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Joe Murdock
Nunavut Water Board
P.O. Box 119
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Nunavut Arctic College Student Accommodations
Drainage Course Relocation

Dear Mr. Murdock:

Nunavut Arctic College in Iqaluit proposes to construct a new Student Accommodation at the North West corner of Saputi Drive & Qulliq Court. The site is currently not developed with an existing drainage course conveys seasonal snow melt to 900 mm diameter CSP culvert that crosses Qulliq Court south east corner of the site (refer to Drawing SSG-1). In order to proceed with the proposed building construction, the existing drainage course that transects the site must be diverted along the northeastern boundary of the site. Flows from the proposed diverted ditch will join the existing drainage ditch directly south east corner of the site near the existing 900mm diameter CSP culvert. The following letter includes a discussion of pre-development and post-development flow conditions in the vicinity of the proposed site.

Existing Flow Condition

The existing drainage ditch that transects the proposed building site has a slope of approximately 3.7% from the upstream to the downstream limit of the proposed site. The ditch conveys flows mainly during spring melt and, to a lesser extend, from occasional rainfall events. The existing culvert crossing Qulliq Court, has been in place for many years.

Due to a lack of information regarding the upstream contributing area to the existing culvert south east of the proposed building site, the theoretical capacity of the culvert under free-flowing state was used to estimate flow rate and velocity in the existing drainage ditch that currently transects the site. As detailed in the attached Flow Capacity Computation Form, Manning's equation for steady uniform flow conditions was used to estimate the maximum flow and velocity. Based on a 900 mm diameter CSP culvert with a 3.3% slope, the peak flow and velocity are calculated to be 1,781.32 L/s and 2.80 m/s, respectively. This flow rate was assumed to be the peak flow that is conveyed by the existing drainage ditch that has to be diverted. The actual peak flow conveyed by the existing drainage ditch is likely less than the calculated peak flow due to the fact that the culvert is actually taking additional flow from the ditch along Saputi Drive.

Proposed Drainage

The proposed diversion ditch will have an average slope of 1.0%, the ditch is trapezoidal shape with 2:1 side slope and 0.75m deep, (approximately top width is 3.0m). As detailed in the attached Open Channel Flow Computation Form, Manning's equation was used to estimate the maximum flow capacity of the proposed diversion swale. Based on the above mentioned swale details and a Manning's 'n' value of 0.018, consistent with a clean, uniform earth section, the calculated capacity is 3,017 L/s, which is greater than the previously calculated maximum flow (based on culvert capacity) of the existing ditch.

Summary

As demonstrated by the attached calculation sheets, the proposed diverted ditch will have a capacity greater than the calculated capacity of the diverted drainage course. Therefore, the proposed drainage ditch is adequate for conveying flows originating from the upstream catchment area through to the undisturbed ditch downstream of the proposed building site.

Yours truly,

Trow Associates Inc.

Abdal Zarad, P.Eng.
Project Engineer
Civil Engineering Services

Steve Burden, P.Eng.
Senior Project Manager
Civil Engineering Services

Enclosures: Flow Capacity Computation Form
Open Channel Flow Computation Form
Figure 1 – Proposed building site
Figure 2 – Existing drainage course.
Drawing SSG-1 – Site Servicing & Grading Plan.

FLOW CAPACITY COMPUTATION FORM

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Manning's Equation for steady uniform flow conditions

$Q = 1000 * R^{2/3} * S^{1/2} * A/n$

Where: Q = Flow (L/s)
R = Hydraulic Radius (m)
A = Cross-Sectional Pipe Area (m^2)
n = Manning Roughness Coefficient
S = Channel Slope (m/m)

$V = (1/n) R^{2/3} * S^{1/2}$

Where: V = Flow Velocity (m/s)
n = Manning Roughness Coefficient
R = Hydraulic Radius (m)
S = Channel Slope (m/m)

R = A / P

Where: R = Hydraulic Radius (m)
A = Cross Sectional Area (m^2)
$A = Pi/4 * Diameter^2$ (m)
P = Wetted Perimeter (m)
P = Pi * Diameter (m)

Manning "n" for CSP:	0.024	(Corrugated Steel Pipe - Unpaved)	**USER DEFINED**
		(MOE Drainage Management Manual)	

Diameter =	900 mm	**USER DEFINED**
Slope =	3.3 %	**USER DEFINED**

A =	0.6362	m^2
P =	2.8274	m
R =	0.2250	m
Q =	1781.32	L/s
V =	2.80	m/s

OPEN CHANNEL FLOW COMPUTATION FORM

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	Bottom Width	Left Side Slope	Right Side Slope	Flow Depth	Wetted Perimeter	Top Width	Area	Hydraulic Radius	Boundary Material	Manning's n	Bottom Slope	Average Velocity	Flow Rate	Flow Rate
	m	X horizontal : 1 vertical	X horizontal : 1 vertical	m	m	m	m^2	m			m/m	m/s	m^3/s	L/s
Proposed Swale North of the Site	0.0	2	2	0.75	3.35	3.00	1.13	0.34	Earth, uniform section, clean	0.018	0.0100	2.68	3.017	3017

Photograph No. 1: Proposed Building Site

Photograph No. 2: Existing Drainage Course Through the Proposed Building Site