NOTICE OF UNIVERSITY ORAL

GEODESY AND GEOMATICS ENGINEERING

Master of Science in Engineering

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Wednesday, April 4, 2012 @ 10:00 am

Head Hall – Room E-11

Board of Examiners:
Supervisor: Dr. John Hughes Clarke, Geodesy and Geomatics Eng.
Examining Board: Dr. Susan Haigh, Geodesy and Geomatics Eng.
Dr. Katy Haralampides, Civil Engineering

Chair: Dr. Sue Nichols, Geodesy and Geomatics Eng.

The Oceanographic Circulation of the Port of Saint John Over Tidal and Seasonal Timescales

ABSTRACT

As part of the sustainable management of the Port of Saint John there is a critical need to maintain sufficient under keel clearance for the various container and cruise ship traffic in and out of the harbour. Because of high and variable sedimentation rates, annual maintenance dredging is necessary and causes economic concerns for the Port. Therefore to better predict future dredging volumes and hence improve the budgeting process for the Port of Saint John, the estuarine circulation of the harbour has been analysed to better quantify the relative importance of the offshore sediments that contribute to the high dredging volumes in the Saint John harbour.

The Port of Saint John lies at the mouth of the Saint John River on the north side of the macrotidal Bay of Fundy. Because of this, the harbour sedimentation is influenced by two major sources of siltation: the Saint John River and the Bay of Fundy. The sediment flux from the river is strongly modulated by the seasonal variations in river discharge. In the Bay of Fundy, there is significant resuspension of offshore marine sediments.

To better understand this complex interaction between the fresh water flow and the tidal inflow of salt water, high density oceanographic surveys have been conducted at four different river discharge periods. In order to quantitatively analyse the mixing of the fresh and salt water in the harbour channels, high density ADCP currents and CTD measurements were acquired along main longitudinal axis of the Main Harbour channel and Courtenay Bay over four tidal cycles. By imaging the 200kHz acoustic volume backscatter within the water column, the appearance of interfacial waves at the pycnocline can be examined. The optical backscatter sensor provided observations used to estimate suspended sediment concentrations.

A cross-sectional analysis of the flow at a location 700m south and seaward of the Rodney bay terminal in the Main Channel revealed that regardless of the river discharge rate, the interfacial waves are best developed on the rising tide. However, during the Spring freshet the interfacial waves are also developed at high tide, low tide and falling tide. Examination of the timing and location of the interfacial waves are important because they influence the nature of sediment transport in the Main Harbour Channel.

During high river discharge periods, the sediment concentration and volume flux estimates indicate that the river is the main source of sediments. For the low river discharge periods, the observations suggest that the possible source of suspended sediments observed in the lower saline layer are either from outside of the harbour or harbour bottom sediments being resuspended on the rising tide.

Faculty Members and Graduate Students are invited to attend this presentation.