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May 1st, 2005

Islands Trust
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Victoria BC V8R 1H8

File: 9000

Attention: **Mr. Gerry Hamblin**
Planner
Islands Trust

Reference: **The Potential Of Roof Tops As Rainfall Collection Systems On Mayne Island**

Dear Gerry,

Please find enclosed our proposal to study the potential of roof tops as a rainfall collection system on Mayne Island. We have developed this proposal following the consultations we have had with the Islands Trust Planners and Mapping Department staff.

Please let me know if any changes are required to fulfill your requirements or if you have questions regarding any part of the proposal.

Yours truly,

NOVATEC CONSULTANTS INC.

Michael Taylor

Michael Taylor Ph.D
Director – Wastewater Technology Centre

Troy D. Vassos

Troy D. Vassos, Ph.D., P.Eng. – Partner-In-Charge
Senior Environmental Engineer
President

The Potential of Roof Tops As Rain Water Collection Systems On Mayne Island

Objectives

- To determine the area, design and composition of roof tops within a rainfall catchment area on Mayne Island
- To determine the type of changes required to convert existing roof tops into systems suitable for rainwater harvesting
- To determine the changes required to fit a first flush (roof cleaning) device to existing roof top structures
- To determine the relationship between roof top characteristics such as design and composition with roof top area and the number residents in each dwelling
- To provide input data to a second (separate) study that will determine the availability of harvested rainfall as a supplementary water source on the Gulf Islands

Background

In response to the increased incidence of water shortages world-wide there has been increased interest on behalf of governments to consider water supply from an integrated management perspective. The integrated perspective considers the range of available water resources within an environment (potable and non-potable) and considers technical and management tools to best meet community water demands in a sustainable manner. An integrated water supply can be managed to limit the demand on vulnerable water sources that can not meet the demands placed on them.

Alternative water sources can reduce the reliance on existing ones. Reducing demand on these existing water sources such as reticulated water or ground water supplies has numerous advantages. Delayed requirements for infrastructure capital associated with surface water harvesting, maintenance of ground water quality by preventing intrusion of lower quality water into the aquifers and continuity of supply are some of the broader benefits that could be realised when supplementary water sources are sought.

Harvested rainwater is a potential water source in Canada and has already been utilised in many parts of the world. Rainfall has been used to supplement ground water and surface water supplies in countries such as Australia, New Zealand and the U.S. Virgin Isles. Rainwater in these countries has been found to be readily harvested, generally of high quality and consequently, suitable for a wide variety of uses.

Harvesting rainwater is not only of value for the potential water supply. Within many townships, rooftops make up approximately 50% of the sealed surface area that is impermeable to water. Harvesting rainwater in appropriately sized roof top collection and storage systems can reduce or delay peak flows exiting a sealed surface water catchment. Mitigation of storm water flows can be a significant issue in developed areas where surface water flows exceed the design capacity of storm water drainage systems. Some municipalities view rainwater harvesting as one solution to managing surface water run-off.

Despite the advantages of rainwater harvesting there are few studies that have investigated rainwater harvesting practices. The quantity and timing of rainwater supplies and those factors which influence them are surprisingly poorly understood. In countries where rainwater makes up a significant quantity of domestic freshwater supplies, such as Australia and New Zealand, rainwater harvesting is not regulated. Most homeowners utilise rainwater under their own initiative therefore data on rainwater supply and quality characteristics are not generally available.

The Water Supply Problem On The Gulf Islands

The quantity of ground water available for domestic use is under threat as more homeowners attempt to draw from the supply. The Gulf Islands are also experiencing deteriorating ground water quality. The overuse of fractured bedrock aquifers in several Gulf Island communities has already contributed to instances of saltwater intrusion, an increasing number of abandoned wells, and a measurable decline in water quality over the summer months. The susceptibility of these aquifers to overuse and contamination can be expected to increase as population density, tourism and development infrastructure continues to grow. A limited supply of quality water for domestic or commercial purposes may result in a decline of economic, social and environmentally sustainable development.

The intent of this study is to evaluate the roof top infrastructure that currently exists within a study area and determine its suitability for the practice of rainwater harvesting. Additionally, the study will provide data on roof top areas which will be used in a second study. The second study will determine the quantity of rainwater which can be harvested from these rooftops based on local climate data.

The Gulf Islands are likely to benefit from wide-spread rainwater harvesting practices by reducing reliance on ground water supplies. Many developments on the Islands are in rural or semi-rural areas and therefore cannot be readily supplied with a common water source. The provision of an additional on-site water supply is therefore the best solution for the protection of vulnerable ground water supplies. Mayne Island is well suited to a study on rainwater harvesting as it has topographic and development features that are common to many of the Gulf Islands. The methodologies used in this project can therefore be readily applied to other Gulf Islands in the future.

Factors Affecting The Suitability Roof Tops For Rainfall Harvesting

The fraction of domestic or commercial water consumption that can be supplied by harvested rainwater is dependent on numerous inter-relating factors such as the relationship between rainfall event characteristics, the period between rainfall events, water storage capacity and water use rates.

The roof top characteristics within a rainfall catchment area, is one of the most significant factors determining the potential value of rainfall as a supplementary water source. The existing roof top structures as well as future roof top designs are fundamentally important to the practice of rainwater harvesting and warrant consideration.

This study is the first step in determining the potential extent to which the reliance on ground water supplies can be reduced through wide-scale adoption of rainwater harvesting systems. The value of harvested rainfall as a water source is location specific due to rainfall event characteristics and their frequency. Additionally, specific knowledge of 'typical' roofing systems in the locale is required. A study within a defined region of the Gulf Islands is therefore required as a first step to determining the benefits of rainwater harvesting across the whole Gulf Island region.

Methodology To Determine Harvested Rainfall Availability

The physical characteristics of roof tops will be determined by analysing building permit data and aerial photography. Roof tops will be characterised according to area, design (slope, segmentation of roofing system, gutter system etc.) and number of people residing in the dwelling etc. An assessment of the suitability of each grouping for the purposes of rainwater harvesting will be developed based on the requirements of a rainwater harvesting system. These requirements include diversion of intercepted rainfall to a rainwater storage tank and a first flush

(roof cleaning) device. The study will identify the extent of roof top changes or additions required to change the majority of residential dwellings within the study area to rainwater harvesting systems.

The analyses of roof top characteristics through building permit and aerial photography will be checked for accuracy by ground truthing. Approximately fifteen dwellings will be picked at random from within the roof top categories and checked against data obtained from sources other than on-site. The home visits will also identify some site specific issues within each roof top category that should be considered but were not previously identified by building permit/aerial photography data.

The project objectives, methodology, results and recommendations will be included in a report produced at the project end. The data analysis conducted by modeling within a spread sheet or through statistical analyses depending on results of the building permit/aerial photography analysis will be presented through appropriate text, tables and graphs. The methodology will be documented in a manner that makes it readily available for studies on other Gulf Islands. It is anticipated that the study will commence in June 2005 and will take 4 months to complete.

Study Budget

A summary of the study budget is shown below.

Rainwater Harvesting In The Gulf Islands-Budget Summary	
	Cost ($)
Labour	
Review of study site location	$320
Develop methodology for data analysis	$960
Analyse building permit data and aerial photography	$5,600
Preparation for homeowner visits	$320
Home site visits	$1280
Report writing	$880
Travel	
Home site visits for data collection	$400
Client Meetings	$200
Total	$9,960