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February 9th, 2009

Community Marine Concepts
c/o WAM Development Group
2630 West King Edward Avenue
Vancouver, B.C. V6L 1T6

Attention : Mr. Lachlan MacLean, General Manager-Marina Operations

Dear Mr. MacLean:

Re: Opinion Letter

Modeling Effects of Wave Attenuator at Victoria International Marina and its Impact on Floatplane Operations

You requested that McNeal & Associates review the report prepared by ASL Environmental Sciences Inc. entitled "Modeling Effects of Wave Attenuator at Victoria International Marina" dated January 2009, and to provide an opinion letter of the impact of the wave attenuator planned to be installed at Victoria International Marina on floatplane operations.

McNeal & Associates are aviation consultants who have expertise in floatplane operations and who conducted the Victoria International Marina study on the impact of floatplane operations for Community Marine Concepts for a submission to Transport Canada.

The wave attenuator will act as a breakwater to protect the large yachts moored in the marina from wave transmission motion. A wave attenuator, however, will also reflect the incident waves back. The potential impact to floatplane operations to be assessed is rough water conditions generated from the reflected back waves that may be higher than the forward incident waves generated by winds.

There is a floatplane taxiway just to the south of the marina that is used occasionally to transit to and from Bravo runway and it is an area subject to reflected waves. Runway Alpha is the east-west (071/251 degrees) water runway. While Alpha is some distance to

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the south of the wave attenuator there will be some wave attenuator impact. The Bravo runway (015/195 degrees) is too distant from the wave attenuator to receive any impact.

ASL Environmental Sciences Inc.'s mathematical model, SWAN developed by Delft Technology University in Holland, is a linear based model that takes into consideration the wind speeds that generate wave action but also the effect of tide, current and water depth and bottom friction. The model is a more detailed representation of the area near the planned Victoria International Marina and is within a larger Victoria Harbour area modeled previously by ASL Environmental Sciences Inc. The model assumed that the wind direction is from the southwest (225 degrees). These are winds from the open water of Juan de Fuca that reach Ogden Point at the entrance to the harbour and continue into the harbour unabated by natural barriers. It is these incident winds that generate most of the wave action.

The model assumed wind speed increments from 10 knots to 50 knots. A 50 knot wind is a storm condition and the Beaufort Number is 10 and produces a sea state scale of 7 scale and wave heights of over 20 feet in open water. These severe conditions have rarely been experienced in Victoria Harbour and floatplane operations would not take place. Monthly weather records indicate the average wind speeds are 3 to 7 knots with gusts between 20 to 23 knots. Wind rose data indicates that December winds from the south are the strongest with 17-21 knot winds recorded 12% of the time. May has southwest winds of 11-17 knots 20% of the time and March records southeast winds of 11-17 knots for 16% of the time. The summer months, which are in the peak floatplane traffic period, record relatively calm winds.

Floatplane maneuvering is influenced by wind direction and speed. The rudders on the floats provide directional control and the engine and propeller provide propulsion to move forward in the water. For takeoff the floatplane turns into the wind to minimize the takeoff run. Wave action from the wind compounds control of the floatplane and creates rough water conditions.

The majority of the floatplanes used in Victoria Harbour operations (e.g. Turbo Otter, Caravan and Twin Otter) are in the 8,000 pound to 12,500 pound range and are considered large floatplanes. They are rugged in design and can operate in relatively strong winds and sea conditions. The can operate in crosswinds as high as 20 knots (Sea State Condition 3- 4) and in head-on winds in the 30-35 knot range or near Gale force (Sea State Condition 5-6) In strong winds from the south the floatplanes will use Bravo water runway for takeoff and landing. The pilots on these floatplanes are all professional pilots with thousands of hours of floatplane flying experience.

The mathematical model predicted that in the worst case scenario (e.g. a 50 knot wind) without the wave attenuator the height of the wave refracted from the shoreline would be 0.69-1.08 meters at the taxiway location. The wave attenuator would cause an additional refracted wave height of 0.01-0.14 meters at this location in these extreme wind conditions.

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In the vicinity of Alpha runway, the height of the wave refracted from the shoreline without the attenuator would be 0.63-0.72 meters in a 50 knot wind. With the wave attenuator an additional height of 0.01-0.05 meters is predicted at Alpha runway in a 50 knot wind.

The refracted wave height is lower with lower wind velocities. At a 30 knot wind, for example, the height of the refracted wave from the shoreline without the attenuator is 0.33-0.51 meters at the taxiway location. The wave attenuator would add 0.01- 0.07 meters to this refracted wave at the taxiway in a 30 knot wind.

The Alpha runway location is predicted to experience refracted waves from the shoreline with heights of 0.30-0.34 meters in a 30 knot wind without the attenuator, and the refracted waves from the attenuator would add less than 0.01 meters to the refracted wave heights at that runway location.

The affect of additional wave heights generated by reflected waves from the wave attenuator on floatplane maneuvering either on the taxiway or Alpha water runway are not significant. It is extremely doubtful that pilots would have to adjust their taxiing, takeoff and landing procedures based on the additional slight increase in wave heights as a result of the wave attenuator installed at the marina. It is the pilot's decision, of course, to operate in rough water conditions with wave heights he considers safe.

Should you have any questions, please contact me.

Wayne McNeal

Wayne McNeal
President

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