HALIFAX
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P.O. Box 1749
Halifax, Nova Scotia
B3J 3A5 Canada

Harbour East Community Council
February 9, 2012

TO: Chair and Members of Harbour East Community Council

SUBMITTED BY: Krista Vining
for Mr. Pierre Clement, Chair, Dartmouth Lakes Advisory Board

DATE: January 12, 2012

SUBJECT: **Case 17443: Clayton Developments, Rezoning of Colby South, Phase II**

INFORMATION REPORT

ORIGIN

Motion of the Dartmouth Lakes Advisory Board January 4, 2012 meeting:

MOVED by Mr. McLean, seconded by Dr. Trevorrow that the Dartmouth Lakes Advisory Board recommend to Harbour East Community Council that, with the intent of the proposed development plan as presented at the January 4, 2011 meeting, the Board does not anticipate that there will be any direct impact to Bissett Lake by stormwater input and thus the Board has no reservations regarding the proposed rezoning of the 57 acres of land in Cole Harbour from R-7 (Rural Estate) to R-1 (Single Unit Residential), to allow an 80 lot subdivision. MOTION PUT AND PASSED.

BACKGROUND

The Dartmouth Lakes Advisory Board received and discussed the application by Clayton Developments Limited to rezone 57 acres of land in Cole Harbour from R-7 to R-1, to allow an 80 lot subdivision during their January 4, 2012 meeting.

Additional information can be reviewed in the attached staff memorandum dated December 15, 2011 and proposed pre and post development Stormwater Management Plans.

DISCUSSION

During the Board's discussion, staff reported that the development site involves 57 acres with 28 acres needing to be rezoned. It was noted that in the mid 1990's, Halifax County approved a site specific policy that would allow the land to be rezoned to permit small lot developments, should Clayton Development Limited satisfy the conditions listed in the policy. There are currently 80 lots on the proposal, along with a P2 park parcel to be conveyed to HRM for playground use and considerable conservation land due to the presence of wetlands which are to be left in their current state.

The Board reviewed the proposed Stormwater Management Plans for pre and post development and staff and the developer responded to questions related to the water quality affects on Bissett Lake from Phase I.

Clayton Development Limited had advised that they would be looking to balance pre and post stormwater to ensure that any existing wetlands being impacted would not be further impacted long term. Clayton Developments Limited has submitted an alteration proposal to the Nova Scotia Department of the Environment for Parkway Road and another small road in the core of the development that is not tied to any water courses. The overall water quality will be improved based on the stormwater management facility they are proposing.

Further, the wetland/brook is a non-fish bearing water course for which Clayton Developments Limited has had an assessment done and has currently applied to the Nova Scotia Department of Environment for a culvert application watercourse alteration.

The Board passed a motion to forward a recommendation to Harbour East Community Council that, with the intent of the proposed development plan as presented at the January 4, 2011 meeting, the Board does not anticipate that there will be any direct impact to Bissett Lake by stormwater input and thus the Board has no reservations regarding the proposed rezoning of the 57 acres of land in Cole Harbour from R-7 to R-1, to allow an 80 lot subdivision.

BUDGET IMPLICATIONS

Budget Implications of this report will be outlined in detail in a future staff report which will be submitted to Harbour East Community Council together with this report.

FINANCIAL MANAGEMENT POLICIES/BUSINESS PLAN

Compliance with the Financial Management Policies/Business Plan will be outlined in detailed in a future staff report which will be submitted to Harbour East Community Council together with this report.

COMMUNITY ENGAGEMENT

The Dartmouth Lakes Advisory Board is an Advisory Committee to Community Council and is comprised of eight volunteer citizens and one Councillor.

ATTACHMENTS

1. Staff Memorandum dated December 15, 2011
2. Proposed pre and post development Stormwater Management Plans

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A copy of this report can be obtained online at http://www.halifax.ca/council/agendasc/cagenda.html then choose the appropriate meeting date, or by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by: Krista Vining, Legislative Assistant, Municipal Clerks Office, 490-6519

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Halifax, Nova Scotia
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MEMORANDUM

TO: Chairman and Members of the Dartmouth Lakes Advisory Board

FROM: Mitch Dickey, Planner, Planning Applications

DATE: December 15, 2011

SUBJECT: Case 17394, Colby South Phase II Rezoning, Cole Harbour

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Application:

Application by Clayton Developments Limited to rezone 57 acres of land in Cole Harbour from R-7 (Rural Estate) to R-1 (Single Unit Residential), to allow an 80 lot subdivision. Map 1 shows the general area of the application.

BACKGROUND

Site Description

The area to be rezoned is 57 acres in size, and represents the remaining lands of the Colby South project, which was first developed by Clayton in the early to mid 1990's. There is a stream on the site as well as significant wetlands, which are shown on the attached concept plan. The site is within the designated Urban Service Area, meaning that city sewer and water service are available. Under the existing R-7 zone, development of single unit dwellings is allowed, however the required lot size is 80,000 square feet.

Land Use Policy

Local planning policy specifically provides for the rezoning of the subject site to the R-1 zone, as outlined in Attachment A, subject to certain criteria:

- That monitoring of sewage flows from Phase 1 has been undertaken to demonstrate that there is capacity in the wastewater treatment system,
- That a road connection is constructed from Astral Drive to Atholea Drive, and
- Completion of an evaluation of the impact of development in Phase 1 on Bissett Lake, and whether there has been adherence to erosion and sedimentation control measures.

Tel: (902) 490 -5719 Fax: (902) 490 - 4346
E-mail: dickeym@halifax.ca Website: www.halifax.ca

Requirements for Watercourse Setbacks and Buffers:

As established by the Regional MPS, the land use bylaw requires provision of a 20 m setback and natural vegetated buffer from any watercourse, or from a wetland that is contiguous with a watercourse. This standard applies equally under either the R-7 or R-1 zones. Alterations to watercourses and wetlands can be permitted only if approved by the Nova Scotia Department of Environment. Alterations will be required to allow the construction of the Parkway Drive road connection.

Watershed Advisory Board Review:

The rezoning proposal is specifically supported by the MPS, and staff feel that the proposed new site plan is generally appropriate and acceptable. As the proposal abuts a waterway and there is policy regarding water quality monitoring, review by the Board is required.

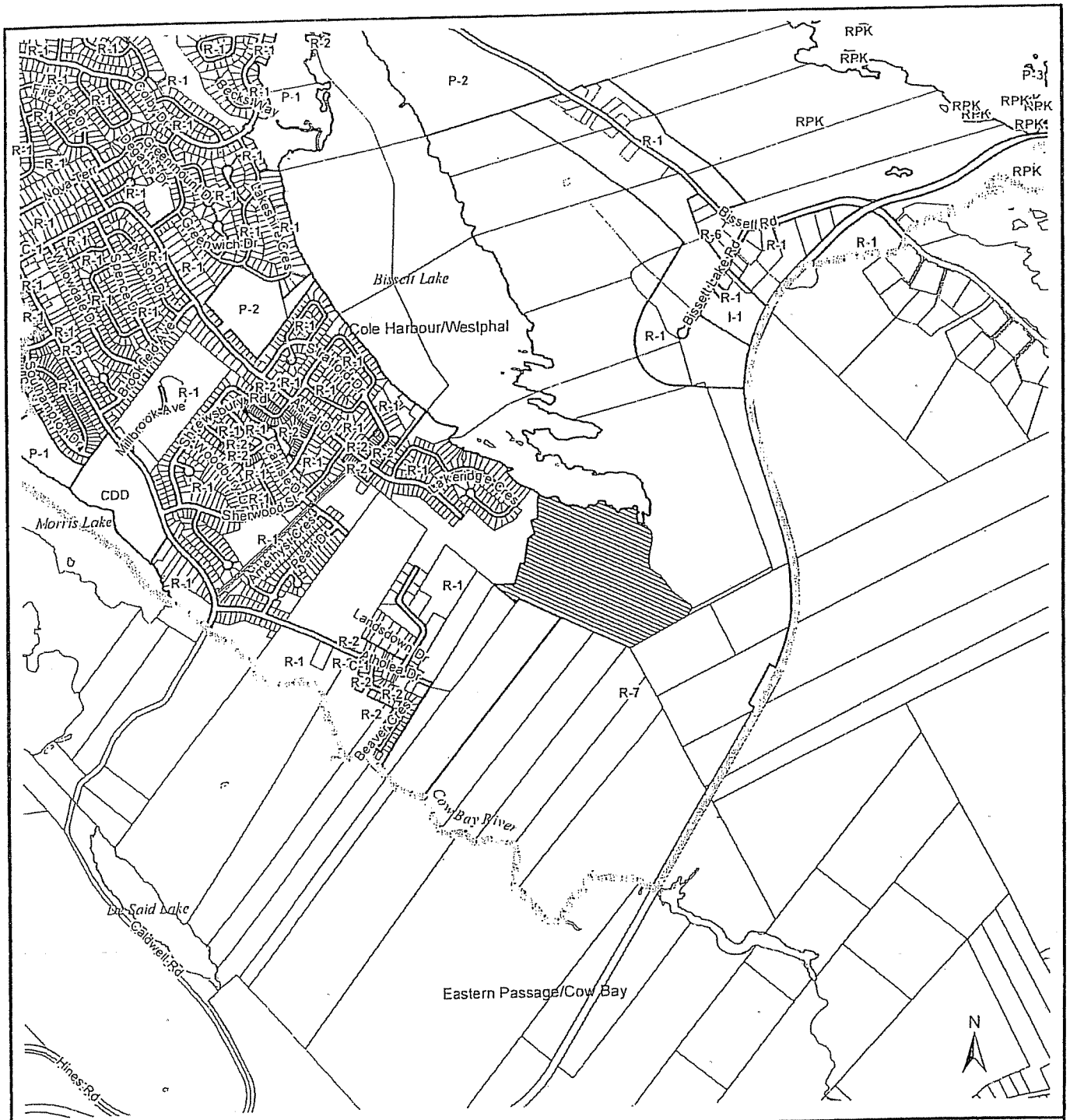
The applicant has provided two items regarding environmental protection, included as Attachments B and C to this report. The first addresses protective measures utilized during Phase 1 construction in 1996, while the second addresses water quality in Bissett Lake.

The Board is requested to review the proposal and attached material, and provide comments and recommendation. Following the review, staff will prepare a report reflecting the Board's comments which will be forwarded to Community Council.

Attachments:

Map 1: Location and Zoning

Attachment A: MPS Policy
Attachment B: Proposed Concept Plan
Attachment C: Correspondence from Stantec Consulting Ltd dated April 13, 2011
Attachment D: Correspondence from Stantec Consulting Ltd dated May 5, 2011



Map 1 - Location and Zoning

Area to be Rezoned from R-7 to R-1

Plan Area Boundary

Cole Harbour Plan Area

Zone

R-1	Single Unit Dwelling
R-2	Two Unit Dwelling
R-3	Mobile Dwelling
R-6	Rural Residential
R-7	Rural Estate
C-1	Neighbourhood Business
I-1	Light Industry
P-2	Open Space
CDD	Comprehensive Development District
RPK	Regional Park

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PLANNING SERVICES

0 125 250 500 750 Meters

This map is an unofficial reproduction of a portion of the Zoning Map for the Cole Harbour Plan Area

HRM does not guarantee the accuracy of any representation on this plan

Dec 13, 2011 Case 17394 file T:/work/planning/holly/casemaps/Case_17394/17394Map1.pdf (HK)

Attachment A
Policy from MPS for Cole Harbour/Westphal

In 1989, Council approved an expansion to the Plan Area's Servicing Boundary as well as the establishment of the Development Boundary. This decision was undertaken to accommodate an additional 73 acres of land adjacent to Colby Village in the Atholea Drive/Astral Drive area, known as Colby South. This expansion is possible because population densities and peak sewage flows discharging from the Colby Village area are substantially less than the design values used in estimating sewage flow from this area in the 1985 Pollution Control Study. Inclusion of these lands within the serviceable area will have a positive effect on community form, and will improve service and road connections between Astral Drive and the Atholea Drive area.

To ensure that the capacity of the overall sewerage system is not negatively affected by inclusion of additional lands, expansion of the services to Colby South is being approved in two phases. The first phase to be included in the serviceable area, consists of 50 acres. The second phase of 23 acres is included within the Development Boundary. Council may approve an extension of services within the Development Boundary subject to a number of conditions being met.

Policy E-7

It shall be the intention of Council to establish a Development Boundary, as shown on Map 2, Servicing Boundaries. Notwithstanding Policy E-3 and in addition to Policy E-2, Council shall consider the extension of municipal services and the rezoning of Phase 2 of Colby South to R-1 (Single Unit Dwelling) Zone within this Development Boundary, without requiring an amendment to the Servicing Boundary, subject to the following conditions:

(a) that regular flow monitoring be conducted by the developer to verify that flows from Phase 15, Colby Village and Phase 1 Colby South are within predicted performance levels as identified in the 'Colby Village Sewer Flow Gauging Study, prepared by UMA Engineering Ltd. for Clayton Development Ltd. in 1988;

(b) that there is a road connection between Astral Drive and Parkway Drive;

(c) consideration of a report or reports from the appropriate provincial or federal agency or agencies indicating:

(i) whether there has been a significant negative effect on Bissett Lake and its outflows as a result of the development of phase 1, and
(ii) whether there has been careful adherence to the Environmental Construction Practice Specifications for the Province of Nova Scotia, dated September, 1981.

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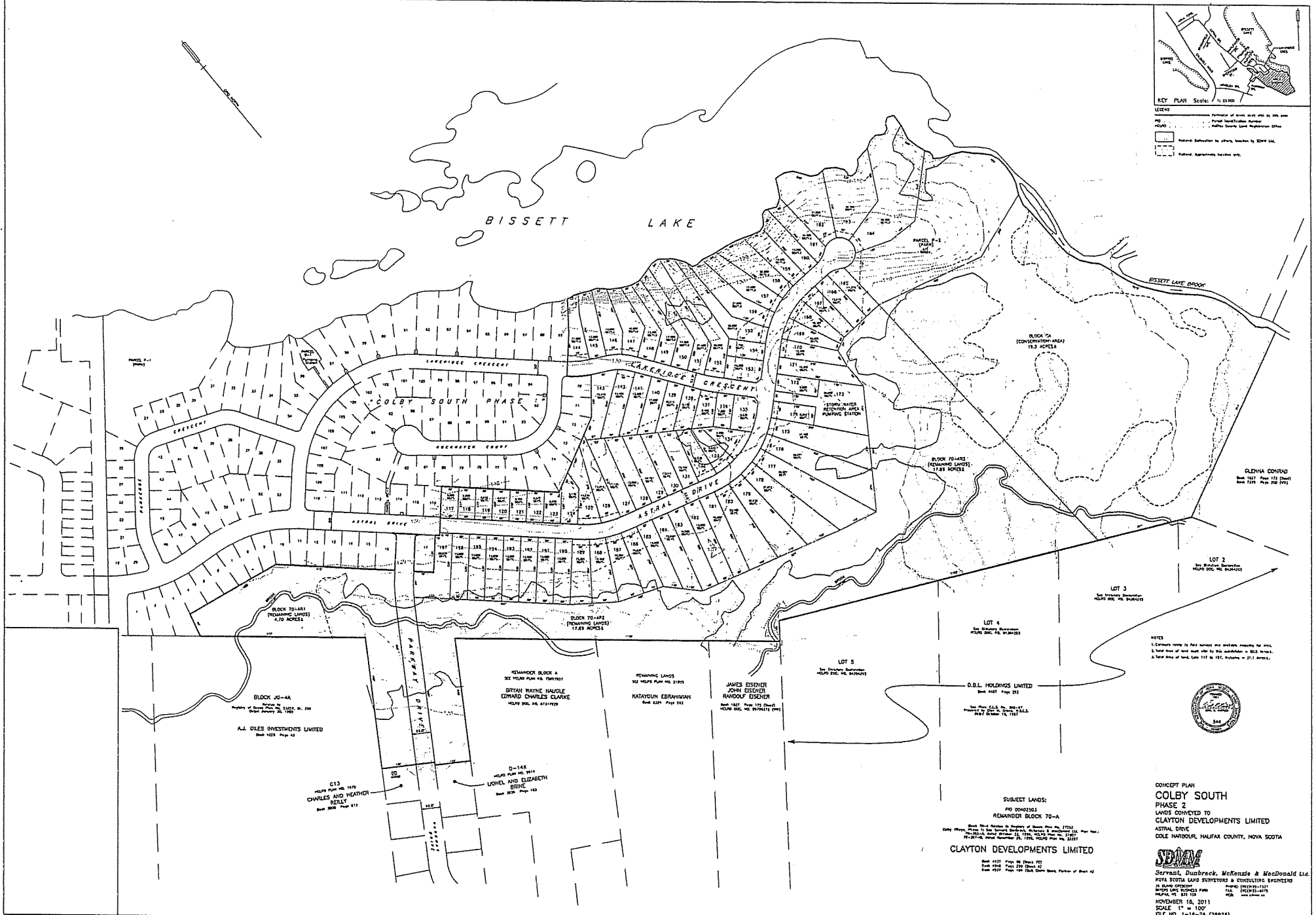

BISSETT LAKE
BISSETT LAKE BROOK
LAKERIDGE CRESCENT
COLBY SOUTH PHASE
ASTRAL DRIVE
BLOCK 70-A
(CONSERVATION AREA)
19.2 ACRES±
BLOCK 70-AR2
(REMAINING LANDS)
17.69 ACRES±
BLOCK 70-AR1
(REMAINING LANDS)
4.70 ACRES±
GLENHA CONRAD
LOT 2
LOT 3
LOT 4
LOT 5
D.B.L. HOLDINGS LIMITED
BLOCK JG-4A
A.J. GILES INVESTMENTS LIMITED
BRYAN WAYNE HAUGLE
EDWARD CHARLES CLARKE
KATAYOUN EBRAHIMIAN
JAMES EISENER
JOHN EISENER
RANDOLF EISENER
C13
CHARLES AND HEATHER REILLY
D-14A
LIONEL AND ELIZABETH BIRCH
SUBJECT LANDS:
PID 00402503
REMAINDER BLOCK 70-A
CLAYTON DEVELOPMENTS LIMITED
KEY PLAN
CONCEPT PLAN
COLBY SOUTH
PHASE 2
LANDS CONVEYED TO
CLAYTON DEVELOPMENTS LIMITED
ASTRAL DRIVE
COLE HARBOUR, HALIFAX COUNTY, NOVA SCOTIA
Servant, Dunbrack, McKenzie & MacDonald Ltd.
NOVEMBER 18, 2011
SCALE 1" = 100'
FILE NO. 1-16-7A (28028)
PLAN NO. 70-658-0

Attachment C: Correspondence from Stantec Consulting Ltd.

Stantec Consulting Ltd.
102 - 40 Highfield Park Drive
Dartmouth NS B3A 0A3
Tel: (902) 468-7777
Fax: (902) 468-9009

Stantec

April 13, 2011
File: Project No. 121612755.

Clayton Developments Limited
255 Lacewood Drive, Suite 100C
Halifax NS B3M 4G2

Attention: **Mr. Kevin Neatt**

Dear Mr. Neatt:

Reference: **Proposed Rezoning of Colby South Phase 2 Bissett Lake**

It is understood that as part of your application for rezoning of Phase 2 of Colby South Subdivision consideration must be given to federal or provincial reports indicating whether there has been careful adherence to the Environmental Construction Practice Specifications for the Province of Nova Scotia dated 1981, on the previous phase. Colby South Phase 1A was the last phase, constructed in 1996. To our knowledge there were no Provincial or Federal reports that addressed adherence to the Environmental Construction Practice Specifications for this project. Through the course of our construction inspection work at the site we can verify that environmental controls were in place and that to our knowledge there were no notable infringements of the Specifications. However, the work was completed 15 years ago and specific written verification is not available from that time.

If you have any questions, please do not hesitate to contact us at your convenience.

Sincerely,

STANTEC CONSULTING LTD.

Dan R. McQuinn, P.Eng.
Senior Principal
Tel: (902) 468-0425
dan.mcquinn@stantec.com

v:\1216\active\121612xxx\121612755 russell lake phase 4b\colby south phase 2 .doc

Attachment D: Correspondence from Stantec Consulting Ltd.

Stantec Consulting Ltd.
40 Highfield Park Drive, Suite 102
Dartmouth NS B3A 0A3
Tel. (902) 468-7777
Fax (902) 468-9009

Stantec

May 5, 2011
File: 121510799

Clayton Development Limited
255 Lacewood Drive, Suite 100C
Halifax, NS B3M 4G2

Attention: **Mr. Kevin Neatt**

Dear Mr. Neatt:

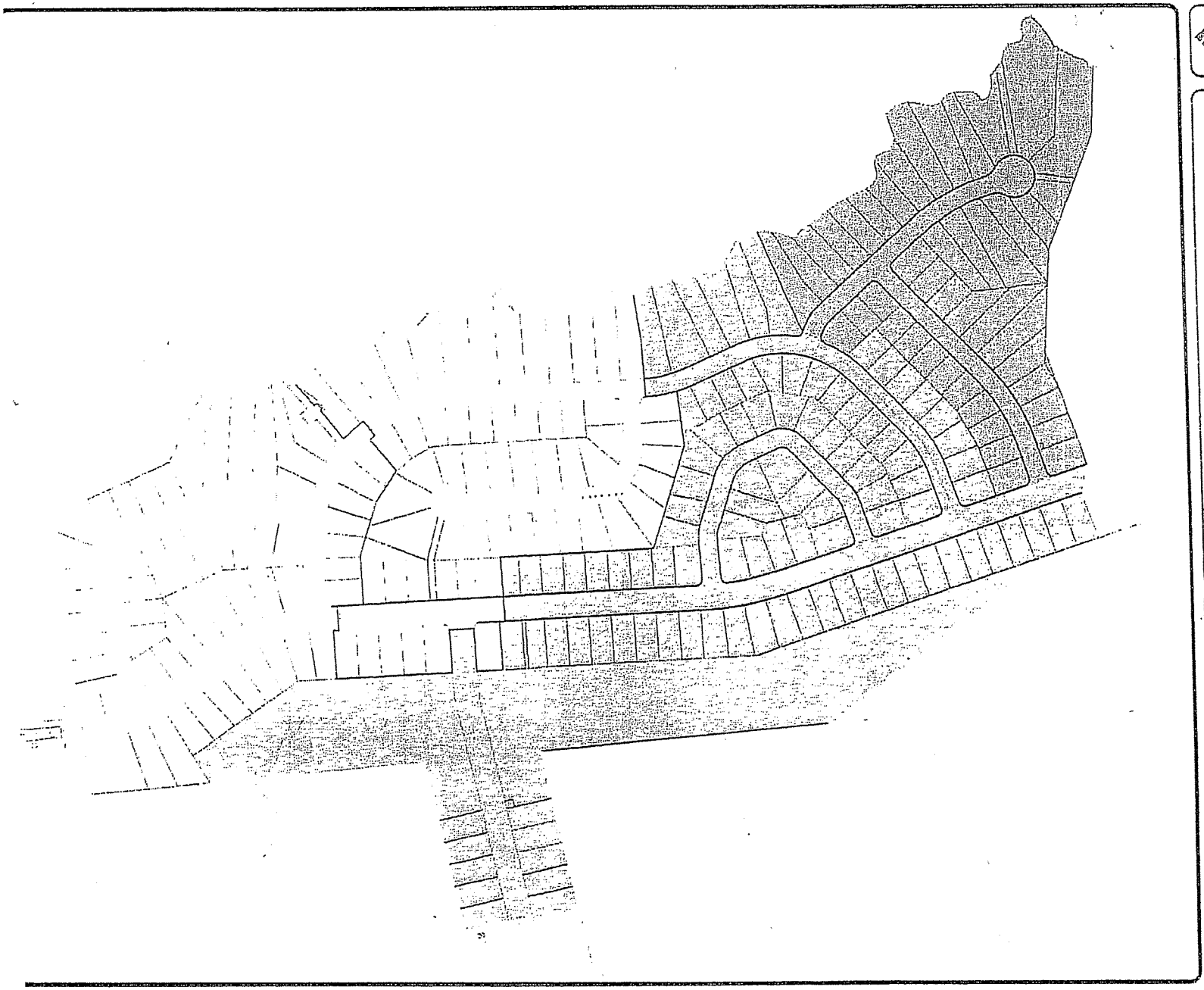
Reference: **Bissett Lake Water Quality Assessment**

Stantec Consulting Limited (Stantec) was contracted by Clayton Development Limited (Clayton) to review and interpret historical water quality data for Bissett Lake (Figure 1 attached) in respect to conditions pertaining to the re-zoning of property in the Colby South development. The property in question will be part of Phase 2 of the Colby South development. Prior to the re-zoning of the lands, Clayton is required to satisfy conditions outlined in the Cole Harbour/Westphal Municipal Planning Strategy.

The objective of the present report is to satisfy condition E-7 (c) (i) in the Planning Strategy which states:

> *Council shall consider the extension of municipal services and the rezoning of Phase 2 of Colby South within this development boundary, without requiring an amendment to the Servicing Boundary, subject to the following conditions:*
>
> *Consideration of a report or reports from the appropriate provincial or federal agency or agencies indicating:*
>
> *(i) Whether there has been a significant negative effect on Bissett Lake and its outflows as a result of the development of phase 1.*

Development surrounding Bissett Lake began in the early 1970s, with the completion of municipal infrastructure construction for sanitary service to Colby Village. Growth was rapid in the subsequent years with annual population increasing annually 19% between 1976-1980. The population growth rate slowed between the years 1987-1991 to 2.3%. Development began again in 1993 with the construction of Colby South Phase 1, a 50 acre development on the south-west shoreline of Bissett Lake that was completed in 1996 (K. Neatt, Clayton, pers comm. 2011). The proposed Colby South Phase 2 development will represent an additional 23 acres of developed land to the south of Phase 1.



Clayton

COMPLETED
YEAR 2 - 2012/2013
YEAR 3 - 2013/2014
YEAR 4 - 2014/2015

N

DRAWN BY:
CG

FILE
Colby South phasing plan Nov 2011.dw

SCALE
NTS

CREATION DATE
Jan 26, 2011

PROJECT
Colby South

DRAWING
Inventory
Delivery Plan
Jan. 2011

METHODOLOGY AND DATA ACQUISITION

Clayton, Stantec and the Sustainable Environment Management Office (SEMO) of the Halifax Regional Municipality (HRM) met to discuss the plan to satisfy condition E-7 (c) (i). From this meeting, specific water quality parameters were chosen to assess the effect on water quality. Archived data were compiled from HRM's archives, Nova Scotia Environment's library, as well as online data sources. Additional resources were received from HRM SEMO and all reports were reviewed for inclusion of any appropriate data for the analysis. The data were reviewed for the date of sample collection and location, chemical parameters, compatibility with data from other years for the same parameters, and completeness before being retained for analysis and graphical representations.

The most consistent parameters for which historical data for Bissett Lake could be identified for the time periods of interest included:

- Total Nitrogen
- Total Phosphorous
- Chlorophyll a
- pH
- Dissolved Organic Carbon
- Transparency (measured as Secchi water depth)
- Turbidity

The station most frequently sampled in Bissett Lake was located in the deepest water depths of the lake and where a surface water sample was generally taken. This station appears to be located more upstream to the Colby South Phase 1 development than downstream and therefore may not represent the most appropriate sampling location to assess the environmental effects of this development. Nevertheless, from the retained data for this deeper station, means of the surface water samples were calculated based on pre- and post-construction timeframes and the results are compared to appropriate guidelines from the Canadian Council of the Ministers of the Environment (CCME) *Guidelines for the Protection of Aquatic Life* (FAL), as well as the CCME *Recreational Water Quality Guidelines and Aesthetics*. The results of the water quality assessment are described in the following sections.

Water Quality

Water quality is loosely defined as the physical, chemical and biological characteristics of water and is relative to the requirements of biotic species and human needs. In this report, water quality will be assessed based on chemical components in relation to ecosystem health and physical parameters in relation to recreational uses.

Water Chemistry

The environmental effects of residential development on water chemistry tend to result in sedimentation, nutrient loading, increased cations and ions through stormwater drainage, and increased microbial activity.

Nutrients

Nutrient accumulation leads to an increase in primary productivity in the watercourse, resulting in increased algal and macrophyte growth. Continued unchecked growth of macrophytes and algae can lead to depleted oxygen levels in the depths of the watercourse when the decaying organic material decomposes. This reduction in oxygen at depth may result in increased mortality of fish species or the emigration of less tolerant species. High levels of nutrients were found in Bissett Lake prior to the development of Phase 1 as indicated in Tables 1 and 2 and Figures 2 and 3. Phosphorous levels monitored during the post-construction periods

remained similar to pre-construction levels, whereas Nitrogen concentrations increased in the post-construction period and more notably in the summer and fall. It should be noted that phosphorous is the limiting nutrient in freshwater environments. In general, nutrients remain elevated for a greater period of time in lentic (still water) systems than for lotic (moving water) systems based on the reduced flushing rates for the former. As the macrophytes and algae decay, the nutrients within the organisms are released back into the water or accumulate in the sediments, thus historical nutrient loading can result in increased plant growth even after the source is removed.

Table 1 Bissett Lake - Total Nitrogen Concentration

	Bissett Lake Deep Station - Total Nitrogen	
	Pre-Constuction 1990-1992	Post-construction 2006-2010
Mean (mg/L)	0.32	0.57
Range (mg/L)	0.2 - 0.5	0.14 - 2.00

Figure 2 Bissett Lake Deep Station - Total Nitrogen

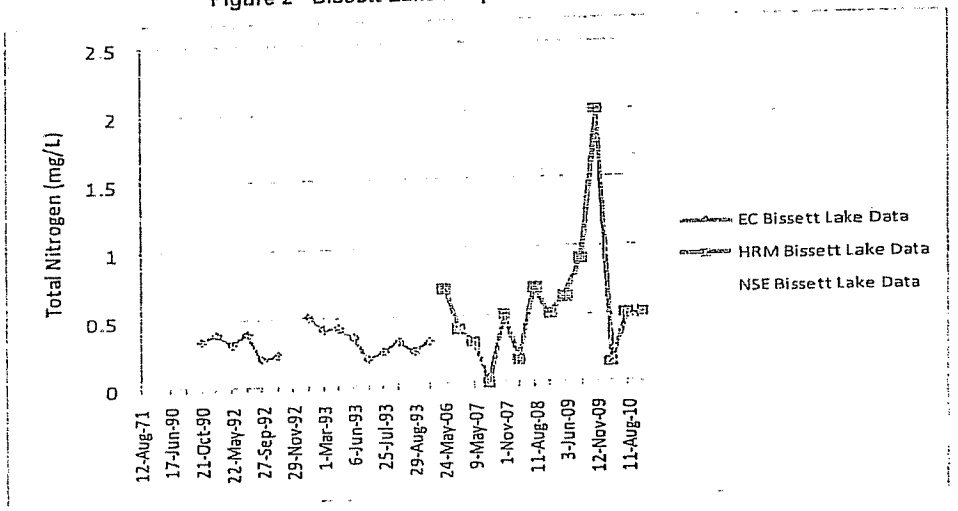
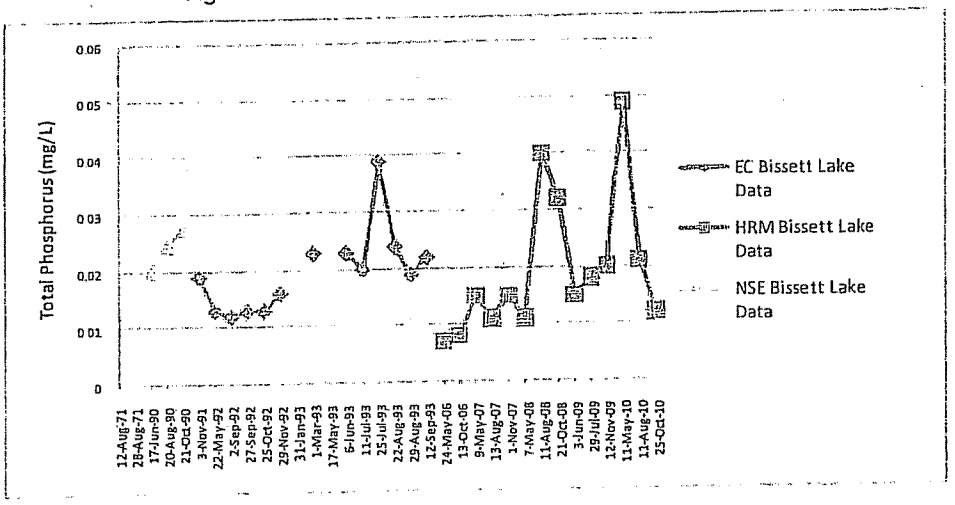


Table 2 Bissett Lake - Total Phosphorous Concentratio

Bissett Lake Deep Station - Phosphorous	Pre-construction 1990 - 1992	Post-construction 2006 - 2010
Mean (mg/L)	0.018	0.020
Range (mg/L)	0.012 - 0.0276	0.007 - 0.049

Figure 3 Bissett Lake Deep Station - Total Phosphorous



The quantities of phosphorous, chlorophyll *a*, and Secchi depth are the primary determinants of a lake's trophic state index (TSI). According to Carlson's Trophic Index published in 1996, a lake's trophic index may be used to make a rough estimate of its biological condition. Carlson's Trophic Index is one of the more commonly used trophic indices, and is the trophic index used by the United States Environmental Protection Agency. A lake is usually classified as being in one of three possible classes: *oligotrophic*, *mesotrophic* or *eutrophic*. Lakes with extreme trophic indices may also be considered *hyperoligotrophic* or *hypereutrophic*. The table below demonstrates how the calculated values translate into trophic classes

Table 3 Bissett Lake - Trophic State

Parameter	Pre-Construction 1990-1992		Post-construction 2006-2010	
	Trophic Index	Trophic State	Trophic Index	Trophic State
Chlorophyll a	47	Mesotrophic	54	Eutrophic
Phosphorous	45	Mesotrophic	47	Mesotrophic
Secchi Depth	55	Eutrophic	43	Mesotrophic

This trophic index is based solely on the concentration of phosphorous in the watercourse and based on the CCME guidance framework, Bissett Lake remained mesotrophic pre- and post-construction.

Based on Carlson's TSI and CCME trophic states, Bissett Lake's trophic state can be classified as mesoeutrophic before and after construction of Colby South Phase 1. A mesoeutrophic lake is one in which the limit for nutrient input has been reached or slightly exceeded. The water is commonly clear or slightly turbid with beds of submerged and emergent aquatic macrophytes; algal blooms may be present within the late summer months when annual water temperatures are the highest. Hypoxic zones may be present at depth caused by the deterioration of the aquatic macrophytes.

pH

In Bissett Lake, the pH remained stable throughout the pre- and post-construction period (Figure 4). One outlier was present in the HRM data set. The sample, taken on August 11, 2008, measured 8.94 which is more than ten times more alkaline than samples taken in May and October of the same year. Using the complete dataset, pH increased slightly from pre- to post-construction, though the lake waters remain neutral, whereas removing the outlier, pH remains similar in the pre- and post-construction periods. The pre- and post-construction mean and range for pH are provided in Table 4.

Figure 4 Bissett Lake Deep Station – pH

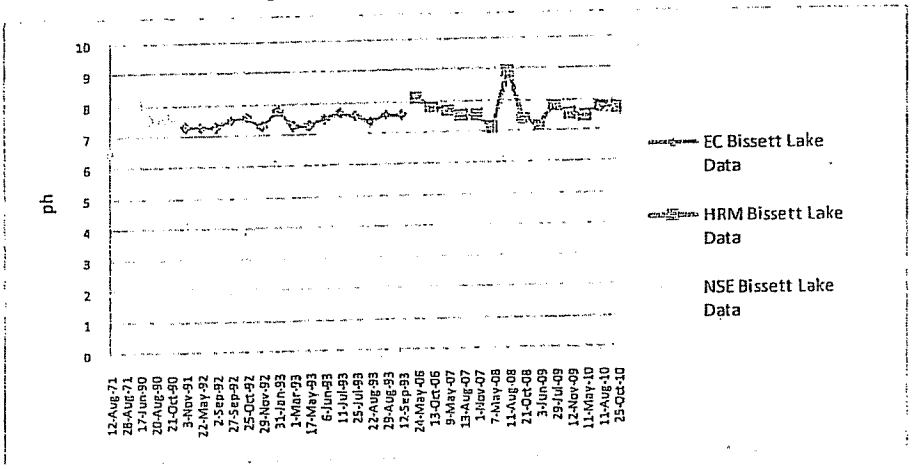


Table 4 Bissett Lake - pH

	Bissett Lake Deep Station - pH	
	Pre-Constuction 1990 - 1992	Post-construction 2006 - 2010
Mean (pH units)	7.48	7.70
Range (pH units)	7.3 - 8.0	7.14 - 8.94

Dissolved Salt Concentrations

Current Bissett Lake salt concentrations resemble pre-construction values. Sodium values are slightly elevated while chloride values are slightly lower than pre-construction values. Sodium and Chloride means and ranges for both the pre- and post-construction periods are presented in Tables 5 and 6. Specific conductivity (the measure of electrical conductance through water) increases with salt levels and post-construction means are slightly elevated. Salt concentrations and conductivity peak during the spring months when the snow melt releases the road salt and sediment accumulated from the winter months into Bissett Lake. These spring peaks are evident in the post-construction monitoring period of conductivity presented in Figure 5. Salt concentrations have the ability to diminish pH in Bissett Lake through the deterioration of alkalinity stores and the subsequent loss of buffering capacity. As illustrated in Figure 4, Bissett Lake's alkalinity concentration remains stable in the post-construction monitoring period, resulting in a watercourse remaining neutral pH.

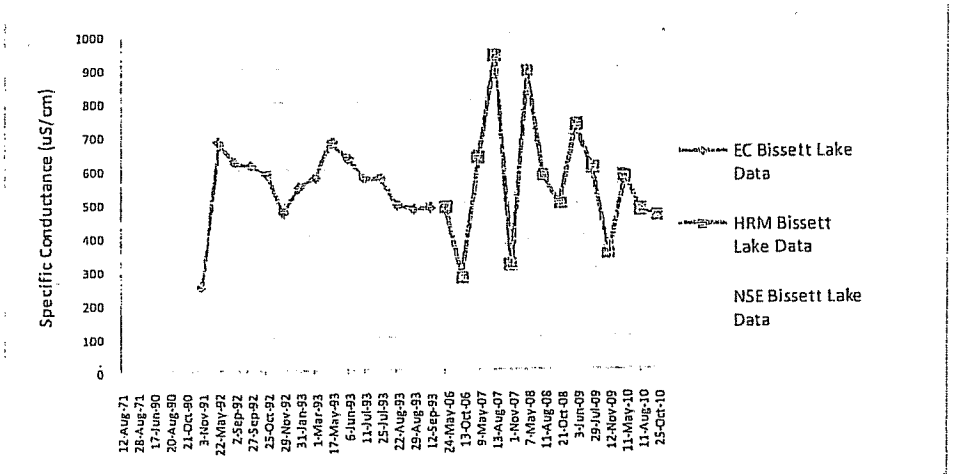
Table 5 Bissett Lake - Sodium

	Bissett Lake Deep Station - Sodium	
	Pre-Construction 1990-1992	Post-construction 2006-2010
Mean (mg/L)	83	93
Range (mg/L)	38 - 113	42 - 150

Table 6 Bissett Lake - Chloride

	Bissett Lake Deep Station - Chloride	
	Pre-Construction 1990-1992	Post-construction 2006-2010
Mean (mg/L)	135	122
Range (mg/L)	68 - 190	54 - 220

Figure 5 Bissett Lake Deep Station - Conductivity



Aesthetics

Parameters assessed for aesthetics purposes include those parameters which would reduce the recreational desire of Bissett Lake These parameters include Dissolved Organic Carbon (DOC) which in high concentrations gives water a brown tea-stained color, and transparency obtained through Secchi water depth measurements. Secchi depth measurements are an efficient method to assess water transparency for changes in turbidity and color as an increase in either results in lower transparency and decreased Secchi depths. Bacteria levels could not be retained for analysis because pre-construction levels were not measured.

Dissolved Organic Carbon

Concentrations of DOC increased in Bissett Lake compared to pre-construction levels (Table 7). The increase in DOC can be explained through the decomposition of macrophytes. DOC is generated from the decomposition of organic material and in the case of Bissett Lake, the DOC most likely originates from the decomposition of aquatic macrophytes. DOC is comprised of low molecular weight compounds such as amino acids and carbohydrates, as well as higher molecular weight compounds termed Humic substances High concentrations of Humic substances give water a characteristic brown tea colour.

Table 7 Bissett Lake - Dissolved Organic Carbon

	Bissett Lake Deep Station - Dissolved Organic Carbon	
	Pre-Constuction 1990-1992	Post-construction 2006-2010
Mean (ug/L)	2.81	4.50
Range (ug/L)	2.3 - 4.5	2.0 - 6.9

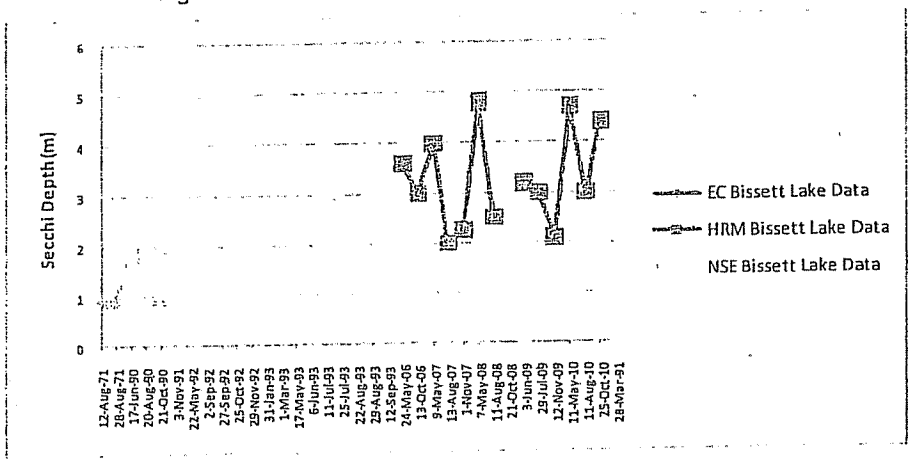
Water Transparency

Transparency of the water in Bissett Lake, a measured by the water depth at which a Secchi Disk disappears from view, has increased from pre-construction levels. Transparency data were taken from Hellenbrand and Dalziel (1992). The mean Secchi depth for the years surveyed is provided in Table 8. During the years 1976-1977, the construction of Colby Village proper was underway and the transparency was reduced during this time, with recorded levels averaging 0.7 m and 0.8 m respectively. The Secchi depth averages and ranges in Table 8 do not include these results in the calculation of the pre-construction mean or range.

Table 8 Bissett Lake - Water Transparency

	Bissett Lake Deep Station - Secchi Depth	
	Pre-Constuction 1990-1991	Post-construction 2006-2010
Mean (m)	1.64	3.2
Range (m)	0.96 - 2.8	2.0 - 4.8

Figure 6 Bissett Lake Deep Station – Water Transparency



Summary

The results provided in this report represent the findings of the best available data at this time. Overall water quality within Bissett Lake does not appear to have been significantly affected during the period of construction of Colby South Phase 1. Based on the available data, the concentration of Nitrogen in the water has increased. Phosphorous concentrations appear to be stable and the overall Trophic State Index has remained mesoeutrophic during pre- and post-construction periods. The pH remained neutral, though may be slightly more basic than the pre-construction period, but this is not an indicator of poor water quality. In contrast, the trend in many other Nova Scotia watercourses is waters are becoming more acidic and fish habitat is being degraded.

Aesthetically, Bissett Lake appears to suffer from many of the common traits of mesoeutrophic lakes. That is excessive aquatic plant growth, high algal productivity, intense water color and poor water clarity. Many of these traits were observed prior to the development of Phase 1 of Colby South, and it appears that water clarity has improved over the pre-construction period. Bissett Lake in the 1970s was even considered eutropic because it was receiving biologically significant amounts of nutrients in 1971 (MAPC 1972) and contained low transparency (low Secchi disk readings of 0.6 m) that appeared to be a result of dense algal growth and suspended sediment concentrations, with the latter originating in streams draining the Forest Hills/Colby Village area that entered the lake (Gordon 1977). In summary, Bissett Lake has a history of inputs resulting in poor water quality and trophic state pre-development of Colby South Phase 1 and in general a result of development in the watershed of the Colby Village area. Since then and post-development of Colby South Phase 1 and after 1996, Bissett Lake has improved for some water quality parameters such as water transparency, but still has some similar levels to pre-development for other water quality parameters that suggest continued contributions from runoff and input from streams and tributaries.

References

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Closure

This report was undertaken exclusively for the purpose outlined herein and was limited to the scope and purpose specifically expressed in this report and the referenced documents. This report cannot be used or applied under any circumstances to another location or situation or for any other purpose without further evaluation of the data and related limitations Any use of this report by a third party, or any reliance on decisions made based upon it, are the responsibility of such third parties. Stantec Consulting, Ltd. (Stantec) accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report

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This report represents the best professional judgment of Stantec personnel available at the time of its preparation. Stantec reserves the right to modify the contents of this report, in whole or in part, to reflect any new information that becomes available. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

This report was prepared by Matt Steeves, B.Sc. and reviewed by Sam Salley, M.Sc. Should you have any questions, please do not hesitate to contact the undersigned or Sam Salley at (902) 468-7777.

Sincerely,

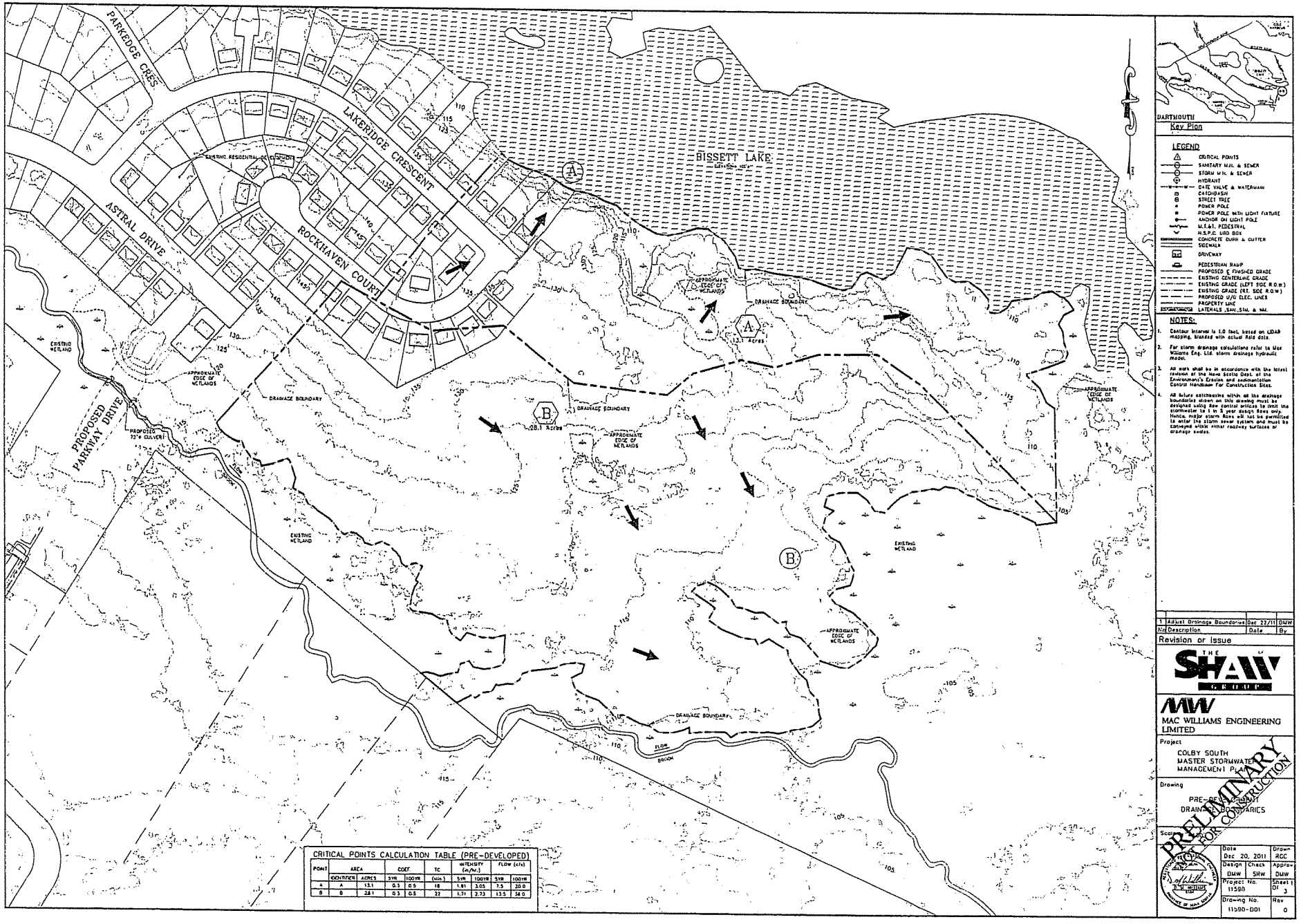
STANTEC CONSULTING LTD.

ORIGINAL SIGNED BY

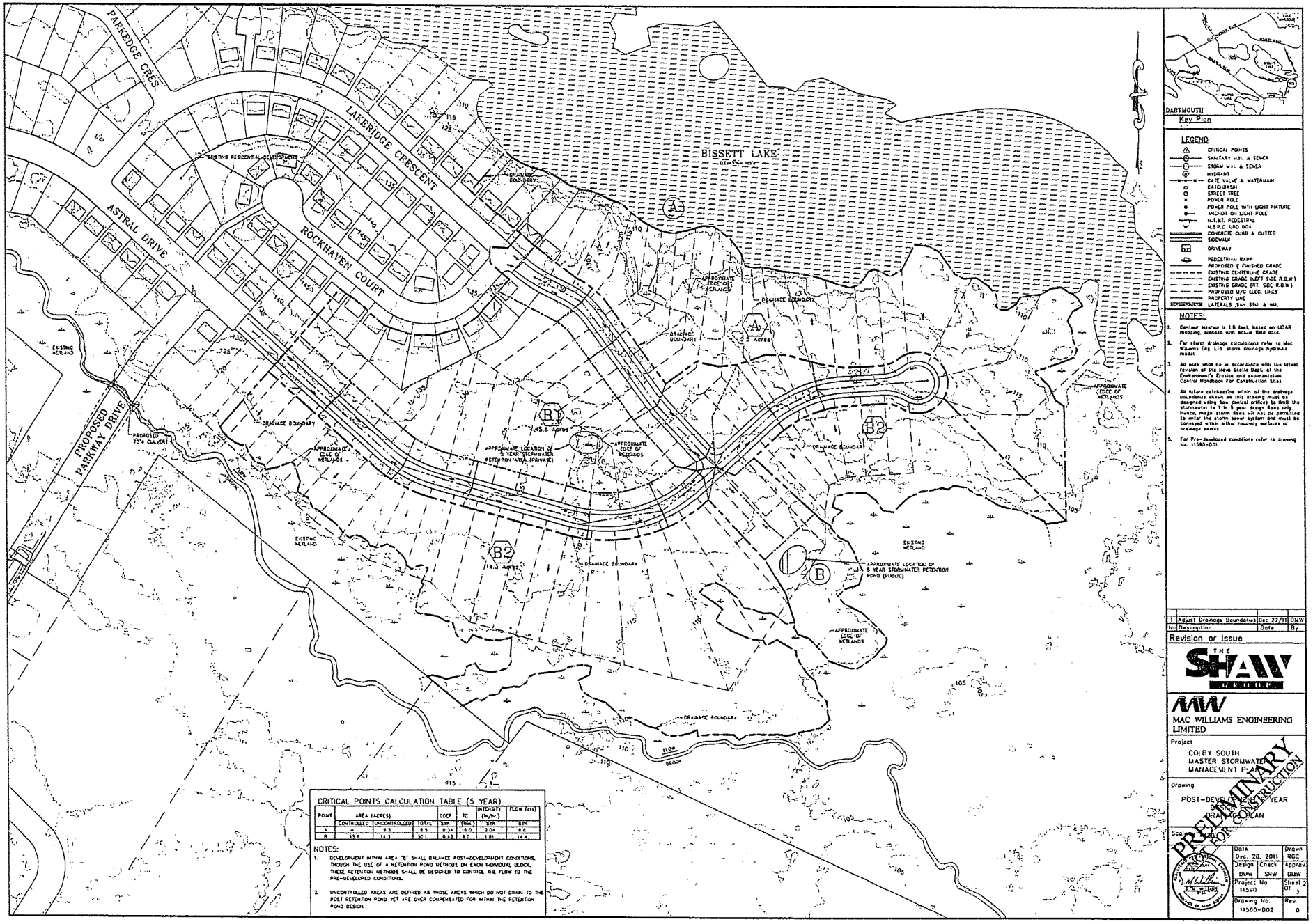
Matt Steeves, B.Sc.
Aquatic Scientist

Attachment 2

Colby South Phase II Stormwater Management Plan- Sheet 1, Pre-development



Colby South Phase II Stormwater Management Plan- Sheet 2, Post-development, 5 Year Event



NOTES:

1. Contour interval is 1.0 feet, based on LIDAR mapping, blended with actual field data.
2. For storm drainage calculations refer to Mac Williams Eng. Ltd. storm drainage hydraulic model.
3. All work shall be in accordance with the latest revision of the Nova Scotia Dept. of the Environment's Erosion and sedimentation Control Handbook For Construction Sites
4. All future catchbasins within all the drainage boundaries shown on this drawing must be designed using flow control orifices to limit the stormwater to 1 in 5 year design flows only. Hence, major storm flows will not be permitted to enter the storm sewer system and must be conveyed within other roadway surfaces of drainage swales.
5. For Pre-developed conditions refer to drawing No. 11590-001

CRITICAL POINTS CALCULATION TABLE (5 YEAR)

POINT	AREA (ACRES)			C COEF	TC (MIN.)	INTENSITY (in/hr.)	FLOW (cfs)
	CONTROLLED	UNCONTROLLED	TOTAL	5YR		5YR	5YR
A	-	9.5	9.5	0.34	16.0	2.04	8.6
B	15.8	14.3	30.1	0.43	8.0	1.81	14.4

NOTES:

1. DEVELOPMENT WITHIN AREA "B" SHALL BALANCE POST-DEVELOPMENT CONDITIONS, THOUGH THE USE OF A RETENTION POND METHODS ON EACH INDIVIDUAL BLOCK. THESE RETENTION METHODS SHALL BE DESIGNED TO CONTROL THE FLOW TO THE PRE-DEVELOPED CONDITIONS.
2. UNCONTROLLED AREAS ARE DEFINED AS THOSE AREAS WHICH DO NOT DRAIN TO THE POST RETENTION POND YET ARE OVER COMPENSATED FOR WITHIN THE RETENTION POND DESIGN.

No	Description	Date	By
1	Adjust Drainage Boundaries	Dec 22/11	DMW

Revision or Issue

THE SHAW GROUP

MAC WILLIAMS ENGINEERING LIMITED

Project: COLBY SOUTH MASTER STORMWATER MANAGEMENT PLAN

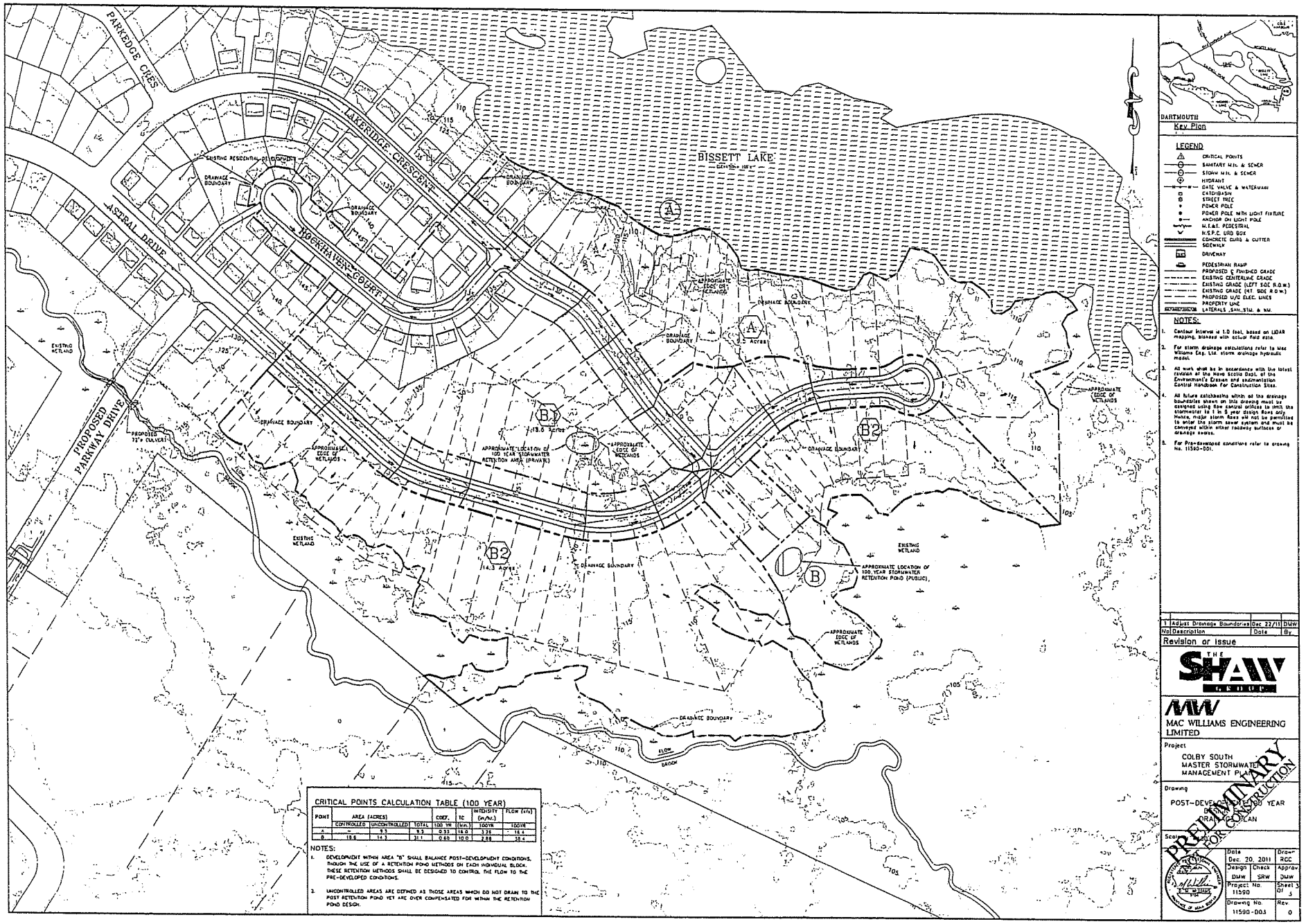
Drawing: POST-DEVELOPMENT 5 YEAR DRAINAGE PLAN

Scale: 1:1000

PRELIMINARY NOT FOR CONSTRUCTION

Date: Dec. 20, 2011			Drawn: RCC
Design	Check		Approv
DMW	SHW		DMW
Project No. 11590			Sheet 2 Of 3
Drawing No. 11590-002			Rev. 0

Colby South Phase II Stormwater Management Plan- Sheet 3, Post-development, 100 Year Event



CRITICAL POINTS CALCULATION TABLE (100 YEAR)

POINT	AREA (ACRES)			COEF.	TC	INTENSITY (mm/hr.)	FLOW (m³/s)
	CONTROLLED	UNCONTROLLED	TOTAL	100 YR	(Min.)	100YR	100YR
A	-	9.2	9.2	0.33	16.0	126	10.4
B	16.6	14.5	31.1	0.60	10.0	178	30.4

NOTES:

1. DEVELOPMENT WITHIN AREA "B" SHALL BALANCE POST-DEVELOPMENT CONDITIONS, THROUGH THE USE OF A RETENTION POND METHODS ON EACH INDIVIDUAL BLOCK. THESE RETENTION METHODS SHALL BE DESIGNED TO CONTROL THE FLOW TO THE PRE-DEVELOPED CONDITIONS.
2. UNCONTROLLED AREAS ARE DEFINED AS THOSE AREAS WHICH DO NOT DRAIN TO THE POST RETENTION POND YET ARE OVER COMPENSATED FOR WITHIN THE RETENTION POND DESIGN.

Key Plan

LEGEND

- CRITICAL POINTS
- SANITARY MH. & SEWER
- STORM MH. & SEWER
- HYDRANT
- GATE VALVE & WATERMAIN
- CATCHBASIN
- STREET TREE
- POWER POLE
- POWER POLE WITH LIGHT FIXTURE
- ANCHOR OR LIGHT POLE
- M.E.&T. PEDESTRAL
- N.S.P.C. U/G BOX
- CONCRETE CURB & GUTTER
- SIDEWALK
- DRIVEWAY
- PEDESTRIAN RAMP
- PROPOSED C FINISHED GRADE
- EXISTING CENTERLINE GRADE
- EXISTING GRADE (LEFT SIDE R.O.W.)
- EXISTING GRADE (RT. SIDE R.O.W.)
- PROPOSED U/G ELEC. LINES
- PROPERTY LINE
- LATERALS SAN.,STM. & WM.

NOTES:

1. Contour interval is 1.0 foot, based on LIDAR mapping, blended with actual field data.
2. For storm drainage calculations refer to Mac Williams Eng. Ltd. storm drainage hydraulic model.
3. All work shall be in accordance with the latest revision of the Nova Scotia Dept. of the Environment's Erosion and sedimentation Control Handbook for Construction Sites.
4. All future catchbasins within all the drainage boundaries shown on this drawing must be designed using flow control orifices to limit the stormwater to 1 in 5 year design flows only. Hence, major storm flows will not be permitted to enter the storm sewer system and must be conveyed within either roadway surfaces or drainage swales.
5. For Pre-developed conditions refer to drawing No. 11590-001.

No	Description	Date	By
1	Adjust Drainage Boundaries	Dec 22/11	DUW

Revision or Issue

THE SHAW GROUP

MAC WILLIAMS ENGINEERING LIMITED

Project: COLBY SOUTH MASTER STORMWATER MANAGEMENT PLAN

Drawing: POST-DEVELOPMENT 100 YEAR DRAINAGE PLAN

PRELIMINARY FOR CONSTRUCTION

Date	Drawn
Dec. 20, 2011	RCC
Design: DUW	Check: SRW	Approv: DUW
Project No. 11590	Sheet 3 Of 3
Drawing No. 11590-003	Rev. 0