Appendix 1 - Development Permit Area Model Bylaw

In addition to having a stand-alone DP for groundwater/aquifer protection there are options where various guidelines could be implemented within existing DP areas for such land uses as industrial. The following guidelines are taken from the Regional District of Nanaimo's Area A OCP (Cedar Development Permit Area).

Groundwater Protection

- 1. The use or disposal of substances or contaminants that may be harmful to area aquifers shall be discouraged and wherever practical, steps shall be taken to ensure the proper disposal of such contaminants.*
- 2. The RDN may require an applicant to submit a rain water management plan prepared by a professional engineer which must ensure that any run off, rain water, or other liquid from any of the proposed land uses, buildings and impervious surfaces does not negatively impact groundwater quality. The plan must include recommendations on how to minimize the risk of deleterious substances entering the groundwater. The RDN should require the applicant to implement the report's recommendations in the proposed development.*
- 3. The RDN shall require that drainage from all impervious surfaces and areas where vehicles and machinery are stored, cleaned, operated, and maintained be directed through an appropriately sized and engineered sedimentation, oil, water and grease separator or other engineered solution to the satisfaction of the RDN. The engineer must provide an appropriate maintenance schedule.*
- 4. The RDN may require the applicant to enter into a Section 219 covenant registering on title the maintenance schedule and a commitment to maintain the sedimentation, oil, water and grease separator as per the engineer's recommendations.*
- 5. Developments that are found to pose detrimental impacts on either the quality or quantity of groundwater shall not be supported.*

Development Approval Information Areas (DAI) Bylaw

Development Approval Information (DAI) Areas Bylaws are to establish areas in which local governments may request additional information from applicants for zoning, development permits, or temporary use permits. The purpose of a DAI is to enable the LTC to obtain expert assessment of the impact of a development on the community at the expense of the applicant.

A DAI bylaw enables the development of site specific information to inform decision making and the ability to require specialized information (e.g. impact assessments, etc.).

The requirement for a detailed assessment may be triggered by an application for a rezoning, a development permit or a temporary use permit. The information required is usually in the form of a professional report and would be used by staff and the LTC in determining permit conditions.

In the case of groundwater the LTC could request a hydrological assessment of:

- The availability of groundwater;
- Cumulative effects of groundwater use;
- Other environmental impacts.

The intent of establishing this DAI is to ensure that potential negative impacts of proposed major developments are identified and documented as part of the development review process and to provide the LTC with complete information to properly assess and mitigate conditions caused by that development. Where reports identify negative impacts, the LTC will require mitigation by the applicant as part of a development permit to improve the proposal and minimize potential negative impacts on hydrology, the environment, and the neighbourhood.

In order for a LTC to establish a DAI bylaw in an OCP it must prepare a bylaw that sets out what information the LTC may require and specific policies and procedures to be followed. DAI may be valuable in that if a bylaw is established and concerns are raised about specific developments specific information can be requested that can go beyond DPAs guideline requirements.

See Appendix 2 - Development Approval Information Model Provisions

Subdivision Servicing Bylaws

The intent of these bylaws is to establish standards for the subdivision of land that maximizes infiltration of water and minimizes impervious surfaces and evaluates the sustainability of new groundwater withdrawal from a specific aquifer.

Subdivision servicing bylaws set the standards by which works and services must be constructed when land is divided into new parcels. Standards that support groundwater quality and supply can be included in subdivision servicing bylaws. They can require each proposed lot to have a reliable source of potable water, and can establish infiltration, drainage and permeability standards. Subdivision servicing standards can direct development to mimic natural hydrology by requiring rainwater infiltration and limiting impervious surfaces. If an LTC has established a wellhead protection area that is regulated by zoning or a development permit area, the requirements could also be included in a subdivision servicing bylaw.

Land developments generally have two water supply options generally a stand-alone water source (surface or well) or a community water system. Of course, on the islands there are other water source options that do not involved groundwater/aquifers such as rainwater collection or desalinization.

Approvals are based on one time “proof of water” evaluations that generally do not give consideration to long-term ground water consideration such as impacts of future development or cumulative impacts of developments over time in a watershed. Most bylaws will contain requirements that each new parcel created have a potable water source and a specific flow rate depending on the type of development proposed. However, this “proof of water” focuses on yield and quality of each well and not the sustainability and protection of the aquifer system as a whole. Some LTCs do require an evaluation of long term sustainability and a qualified professional’s hydrology report especially where a development will be drawing on the aquifer in a greater quantity than single family development (e.g. higher density development, commercial uses, etc.). On-going monitoring should be implemented in sensitive aquifers or groundwater-limited areas.

There may also be instances when “proof of water” is not required with some subdivisions such as the creating of large lots (> 20 acres) or boundary adjustments where sources of water have historically been proven.

Community water approvals (>3 connections) are dealt with through the provincial government (i.e. Vancouver Island Health Authority). If lots are to connect to a community system, the LTC has an option to require that unused wells (if any) be closed in accordance with the Ground Water Protection Regulation (GWPR) by establishing a well closure bylaw thereby protecting the groundwater/aquifer and possible contamination. Given that Island Health is involved in these community wells it may be possible to ensure monitoring is done, however, there are not that many community wells on the islands.

Water Conservation Tools – General Information

In addition to regulatory requirements that an LTC can implement, there are a number of water conservation tools that should be encouraged on the islands. These are less regulatory and more voluntary in nature. Given the groundwater source the islands are reliant on it is important that each resident does their own part to lessen the water demand. The protection of a quantity and quality of water should not be solely reliant on regulatory processes. Education and awareness is also a big part of what is needed in the sustainable use of water on the Islands – a resource used by all. Water conservation practices should become common place for all residents and visitors to the Gulf Islands.

The Trust Programs Committee has initiated a site to educate islanders about water issues and options to promote sustainable use or reuse of water. The intent is that educational materials will be regularly posted on the Islands Trust website as a resource and part of the necessary community outreach. <http://www.islandstrust.bc.ca/trust-council/projects/water-resource-information-for-islanders.aspx>



Source: Regional District of Nanaimo. For indoor and outdoor tips: <http://www.rdn.bc.ca/cms.asp?wpID=877> , <http://www.rdn.bc.ca/cms.asp?wpID=878> and <http://www.rdn.bc.ca/cms.asp?wpID=2155>

Overview

The intent of this toolkit is to provide a variety of tools (options) that will enable LTCs and planners to choose the correct tool for the project at hand that suits their island. The tools presented will aim to achieve the actions presented in Table 1. The following table outlines five objectives for groundwater protection and possible actions that local government can take.

Groundwater Protection Objectives and Actions:

#	Objective	Description	Local Government Actions
1	Minimize impacts on water sources	Streams depend on groundwater, especially during low-flow (baseflow) conditions. Groundwater pumping from many aquifers connected to surface water bodies can deplete or capture surface water flows. Retaining sufficient groundwater retains the health of fish-bearing streams and the security of community water supplies.	<ul style="list-style-type: none"> Establish watershed protection zones supported by containment boundaries to preserve hydrologic function between aquifers and surface water sources Establish well protection areas to capture zones to protect drinking water Prohibit potentially polluting uses in critical aquifer recharge areas as well as capture or wellhead protection areas. Understand composition of underlying aquifers
2	Sustain aquifers at healthy levels	Prevent over-use of aquifers and impacts on natural aquifer recharge to promote a healthy water balance. If this does not happen, the aquifer goes into decline and eventual depletion. Maintaining and monitoring water levels promotes healthy habitat and sustainable water supply.	<ul style="list-style-type: none"> Plan land uses based on sustainable yield, not site-specific reports on proof of water. Commit to integrated watershed management planning to coordinate action on community water supply, rainwater management, green infrastructure, and other regulations (e.g. Riparian Areas Regulation requirements) Require all new development to provide evidence of a sustainable water source as a condition of subdivision or through the development permit process. Monitor aquifer quality and quantity in partnership with other levels of government.
3	Maximize infiltration	Rainwater and snowmelt infiltration is key to aquifer recharge. Infiltration rates are affected by soil permeability, the amount of topsoil, and the rate that water moves across a landscape (as affected by vegetation, slope, etc.)	<ul style="list-style-type: none"> Prohibit or limit development in groundwater recharge areas. Protect sensitive ecosystems (e.g. wetlands) by establishing development permit areas that require buffer zones and special permitting before development takes place Preserve baseflows in fish-bearing streams by maximizing groundwater recharge. Infiltrate virtually all rainwater by limiting effective imperviousness to less than a specific percent. This includes maintaining extensive natural areas above recharge zones. Implement cluster development through rezoning to maximize land available for

			<p>infiltration.</p> <ul style="list-style-type: none"> • Maintain native soils and vegetation (e.g. trees and other absorbent landscaping) • Establish landscaping standards for soil depth and type of landscape materials • Promote engineered infiltration systems such as infiltration ponds, vegetated swales, bioswales (i.e. grassy or vegetated areas besides roads and parking areas) or splash pads of gravel or other hard material • Create bioretention areas • Use permeable paving • Require alternative design standards and best management practices that maintain ecosystem functions (e.g. reducing impervious surfaces) • Use green roofs • Specify site design that causes no net increase in post-development flows • Maximum wetland recharge
4	Reduce groundwater use	The less the resource is extracted, the better the chances are that the system will maintain its natural balance. Each aquifer has a carrying capacity that should be considered before intensive use.	<ul style="list-style-type: none"> • Minimize leakage and waste within public water distribution systems (i.e. regional systems, improvement districts, etc.) • Reduce peak and annual demand for groundwater through water demand management approaches • In groundwater limited areas, limit development and require other water sources (i.e. rainwater and cisterns) • Enact restrictions on outdoor water use where a community water system is used • Promote use of native vegetation and landscaping to minimize water irrigation demand • Promote awareness for low flow devices to be installed in all new developments • Encourage individuals and non-government organizations to practice water conservation and protection
5	Protect groundwater quality	Protecting quality is critical to promoting healthy habitat and ensuring the safety and security of the potable water supply.	<ul style="list-style-type: none"> • Map and understand the vulnerability of aquifers • Minimize risks from point and non-point (i.e. from a diffuse source such as agricultural runoff, roads) source contaminants by prohibiting or regulating uses that could contaminate fish-bearing streams or aquifer recharge areas, capture zones or wellhead protection areas • Design sites to prevent increases in post-development flows that can pick up contaminants

			<ul style="list-style-type: none"> • Develop and implement a wellhead protection plan • Establish a local water quality testing program • Adopt a well closure bylaw • Plan developments to protect groundwater recharge areas
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Table 1: Primary Source: Groundwater Bylaws Toolkit (2009)

Information Note: Well Protection Toolkit

A set of voluntary guidelines developed by the Ministry of Environment to assist communities in developing well protection plans to prevent contamination of their well water supply. A well protection plan contains practical, protective measures to minimize and prevent undesirable impacts from land use activities on the source of water for the community well.

See:

http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/wells/well_protection/acrobat.html

APPENDIX 1: Development Permit Area X – Groundwater Protection DPA

2.1 Designation

All lands shown on Schedule _X_ as being a groundwater protection area are designated as a development permit area.

Alternately may be designated based on an elevation

2.2 Authority

The Groundwater Protection Development Permit Area is designated a development permit area pursuant to Section 919.1(1)(a) of the Local Government Act for the protection of the natural environment, its ecosystems and biological diversity and Section 919.1(i) of the Local Government Act for the establishment of objectives to promote water conservation.

Legislative basis of designation

2.3 Special Conditions and Objectives that Justify the Designation

It is the Object of the Islands Trust to “Preserve and protect the Trust Area and its unique amenities and environment of the Trust Area for the benefit of the residents of the Trust Area, and of British Columbia generally, in cooperation with municipalities, regional districts, improvement districts, other persons and organizations and the government of British Columbia.”

It is Provincial legislation in Section 877(1)(d) of the Local Government Act that an official community plan must include statements and map designations for the area covered by the Plan respecting restrictions on the use of land that is environmentally sensitive to development.

It is policy of the Islands Trust Council that Local Trust Committees address measures that ensure:

- neither the density nor intensity of land use is increased in areas which are known to have a problem with the quality or quantity of the supply of freshwater,
- water quality is maintained, and

The [Groundwater Study prepared by...] concluded that ... and recommended the measures in order to preserve and protect groundwater resources:

Note: insert reference to professional report supporting designation of DPA (if applicable) and summarize key conclusions and recommendations

The Objectives of the development permit area are:

- to protect and sustain access to a reliable and safe supply of drinking water for private wells
- to protect and sustain the quality and supply of surface and groundwater necessary to the provision of ecological services
- to mitigate the impacts of development on sub-surface water supplies

2.4 Development Approval Information

The area is also designated an area for which development approval information (DAI) may be required according to Section 920.01(1)(c) of the *Local Government Act*. The designation of these areas for this purpose is based on the special conditions or objectives supporting the designation of the DPA. Development approval information means information on the anticipated impact of the proposed activity or development on the community or the natural environment.

See DAI for impact assessment report requirements

2.5 Applicability

A development permit is required for the subdivision of land, construction of a new residence or commercial or industrial building, land alteration, or the cutting of trees in excess of the number exempted below.

2.6 Exemptions

The following activities are exempt from any requirement for a development permit:

- a) Repair, maintenance, alteration, additions to, or reconstruction of existing lawful buildings, structures or utilities, including those that are lawfully non-conforming (a building permit may still be required)
- b) Construction of a dwelling or subdivision of land that is, or will be, serviced by a community water system.
- c) Construction of a dwelling where the dwelling:
 - a) Is not to be connected to a groundwater source; and,
 - b) Is entirely serviced with water through stored and treated rain water which meets or exceeds Canadian Drinking Water Standards.
- d) Development on land that is subject to a conservation covenant under section 219(4) of the *Land Title Act* in relation to natural, environmental, wildlife or plant life value relating to the land, granted to the Local Trust Committee or a covenantee designated under section 219(3)(c) of the *Land Title Act* .
- e) Repair and maintenance of existing roads, driveways, paths and trails, provided there is no expansion of the width or length of the road, driveway, path or trail, and no creation of additional impervious surfacing, including paving asphaltting or similar surfacing.

This is based on the DPA being intended to address impacts of individual wells
A report from an engineer or other qualified professional may be required to satisfy the Islands Trust/Regional District that the proposed rainwater system has adequate capacity to meet the year-round water demands of the dwelling being proposed and that water will be stored and treated to meet potable water standards.

- f) The placement of temporary buildings or structures
- g) All vegetation removal except for cutting and removal of more than 5 trees (with a trunk diameter greater than 20 centimetres measured 1.5 metres above the ground) within a 12-month period on any one lot.
- h) Removal of trees that have been examined by an arborist and certified to pose an immediate threat to life or property.
- i) Farm operations as defined in the *Farm Practices Protection (Right to Farm) Act* and farm uses as defined in Section 2(2), (3), (4) and (5) of the *Agricultural Land Reserve Use, Subdivision, and Procedure Regulation*.
- j) Forest management activities, as defined in the *Private Managed Forest Land Regulation*, on land classified as managed forest land under the *Private Managed Forest Land Act*.
- k) Land alteration that does not alter the natural contours of the land.
- l) The construction of an accessory building or structure with a lot coverage of less than 100m², provided the accessory building or structure is not connected to a supply of water.
- m) Construction of fences.
- n) Emergency actions required to prevent, control or reduce an immediate threat to human life, the natural environment or public or private property including:
 - i. Forest fire, flood and erosion protection works;
 - ii. Protection, repair or replacement of public facilities;
 - iii. Clearing of an obstruction from a bridge, culvert, dock wharf or stream; or
 - iv. Bridge repairs.
- o) Works undertaken by a local government or a body established by a local government.

From other RD bylaws and steep slope DPA, could be revised based on specific recommendations

Intended to ensure cut and fill or blasting requires a permit. Language could be revised to be more specific based on recommendations
Exempts small non-plumbed buildings, lot coverage could be altered based on specific recommendations

2.7 Guidelines

1. In general, development should minimize negative impacts on the quality and quantity of subsurface water supplies.
2. Where a qualified professional hydrogeologist or engineer has made recommendations for mitigation measures, the LTC may impose permit conditions, including a requirement for security in the form of an irrevocable letter of credit, to ensure the protection of groundwater supply quality or quantity consistent with the measures and recommendations described in the report.

Authorizes LTC to implement conditions of professional report

3. Where the a qualified professional hydro-geologist or engineer's report describes an area as suitable for development with special mitigating measures, the development permit should only allow the development to occur in compliance with the measures described in the report. Monitoring and regular reporting by a hydro-geologist or other professional at the applicant's expense may be required during construction and development phases, as specified in a development permit.
4. Where an application involves the subdivision of land, layout of the subdivision should be designed to:
 - a) replicate the function of a naturally vegetated watershed;
 - b) maintain the hydraulic regime of surface and groundwater pre-development flow rates;
 - c) not interfere with groundwater recharge;
 - d) not introduce or remove material where it would cause erosion of or the filling in of natural watercourses or wetlands.
5. The LTC may require the applicant to install a groundwater monitoring device in at least one well within each proposed subdivision. The LTC may require an agreement to be registered on title to allow a designated person or agency to access the property to collect the data from the device.
6. Where rainwater management is recommended by the report, rainwater should be retained on-site and managed using methods such as vegetated swales, rain gardens, or other methods which allow rainwater to return to the ground.
7. Where rainwater harvesting is recommended by the report for the construction of a new dwelling unit:
 - a) Dwelling units should be sited to allow for the optimal placement of a gravity fed rainwater collection tank which collects rainwater from the roof leaders of the dwelling unit which capture the majority of the rainwater flows.
 - b) Dwelling units should be designed to maximize opportunities for rainwater catchment from all roof surfaces.
 - c) Impervious surfaces should be minimized. The use of impervious paved driveways shall be discouraged.

Appropriate where there is an agency or community group able to monitor wells

Revise to read all buildings where commercial, industrial or institutional buildings are permitted by zoning

- d) The LTC may require that all new dwelling units include an external rainwater harvesting system such which includes the following:
 - i. External equipment for collecting and distributing rainwater from the dwelling unit roof;
 - ii. A storage tank(s) with a minimum storage capacity of 18,000 litres which is designed for rainwater collection and is rated for potable use;
 - iii. A pumping system;
 - iv. An overflow handling system.
 - e) All external pipe, plumbing fixtures, and hose bibs where rainwater is used shall be clearly marked with “Non-Potable Water Do Not Drink”.
 - f) Where external rainwater harvesting equipment is required as a condition of the permit, the LTC shall encourage the applicant to install dedicated plumbing lines within proposed dwelling units to make use of stored rainwater for flushing toilets and other non-potable uses.
8. Where tree removal which is not exempt from the requirement for a permit:
- a) Removal of trees from steep slopes should only be allowed where necessary and where replacement vegetation / erosion control measures are established. Plans delineating extent of vegetation / tree removal and location of proposed construction, excavation and / or blasting, may be required.
 - b) All development should be undertaken and completed in such a manner as to prevent the release of sediment to any watercourse. An erosion and sediment control plan, including actions to be taken prior to land clearing and site preparation and the proposed timing of development activities to reduce the risk of erosion, may be required as part of the development permit application.
 - c) Existing, native trees should be retained wherever possible and trees to be retained near development should be clearly marked prior to development, and temporary fencing installed at the drip line to protect them during clearing, grading and other development activities.
 - d) If the area has been previously cleared of trees, or is cleared during the process of development, replanting

requirements may be specified in the development permit. Areas of undisturbed bedrock exposed to the surface or natural sparsely vegetated areas should not require planting.

- e) Tree species used in replanting, restoration or enhancement should be selected to suit the soil, light and groundwater conditions of the site, should preferably be native to the area, and should be selected for erosion control and/or wildlife habitat values as needed. Suitably adapted, non-invasive, non-native trees may also be considered acceptable.
 - f) All replanting should be maintained by the property owner for a minimum of 2 years from the date of completion of the planting to ensure survival. This may require removal of invasive, non-native weeds (e.g., Himalayan blackberry, Scotch broom, English ivy) and irrigation. Unhealthy, dying or dead trees should be replaced at the owner's expense in the next regular planting season. Permits may include, as a condition, the provision of security to guarantee the performance of terms of the permit.
9. Roads, driveways, trails and pathways should follow the contours of the land and appropriately manage drainage.
 10. Parking areas should be located and constructed so as to minimize erosion and water pollution by controlling storm runoff. Structural measures such as catch basins, oil separators, bio-filtration trenches or swales, unpaved or permeable all-weather surfaces should be considered for this purpose.
 11. The Local Trust Committee may consider variances to subdivision or building and structure siting or size regulations to meet the objectives of the development permit area.

APPENDIX 2: Model DAI Bylaw Provisions

1. For an application for a permit in respect of a development permit area designated under s. 919.1(1)(a) of the Local Government Act for protection of the natural environment, its ecosystem and biological diversity and Section 919.1(1)(i) for the establishment of objectives to promote water conservation, for the purpose of requiring development permits for Groundwater Protection, the report shall consist of a hydrogeological assessment report containing the following information:
 - a. A site plan professionally prepared at an appropriate scale, based on a legal survey, delineating the proposed development and associated features, the development permit area boundary, existing buildings and structures, roads and driveways, topographic features, and significant features identified in the site inventory. Site profiles and cross sections demonstrating terrain conditions prior to disturbance and intended conditions post development shall be included where development would occur on slopes exceeding 20% grade.
 - b. A map showing the ownership and locations of all currently used water wells, springs and surface water features within a minimum radius of 1.0 km from the development site.
 - c. A site inventory, providing information on existing pre-development conditions, current on-site and adjacent land uses, slope stability, erosional processes, hydrology, surface water bodies, and topography.
 - d. A background analysis that includes the following known information on the site:
 - A description of the hydrogeological system and setting, including the type of aquifer, aquifer boundaries, local surficial and bedrock geology, physical hydrogeology, local surface water features, estimated recharge area and conditions and climate;
 - A conceptual model of groundwater occurrence and groundwater-surface interaction;
 - A description of existing users within 1.0 km of the development site;
 - A preliminary pre-development water budget;
 - Water quality, including characterization of natural groundwater quality, potability, as well as possibility of contamination;
 - Methodology and, if applicable, uncertainties and limitations of the report.
 - e. A description of the proposed work, detailing construction, cut and fill, blasting, road, driveway or utility line construction, vegetation clearing, water supply requirements, alteration to hydrological systems, septic field installation, landscaping, or other land alteration during or after the development phase. The report should also identify alternative development options.

- f. An impact assessment consisting of:
- Cumulative effects analysis;
 - Impact to existing groundwater users, identification of the potential groundwater protection issues in the area and risk of saline intrusion;
 - Impact to surface water where applicable;
 - Other potential impact implications.
- g. Conclusions and recommendations consisting of:
- A summary of results and impact assessment;
 - An unqualified statement that the proposed development will not adversely impact aquifer(s), existing wells, or surface water bodies in terms of water quality and quantity; or
 - Where such a statement cannot categorically be made, specific recommendations on well and aquifer protection measures which would result in the requirement being met.
- h. Any recommended monitoring requirements, identifying actions that will be taken to ensure all proposed activities are completed as described, including a monitoring schedule and process for resolving any non-compliance.