HALIFAX
REGIONAL MUNICIPALITY
PO Box 1749
Halifax, Nova Scotia
B3J 3A5

MEMORANDUM

To: Chair and Members of Halifax Watershed Advisory Board

From: Jillian MacLellan, Planner

Date: May 4, 2012

Subject: **Case 17585: Application by Sunrose Land Use Consulting for the lands of Foxwood Developments Inc. for a development agreement for Hubley Village, an Open Space Design development at 130 Dreamcatcher Lane, Hubley (Old Case 16652).**

Synopsis of Proposal:
An application for an Open Space Design Development for 130 Dreamcatcher Lane, in Hubley, was received by HRM in November 2010 (Case 16652). This Stage II application proposed a hybrid open space design development with 47 lots for mainly single unit dwellings; of the 47 lots, 2 to 4 lots were to be developed for townhouses. This application was brought to HWAB on March 16, 2011. Please see the comments from HWAB attached. Although the applicant would still like to keep the proposed design reviewed as Case 16652 under consideration, they have proposed an alternative design for the property.

The alternative design is for a Classic Open Space Design Development with 57 residential units. Features of the proposed development include the following:

- The residential units would be in the form of single-unit, two-unit and townhouse dwellings;
- Residential units would be situated in clusters. Each cluster would be serviced by one or two septic systems;
- All residential development is to be located in the western portion of the property, which will avoid the development of a driveway through a large wetland and brook located in the center of the development;
- There will be no subdivision - access to each unit/cluster would be through a shared driveway; and,
- Ownership is proposed to be through a condominium corporation. The condo corporation would be responsible for all shared services such as the shared driveway and septic systems

Site Features:

- Approximately 58.5 hectares in size
- Driveway access from St. Margaret's Bay Road
- Site contains numerous wetlands throughout the property

application. A copy of this report has also been submitted. HWAB's recommendation and specific comments will be included in the staff report to Western Region Community Council.

Attachments:

- Attachment A: Proposed Hybrid Open Space Design Development – November 2010(old Case 16652);
- Attachment B: Proposed Classic Open Space Design Development – January 2011;
- Attachment C: Proposed Stormwater Management Plan (Dated November 2010; Amending letter January 2012) (Please note the Pre / Post-Development Modelling Results for the 1:10 and 1:100 year storm have not been enclosed, but can be provided by the planner if required);
- Attachment D: Proposed Stormwater Drainage Plan;
- Attachment E: Proposed On Site Septic Report (Please note the appendixes have not been enclosed, but can be provided by the planner if required);
- Attachment F: Air Photo

Attachment A

Proposed Hybrid Open Space Development
November 2010

Key Plan
N.T.S.

NOTES:

1. Contour interval is 2 meters, based on LRIS mapping data
2. Total Property area is 58.5 Ha (144.4 Acres)
3. Wetlands were delineated by Strum Environmental and surveying in the field by Thompson Conn Limited

AREA:
TOTAL PROPERTY AREA = 58.5 Ha
DEVELOPABLE AREA = 40.5 Ha (69.2 %)
UNDEVELOPABLE AREA = 18.0 Ha (30.8 %)

UNDEVELOPABLE AREA

No	Description	Date	By
3	Remove Lots 26, 27, 28 & 29, add two more Townhouse Lots	Oct 26/11	SRW
2	Add Phase boundary & Relocate Townhouse Lots	Jun 10/11	SRW
1	Add additional Buffer Area	Jan 13/11	SRW

Revision or Issue

MAC WILLIAMS ENGINEERING LIMITED

Project

HUBLEY VILLAGE
HUBLEY, NOVA SCOTIA

Drawing

PROPOSED DEVELOPMENT LAYOUT

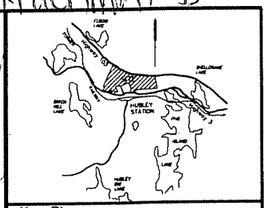
Scale 1:2500

REGISTERED PROFESSIONAL ENGINEER
DATE Nov 2010
S. R. Williams
5188
PROVINCE OF NOVA SCOTIA

Date Nov 2010		Drawn SRW
Design SRW	Check DMW	Approv. SRW
Project No. 08531		Sheet 1 Of 1
Drawing No 08531-C02		Rev. 3

Attachment B

Proposed Classic Open Space Development
January 2011



Key Plan
N.T.S.

NOTES:

1. Contour interval is 2 meters, based on LRIS mapping data
2. Total Property area is 57.5 Ha (144.4 Acres)
3. Wetlands were delineated by Strum Environmental and surveying in the field by Thompson Conn Limited

AREA:
TOTAL PROPERTY AREA = 57.5 Ha
DEVELOPABLE AREA = 39.5 Ha (68.7 %)
UNDEVELOPABLE AREA = 18.0 Ha (31.3 %)

- UNDEVELOPABLE AREA (WETLAND)
- UNDEVELOPABLE AREA (RIPARIAN BUFFER)
- SINGLE FAMILY UNIT
- DUPLEX UNIT
- TOWNHOUSE UNIT

No	Description	Date	By
	Revision or Issue		

MAC WILLIAMS ENGINEERING LIMITED

Project

HUBLEY VILLAGE
HUBLEY, NOVA SCOTIA

Drawing

PROPOSED DEVELOPMENT LAYOUT
OPTION NO. 2

Scale 1:2500

REGISTERED PROFESSIONAL ENGINEER
DATE DEC 2011
D. R. Williams
3168
PROVINCE OF NOVA SCOTIA

Date DEC 2011		Drawn SRW
Design SRW	Check DMW	Approv. SRW
Project No. 08531		Sheet 1 Of 1
Drawing No. 08531-C06		Rev

Attachment C

MAC WILLIAMS ENGINEERING LIMITED

109 Chain Lake Drive • Halifax • Nova Scotia • B3S 1B3
Phone (902) 450-1414 • Fax. (902) 450-1424

08531.09

January 18, 2012

Halifax Regional Municipality
7071 Bayers Road, Suite 2005
P.O. Box 1749
Halifax, NS B3J 3A5

Attention: Jillian MacLellan
HRM Planner

Dear Jillian:

Re: Hubley Village, Open Space Development Planning
Hubley, Nova Scotia
HRM Case #16652 - 130 Dreamcatcher Lane
Stormwater Management Plan

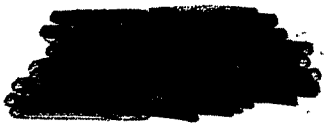
As you are aware, the above noted proposed development has been revised in an effort to further minimize the impact to the environment. This latest proposal will see the development of a bare land condominium consisting of a private laneway to access the residential units. The residential units will consist of 18 single family units, 7 duplex units and 5 townhouse units (five units per structure) for a total of 57 residential units.

The original Stormwater Management Plan dated November 2010 was developed for the initial proposal for this property, which consisted of the construction of a public road network along with the development of 46 single family home lots and 2 four unit townhouse lots for a total of 54 units.

The principles and procedures discussed in the original report will all remain as stated. Focus will remain on sedimentation and erosion control and the balancing of pre and post stormwater flows. The ongoing care and control of the Stormwater Management plan will be under the jurisdiction of the new condominium corporation. This proposed layout will further reduce stormwater impacts given the smaller foot print of the project.

If you have any further questions and or comments or require any additional information, please do not hesitate to contact us at your convenience.

Yours very truly,



Steven R. Williams, P.Eng.,
SRW/caw

MAC WILLIAMS ENGINEERING LIMITED

Hubley Village

Hubley, Nova Scotia
Stormwater Management Plan

Prepared by:

Mac Williams Engineering limited
109 Chain Lake Drive
Halifax, Nova Scotia, B3S1B3

Tel: 902-450-1414
Fax: 902-450-1424

For:

Foxwood Developments Inc.
409 Bluewater Road
Bedford, Nova Scotia, B3B 1J7

Principal Contact:

Steven R. Williams, P.Eng.
Mac Williams Engineering limited
Tel: 902-450-1414

November 2010

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APPENDICES

1.0 INTRODUCTION

This report provides the master stormwater management plan (MSWMP) for the proposed subdivision known as Hubley Village (Hubley, Nova Scotia) and owned by Foxwood Developments Inc. as shown on the General Site Plans in Appendix A.

This development is located just off the St. Margaret's Bay Road (Highway #3) and is just east of Five Island Lake (Appendix A). The site is situated between the St. Margaret's Bay Road and Highway #103 and has a property Identification Number (PID) of 40052664.

This stormwater management plan is intended for use in the planning and construction of Hubley Village, as noted above. The plan presents conceptual design considerations for the site that should ultimately meet or exceed the goals and objectives of the Nova Scotia Department of Environment.

2.0 WATERSHED DRAINAGE

The plan area has five distinct drainage areas all of which have drainage patterns which migrate from North to South and eventually cross the St. Margaret's Bay Road through existing stormwater culverts. (refer to Drawing 08531-D01 in Appendix A).

The overall site will undergo cut and fill operations in order to construct this roadway. As a result of the roadway construction some wetlands will be impacted and will require wetland compensation. To the extent that is possible, existing on-site wetlands will be maintained and utilized as a part of the overall storm water management system. Wetlands which are unavoidably lost will be compensated for as per Provincial policy.

In general, storm-water runoff from the developed areas of the site (i.e. areas covered with pavement or buildings and other facilities) will be collected in a system of roadway ditches and discharged back into the wetlands or watercourses.

A Spill Management Plan and Emergency Response and Contingency Plan will also need to be developed and implemented, by all future roadway contractors, in order to minimize the chances of a spill reaching any water body including groundwater, and should also include mitigation measures to minimize impact if a spill does occur and manages to reach a water body. In order to minimize, contain, and control any potential releases of hazardous materials, a site-specific Spill Management Plan should also be developed. All construction personnel must be appropriately trained in the handling, storage, and disposal of hazardous materials (i.e. WHMIS, TDG). Chemical storage and handling will be done in accordance with the manufacturers' recommendations and federal and provincial regulations, where applicable.

3.0 PLAN GOALS AND OBJECTIVES

This stormwater management plan addresses the potential effects upon water quality and quantity, from within this development on the associated watersheds. The intent of this plan is to adhere to all relevant policies and objectives for development as set forth in the "Department of Environment" policies and procedures.

The goal of stormwater management is to preserve the natural hydrologic cycle. At present there are no watershed management plans for this area. The goal of the master stormwater management plan (MSWMP) will be realized through objectives that maximize pollution prevention opportunities and conservation practices to protect water quality and control water quantity. Objectives for stormwater drainage are as follows:

- To prevent loss of life and to protect structures and property from damage due to major storm events;
- To provide safe and convenient use of roadways, lot areas, and other improvements during and following rain and snow events;
- To adequately convey stormwater flow from upstream sources;
- To mitigate the adverse effects of stormwater flows, such as flooding and erosion, onto downstream areas;
- To preserve natural watercourses;
- To minimize the long term effects of development on receiving watercourses and on groundwater, therefore;
- Stormwater management should be an integral part of the overall site design and development.

4.0 ENVIRONMENTAL SETTING

4.1 WATERCOURSES AND WETLANDS

Watercourse and wetland study has also been performed for the site by Strum Environmental and summarized in their report dated July 7th, 2009. This study includes an assessment and delineation to inventory the actual number, type and sizes of wetlands and water courses present in the various areas, and to identify potential impacts to these wetlands and water courses as a result of the development of the project.

4.2 GEOLOGY AND SOIL

The footprint for the proposed Project is 58.4 Ha (144.35 acres). The area is generally underlain by glacial till over bedrock. The area is forested for the most part with softwood, scrub bushes and mixed hardwood stands. Drainage in and around the proposed Project footprint is via small watercourses (i.e., streams) mostly flowing from the North to the South. Additionally, there are wetlands that receive some localized drainage from the adjacent upland areas.

The surficial geology of the project area and vicinity consists of glacial deposits of upland tills with varying composition and thickness. The proposed Project footprint is in an area where till dominates, giving a nearly even proportion of sand, and silt to depths up to 3 meters. There are areas where the bedrock is exposed with little or no vegetative cover.

4.3 SOIL EROSION

The geology of the site consists mainly of bedrock overlain with glacial till. Overall, the area is considered to have low risk of soil erosion. Imported soil will mostly be limited to topsoil needed for landscaping. Standard erosion and sedimentation control measures will be employed for all erodible soils (Appendix B: Erosion and Sediment Minimization Plan).

5.0 CONCEPTUAL STORMWATER MANAGEMENT PLAN FACILITIES

The goal of the stormwater management plan is to minimize and reduce peak flows and contaminant inputs to nearby watercourses. These goals will be met through implementation of the following two strategies:

- minimize peak flows by providing retention, and
- reduce contaminant inputs.

The overall strategy for the site is to provide an integrated approach to stormwater management, which is premised on controlling runoff and pollution at the source. Therefore, a hierarchy, or train, of stormwater management practices shall be implemented on the site and include:

- stormwater lot level controls, which wherever possible will be achieved by directing roof leader downspouts overland to the natural drainage corridors,

- end-of-pipe stormwater management facilities, wherever necessary, will consist of extended detention dry ponds, grassed swales, and velocity breaks.

5.1 STORMWATER QUANTITY/RATE CONTROL PRACTICES

The goal of the MSWMP for stormwater quantity control is to match, as closely as possible, the pre-development hydrologic conditions to the post-development conditions on areas that drain into freshwater brooks/rivers. A hierarchical approach to stormwater management shall be utilized. This process results in a series of stormwater control measures, as opposed to one single end-of-pipe technology selection.

The Stormwater Drainage Plan, Drawing 08531-D01 is attached in Appendix A.

The basic design criteria shall be to balance, freshwater brooks/rivers in such a manner that pre-development peak flows closely match post-development peak flows from the 10, and the 100-year 24-hour storm events. The closest Atmospheric Canada weather station to this site is Halifax and storm event data from this station was used for all hydraulic modeling for this report.

5.1.1 Pre and Post Development Modeling Results

The water quantity and flow rate modeling for the project was performed by Mac Williams Engineering. The pre-development modeling results are summarized in Appendix C. Overall the pre-development drainage consists of the following:

Region	Area (Ha)	Flow (10 yr)	Flow (100 yr)
Area A	14.92	0.1704 cu.m/s	0.4270 cu.m/s
Area B	7.72	0.0853 cu.m/s	0.2019 cu.m/s
Area C	7.15	0.0975 cu.m/s	0.2468 cu.m/s
Area D	11.59	0.1840 cu.m/s	0.4366 cu.m/s
Area E	12.68	0.1823 cu.m/s	0.4303 cu.m/s

The post-development modeling results for the 1 in 10 year and 1 in 100 year storm event are also summarized in Appendix D. Overall the post-development drainage consists of the following:

Region	Area (Ha)	Flow (10 yr)	Flow (100 yr)	Storage (10 yr)	Storage (100yr)
Area A	14.92	0.1704 cu.m/s	0.3704 cu.m/s	326 cu.m	693 cu.m
Area B	7.72	0.0854 cu.m/s	0.1749 cu.m/s	87 cu.m	202 cu.m
Area C	7.15	0.0975 cu.m/s	0.1876 cu.m/s	152 cu.m	371 cu.m
Area D	11.59	0.1840 cu.m/s	0.4212 cu.m/s	111 cu.m	229 cu.m
Area E	12.68	0.1823 cu.m/s	0.4211 cu.m/s	195 cu.m	494 cu.m

Stormwater detention facilities will be necessary in order to balance these flows to pre-developed conditions. The storage requirements are listed in the above table.

It should be noted that these values are based on preliminary concept layouts and eventually detailed design will be necessary, and at that stage these boundaries and volumes should be revisited in order to ensure accuracy in relation to layouts and site design. Overall the boundary is subject to change and the main design criteria is the implementation of a stormwater detention pond which is capable of balancing the 1 in 10 and 1 in 100 design storms discharging into wetlands and watercourses.

5.1.2 Stormwater Lot-Level Controls

Stormwater lot-level controls involve measures to store and treat stormwater before it reaches the roadway conveyance system.

The lot controls for this development may include, where possible:

- roof leaders shall be directed to vegetated areas wherever possible, rather than the asphalt areas direct footing drainage systems to low areas
- direct footing drainage systems to low areas
- use of rain barrels

Roof Leaders

Wherever possible, roof leaders shall be directed to vegetated areas in order to recharge groundwater and minimize the volume of water entering the roadway conveyance system. This control measure is designed to infiltrate stormwater and to reduce runoff.

The advantages of incorporating roof leader strategies into stormwater management are:

- Reduced total volume of runoff
- Reduced peak stormwater flows
- Reduction of erosion
- Treatment/removal, and soil saturation, filtration of stormwater pollutants

Footing Drainage Systems

It is anticipated that most buildings will have a footing drainage system. The discharge from these systems should be directed to low lying areas near the homes and avoid direct discharge to the development's drainage conveyance systems. This control measure is designed to infiltrate stormwater and groundwater and to reduce runoff.

The advantages of incorporating this strategy into the stormwater management are similar to the ones described for roof leaders.

Use of Rain Barrels

Rain barrel usage is critical to the overall success of the stormwater management system. The benefits of using a rain barrel include:

- Stormwater that washes off rooftops and into downspouts is caught and retained
- Homeowners use the water in the rain barrels as needed during growing season
- Water can be reused as needed in the garden or lawn landscape
- Reduces stormwater runoff and pollution by providing treatment to the "first flush" of contaminants
- Easy installation - suitable for all property types.
- Water generated is very soft (low in minerals), which is good for plant growth.

5.1.3 Stormwater End of Pipe Controls

End-of-pipe stormwater management facilities have been found to be most suitable for the treatment of stormwater. They include an extended dry detention facility for the five subwatershed areas and grassed ditches wherever possible. An extended detention dry pond is a reliable end-of-pipe stormwater management facility for rate control and quality improvements for the following reasons:

- performance does not depend upon soil characteristics;
- the settling pond prevents re-suspension of particulates;
- extended detention times allow for increased particulate removal.

Overall, the stormwater management system shall be designed to attempt to take advantage of the natural depressions on the site, where ever possible, in order to provide detention of storm water as well as the opportunity to recharge the groundwater.

Natural wetlands, which are able to be maintained, are proposed for integration into the overall stormwater management system. In general, wetlands extend detention time and utilize high surface area to volume ratios to effectively remove water pollutants. Typically, water is released from a wetland at a slower rate than the influent water flow rate. The pollutant removal pathways within stormwater wetlands include:

- sedimentation;
- adsorption to sediments, vegetation, detritus;

- physical filtration of runoff;
- microbial uptake and transformation;
- uptake by wetland plants;
- extra detention and/or retention.

Hence, wetland perform a useful function and shall continue to do so as part of the developed stage of this subdivision.

5.2 STORMWATER QUALITY PRACTICES

To prevent deterioration of the freshwater bodies in the area, stormwater runoff shall be treated on the site. During construction the erosion and sediment minimization plan shall be followed to minimize sediment mobilization (Appendix D). Mobilized sediments will be contained by the use of silt fences, checkdams and stormwater ponding on individual sites.

Water quality improvements as part of the treatment train approach will be achieved by the implementation of the following technologies:

GRASSED SWALES

A vegetated swale is a broad, shallow channel that is planted to promote dense vegetation. Vegetated swales serve a variety of functions including: particulate filtration, infiltration, stormwater velocity reduction and stormwater conveyance. Vegetated swales are considered to greatly increase the water quality on a site as well as increase the potential for soil infiltration.

BEST MANAGEMENT PRACTICES FOR LAWN CARE

Building owners will be encouraged to promote a sustainable approach to managing stormwater, reducing the reliance on fertilizers and pesticides, suggest the best native plant species for landscaping, educate responsible lawn irrigation practices and offer advice on other sustainable lawn care practices that can positively impact green areas, while improving the effectiveness of the stormwater management system.

6.0 PROTECTION MEASURES DURING AND AFTER SITE DEVELOPMENT

Some degree of erosion and sedimentation can be expected from equipment activity and earth moving on the property during site development. This temporary effect can be minimized by appropriate erosion and sedimentation prevention and control measures. All personnel shall comply with applicable environmental laws, regulations, standards and practices, permits, approvals, and requirements of federal, provincial, and municipal authorities. Guidelines shall also be enforced throughout the

tender/contract period. Clear and concise guidelines and site specific erosion control plans shall be provided to all contractors.

For construction projects, there are three categories of erosion and sediment control: runoff controls, erosion protection, and sediment interception. Runoff controls limit or contain soil movement from the construction site, minimizing raindrop impact on the soil and reduce runoff volume and runoff velocities.

Erosion protection measures are used to reduce or eliminate the detachment of soil particles by falling raindrops or to resist sheet or channel flow. These measures are placed on, or applied to, the soil surface and are often used in conjunction with runoff control and sediment interception measures.

Soil loss from slopes may occur even with erosion and runoff control measures. If this soil can enter a waterbody, mitigative measures will be required to intercept it. Methods used to trap sediment include vegetated buffer strips, silt fences, filter berms, and sediment traps.

6.1 Temporary Protection Measures

The geology of the site consists mainly of bedrock overlain with glacial till. As a result, the area is generally considered to have low risk of soil erosion. Imported soil will be limited to topsoil needed for some landscaping areas. Standard erosion and sedimentation control measures will be employed for all erodible soils.

A detailed erosion and sedimentation control plan shall be required from the contractor prior to the commencement of construction. This plan shall be specific to the contractors method of work and at a minimum should include:

- Silt fences, etc., installed before grubbing operation;
- Clean run-on water controlled/diverted by installation of channels, berms, and grading;
- Exposed soil minimized via rapid cover by mulch, gravel, straw etc.;
- Soil exposure controlled relative to forecasted weather conditions;
- Site grading to low slopes complete with ponding depression areas and shallow ditches to retain stormwater; and
- Monitoring

6.2 Permanent Protection Measures

The erosion and sedimentation control plan for permanent stabilization should include:

- Stabilization of all disturbed surfaces;
- Periodic inspection of erosion and sedimentation control measures to ensure continued effectiveness.

7.0 STORMWATER FACILITIES MAINTENANCE PROGRAM

The maintenance program to ensure the effectiveness of the erosion and sedimentation control plan should include:

- Inspection of temporary measures to be performed daily (and during precipitation events) to check for damage. Damaged structures must be repaired.
- Environmental protection structures to be maintained (including removal of silt material) until stabilization of disturbed areas has occurred. The structures shall then be removed and the area shall be re-graded and stabilized.
- Inspection and maintenance of BMP's at a minimum quarterly frequency and as site conditions warrant during the construction phases within each sub-watershed.

8.0 STORMWATER MANAGEMENT SUMMARY

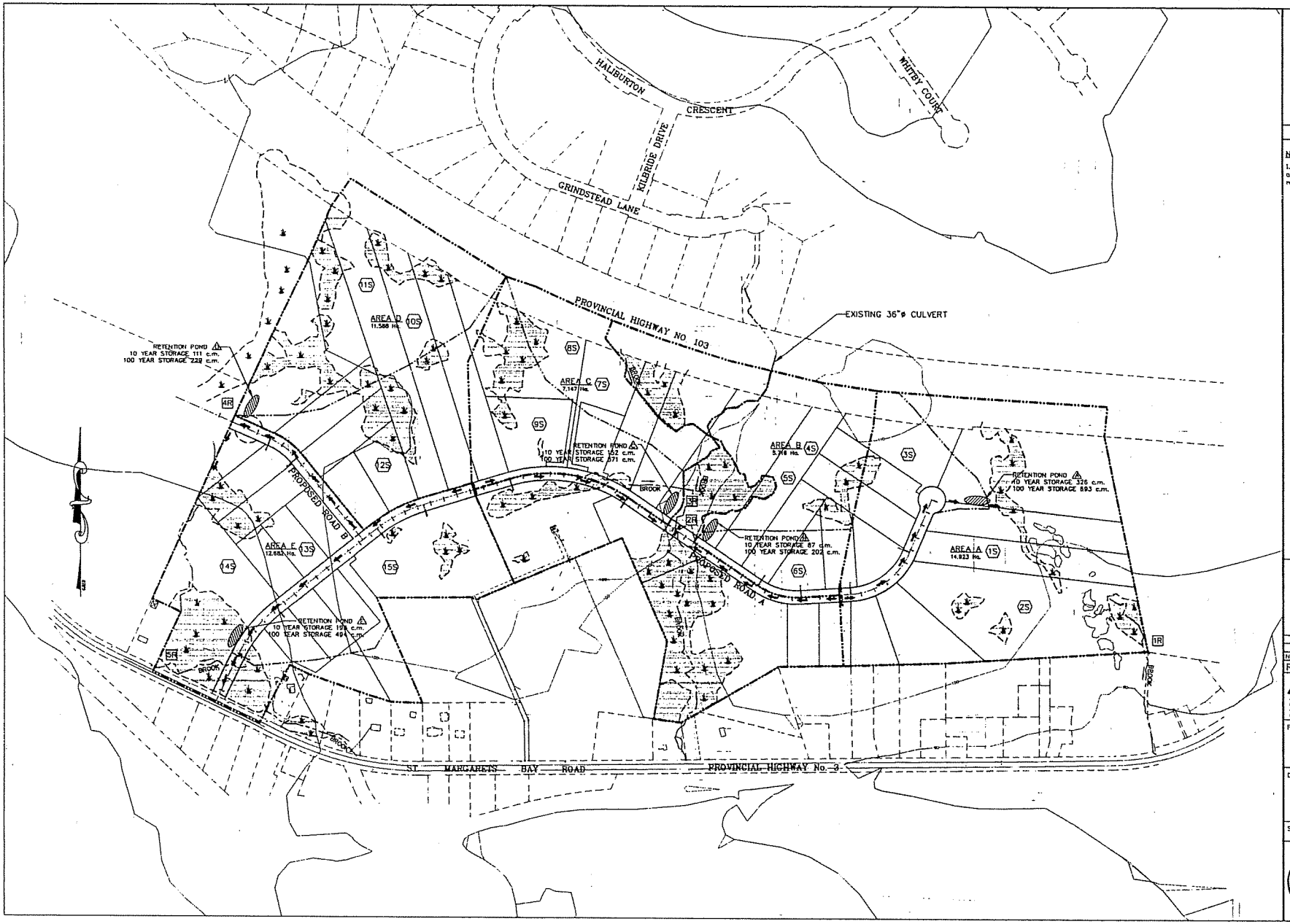
A series of stormwater management facilities are being considered to manage the water quantity and quality in the surface runoff from the sites within this Master Stormwater Management Plan (MSMP). Water quantity facilities such as disconnected roof leaders, retention wet ponds and extended detention dry ponds shall be used to prevent downstream flooding and to prevent erosion of off-site watercourses and wetlands. Water quality shall be enhanced by a treatment train approach to stormwater management. Some of Best Management Practices facilities that are being considered for use include: a comprehensive erosion and sediment control program, grassed swales and retention and detention ponds.

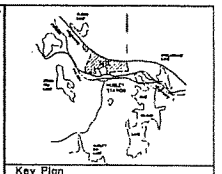
The use of the Best Management Practices facilities is intended to meet the following objectives:

- To adequately convey stormwater flow from upstream sources;
- To mitigate the adverse effects of stormwater flows, such as flooding and erosion, onto downstream areas;
- To prevent flooding of properties and safeguard flood plains;
- To preserve the water quality of lakes and rivers; and
- To preserve groundwater flows.

APPENDIX A

SITE MAP/STORMWATER DRAINAGE PLAN





Key Plan

NOTES:

1. Contours are 2.0m interval and derived from available LRIS mapping.

No	Description	Date	By

Revision or Issue

MAC WILLIAMS ENGINEERING LIMITED

Project

HUBLEY VILLAGE
HUBLEY, NOVA SCOTIA

Drawing

SITE PLAN &
STORMWATER DRAINAGE PLAN

Scale 1:2500

Date	Drawn
Nov 2010	SRW
Design SRW / Check DMW	Approv SRW
Project No 08531	Sheet 1 Of 1
Drawing No. 08531-D01	Rev

APPENDIX B

EROSION AND SEDIMENTATION

MINIMIZATION PLAN

EROSION AND SEDIMENT MINIMIZATION PLAN

CONSTRUCTION SCHEDULE

Environmental Concern

The probability for erosion and sedimentation on construction sites is highest during precipitation events. Generally speaking, the greatest amounts of precipitation occur during winter and spring months.

The surficial geology of the project area and vicinity consists of bedrock overlain with glacial till varying composition and thickness. The proposed Project footprint is in an area where the till dominates, giving a nearly even proportion of sand, and silt to depths up to 3m.

Overall, the characteristic permeability of these soils is considered moderate. Though these soils are only low to moderately erodible the construction on the site must proceed with caution to ensure that the environmental protection measures are adhered to and enforced.

CLEARING AND GRUBBING

Environmental Concern

Clearing activities in the vicinity of a watercourse will cause disturbance of the 20m protective vegetative buffer or riparian zone adjacent to the watercourse and could subsequently lead to erosion of the approach slopes and sedimentation into and the obstruction of the watercourse. For construction projects, there are three categories of erosion and sediment control: runoff controls, erosion protection, and sediment interception.

Runoff controls limit or contain soil movement from the construction site, minimizing raindrop impact on the soil and reducing runoff volume and runoff velocities. Generic controls considered for this Project are discussed below.

Erosion protection measures are used to reduce or eliminate the detachment of soil particles by falling raindrops or to resist sheet or channel flow. These measures are placed on, or applied to, the soil surface and are often used in conjunction with runoff control and sediment interception measures. Erosion protection measures to be used as appropriate to this type of construction include:

- gravel sheeting;
- mulches;
- checkdams;
- erosion control blankets; and
- re-vegetation.

Re-vegetation is generally used only for permanent protection and often requires another form of temporary protection measure to be successfully established.

The key to managing runoff and stormwater flows is to minimize erosion and sedimentation. Methods for managing stormwater flows include:

- wet and dry ponds for stormwater detention;
- infiltration systems;
- engineered stormwater systems;
- onsite detention facilities;

Best Management Practices

- Before any clearing or grubbing commences, clearing limits, easements, setbacks, sensitive/critical areas and their buffers, trees and drainage courses will be delineated with flagging tape. This practice ensures workers can clearly recognize areas to be protected.
- No clearing or construction will occur within the protective green/belts/protected sensitive areas as identified on the construction plans.
- To reduce the velocity of runoff, crop residues, plants, and rough soil surfaces are applied to help spread the flow of water over a greater area and into a thin layer.
- Diversion berms are commonly used on slopes to intercept sheet flow on exposed surfaces and to reroute flow into undisturbed areas. Erosion protection is required at the berm outlets.
- Check dams are a temporary measure constructed in ditches, swales, or chutes to reduce hydraulic gradient and flow velocity, thus minimizing the potential for erosion of the channel.
- The work site shall not be cleared nor will topsoil be removed prior to commencement of construction
- Cleared and graded areas shall be limited to minimize the area of exposed soil
- Minimal amount of natural vegetation and topsoil shall be removed at each construction site
- Mulches consisting of wood chips, stone or commercial anti-erosion mats shall be used to limit erosion on land, which is cleared of vegetation.
- All non-mercantile timber shall be chipped on site and used as temporary protective cover over exposed and disturbed areas.
- Grubbed material, which is not used for fill on-site, shall be disposed offsite in accordance with Nova Scotia Department of Environment legislation.
- The contractor shall maintain a stockpile of erosion control material onsite.

GRADING

Environmental Concern

Grading requirements can tend to be extensive in order to accommodate street construction. Accordingly, slopes may be contoured in order to allow for the site development. Disturbance of the slopes may cause instability, which could result in erosion and subsequent sedimentation of nearby watercourses.

Soil loss from slopes may occur even with erosion and runoff control measures. If this soil can enter a water body, mitigative measures will be required to intercept it. Methods used to trap sediment include vegetated buffer strips, silt fences, filter berms, and sediment traps.

Best Management Practices

- Construction should be sequenced such that each section is to be completed and stabilized before proceeding to the next section unless overlapping work is approved by the project engineer.
- The contractor shall work continuously until the travelled ways are completed. If work is halted for 5 days, temporary stabilization structures and material shall be installed.
- A crushed rock construction entrance shall be established to prevent tracking of mud offsite and through the new or adjacent roadways.
- The temporary driveway shall consist of clear stone or gravel to a thickness of 75 to 150mm. If necessary, filter fabric will be laid under the stone if fines are encountered. This surface will be maintained during construction.
- Imported fill material shall be assessed to ensure that the material is not composed of a high percentage of fines.
- Sediment barriers shall be used to treat small areas and include enviro-fencing, straw bales, filter fabric, gravel and earth berms. Barriers shall be placed below disturbed areas subject to erosion including along the contour of exposed slopes; at the base of a slope; along a street or at storm drain inlets. Barriers will not be placed in a drainage way with high volume or high velocity.
- All water pumped from ditches, swales or sumps shall be discharged away from the watercourse and filtered through a sediment trap, 2 m^3 (3 yd^3) of class B gravel, filter bag, or undisturbed vegetation to filter out solid material before the water enters the watercourse.
- Silt accumulation along silt fences and swales shall be removed regularly.
- Long and steep slopes on the construction site shall be minimized to prevent erodible velocities from developing. If long slopes are present, they will be benched to interrupt the flow of water and minimize erosion.

CULVERT INSTALLATIONS IN WATERCOURSES

- A 20m buffer zone will be established along all watercourse being retained, by placing geotextile silt fences on both sides of the channel. Work must be completed in the dry; therefore water shall be diverted around the construction site.
- Diversion channels can consist of a ditch lined with polyethylene liners that are properly placed and secured. Sandbags or an impermeable dam will be installed at the inlet to divert the flow. Inlet and outlet protection to prevent erosion and scouring at the ends will be installed.
- Unlimited fording of watercourses by construction equipment will not be permitted.
- Culverts will be properly designed to handle the increased flows as a result of development and comply with NSDOEL regulations with respect to the associated Watercourse Alteration Permit.

- Side banks of the channel will be stabilized and re-vegetated subsequent to completion of the culvert installation.

INSPECTION AND ENFORCEMENT

Environmental Concern

Thorough maintenance of all temporary and permanent erosion and sediment control measures will ensure the integrity of the aquatic resources they protect. Monitoring of the site following major rainstorms will determine that runoff control devices are effective and allow for the removal of accumulated sediment.

Best Management Practices

- With respect to sediment control, all work is to be completed to the satisfaction of the project engineer and owner.
- On-site inspection will be an active part of any development and management program. The effectiveness of control measures will be inspected and monitored during rain events and maintained and upgraded as necessary or as directed by the Project Engineer or Environmental Inspectors.
- The Contractor and Project Engineer will incorporate a routine end-of-day check to ensure the integrity of the protection measures.
- Monitoring of meteorological conditions and forecasts as a proactive means will be conducted to minimize the potential for erosion.

RESTORATION AND PERMANENT PROTECTION MEASURES

The final restoration phase is critical for mitigating long-term impacts to watercourses. The owner shall incorporate all appropriate mitigating measures to ensure proper restoration of the sites adjacent to any watercourses which are being maintained and channel of each watercourse.

Environmental Concern

Proper restoration of the watercourses and adjacent areas will minimize post-construction impacts to these areas. Implementation of permanent protection measures such as a stormwater management plan will minimize the volume of stormwater constituents into watercourses.

Best Management Practices

- The sites will be reclaimed immediately to limit sustained erosion.
- Wood chips, vegetative growth or rock facing (riprap) on steep slopes will be restored in all exposed areas.
- Prompt re-establishment of vegetation will reduce the need for costly remedial measures caused by erosion damage to slopes.

- The target is to minimize and reduce contaminant input into the freshwater rivers in the area. This will be met through the implementation of control devices that have proven to reduce contaminant inputs. The strategy recommended for this site is to provide an integrated approach to stormwater management that is premised on controlling surface runoff and pollution at the source.

HAZARDOUS MATERIAL STORAGE AND HANDLING OF FUELS AND HAZARDOUS MATERIALS

Environmental Concern

Accidental spills of fuels, lubricants or other chemicals may enter watercourse and eventually reach the local streams/rivers and wetlands. Proper storage and handling of these materials should prevent the probability of accidents.

Best Management Practice

- Machinery maintenance will not be performed in or near a watercourse, ditch or storm sewer. Some examples of maintenance include washing out cement mixers, changing oil, greasing, spray painting, cleaning of spraying equipment or painting equipment, etc.
- Any hazardous liquid including fuel and lubricants will be stored in a designated area surrounded by an impervious berm, which would contain a spill of the volume of all stored liquid.
- Solid hazardous materials including cement, lime and sulphur should not be stored within 25 m of a watercourse.
- Any spillage of a hazardous material into any watercourse will be reported to the Nova Scotia Department of Environments Environmental Emergencies 24 Hour Service (424-5620).

CONTINGENCY PLANNING

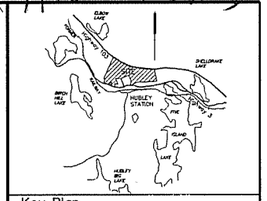
Extreme Storm Events

Extreme storm events (usually subtropical storms) can result in extensive erosion due to heavy rainfall impact and the associated stormwater runoff. Erosion of approach slopes adjacent to watercourses is to be expected during these events. Watercourse flows can be expected to increase suddenly, possibly exceeding the capacity of ditches, swales and sediment traps. Throughout the course of construction, the Environmental Inspectors must be aware of current meteorological predictions and the potential ramifications. Subject to a review of the construction activities planned for the day and the locations of these activities, the prediction of storm events will result in the suspension in the vicinity of watercourses and wetlands.

Excessive runoff can be mitigated or controlled by the use of additional diversion berms, straw-bale check dams, sediment fences and/or sandbag barriers. Additional sediment interception measures such as sediment traps can also be constructed quickly. The CONTRACTOR will ensure that, equipment, personnel and required materials will be available for application as required.

Following extreme storm events, Environmental Inspectors, will conduct environmental monitoring in those areas deemed at risk. Recommendations regarding erosion control will be made by the Environmental Inspectors as required.

Attachment D



Key Plan
N.T.S.

NOTES:

1. Contours are 20m interval and derived from available LRIS mapping

HALIBURTON CRESCENT
KILBRIDE DRIVE
WHITBY COURT
GRINDSTEAD LANE
PROVINCIAL HIGHWAY NO. 103
HIGHWAY BOUNDARY
EXISTING 36"ø CULVERT
P.I.D No. 40053043
PARCEL "B"
Lands Conveyed to
COLIN KELLY
Book 7812 Page 87
(Portion thereof)
3 SINGLE FAMILY UNITS
4 SINGLE FAMILY UNITS
4 SINGLE FAMILY UNITS
25 TOWNHOUSE UNITS
RETENTION POND
P.I.D No. 40329619
Lands Conveyed to
ERIC RAYMOND SIMPSON and
ANN FRANCES VERNON SMITH
Book 8551 Page 146
See plan certified by Robert G. Becker
N.S.L.S. dated March 24, 2002
PARCEL "S-3"
PROPOSED LANEWAY
7 DUPLEX UNITS
7 SINGLE FAMILY UNITS
RETENTION POND
P.I.D No. 41025982
LOT 11A
Access Easement in favour of Lot 11A
Book 6197 Page 21
Water Line Easement Y1
LOT A and X-1
P.I.D. No. 40052755
Lands Conveyed to
TRECAN COMBUSTION LIMITED
Water Line Easement Y1
in favour of Halifax Regional Water Commission
Book 5502 Page 341
150m Setback Radius from Well
P.I.D No. 40849499
LOT A
Lands Conveyed to
Her Majesty The Queen
in right of the
Province of Nova Scotia
Book 6353 Page 204
See plan certified by
J. Jeff Fee, N.S.L.S.
dated January 29, 1999
(LRO Plan 33093)
See plan certified by
Glenn M. Crews, N.S.L.S.
dated August 15, 1989,
approved June 27, 1990
(LRO Plan 27250)
See plan certified by E.O.
Temple Piers, P.L.S. dated
December 5, 1961,
approved December 11, 1961
(LRO Plan 6363)
See plan certified by Allan J. Owen, N.S.L.S.
dated November 27, 2007
EASEMENT IN FAVOUR OF NOVA SCOTIA POWER INC. DOCUMENT # 69750757
P.I.D No. 40053068
LOT J-1A2
LOT J-1A1
P.I.D No. 40053316
LOT N-2
P.I.D No. 40052953
LOT A-B
P.I.D No. 41220294
LOT R1
P.I.D No. 40815086
PARCEL E
P.I.D No. 40053381
PARCEL F
LOT N-1
LOT X
Civic 4011
Civic 3999
LOT C
LOT F
LOT E
LOT D
LOT B-R
LOT B
LOT A
P.I.D No. 40229767
Lands Conveyed to
RICKY P. LEE and
PAULINE LEE
P.I.D No. 00635522
LOT A
Civic 4183
LOT M-2
LOT M-1A
LOT M-1B
LOT 8
LOT 7
LOT 6
LOT 2A
LOT 5
LOT 1
LOT 1C
LOT 2C
Civic 4127
Civic 4097
P.I.D No. 40393217
P.I.D No. 00635417
LOT KN
LOT 8
LOT 9
P.I.D No. 40760159
LOT 10
P.I.D No. 40052755
See plan certified by
R.J. Donovan, P.L.S.,
dated September 20,
1962, approved
October 18, 1962
(LRO Plan 6212)
P.I.D No. 40052748
Civic 4011
LOT 12
LOT 13
LOT 14
LOT 15
LOT 16
ST. MARGARETS BAY ROAD
PROVINCIAL HIGHWAY No. 3
(width varies)
EDGE OF ASPHALT
HIGHWAY BOUNDARY
EDGE OF WETLAND
WET AREA
BROOK
GRID NORTH

No	Description	Date	By

Revision or Issue

MAC WILLIAMS ENGINEERING LIMITED

Project

HUBLEY VILLAGE
HUBLEY, NOVA SCOTIA

Drawing

SITE PLAN &
STORMWATER DRAINAGE PLAN

Scale 1:2500

REGISTERED PROFESSIONAL ENGINEER
DATE Feb. 2012
S. R. Williams
5168
PROVINCE OF NOVA SCOTIA

Date Feb 2012		Drawn SRW
Design SRW	Check DMW	Approv SRW
Project No 08531		Sheet 1 Of 1
Drawing No 08531-D02		Rev.

Attachment E

MAC WILLIAMS ENGINEERING LIMITED

Hubley Village

Hubley, Nova Scotia
On-Site Sewage Disposal Systems
Pre-Design Report

Steven R. Williams, P.Eng.
November 25, 2010

Table of Contents

1.0 Project Description

Hubley Village is proposed as a Hybrid Open Space Development in the Hubley, Nova Scotia area. The property consists of 58.4 hectares bounded on the north by Highway #103, on the south by Highway #3, to the east by Crown Lands and to the west by privately held lands. The development is proposed to consist of approximately 46 single family homes and 2 multi unit structures with 4 units per structure. The individual single family homes will be serviced with an on-site drilled well and individual on-site sewage disposal systems. The 2 multi units will be serviced with on-site drilled wells and clustered on-site sewage disposal systems. The on-site services will be owned, operated and maintained by the individual property owners.

2.0 Soils Analysis

Soils analysis was conducted on the property in November 2010. A total of 17 testpits were excavated and analyzed and soil profiles record. In general, the site is over laid with an organic mat between 150mm to 400mm over a permeable soils layer of silty sand. The silty sand layer varies in depth from 0.0m to 1.2m. Bedrock was encountered in most testpits while others were dug to a depth of 1.6m with no evidence of bedrock. Localized topographical slopes were noted at the testpit locations for use during on-site sewage disposal system design. Testpit field notes are attached in Appendix A. A testpit location plan has been included in Appendix B.

3.0 Proposed On-Site Sewage Disposal Systems

There are a number of different types of on-site sewage disposal systems proposed for this project. These systems are considered to be passive and require only minimal maintenance. The most common systems being proposed are referred to as C1, C2, C3 or peat systems. There are other systems available but these will likely be the most commonly used within this development.

The C1 system consists of a septic tank (primary treatment), and a distribution trench excavated below existing grades of undisturbed natural soils. The depth of this trench can vary from 300 to 600mm and vary in width depending on the final design criteria. The trench contains a layer of filter sand followed by a layer of clear stone and distribution piping. This type of system can be gravity fed from the septic tank or may need to be fed via a pump system if grades do not allow for gravity flow. If the use of a pump is required a separate chamber will be installed beyond the septic tank which will contain the pump. The effluent is pumped to the distribution bed from the pump chamber. Effluent filters will be installed on the outlet of the septic tank. Sewage treatment is achieved within the existing natural soils and the resultant effluent then flows downslope from the contour bed location and into the sub-soils.

The C2 (or C2R) system consists of a septic tank (primary treatment), and a distribution trench excavated below existing grades of undisturbed natural soils. The depth of this trench can vary from

100 to 175mm and vary in width depending on the final design criteria. The trench contains a layer of filter sand followed by a layer of clear stone and distribution piping. The system requires a 5.9 meter wide buffer of sand downslope of the distribution bed to aid in the treatment of the effluent due to minimal good natural existing permeable soils. This type of system can be gravity fed from the septic tank or may need to be fed via a pump system if grades do not allow for gravity flow. If the use of a pump is required a separate chamber will be installed beyond the septic tank which will contain the pump. The effluent is pumped to the distribution bed from the pump chamber. Effluent filters will be installed on the outlet of the septic tank. Sewage treatment is achieved within the existing natural soils and buffers and the resultant effluent then flows downslope from the contour bed location into the sub-soils.

The C3 system consists of a septic tank (primary treatment), pump chamber and a bed of imported sand fill containing a gravel distribution trench and associated distribution piping. The bed of sand will vary in depth from 600mm to 1000mm depending on the nature of the existing soils. The distribution piping within the gravel bed will be pressurized, thereby producing an even distribution of sewage effluent along the gravel bed. Effluent filters will be installed on the outlet of the septic tank. It is proposed that the distribution pipe within the C3 system will be pressurized utilizing a sewage effluent pump contained in a separate concrete chamber. Sewage treatment is achieved within the imported sand bed and the resultant effluent is then distributed across the contour and back into the natural soils.

The last type of on-site sewage disposal system proposed for this project is referred to as the Ecoflo Peat Module system. This system is also considered by the Department of the Environment as a passive system. However, it does require more maintenance then the conventional on-site sewage disposal systems. The Peat system consists of a septic tank (primary treatment) and one or more peat module units installed on a gravel dispersion bed. Effluent filters will be installed on the outlets of the septic tanks. Depending on final grading this type of system may or may not require pumping of sewage effluent to the peat units. Treatment of the sewage effluent is contained within the peat module and the treated effluent is then dispersed from the open bottom of the peat unit into the gravel bed below the units. The effluent then enters the surrounding natural soils.

4.0 Maintenance of the On-Site Sewage Disposal Systems

The C1, C2 and C3 type sewage disposal systems require that the septic tank be pumped out every 2-3 years. If a pump is utilized to deliver effluent to the distribution bed, it will be designed with an audio/visual alarm system which notifies the home owner that the pump has malfunctioned and needs maintenance. Additional storage volume in the pump chamber will be provided so that the household can continue to function while waiting for service to be provided on the pump. It will be very important to inform the home owners about what not to put down the drain. There are numerous items which become very detrimental to a septic system. Effluent filters will need to be cleaned on an as required base. It is anticipated that the cleaning cycle for the effluent filters would be every 9-12 months. However, this period could be shorter as it is directly related to the uses

within the household.

The peat module system requires more maintenance then the conventional type sewage disposal systems. The septic tank will need to be pumped out every 2-3 years and the effluent filtered cleaned every 9-12 months. However, these periods could be shorter as it is directly related to the uses within the household. The peat units will require annual maintenance by the service provider. This maintenance will consist of removal of the lid, tipping bucket and distribution plates to be able to perform a visual inspection of the peat media. Photos will be taken and sent to the manufacturer for review. The top 150mm of peat will be raked and turned over and the unit put back together. The manufacturer of the unit will make the decision as to whether the peat needs to be changed out at that point or if the peat is suitable for continued use.

5.0 Operational Life Cycle and Replacement - On-Site Sewage Disposal Systems

With proper care and maintenance it is anticipated that a conventional contour system should have a life cycle of 20-25 years. When failure occurs and replacement is required there are two options for a contour system. The first is to select a new location for the installation of a new disposal bed and then to abandon the old bed, this is the typical solution for existing C1, C2 or C3 sytems. Secondly, the malfunctioning system is a C3, it could be removed from its current location and replaced with another C3 in the same foot print as treatment of the effluent is contained with the imported sand bed below the C3 system.

The peat media within the peat module units is expected to last about seven years before the peat media itself has to be removed from the unit and replaced with new peat. The seven year cycle is based on year round use of the unit and a family size of four. The manufacturer will only replace the peat when they conclude (through the annual maintenance program) that the peat has reached its life cycle. The peat units are not moved from their original positions and it is only the peat media that is take out of the unit and replaced with new peat media.

6.0 Engineering Design Parameters for the On-Site Sewage Disposal Systems

The design parameters for these two sewage types of on-site sewage disposal system will be based on the requirements contained within the Nova Scotia Department of the Environment On-Site Sewage Disposal Systems Technical Guidelines (April, 2009) and the approved Manual and Installation Guide for Sub-Surface Fiberglass Ecoflo Biofilters manufactured by Premier Tech Environment.

7.0 Water Supply Metering and Water Conservation Fixtures

We propose that each dwelling unit be outfitted with a water supply meter and that the readings be reviewed and record and then checked against the design loadings for each on-site sewage disposal systems. This becomes a very good way to confirm that the on-site systems are not being over loaded.

We recommend that all plumbing fixtures within the dwelling units be outfitted with water conserving fixtures. They should consist of, but not limited to, low flush toilets, low flow shower heads, aerators on all faucets, front load washers etc. At no time should the backwash from any water softening unit be discharged to the on-site septic system.

Attachment F