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Item No. Info Item 2
North West Community Council
April 17, 2023

TO: Chair and Members of North West Community Council

SUBMITTED BY: [redacted]

Denise Schofield, Acting Chief Administrative Officer

DATE: April 12, 2022

SUBJECT: **Bedford West Water Quality Status Update - 2022**

INFORMATION REPORT

ORIGIN

Bedford Municipal Planning Strategy, Bedford West Secondary Planning Strategy, Policies BW-3, BW-4, and BW-5.

Development Agreements between the Halifax Regional Municipality and West Bedford Holdings Ltd, and between Halifax Regional Municipality and Cresco Ltd.

LEGISLATIVE AUTHORITY

The *Halifax Regional Municipality Charter*, Part VIII, Planning and Development, Section 240, Development Agreements.

BACKGROUND

The Bedford West area is one of three areas designated as existing growth areas under the Regional Plan for serviced development (municipal water and wastewater systems). The Bedford West area is approximately 1,052 hectares (2,600 acres) in size and located on the west side of the Bicentennial Highway, in the vicinity of Hammonds Plains Road and Kearney Lake Road. In 2006, the Bedford West Secondary Planning Strategy (BWSPS) was adopted with the policy directive to enabling new mixed-use communities with care being taken to ensure the design of new neighbourhoods was done with consideration being given to the natural environment. Figure 1 illustrates the areas encompassed by the BWSPS. Sub Areas 2 to 9 have approved development agreements and are either constructed or under construction. Sub Areas 1, 10 and 12 are Special Planning Areas under the *Housing in the Halifax Regional Municipality Act.*

Policy BW-3 of the BWSPS requires a water quality monitoring program to be undertaken for the Paper Mill Lake watershed to track the eutrophication process. Eutrophication is the process of nutrient enrichment in lakes. This process can happen naturally, through the accumulation of biological material. However, the eutrophication process is often accelerated through the impacts of human activities contributing excess

nutrients to a lake, typically through the application of chemical fertilizers, and through land disturbances as a result of the development process. This results in relatively rapid changes in trophic state, from lower states (fewer nutrients) to higher states (more nutrients), with corresponding changes in appearance, functional uses, and amenity values.

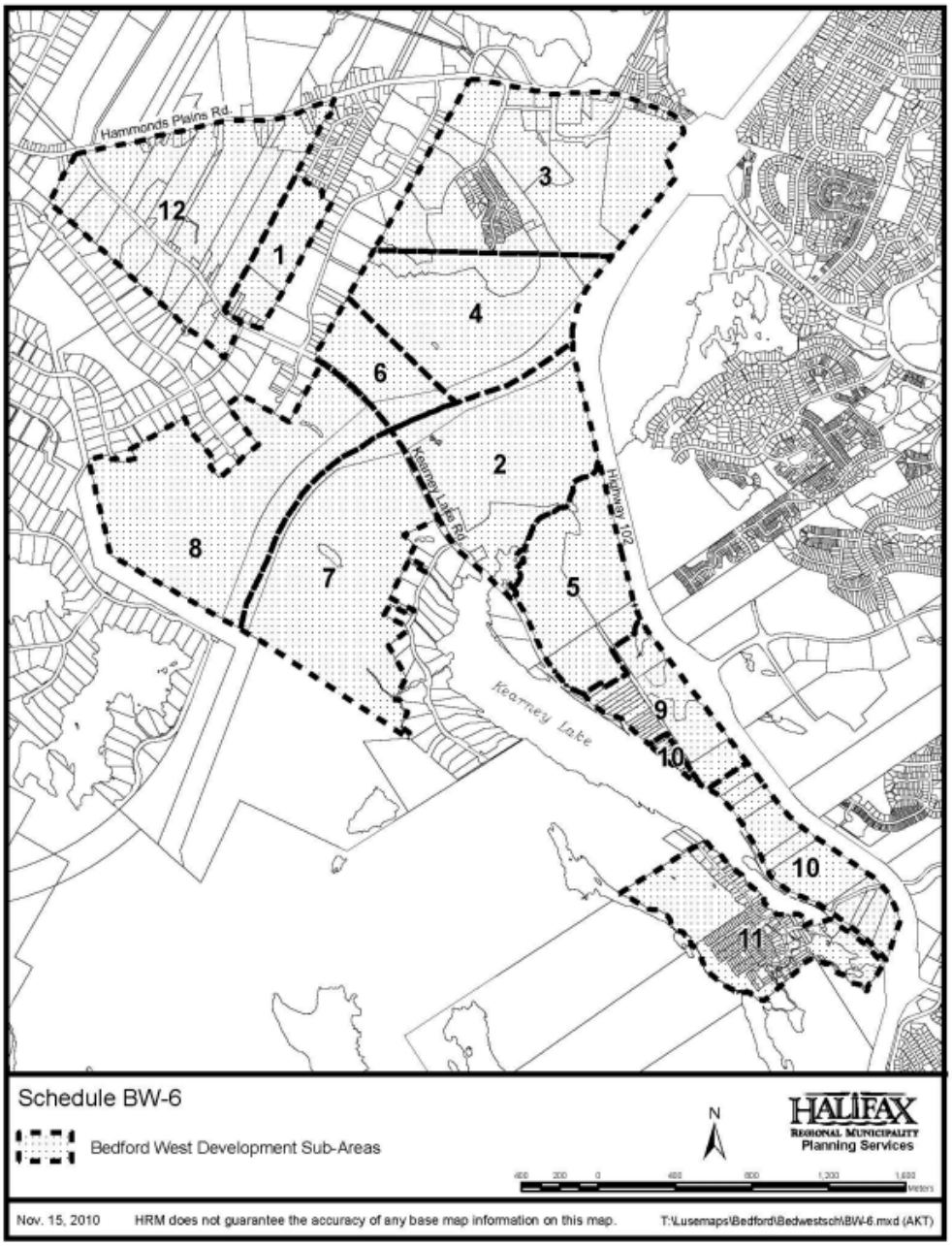

Figure 1: Sub Areas identified under the Bedford West Secondary Planning Strategy

The water quality monitoring program was specified in the BWSPS in response to the Municipality's statement "that best management practices may be needed both during development and afterward to

maintain water quality in the lakes" and "that a water quality monitoring program be established on lakes throughout the watershed" as published in the BWSPS in 2006.[1]

The terms of the monitoring program are specified within the Development Agreements that have been negotiated in consultation with the former Bedford Watershed Advisory Board (Sub Areas 1-9). This board was dissolved in 2013 and replaced with the broader Regional Watersheds Advisory Board (RWAB). All development agreements for the Beford West subdivision negotiated since 2013 have been negotiated instead in consultation with RWAB.

All such Development Agreements have identified the value of 10 micrograms per litre (µ/L) of total phosphorus (TP) as a "trigger value," representing the transition point between the second-lowest trophic state (oligotrophic) to the next-highest trophic state (mesotrophic) per Environment Canada Criteria (*Table 1*).

Table 1: Summary of Canadian trophic status trigger ranges. Environment Canada (2004).

Trophic Status	TP (µ/L)
Ultra-oligotrophic	< 4
Oligotrophic	4-10
Mesotrophic	10-20
Meso-eutrophic	20-35
Eutrophic	35-100
Hyper-eutrophic	> 100

Threshold values for acceptable *E. coli* concentration under the terms of the Bedford West Development Agreements conform to Health Canada's Guidelines for Canadian Recreational Water Quality.[2] Threshold values for other parameters monitored under the terms of the Bedford West Development Agreements conform to Canadian Council of Environment Ministers (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life.[3]

In accordance with the terms for the Bedford West development agreements, the Municipality is required to submit test results to the Developer, the North West Community Council (NWCC), and RWAB within three months of being received from the consultant, or immediately, if TP or bacterial results exceed management thresholds identified therein (Attachment B). According to Policy BW-5 under the Bedford West SPS,

> In the event that water quality threshold levels, as specified under clause (c) of Policy BW-3, for Paper Mill Lake of Kearney Lake are reached, the Municipality shall undertake an assessment and determine an appropriate course of action respecting watershed management and future land use development in the area. An assessment shall consider the CCME guidelines. Water quality thresholds and any assessment reports shall be made available to the public.

[1] The Bedford West Secondary Planning Strategy can be found online here: THE BEDFORD WEST SECONDARY PLANNING STRATEGY.pdf (halifax.ca)
[2] Health Canada's Guidelines for Canadian Recreational Water Quality can be found online here: Guidelines for Canadian Recreational Water Quality – Third Edition - Canada.ca
[3] CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life can be found online here: Resources | CCME

In cases where an exceedance is noted, staff can request confirmation testing and corrective action by the developer. Further assessments and corrective actions being undertaken by staff are described in the discussion section of this report.

DISCUSSION

The purpose of this report is to share the results of the water quality monitoring program in the Paper Mill Lake watershed undertaken as part of the Bedford West Development Agreements from 2019 through 2022. Staff acknowledge the gap in reporting and will resume reporting on the schedule outlined in the Development Agreements going forward.

Summary results from 2019-2022 are included as Attachment A. Detailed information for Bedford West 2019-2022 Water Quality results is posted publicly on the HRM Lakes & Rivers webpage.

It is clear from the results that phosphorus levels are repeatedly exceeding the guideline values set under the Bedford West Development Agreements. A slight upward trend in phosphorus concentration can be observed at all sampling locations, but in general exceedances tend to fall within a relatively narrow range below 70µg/L. It should be noted that this is 60µg/L above the trigger value stated in the Development Agreement. In the future, trends observed in this sampling program should be compared with the results of water quality data collected as part of the LakeWatchers program for an overall picture of trends in phosphorus concentrations in the lakes over time.

As noted in the Background section of this report, the Bedford West Development Agreements stipulate results be reported within three months, or immediately to the developer, RWAB, and NWCC at the next scheduled meeting. This provision assumes that development activity bears relation to the test results. Research done by the Centre for Water Resource Studies[4] in the Paper Mill Lake Watershed has since pointed out that site-specific changes in water quality identified from lake sampling cannot be attributed to a single source, and further has recommended that individual developments should not be regulated based on trophic state indicators in a lake. Some reasons for this are:

1. Development-derived surface water contamination tends to originate from non-point sources, for example contamination tends to come from overland water flow across an entire site rather than from a single discharge pipe into a lake.

2. In-lake phosphorus, while easily measured, cannot be traced back to a single source. For example, phosphorus released by decomposing plant material in a lake cannot be differentiated analytically from phosphorus released by sediment flowing into a lake from a development site.

Through the sampling program undertaken in 2019-2022 inclusive, the developer has been notified of the exceedances observed during sampling events. These exceedances are summarized in the attachments to this report. Specific corrective actions are not being recommended by staff at this time, as the exceedances cannot be directly attributed to development activities.

To address the requirements of BWSPS Policy BW-5[5] moving forward, staff are taking a combination of approaches to monitoring and managing development impacts on water systems. Water quality data collected under this program and through other programs underway in the area subject to the Bedford West Development Agreements is being considered collectively to assess current watershed health and lake

[4] Presentation by Rob Jamieson, Ph.D., P.Eng., entitled “Phosphorus Loading and Trophic State Assessment in the Paper Mill Lake Watershed”, North West Community Council, November 15. 2016. The presentation can be found online here: https://legacycontent.halifax.ca/Commcoun/central/documents/161115nwcc1131pres.pdf.

[5] Policy BW-5 states: In the event that water quality threshold levels, as specified under clause (c) of Policy BW-3, for Paper Mill Lake of Kearney Lake are reached, the Municipality shall undertake an assessment and determine an appropriate course of action respecting watershed management and future land use development in the area. An assessment shall consider the CCME guidelines. Water quality thresholds and any assessment reports shall be made available to the public.

trophic status. Staff are using this information to inform future development approvals, and to develop a watershed management framework for the entire municipality, A description of these programs is below.

Development with the potential to affect lakes is being monitored as part of the Lake Watchers baseline water quality monitoring program. This program samples 76 lakes in the municipality semi-annually and reports the results against CCME thresholds. An example of this is the development underway at the former Penhorn Mall, upslope from Penhorn Lake.

A specific management plan for Kearney Lake, one of two primary lakes sampled under this program, was requested by Regional Council. A report recommending remediation actions was presented to Regional Council on August 23, 2022,[6] and the recommendations put forward by staff in the report were accepted by Regional Council at that time. Staff are currently working to complete the recommended remediation, including sourcing designs to install floating treatment wetlands in Kearney Lake to lower the concentration of phosphorus in the water column.

In addition, staff are developing a framework for improved watershed-level management at the request of Regional Council. In coordination with the Green Network Plan and Regional Plan, this framework will support proactive protection of aquatic ecosystems and set water quality targets for managing land-based activities affecting water quality, aquatic and riparian ecosystems, and water resources. This framework will seek to manage collective land-use impacts on a watershed scale, in alignment with the terms of Policy BW-5 as quoted above.

The first monitoring event for 2023 will be conducted in May, with subsequent sampling events taking place in August and October. Results will be reported within three months of their receipt by staff, as per the conditions stated in the development agreements.

FINANCIAL IMPLICATIONS

There are no financial implications for this report.

COMMUNITY ENGAGEMENT

No community engagement was required for this report.

ATTACHMENTS

Attachment A: Summary - Bedford West Water Quality Status Update

Attachment B: Excerpt - Terms for Water Quality Monitoring under the Bedford West Development Agreements

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A copy of this report can be obtained online at halifax.ca or by contacting the Office of the Municipal Clerk at 902.490.4210.

Report Prepared by: Elizabeth Montgomery, Water Resources Specialist, Environment & Climate Change, Property, Fleet & Environment, 902.943.1954

[6] The staff report can be found online here: Kearney Lake and Little Kearney Lake Management Plan - Aug 23/22 Regional Council | Halifax.ca

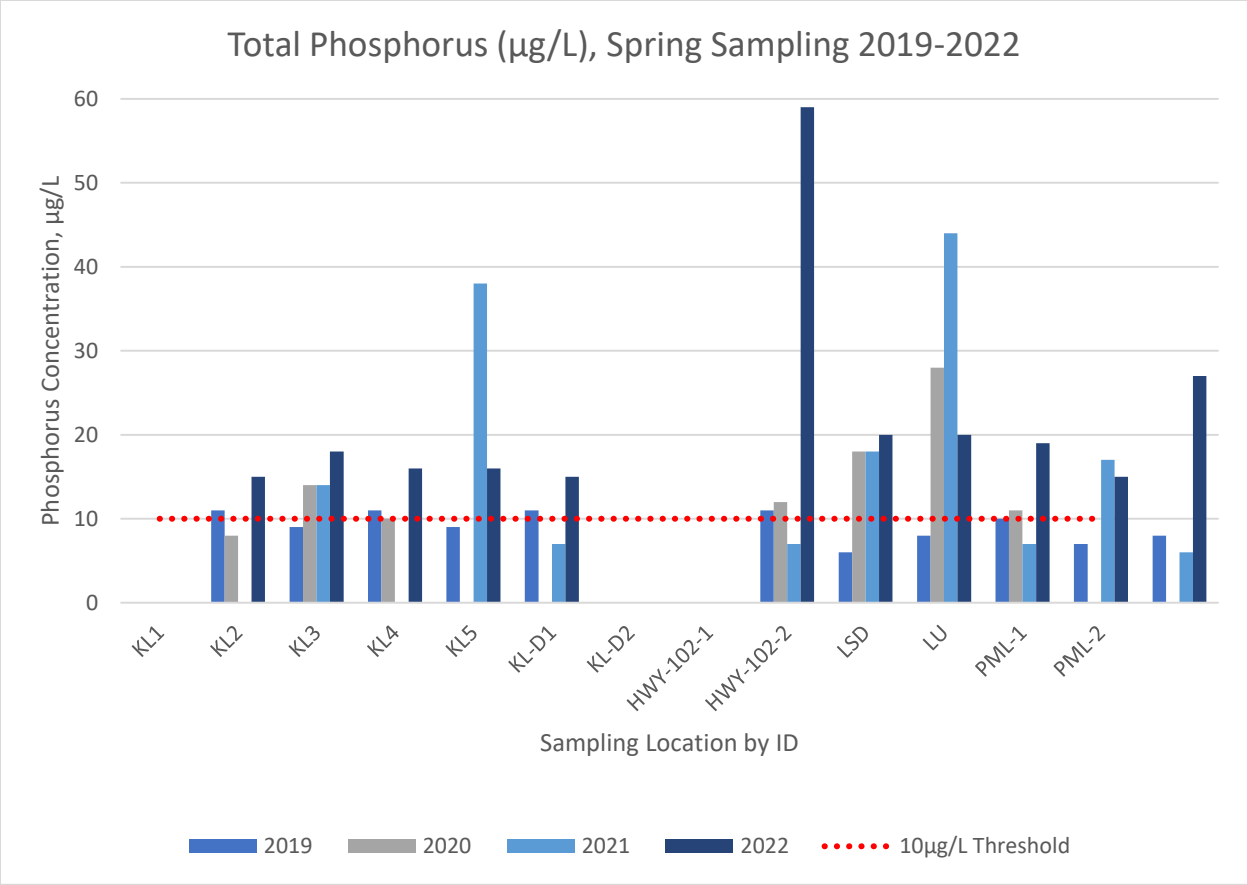

Figure 1: Total Phosphorus Concentrations from the Bedford West Water Quality Monitoring Program, Spring Sampling Events, 2019-2022

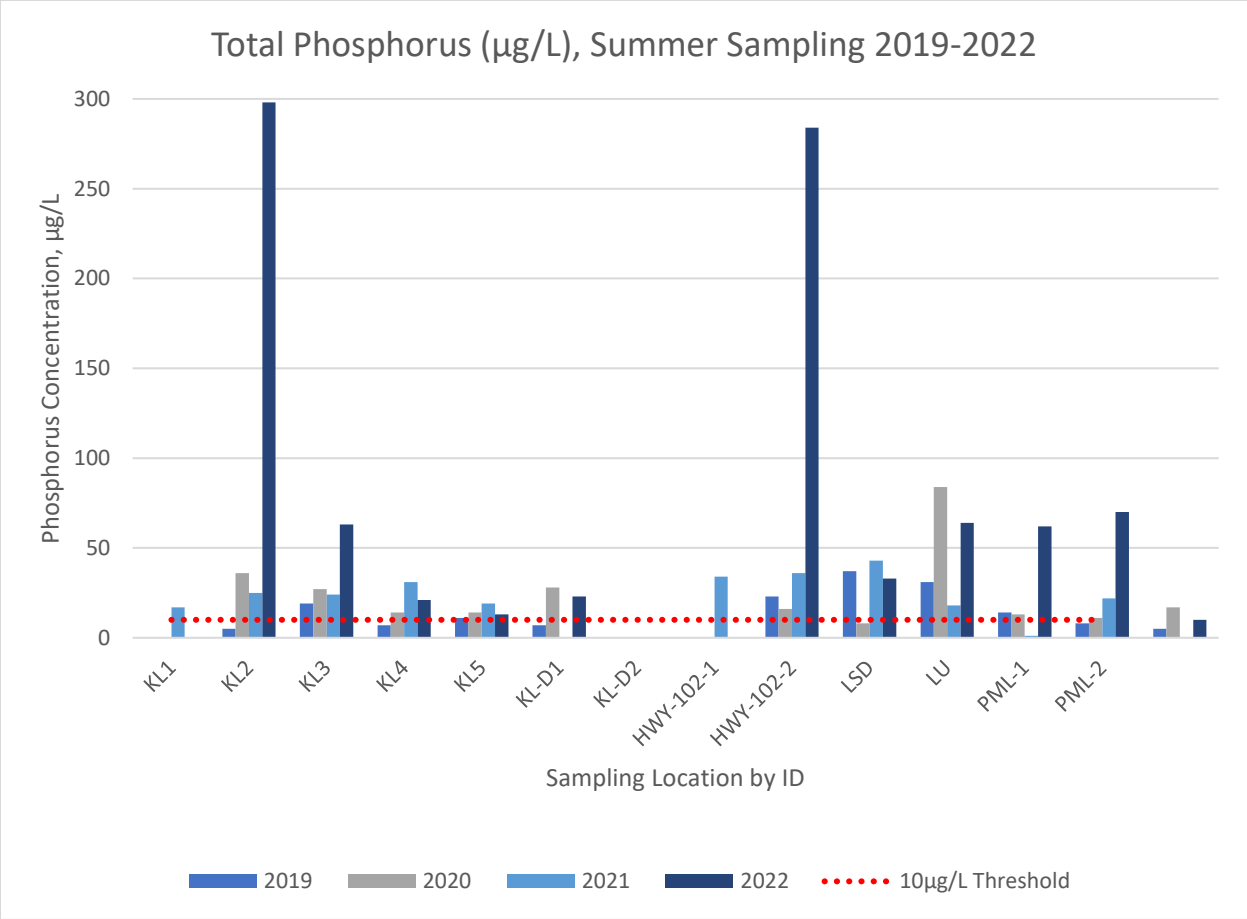

Figure 2: Total Phosphorus Concentrations from the Bedford West Water Quality Monitoring Program, Summer Sampling Events, 2019-2022

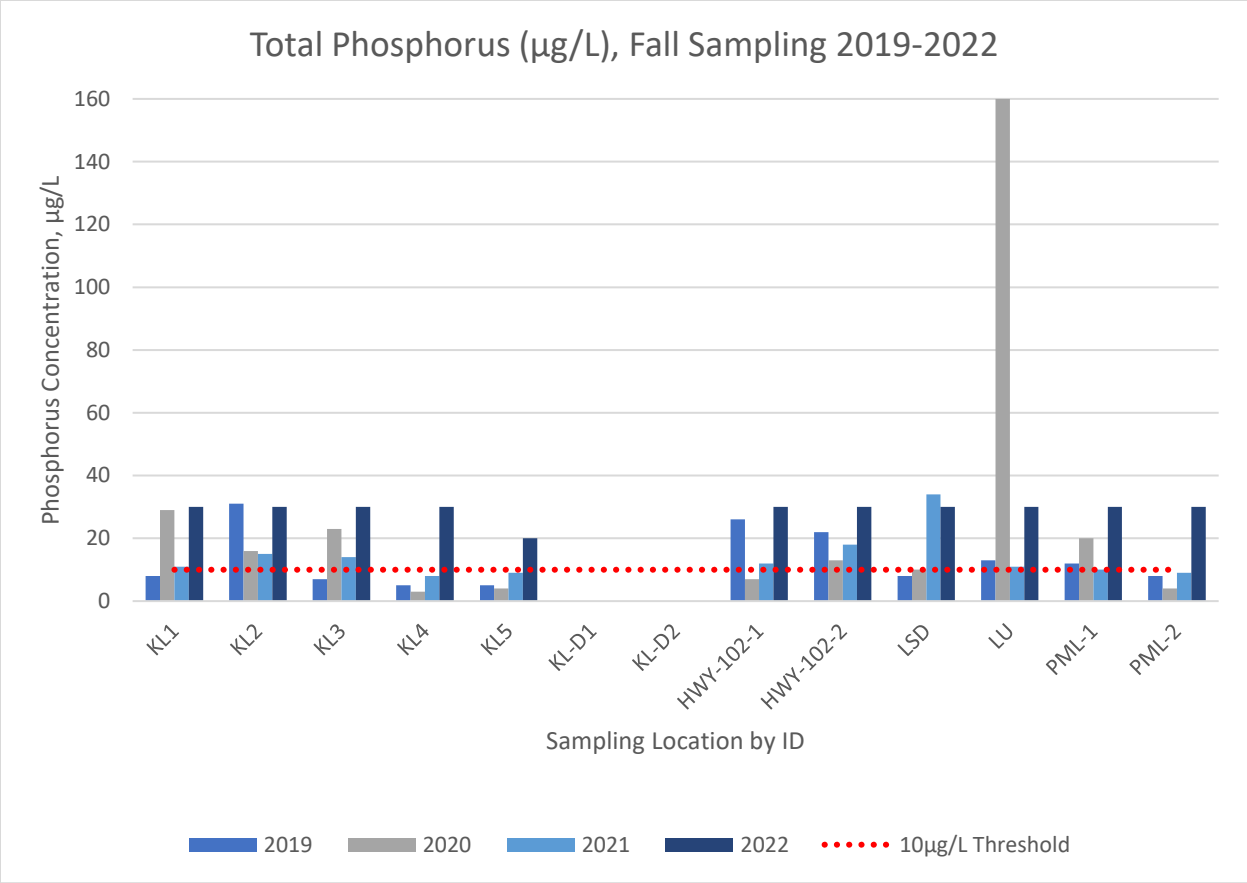

Figure 3: Total Phosphorus Concentrations from the Bedford West Water Quality Monitoring Program, Fall Sampling Event, 2019-2022

2022 Exceedances

Table 1: Total Phosphorus and E. Coli results from May 31, 2022, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	15	18
KL2	18	36
KL3	16	41
KL4	16	37
KL5	15	4
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	59	46
HWY-102-2	20	33
LSD	20	109
LU	19	32
PML-1	15	29
PML-2	27	6

Table 2: Total Phosphorus and E. Coli results from August 18, 2022, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	298	1500
KL2	63	13
KL3	21	173
KL4	13	100
KL5	23	13
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	284	400
HWY-102-2	33	49
LSD	64	Above detection limit
LU	62	Above detection limit
PML-1	70	48
PML-2	10	10

Table 3: Total Phosphorus and E. Coli results from October 21, 2022, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	30	86
KL2	30	28
KL3	30	62
KL4	30	50
KL5	20	12
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	30	68
HWY-102-2	30	22
LSD	30	53
LU	30	500
PML-1	30	44
PML-2	30	50

2021 Exceedances

Table 4: Total Phosphorus and E. Coli results from May 27, 2021, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	Below detection limit	25
KL2	14	195
KL3	Below detection limit	12
KL4	38	39
KL5	7	Below detection limit
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	7	27
HWY-102-2	18	14
LSD	44	Above detection limit
LU	7	Below detection limit
PML-1	17	2
PML-2	6	2

Table 5: Total Phosphorus and E. Coli results from August 9, 2021, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	17	130
KL2	25	26
KL3	24	18
KL4	31	24
KL5	19	9
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	34	34
HWY-102-2	36	31
LSD	43	27
LU	18	60
PML-1	1	23
PML-2	22	19

Table 6: Total Phosphorus and E. Coli results from October 22, 2021, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	11	43
KL2	15	12
KL3	14	29
KL4	8	44
KL5	9	1
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	12	1
HWY-102-2	18	<1
LSD	34	18
LU	11	70
PML-1	10	2
PML-2	9	9

2020 Exceedances

Table 7: Total Phosphorus and E. Coli results from July 2, 2020, sampling event. Exceedances are indicated by shaded red cells. Note: Spring sampling event was delayed due to logistical and safety concerns related to the COVID-19 pandemic.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	8	59
KL2	14	31
KL3	10	44
KL4	Below detection limit	48
KL5	Below detection limit	6
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	12	70
HWY-102-2	18	365
LSD	28	12
LU	11	11
PML-1	Below detection limit	3
PML-2	Below detection limit	2

Table 8: Total Phosphorus and E. Coli results from August 17, 2020, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	36	11
KL2	27	58
KL3	14	61
KL4	14	133
KL5	28	122
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	16	33
HWY-102-2	8	172
LSD	84	172
LU	13	2
PML-1	11	10
PML-2	17	7

Table 9: Total Phosphorus and E. Coli results from October 29, 2020, sampling event. Exceedances are indicated by shaded red cells

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	29	1
KL2	16	4
KL3	23	<1
KL4	3	5
KL5	4	<1
KL-D1	Not sampled	179
KL-D2	Not sampled	37
HWY-102-1	7	3
HWY-102-2	13	<1
LSD	10	2
LU	160	<1
PML-1	20	2
PML-2	4	2

2019 Exceedances

Table 10: Total Phosphorus and E. Coli results from May 9, 2019, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	11	<1
KL2	9	<10
KL3	11	1
KL4	9	<1
KL5	11	1
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	11	1
HWY-102-2	6	<10
LSD	8	7
LU	10	<10
PML-1	7	<1
PML-2	8	<1

Table 11: Total Phosphorus and E. Coli results from August 20, 2019, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	5	6
KL2	19	2
KL3	7	15
KL4	11	1
KL5	7	<1
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	23	3
HWY-102-2	37	30
LSD	31	50
LU	14	26
PML-1	8	4
PML-2	5	3

Table 12: Total Phosphorus and E. Coli results from November 8, 2019, sampling event. Exceedances are indicated by shaded red cells.

Sample Station	TP Concentration (µ/L)	*E. Coli* Concentration (MPN/100mL)
KL1	8	26
KL2	31	12
KL3	7	6
KL4	5	<1
KL5	5	8
KL-D1	Not sampled	Not sampled
KL-D2	Not sampled	Not sampled
HWY-102-1	26	2
HWY-102-2	22	14
LSD	8	12
LU	13	8
PML-1	12	14
PML-2	8	20

Water Quality Monitoring Program

5.4.1 The Parties agree that a water quality monitoring program shall be undertaken in conformity with the following requirements:

(a) the consultant shall be selected by the Municipality and the Developer agrees to pay for all required costs;

(b) except as required by clause (d), monitoring shall be undertaken at each location shown on Schedule O three (3) times per year. Spring testing shall include the RCAp-MS suite, Total Phosphorus (0.002 mg/L detection limit) , Total Suspended Solids, E. Coli, Total Coliforms and Chlorophyll A (acidification and Welschmeyer methodologies), plus standard field measurements (pH, dissolved oxygen (mg/L), conductivity, temperature, Secchi Depth, total dissolved solids, salinity). Summer and Fall testing shall include the RCAp suite (without MS), Total Phosphorus, Total Suspended Solids, E.Coli and Chlorophyll A (Acidification and Welschmeyer techniques), plus standard field measurements (pH, dissolved oxygen (mg/L), conductivity, temperature, Secchi Depth, total dissolved solids, salinity);

(c) monitoring shall be undertaken at least one time at each location illustrated on Schedule O prior to any initial disturbance being commenced within the upstream watershed of the Lands;

(d) in the event that threshold levels specified under 5.4.2(b) are exceeded, the Municipality may direct the consultant to undertake further testing deemed reasonable to verify results;

(e) except as provided for by clause (f), the program shall be undertaken until two (2) years after subdivision approval has been granted for the final phase of development permitted by this Agreement and, prior to subdivision approval being granted for the first phase, the Developer shall post a security in an amount of 110 percent of the cost to complete the monitoring program for a period of one year. This security shall be maintained for the term of testing. Should this security have to be used by the Municipality because of default of payment, no further subdivision shall be permitted until bonding for another year is provided;

(f) where further development agreement applications are approved within the Paper Mill Lake watershed which require that a water quality monitoring program be undertaken pursuant to the requirements of the Secondary Planning Strategy, the Parties agree that the Developer may seek amendments to the requirements of this Section in accordance with the provisions of Clause 6.1 of this Agreement; and

(g) The water quality monitoring program shall commence a minimum of six months prior to initial disturbance and the developer shall pay all costs associated. The developer shall give the Municipality an additional 30 days notice to prepare for the program.

5.4.2 The Municipality will designate a person to administer the requirements of Section 5.4.1 and receive the test results of the monitoring program. The designated person shall submit the test results to the Developer, the Community Council and the Waters Advisory Board within:

(a) three (3) months of being received from the consultant; or

(b) if any total phosphorous measurement meets or exceeds ten (10) micrograms per liter or if the geometric mean of any E. coli measurement within a given calendar year exceeds two hundred (200) counts per 100ml at any location or if any fecal coliform measurement exceeds four hundred (400) counts per 100ml, the findings will be reported immediately to the Developer and to the Waters Advisory Board and the Community Council at the next scheduled meeting. The Municipality shall make all reports provided to the Waters Advisory Board and the Community Council available to the public.

Subdivision and Lot Grading Plans

5.5.1 Any Subdivision Grading Plan submitted for subdivision approval shall be certified by a qualified professional that the plan conforms with the recommendations of the Master Stormwater Management Plan;

5.5.2 Any riparian buffer area established pursuant to Section 3.8 of this Agreement shall be shown on any lot grading plan submitted pursuant to the requirements of the Municipality's Grade Alteration By-Law.

5.5.3 The Developer shall prepare lot grading plans which comply with the Subdivision Grading Plan. Modifications to the site grading and proposed finished elevations may be approved by the Development Engineer. The Developer shall provide written confirmation of compliance that the lot has been graded in accordance with the lot grading plan and, where it has been determined that any lot grading has not been properly carried out, remedial or corrective measures shall be carried out by the Developer at it's cost.

5.5.4 No occupancy permit shall be granted unless the requirements of Section 5.5.3 have been satisfied or a security deposit for the completion of the work has been provided in accordance with the requirements of the Municipality's Grade Alteration By-Law

PART 6: AMENDMENTS

6.1 Non-Substantive Amendments

6.1.1 The following items are considered by both parties to be not substantive and may be amended by resolution of Council:

(a) the granting of an extension to the date of commencement of construction as identified in Section 7.3 of this Agreement;
(b) the length of time for the completion of the development as identified in Section 7.5 of this Agreement;
(c) amendments to the development standards in Sections 3.4.1 and 3.4.2 of this Agreement;