KEMSLEY FARM SUBDIVISION

MUNICIPALITY OF CENTRAL ELGIN

PRELIMINARY STORMWATER MANAGEMENT REPORT

1312 19 July 2017



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19 July 2017

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PRELIMINARY

STORMWATER MANAGEMENT REPORT

1.0 Introduction

Kemsley Farm Subdivision property consists of approximately 29.98 ha (74.1 ac) of land, being part of Lots 2 and 3, Concession 6, Municipality of Central Elgin (Yarmouth). For the purposes of this report, "Kemsely Farm" also includes 42477 Southdale Line (0.29 ha (0.7 ac)) and part of 42405 Southdale Line (0.79 ha (2.0 ac)), both of which have been acquired by the Developer and are included in the Draft Plan Application. Of the Kemsley Farm lands, 25.12±ha (62.1 ac) is considered developable, and 4.86± ha (12.0 ac) is ravine/woodlot. Doug Tarry Limited is proposing to develop these lands as a 325± lot single family residential subdivision.

The farm is bounded on the north by Southdale Line, to the east by the Port Stanley Terminal Rail/existing development along Sunset Drive, to the west by Kettle Creek Valleylands/open farmland, and to the south by ravine/existing development. The lands drain westerly to Kettle Creek and are divided north (Titterington/Code Municipal Drain) central and south (Hepburn Municipal Drain) ravine watercourses.

This report has been prepared to ensure 'Mill Creek Subwatershed Study Area' goals and objectives, as presented in 'Mill Creek - South Block Subwatershed Study Addendum' (Dillon, 2009), are considered with development of the Kemsley Farm property. The goals are as follows;

- i) To ensure the safety of Subwatershed residents, users, property and natural resources with respect to natural hazards, such as flooding and erosion.
- ii) To protect, maintain and enhance the warm water fishery fish habitat and associated aquatic communities (including benthic invertebrates). This includes Mill Creek and its tributaries including Lake Margaret, and Pinafore Lake, Kettle Creek and its tributaries.
- iii) To protect, maintain and enhance the significant natural terrestrial features (land, forest and wildlife) and ecological functions within the Subwatershed.
- iv) To protect, maintain and enhance the quality and quantity of surface and groundwater resources in the Subwatershed.



2.0 South Block Area Subwatershed Study Design Criteria

In response to expanding urban development and amendments to the Planning Act, Dillon Consulting produced the "Mill Creek - South Block Area Subwatershed Study - Final Report" in May 1997 which amongst other considerations stipulated:

- Quality/streambank erosion detention for 24 hours (minimum) of a 25mm (1") storm.
- Quality control post-development run-off to pre-development levels up to a 5 year storm event.

As well as other proposed development, the Subwatershed Study specifically considered Kemsley Farm Subdivision lands even though outside the City of St. Thomas.

Over the years, development within the subwatershed tributary progressed based on the findings of the 1997 Dillon Subwatershed Study. In May 2009, Dillon issued an Addendum to their 1997 report in support of an Official Plan Amendment to expand the City of St. Thomas municipal boundary. Official Plan Amendment No. 66 was adopted by City Council on 18 October 2010 under By-Law No. 158-2010. The Kemsley Farm lands remain within the Municipality of Central Elgin municipal boundary.

The 2009 Dillon Subwatershed Addendum concluded for Kemsley Farm (Pond P7), amongst other considerations, that:

- Groundwater recharge and infiltration capacity is expected to be low because of the dominance of low permeability Port Stanley clay tills at the surface.
- Facility to be either an artificial wetland or a wet pond constructed as an extension to the central ravine. A wet pond was chosen by CJDL as the most appropriate to suit the existing topography.
- It was recommended by Dillon that the Kemsley pond would only required 5 year storm attenuation due to its proximity to Kettle Creek.
- Quantity controls to mitigate potential flooding in Kettle Creek are not required and the major system drainage should be designed (where possible) to by-pass the SWM pond to safe outlet.

This 'Preliminary Stormwater Management Report' demonstrates that the proposed storm sewer and stormwater management servicing of Kemsley Farm Subdivision is in general overall compliance with the May 2009, Dillon UAE "Mill Creek Subwatershed Addendum".



3.0 Proposed SWM Facility

3.1 SWM Design Concept

In general accordance with the May 2009, Dillon UAE "Mill Creek Subwatershed Addendum", an end-of-pipe SWM wet pond facility is proposed to be constructed as an extension of the central ravine finger within the subject lands. A pond is proposed as the primary vehicle to provide quantity and quality control for the proposed development, due to their widely accepted reliability of operation. With relatively little maintenance required, wet ponds are proven to maintain MOECC recommended levels of quality control (i.e. suspended solids settlement, biological removal of pollutants, etc.), which is primarily achieved via the permanent pool volume. Outlet control structure(s) designed to be incorporated with the design to reliably control peak flows to pre-development levels.

The wet pond is proposed to be constructed as a 2-cell design. The upper cell, inclusive of a sediment forebay, will contain a permanent water level volume designed to provide "enhanced" level of quality control treatment. Runoff from the 25mm quality/stream bank erosion storm will be detained exclusively within the upper (wet) cell for treatment prior to release. The upper cell will be situated within the limits of the existing ravine finger; however, will require expansion and over-excavation to achieve necessary design criteria.

The lower cell will be dry, and is necessary to provide quantity control for design storm events greater than 25 mm. The dry cell will be located downstream, in line with the wet cell. Aside from the proposed construction of an earth berm towards the downstream limits of the ravine finger, the dry cell will otherwise utilize the existing ravine without modification to achieve required storage volumes.

The footprint of the SWM facility is located partially within Category 1 natural heritage valleylands, as defined by the "Mill Creek - South Block Area Subwatershed Study - Final Report". The Developer has retained Leonard + Associates in Landscape Architecture to complete an Environmental Impact Study (EIS) for the subject lands. The EIS includes detailed flora and faunal inventories of the natural heritage areas, and concludes that the proposed SWM location is supported, subject to restoration and revegetation in accordance with the terms of the EIS. Please refer to the EIS for further information.

The pre-development outlet for the central ravine (i.e. where the SWM pond is proposed to be located) is an existing open channel ravine/watercourse. This watercourse flows from the Kemsley Farm Subdivision westerly 300±m before outletting to swamp/marsh lands within the Kettle Creek floodplain. These lands remain saturated on a regular basis, and in events of high flow, eventually will outlet southwesterly to Kettle Creek. This drainage outlet is proposed to be maintained in post development conditions and utilized as the outlet for the SWM pond.

Please refer to the enclosed Drawings 1 and 2 for further design information.



3.2 Hydraulic Analysis

Pre-development topographic survey of the subject lands has been completed and used to ensure that storm sewers can be extended to provide gravity service from limits of development to the SWM wet pond. Sewers are sized to convey a 2-year design storm using Municipality of Central Elgin standard IDF-curve factors. Proposed pond bottom, permanent pool and top of berm elevations have been set to suit anticipated future storm sewer design and deign profile grades. The wet pond is anticipated to have a tributary area of 28.34 ha (70.0 ac); 23.20 ha (57.3 ac) of Kemsley Farm subdivision lands, and 5.14 ha (12.7 ac) of external tributary lands, comprised of lands located east of the PSTR tracks, rear yards of existing houses on Southdale Line, and agricultural lands west of the site.

The pond's quality component will meet recommendations of Table 3.2 of MOECC 2003 "Stormwater Management Planning and Design Manual Guidelines". Assuming post-development tributary area of 23.20 ha (52.4 ac) from Kemsley Farm lands and impervious level of 42%, 157.5m³/ha storage volume (40m³/ha active + 117.5m³/ha passive) is provided for enhanced (Level 1) protection. This equates to 2,726m³ of passive and 928m³ of active quality storage, for a total required storage of 3,654m³. Note that a passive storage volume of 3,046±m³ corresponding to a permanent water level of 225.60m will be provided in excess of MOECC 2003.

The pond will detain the run-off from a 25mm streambank erosion event for 24 hours (min.) using a 120mmø orifice plate. Post-development run-off from 2 and 5 year storms will be restricted to pre-development levels using an outlet control structure; pre-design of this structure has assumed an orifice and weir combination.

Hydraulic models of both pre and post development conditions have been developed using MIDUSS V2 (Ver. 2.07, Rev. 365). As recommended by the Subwatershed Study, CN=72 (pre-development) and CN=79 (post-development) have been inputted to the model. A post-development impervious weighted average of 38.3% has been calculated for the tributary area. The Stage-Storage-Discharge Relationship output results are summarized by the following Table 3.1.

Depth			Notes			
	Passive	Active Storage				
Water Elev. (m)	Permanent Pool ¹ (m ³)	Quality SB ² Erosion Storage (m ³)	Quantity Storage ³ (m ³)	Total Active Storage (m ³)	Total Storage (m³)	
223.00	0	0	0	0	0	Pond Bottom
225.60	3046	0	0	0	3046	Top of Permanent Pool
226.50	3046	2360	0	2360	5406	Quality/SB ² Erosion Control
226.63	3046	2360	457	2817	5863	2 Year Storm
226.82	3046	2360	1100	3460	6506	5 Year Storm
227.14	3046	2360	1952	4312	7358	100 Year Storm
227.20	3046	2360	2586	5632	8678	Before Emergency/Overflow 120± Year Storm

Table 3.1: Stage-Storage-Discharge Relationship



UPPER WET CELL - QUALITY CONTROL

LOWER DRY CELL - QUANITY CONTROL

Depth		Storage		Discharge		Notes
	Passive	Active		Post- Development	Pre- Development	
Water Elev. (m)	Permanent Pool ¹ (m ³)	Quantity Storage (m³)	Total Storage (m³)	Proposed Restricted Discharge Rate (m ³ /s)	Max Allowable Discharge Rate (m ³ /s)	
227.20	0	0	0	0.00	0.00	Pond Bottom
227.21	0	0	0	0.03	0.09	Quality/SB ² Erosion Control
220.67	0	826	826	0.34	0.35	2 Year Storm
221.78	0	1851	1851	0.82	0.85	5 Year Storm
222.33	0	2489	2489	4.23	N/A	100 Year Storm
222.35	0	2520	2520	4.27	N/A	Before Emergency/Overflow 105± Year Storm

NOTES:

- ¹ Based on Table 3.2 of the MOE 2003 "Stormwater Management Planning and Design Manual" for a wet pond, enhanced protection level (80% TSS Removal) and impervious=42% (for subdivision land) for 23.2 ha.
- ² SB=streambank
- ³ Assume 5 % pipe storage.
- ⁴ Although not required, the 100 year storm was modelled to evaluate pond berms. Assumes major flow catchment to pond same as pre-development
- ⁵ The quality storm is based on a 25mm 4-hour Chicago while the 2, 5 and 100-year storms are based on a 24 hour Chicago per the May 1997 "Mill Creek-Southblock Area Subwatershed Study Final Report" (Addendum May 2009).

Although major flow will generally follow the proposed street pattern, topography is such that it is impractical to route all flows through the SWM pond. For the purposes of this report, it has been assumed that major flows will generally follow pre-development catchments, with approximately 30±% of major flows are anticipated to be tributary to the SWM pond. Of the remaining areas, 20±% of the major flow will continue to flow north to the Titterington Municipal Drain, 22±% south to the Hepburn Municipal Drain, and 28±% westerly via the south finger of the Central Ravine (i.e. by-passing the SWM pond). It is anticipated that post-development major flows by-passing the SWM pond will be less than current pre-development levels at all discharge points, due to minor flows removed by the storm sewer system. The stormwater management pond will be designed to pass major flows from a 100-year design storm without overtopping the pond berms.



3.3 Site Information

Access to the SWM pond will be provided from Street 'A'. In consultation with the Municipality, consideration will be given to providing a 3m wide multi-use trail that will double as maintenance access extending along the south side of the upper pond and connecting to the ravine trail system. The pond cells will incorporate 3m wide benching on the 2 pond berms for safety.

Much of the proposed pond limits and slopes are forested with mature vegetation to remain. Pond landscape design will be by the Developer's Consultant and forwarded to the Municipality and KCCA for review. Species tolerant to submergence will be selected as required. Plantings will be placed in the wet cell to enhance stormwater management treatment and to provide aquatic habitat.

The Developer will provide 1.8m (6') high black vinyl chainlink fence along the north perimeter of the SWM pond, parallel with the rear yards of the proposed houses. As the pond is adjacent southerly to the proposed park within the development, it is recommended that fencing be omitted in this location.

Erosion and sedimentation control during construction will include a sedimentation basin located in the proposed stormwater management area. Topsoil piles will be located as far as practical from the stormwater management area. Geotextile will be placed under all catchbasin and manhole castings to prevent the flow of construction silt into storm sewers and receiving watercourse, with straw bales and silt fence used as required. Silt fences and straw bales shall be maintained until development is complete.

4.0 Conclusions

The following is a summary of findings presented in this 'Preliminary Stormwater Management Report';

- The proposed SWM facility has been designed in general accordance with recommendations and design criteria of Dillon Consulting's "Mill Creek - South Block Area Subwatershed Study - Final Report" (May 1997) and subsequent "Mill Creek Subwatershed Addendum" (May 2009).
- ii) The SWM facility is proposed to be located as an extension of the north finger of the central ravine. The facility is proposed as a two-cell wet pond, with the upper wet cell to provide quality control and the lower dry cell to provide quantity control.
- iii) The SWM facility will detain the run-off from a 25mm streambank erosion event for a minimum of 24 hours. Post-development run-off from 2 and 5 year storms will be restricted to below predevelopment levels.
- iv) The developer has retained Leonard + Associates in Landscape Architecture to complete an Environmental Impact Study (EIS) for the subject lands. A landscape design will be developed for revegetation of the disturbed ravine lands.

All of which is respectfully submitted,

() Comprand

Deren Lyle, P. Eng.

T. Paul Tuff, P. Eng.

TPT/sed



LIST OF FIGURES

- Drawing 1: Storm Drainage System and Areas CJDL, 19 July 2017
- Drawing 2: Stormwater Management Pond Plan and Profile CJDL, 19 July 2017



SIN, EXISTING/FUTURE			JRE		2.1Ac (0.85ha)		VISION PHASE LIMITS		
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			DESIGN BY:	TP T DJL	DRAWN BY:	TJW	CHECKED BY: DJL		AND AREAS
	DATE	ΒY	PROJECT NO.	1312	SURVEY BY:	TPM	DATE: 19 JULY 2017	DRAWING No.	1

METRIC CONTOUR ELEVATIONS IN METRES (BY CJDL SITE SURVEY) MAJOR OVERLAND FLOW ROUTE MUNICIPAL BOUNDARY

A1 \-3.270.50

-AREA IN HECTARES

-RUN-OFF COEFFICIENT

—AREA NUMBER

