PROJECT PLANNING REPORT

FOR A

STORMWATER MANAGEMENT POND

AT

UNIVERSITY OF TORONTO MISSISSAUGA

October 16, 2007

40697

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I. EXECUTIVE SUMMARY

The past seven years have been a period of substantial capital development on the University of Toronto Mississauga (UTM) Campus. Five new buildings have been constructed: Erindale Hall residence; the Communications and Culture Technology Building, including an underground parking garage; the Wellness Centre; the Hazel McCallion Academic Learning Centre; and the recently completed Oscar Peterson Hall residence. These buildings represent 62,000 gross square metres of institutional space and a 59% increase in the physical resources of the campus and were necessitated by the University of Toronto's decision to double undergraduate enrolment at UTM.

The Credit Valley Conservation (CVC), which manages the natural resources of the Credit River Watershed, has monitored each of these projects and their cumulative effect on the watershed. In December 2005, the CVC requested that the University undertake the necessary studies for, and design and construction of, a stormwater management (SWM) facility prior to any further development at the UTM Campus.

Currently UTM and the Faculty of Medicine are in the planning stages for a Mississauga Medical Academy that is to be accommodated in a newly constructed building on the UTM campus. The University has initiated the design of a central SWM pond and construction is planned for the summer of 2008 to ensure that the schedule of the Medical Academy is not compromised.

The site for the proposed SWM pond is currently in use as a parking lot (#4) and will result in the removal of approximately 298 parking spaces. A parking study, the Lea Report, also commissioned in December 2005 recommended that a parking survey be conducted in 2009-2010 to determine if additional parking, potentially in a parking structure, would be required on the UTM campus to accommodate the demand for spaces. The administration will use that survey to monitor the impact of the construction of the SWM pond and attenuated loss of parking spaces, as well as any changes in general demand for parking since 2005. Should it be determined that additional spaces are required, then a parking structure will be constructed on a site currently occupied by a surface parking lot.

The design of the SWM pond will incorporate emergent plants below the normal water level, shoreline planting at the pond's edge above the normal water level, and trees and shrubs on the slopes of the pond to "naturalize" the slope between the pond and the adjacent roads.

The Total Project Cost for this Project is estimated to be $2.7 million and is to be funded by the UTM parking ancillary ($450,000); the Mississauga Medical Academy ($650,000); and borrowing to be repaid from the UTM Operating budget ($1,600,000).

II. MEMBERSHIP AND TERMS OF REFERENCE

A. Members of the Project Planning Committee:

Mr. Ray deSouza, (Chair) Chief Administrative Officer, UTM
Mr. Julian Binks, Manager, Project Planning, Capital Projects
Ms Christine Capewell, Director Business Services, UTM
President, UTM Students Union or designate (student representative)
Mr. Paull Goldsmith, Director Utilities and Campus Infrastructure, UTM
Mr. Ben Louie, Capital Projects Officer, UTM
Professor Robert Reisz, Department of Zoology, UTM
Ms Gail Milgrom, Managing Director, Campus and Facilities Planning
Mr. Jason Lum-Yip, Project Manager, Capital Projects

B. Terms of Reference:

A Project Planning Committee to determine the Campus Infrastructure Requirements for the University of Toronto Mississauga was struck in December 2005 to address the following terms

1. Identify the capacity and assess the condition of the existing infrastructure components on the University of Toronto at Mississauga Campus.

2. Identify the future requirements for infrastructure on the campus to support the expansion identified in the UTM Master Plan and approved academic initiatives.

3. Recommend a plan to upgrade the campus infrastructure in accordance with the Grow Smart Grow Green philosophy at the UTM campus.

4. Identify all resource implications, including an estimate of capital costs, and projected expense and savings to the annual operating budget.

5. Identify available sources of incentive funding from external agencies.

6. Identify a funding plan for the capital costs.

7. Report by February 7, 2006.

A Report was submitted for information to the Planning and Budget Committee in February 2006 proposing a phased upgrade to the UTM infrastructure identifying work required immediately (over the next two years), work required in the three to eight year horizon, and work that would continue beyond an eight year timeframe. (This document can be found at the following website: http://www.utoronto.ca/govcncl/bac/details/pb/2005-06/pba20060228-08.pdf) Two of the projects required in the short term - Project 5: Capital Upgrade and Repair Storm System and Project 6: Storm Water Management Pond have been combined and are essentially addressed within the scope of the project being proposed in this Planning Report. One major change is that, at the time, the estimated cost for the two projects was $6.34 million, however, $4.4 million if this amount was projected for parking lot replacement. The project which is now being proposed addresses the stormwater management requirements, but does not require the parking lot to be replaced.

III. BACKGROUND INFORMATION

The University of Toronto Mississauga (UTM) began operations as "Erindale College" in 1967 and for the first decade only two academic structures were built (the North Building and the South Building). Over the next two decades additional academic structures and residences were built but to a large extent the basic campus infrastructure was not updated.

By 2000, with the pressure of demographics, the rapid development of Mississauga and communities to the north and west and the arrival of the "double cohort", UTM stood poised for a significant enrolment growth of an estimated 50% to 100% beyond the 5,000 FTE students (6,300 headcount) at that time. However, the existing physical resources could not accommodate such growth either in terms of capacity or infrastructure. UTM commissioned Sterling Finlayson to prepare a Master Plan that would direct future development over the next 10-20 years. The purpose of the Master Plan was to "…*strategically address the issues of growth, built form, microclimate, parking, ecology, culture, and circulation with an incremental and reciprocal implementation*" (Sterling Finlayson 2000). The plan identified new development sites and proposed additional residences, academic and non-academic buildings to meet various growth scenarios. In addition it provided guidelines for future developments that addressed the needs of open spaces, parking, traffic, servicing, pedestrian circulation, ecological concerns (such as stormwater management and habitat preservation), connections and phasing. Finally, it reviewed the regulatory issues and evaluated the plant and site services infrastructure needed to accommodate phased growth. This document provided an important resource for all subsequent investigations and planning studies.

The seven years since 2000 have been a period of substantial capital development at UTM. Five new buildings have been constructed: Erindale Hall residence; the Communications and Culture Technology Building, including an underground parking garage; the Wellness Centre; the Hazel McCallion Academic Resource Centre; and the recently completed Oscar Peterson Hall residence. These buildings represent 62,000 gross square meters of institutional space and a 59% increase in the physical resources of the campus.

During the planning and implementation of these buildings, issues had been raised by the approval agencies regarding current best management practices relating to stormwater management. UTM commissioned a Master Drainage Plan (MMM 2004)[1] to look at the existing storm drainage system and identify future needs. The Master Drainage Plan set the preliminary design criteria for a SWM pond that would temporarily store and treat the majority of the stormwater runoff from the campus before it entered the Credit River.

The Credit Valley Conservation, in a letter to the City of Mississauga on December 1, 2005 requested that no further development on the UTM Campus occur without development of a SWM facility. The University has had on going discussions with the

[1] MMM. 2004. *Revised Draft Master Drainage Plan, Erindale Campus in Mississauga*. Prepared for the University of Toronto by Marshall Macklin Monaghan. Toronto, Ontario.

City of Mississauga and with the CVC regarding the technical details of a central SWM pond.

In 2006 MGM Consulting Inc. was engaged to complete the final design of the SWM Pond as described in this Planning Report. It is anticipated that the designed facility will not only meet the current requirements of the CVC but will also accommodate future development on the campus.

IV. STORMWATER POND DEVELOPMENT PROPOSAL

Marshall Macklin Monaghan Master Drainage Plan for UTM (2004)

The purpose of the Marshall Macklin Monaghan (MMM) Master Drainage Plan was to develop a comprehensive stormwater management plan for UTM which considered existing and future development while protecting and enhancing the environment. The report reviewed the ability of the existing storm drainage system to handle the one-in-ten-year and one-in-one-hundred-year storm event. As well, MMM developed a preliminary proposal for a new SWM Pond which would treat storm runoff prior to its release to the Credit River.

The consultants, with input from Credit Valley Conservation, concluded that quantity controls were not required from the site, to some extent due to its location nearer to the mouth of the Credit River, and that the main outfall storm drain had the capacity to convey the one-in-one-hundred-year post-development peak flow from the campus to the Credit River valley.

The MMM study further concluded there would be no serious impacts to the existing storm drainage system due to future development on the campus. That is, the level of service provided by the storm drainage system will generally remain the same (MMM 2004, page 22). The report notes that “not all the storm sewers have the capacity to convey the one in 10-year peak flow under existing conditions,” but it recommended “that UTM accept a lower level of service from portions of the existing storm sewer system…on-site” (MMM 2004, page 24).

However, it did conclude that a wet pond immediately upstream of the discharge would best satisfy the needs of the campus to meet quality control objectives of Level 1 Protection (also known as an ‘Enhanced’ level of protection) and erosion control objectives (24 hour extended detention of 25 mm storm event at an average release rate of 0.065 m^3/s) and recommended that a stormwater pond be constructed in the general location of Parking Lot 4 adjacent to the intersection of the new entrance road and the Outer Ring Road (see Appendix C – Map of Stormwater Management Pond Proposed Location).

The study reviewed several SWM options and established targets for the design of the ultimate SWM Facility:

Table 1 - SWM Facility – Wet Pond Volume Requirements

Level of Protection	Permanent Pool (m^3)	Quality (m^3)	Erosion (m^3)	Total (m^3)
Enhanced Target	5,540	2,200	5,610	11,150

Source: Marshall Macklin Monaghan 2004, *Erindale Campus in Mississauga, Revised Draft Master Drainage Plan.* Table 4-5
Note: Volume required for quality control is incorporated within the volume required for erosion control.

The recommendation of this report was incorporated into the February 2006 Infrastructure Improvement Program discussed above. Subsequent consultations with campus academic and operational staff were undertaken and the concept for the SWM facility refined.

MGM Consulting Inc. Current Stormwater Pond Development Proposal (March 2007)

MGM Consulting Inc. was asked to assemble information from the Master Drainage Plan and prepare a conceptual plan and cost estimate for the implementation of the SWM facility and the restoration of impacted parking areas.

MGM Consulting combined Lidar generated topographic information, supplied by the University, with aerial photographic mapping of the SWM construction site and servicing information from the MMM study to create a plan for the proposed facility. This was then used to derive quantities and cost estimates for construction of the project.

The design basis for the facility was taken from the MMM study. Specifically, the target pond volumes required to achieve an Enhanced Treatment level for a wet pond was used in the design of the ultimate facility (see above).

As recommended in the MMM report, the storm drain between MH S205 and MH S12 would be reconstructed to a shallower grade. The report recommended the reconstruction of MH S12 as a splitter structure. An option to discharge the complete flow through the pond was also considered and will be incorporated into the SWM pond facility.

The SWM pond was designed to fit into the proposed location in a configuration that would meet the design criteria for accommodating the full build out of the UTM Campus Master Plan. This includes the construction of a forebay, which will settle out the coarsest sediments and most of the contaminants in the storm runoff, and a main bay that will provide the remainder of the required storage volume and will help to settle the finer material that passes the forebay. Provincial guidelines set criteria for these aspects of the design. The conceptual design provides the following configuration:

Table 2 - Sediment Forebay Summary – Ultimate SWM Facility (revised design)

Design Criteria	Recommended (SWMP Manual)	Provided
Minimum Length (m)	29	44
Minimum Width (m)	4	22
Length to Width Ratio	Minimum 2:1	2.0
Depth (m)	1.5	1.5

Source: After Marshall Macklin Monaghan 2004, *Erindale Campus in Mississauga, Revised Draft Master Drainage Plan.* Table 4-6

The minimum length and width criteria were exceeded in the proposed design since the volumetric considerations govern the design. The conceptual design in the current proposal was altered from that presented in the MMM report such that the new facility was fitted into the new available topographic information. The side slope configuration of the pond was also revised. A decreased slope (7:1) was inserted between 0.3 m below and 0.2 m above the normal water level. This provides a planting area at the normal waterline and adds a safety which will allow easier access to the area of the normal water level.

As a result of the new conceptual design, a permanent pool volume of 5,579 m^3 is achieved (compared to 5,540 m^3 required). The total volume of 11,594 m^3 is achieved at an elevation of 112.35 m. The overflow elevation for the perimeter of the pond is 113.1 m. There could be an additional storage volume of 7,550 m^3 between the required flood elevation and the overflow elevation. This can be used for future flow attenuation through simple modifications to the outlet structures, if necessary.

The conceptual design of the facility envisions that the slopes of the pond and the adjacent tableland will be planted to encourage 'naturalization' of the area between the water surface and the adjacent parking or roadways. This will provide a naturalized extension of the Credit River valley into this area of the tableland of the campus grounds.

<u>MGM Inc. Review of Impervious Areas (May 2007)</u>

MGM Consulting Inc. was asked to review the assumption for impervious areas contained in the Master Drainage Plan prepared by Marshall Macklin Monaghan Limited and on which the design of the proposed SWM pond was based. Stormwater runoff is highly correlated with the amount of 'impervious' surface within the storm catchment area thus the amount of impervious surface on the campus is a major design consideration for the SWM pond. It governs the size of the SWM facility and the capacity of the facility to accommodate future Campus development as new buildings and paved areas will contribute to increases in the impervious percentages.

The engineering design of the facility anticipated a certain level of development defined by the Campus Master Plan 2000. As there had been significant development on the campus since 2000 and several sites have yet to be developed, the University wanted to ensure that the SWM pond design provided for future development identified in the campus master plan.

The catchment areas analyzed, as delineated by the Master Drainage Plan, total 54.20 ha. Calculations were made of the existing impervious areas within each catchment and then summed for the entire storm drainage catchment. It was estimated that the conditions within the total catchment, following the completion of the SWM pond (late summer 2008), would have an impervious ratio of slightly less than 35% or 18.839 ha.

The design of the SWM Pond was based on an assumption that the total impervious area over the drainage catchment would be 40%. The total impervious area is therefore implied to be (54.205 ha x 40% =) 21.682 ha. The current impervious area as indicated above is 18.839 ha. This would imply that 2.843 ha of existing pervious area can be developed before the design capacity of the SWM pond is exceeded.

The Table below summarizes the surface area statistics for several categories of impervious areas and statistics for each catchment area can be found in Appendix A:

Table 3 – Summary of Impervious Areas Statistics[1]

	Current 2007/08 Scenario	**Potential Development**	**Projected Scenario**
Buildings	57,611	19,989	77,600
Roads	32,136		32,136
Parking	61,819	3,081	64,900
Walkways	22,376	5,294	27,670
Water Surface	11,015		11,015
Miscellaneous	3,436	64	3,500
Total Impervious (m^2)	**188,393**	**28,428**	**216,821**
Total Catchment (m^2)	542,054		542,054
Avg. Percent Impervious	**34.8%**		**40.0%**

Note: 1 – subject to detailed development plans

In summary, the information provided in the above table indicates that approximately 2.843 ha of land can be developed within the catchment area of the SWM pond before the design capacity of the proposed facility is exceeded and there is a development potential of approximately 35%, beyond the 07/08 conditions, in the “Buildings” category. In addition, existing impervious areas (i.e. parking areas) can be redeveloped within the design parameters of the SWM facilities as they will neither significantly contribute to additional runoff nor additional pollution load to the pond.

VI. SPECIAL CONSIDERATIONS

A. Personal Safety

UTM makes the personal safety of its community a high priority. Every effort will be made when implementing the stormwater management pond project to improve campus

safety and security through upgrading lighting, improving sight lines and installation of emergency telephones. The pond will include a planting area at the normal waterline that adds a safety feature which will allow easier access. Members of the project implementation committee will include professional staff with responsibilities for campus and personal safety.

B. Campus Planning Issues

As discussed in Section IV a detailed analysis of the impervious area assumptions was completed using mapping of the University of Toronto Mississauga Campus for two time horizons - 2007/2008 and upon completion of the final Master Plan. The analysis mapped all building footprints, road surfaces, parking areas, walkways, water surfaces and miscellaneous hard surfaces that would significantly contribute to stormwater runoff.

In summary, there is capacity in the proposed stormwater management pond to allow an additional 2.843 ha of land to be developed within the catchment area before the design capacity of the proposed facility is exceeded. Specifically there is a development potential of approximately 35%, beyond the 07/08 conditions, in the “Buildings” category. In addition, existing impervious areas (i.e. parking areas) could be redeveloped for institutional uses thus allowing for development without changing the impervious ratios.

C. Sustainability

As a microcosm for the pressures of urban growth, UTM is determined to prove that rapid expansion and development can be accomplished in an environmentally sensitive and responsible manner. Grow Smart, Grow Green is the banner under which UTM's comprehensive, multi-faceted initiative was launched and provides a framework to guide all decisions that might impact upon the environment of the campus. Sustainability of UTM, its buildings and its infrastructure is a cornerstone design principle. As with other campus projects the SWM pond will include all possible design features to enhance sustainability on the campus.

In discussions with CVC it was learned that although Level 1 protection would typically be required for development within the Credit River watershed, any storm water quality controls would be a retrofit to the UTM campus and a lower level of quality control would likely have been acceptable to CVC. However, given the sensitivity of the Credit River to urban pollutants and the University’s philosophy of employing environmentally sustainable practices the decision was made to provide a facility which retrofits an Enhanced Level (1) water quality control for the entire campus area. The stormwater facility was designed with that criteria in mind.

D. Secondary Effects

The location of the new SWM Pond will displace a number of parking spaces in Lot 4. The concept plan indicates that 297 parking spaces may be impacted. This will reduce the total number of campus parking spaces from 3,091 to 2,794. These spaces, however, are the least used, thus the immediate impact on parking will be minimal.

A parking study, the Lea Report, commissioned in December 2005, recommended that a parking survey be conducted in 2009-2010 to determine if additional parking, potentially

in a parking structure, would be required on the UTM campus to accommodate the demand for spaces. The administration will use that survey to monitor the impact of the construction of the SWM pond and attenuated loss of parking spaces, as well as any changes in general demand for parking since 2005. Should it be determined that additional spaces are required, then a parking structure will be constructed on a site currently occupied by a surface parking lot.

It is anticipated that construction activities will cause temporary road closures or lane reductions on the Ring Road from parking lot 4 to parking lot 9 to accommodate the upgrading and connection of the existing storm sewer system and that Lot 4 parking may not be available during the construction of the SWM facility.

VIII. RESOURCE IMPLICATION INCLUDING SECONDARY EFFECTS

A. Total Project Cost

The estimated Total Project Cost for the construction of the SWM pond is $2,700,000. A commentary on the cost estimate is provided in Appendix B with the Total Project Cost table.

B. Operating Costs

The Operating Costs for the grounds and site landscaping, associated with the SWM Pond, will need to be added to the current Grounds budget. This is anticipated to represent an incremental cost of approximately $3,000 per year.

The Operating and Maintenance budgets for the SWM Pond were estimated by the consultant and are subject to review by the Director of Grounds and Utilities for the Campus. An initial budget for the first 3 years is in the range of $5,000 to $10,000. The removal of accumulated sediments is planned after 17 years of use. Costs will be determined at that time and will depend on whether or not the sediment is considered non hazardous waste. If so, the estimate for removal of accumulated sediment is between $10,000 and $15,000 (2007 dollars), if determined to be hazardous waste, the costs would rise significantly.

IX. SOURCES OF FUNDING AND CASH FLOW ANALYSIS

The Total Project Cost of $2.7 million is to be funded by the UTM parking ancillary ($450,000); the Mississauga Medical Academy ($650,000); and borrowing to be repaid from the UTM Operating budget ($1,600,000).

X. SCHEDULE

	Duration	Scheduled Completion Date
Business Board Approval		November 2007
Tender & Award	5 weeks	March 2008
Construction	15 weeks	17 August 2008
Commissioning	±2 weeks	31 August 2008
Monitoring	Continuous	On-going

APPENDIX A
CATCHMENT AREA STATISTICS

Table 3.1 - 2007/2008 Scenario Impervious Statistics

Catchment	Areas (m^2) Buildings	Roads	Parking	Walkways	Water	Misc.	Total Impervious Area (m2)	Total Catchment Area (m2)	Percent Impervious
100	68	1,184					1,252	52,721	2.4%
110	93	1,956					2,049	37,847	5.4%
120	346	1,343					1,689	5,073	33.3%
130		2,494	8,518	29			11,041	13,911	79.4%
140		3,000	3,847	1,134			7,981	25,892	30.8%
150	4,733	460		1,721		1,024	7,938	32,653	24.3%
160	2,700	1,987		1,435			6,122	8,612	71.1%
170	2,211			1,149			3,360	6,250	53.8%
180	1,945			1,776			3,721	8,198	45.4%
200	6,163	1,027	900	2,180			10,270	32,327	31.8%
210	6,351	2,903	1,331	2,790			13,375	48,312	27.7%
220		378					378	2,169	17.4%
230	3,028						3,028	3,042	99.5%
400		2,345	355	77			2,777	9,078	30.6%
410	778		6,352	840			7,970	12,539	63.6%
500	1,758	2,943	159	65			4,925	17,579	28.0%
510	8,022	179	13,353	916			22,470	42,786	52.5%
520	5,600	3,156	206	1,941			10,903	19,742	55.2%
530	7,841	2,818		499			11,158	11,903	93.7%
600		2,798		2,155			4,953	18,316	27.0%
610	5,215	328	441	3,060			9,044	22,239	40.7%
620		815	4,016	531	5,263		10,625	21,439	49.6%
630			18,656	78		2,412	21,146	30,809	68.6%
640	759		3,685				4,444	44,137	10.1%
700		22			5,752		5,774	14,480	39.9%
Subtotal	**57,611**	**32,136**	**61,819**	**22,376**	**11,015**	**3,436**	**188,393**	**542,054**	**34.8%**
External	3,414	6,839	1,927	1,231	-	-	13,411		
Total	**61,025**	**38,975**	**63,746**	**23,607**	**11,015**	**3,436**	**201,804**		

MGM Inc. Review of Impervious Areas (May 2007)

APPENDIX B
PROJECT COST ESTIMATE

Project Title: **UTM storm water management pond and associated work**

Items			notes
Construction amount	1,700,000		escalated to May 2008.
Construction Contingency	297,336		
Applicable GST	39,547		
Total, including GST	**$2,036,883**		
Hydro/City charges	0		
Secondary projects	0		
Landscaping	163,170		escalated to May 2008.
Permits & Insurance	16,000		
Professional Fees	364,962		engineering, misc, PM.
Computing Infrastructure	0		
Telephone set & install	0		
Audio/Visual	0		
Moving	0		
Staging	0		
Furnishings: Department	0		
Furnishings: Classrooms	0		
Equipment	0		
Security & access systems	0		
Signage: Interior & Exterior	10,198		
Signage: Donor Recognition	0		
Groundbreaking & Building opening	0		
Miscellaneous	1,020		
Project Contingency	77,767		
Finance Costs	30,000		allowance
Total Project Cost Estimate incl GST	**$2,700,000**		

prepared 2nd Oct 2007 jcb

This cost estimate has been compiled on the basis of conceptual plans for the facility enclosed herein. There are a number of assumptions inherent in the preparation of this cost estimate. These are discussed hereafter.

Timing

It has been assumed that the project will proceed during the summer of 2008.
It is anticipated, due to the period of construction, that no significant weather-related issues will impact neither the cost of completing the works nor the schedule of construction.

The prices presented in this estimate are indicative of the prices received on similar projects in late 2006 and some proceeding in 2007. Since oil and aggregate prices have seen significant fluctuations through the last three years, there is some risk that these items could inflate further in the next construction season and alter the estimates. The 15% contingency should accommodate most fluctuation in the base prices used in this estimate.
Allowances have been made to incorporate reasonable design and review periods so that the work will be completed during the optimal summer period. Delays in obtaining the approvals could impact the completion of the work and the prices for the landscape aspect of the development.

Site Preparation
There are two aspects to the site preparation task: preparing the site for sediment management, and the removal of existing vegetation and surfaces. In the former regard, allowances have been made to reflect the quantity of work required at the pond site. The earth disposal site is not known at this time. It is anticipated that the material will need to be disposed of off the site so the costs estimates reflect this scenario. Cost savings can be achieved if some or all of the material can be placed on the Campus. Only a nominal allowance has been made for dealing with that site.
An allowance has been made to remove the asphalt in the area of the new pond. No allowance has been made to remove granular materials or any contaminated materials. No contaminants have been identified in this area. A nominal allowance has been made to remove any electrical facilities (i.e. lights) or any structures.

Earthworks
It was assumed that there is approximately 300 mm of topsoil in the treed area. No geotechnical data has been made available at this point in time. Since this material will be reused on the site, it is assumed that the topsoil can be stored nearby for reuse. There is limited space in the vicinity of the pond to place the excavated material and there is limited room to handle the material as it is being excavated. It has been assumed that a disposal site will not be available on the campus site to place this material.

Storm Drain Replacement
It has been assumed that the storm drain replacement will be completed during the summer when the Ring Road can be closed to traffic, therefore there will be limited traffic control costs to the project.
It has been assumed that ground conditions will allow the use of standard Class ‘B’ Bedding and that no special trenching requirements will be required. It is also assumed that no special provisions will be required due to the presence of the hydro distribution system adjacent to the Ring Road. A lump sum has been included in the estimate to provide the minimal support for hydro services.
It has been assumed that the catch basins can be reused.
The cost estimates assume the replacement of the topsoil over the new pipes in the boulevard. It is anticipated that the disturbed areas will be restored using sod for a distance of five metres.
An allowance has been made to grind edges of the existing road surface and to repave with a surface coat of asphalt 8.5 m wide for the length of the replacement drain (±450 metres).

Stormwater Management Pond Construction

The inlet structure in the forebay is assumed to be a standard concrete headwall for a 1500 mm diameter storm drain. It was also assumed that a new structure can be constructed at MH S12 to serve the SWM facilities. At this point, it was first proposed that this structure would contain a weir structure to divert major flows back to the existing sewer to bypass the SWM pond. It has been assumed that a pre-cast concrete surface material would not be placed on the floor of the forebay to facilitate its cleaning out. Preliminary geotechnical indications suggest that the bedrock shale layer should be located at approximately the floor level of the forebay. It was assumed that the pre-cast concrete material would be required on a ramp structure constructed into the two bays.
The outfall discharge will be controlled with a standpipe with orifice controls. If a diversion scheme is used, this will discharge to the outfall sewer. Alternatively, the entire flow might be diverted through the SWM pond. In this scheme, a major flow, outfall structure will also be required. The cost estimate has made allowances for structures and pipes required for this option as well. In either option, an emergency overflow will also be required. It has been assumed that this can be discharged directly to the surround area without further works.
The cost estimates include the replacement of 300 mm of topsoil on the slope of the pond above normal water level. Below normal water level, it assumes that suitable silt or clay material exists in the native material to seal the pond. An allowance has been made to sub-excavate and replace approximately 30% of the slope below the permanent pool elevation. It is assumed that this material will be available on site. The estimate does not include an allowance to import or purchase clay to line the pond. An allowance has been made to hydroseed the disturbed areas with normal seed mixtures. Some projects have been required the use special mixtures which could be up to three times as expensive to use. An allowance has also been included in the estimate to place an erosion mat/grid on the disturbed surfaces until the vegetation is properly established.

Landscaping

The landscaping works were divided between those required in conjunction with the pond and those related to enhancing the area adjacent to the pond itself.
The review agencies will require a certain level of planting associated with the SWM facility. This will include emergent plants below the normal water level and shoreline planting at the pond's edge above the normal water level. There will also be the requirement for trees and shrubs on the slopes of the pond. These have been indicated as being associated with the SWM pond.
To satisfy the University's other objectives related to enhancing the Campus, further landscape budgets have been added to the overall budget. This also aims to satisfy the City's requirements for compensation planting for the removed brush lot. An additional budget has been allocated to "naturalize" the slope between the pond and the adjacent roads.
A 3.5m wide stone path has been allowed between the entrance road and the inlet headwall.

Remove and Replace Storm Sewer Works

Although the storm sewer needs to be raised, it has been assumed that the new storm drain will be located in a utility corridor situated south of the Outer Ring Road. This assumes minimal by-pass pumping will be required to handle the flows while new drains are being constructed.
The existing road base will be patched over the new storm laterals and drain pipes. The entire length of the disturbed road will be resurfaced.

Although this is required external work to the pond, it has been included in the main contract for the TPC budget.

Retrofit Existing Parking Lot and Entrance

The parking area north of the woodlot will likely be damaged by the construction activities and require resurfacing.

A storm drain has been extended through the area that will also accommodate the runoff from the existing and future parking area east of the existing tennis courts.

APPENDIX C
MAP STORMWATER MANAGEMENT POND PROPOSED LOCATION