LARRATT AQUATIC

Kalamalka Lake Boat Trials

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Larratt Aquatic Consulting Ltd. 2605 Campbell Rd. West Kelowna B.C. V1Z 1T1

Phone: 250.769.5444 www.lakebiology.ca

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General Observations

A study of the impact of boat wakes on sediments in the shallow south bay of Kalamalka Lake was performed on August 27, 2019. A series of buoys were deployed along a transect of increasing depth from 1 m to 8 m (Figure 1, Figure 2). The south bay of Kalamalka Lake is shallow with nearly the entire area less than 4 m deep. At the north edge of the bay is a steep drop off to >20 m. The buoys at 4 – 8 m were closely spaced because of this drop off (Figure 1).

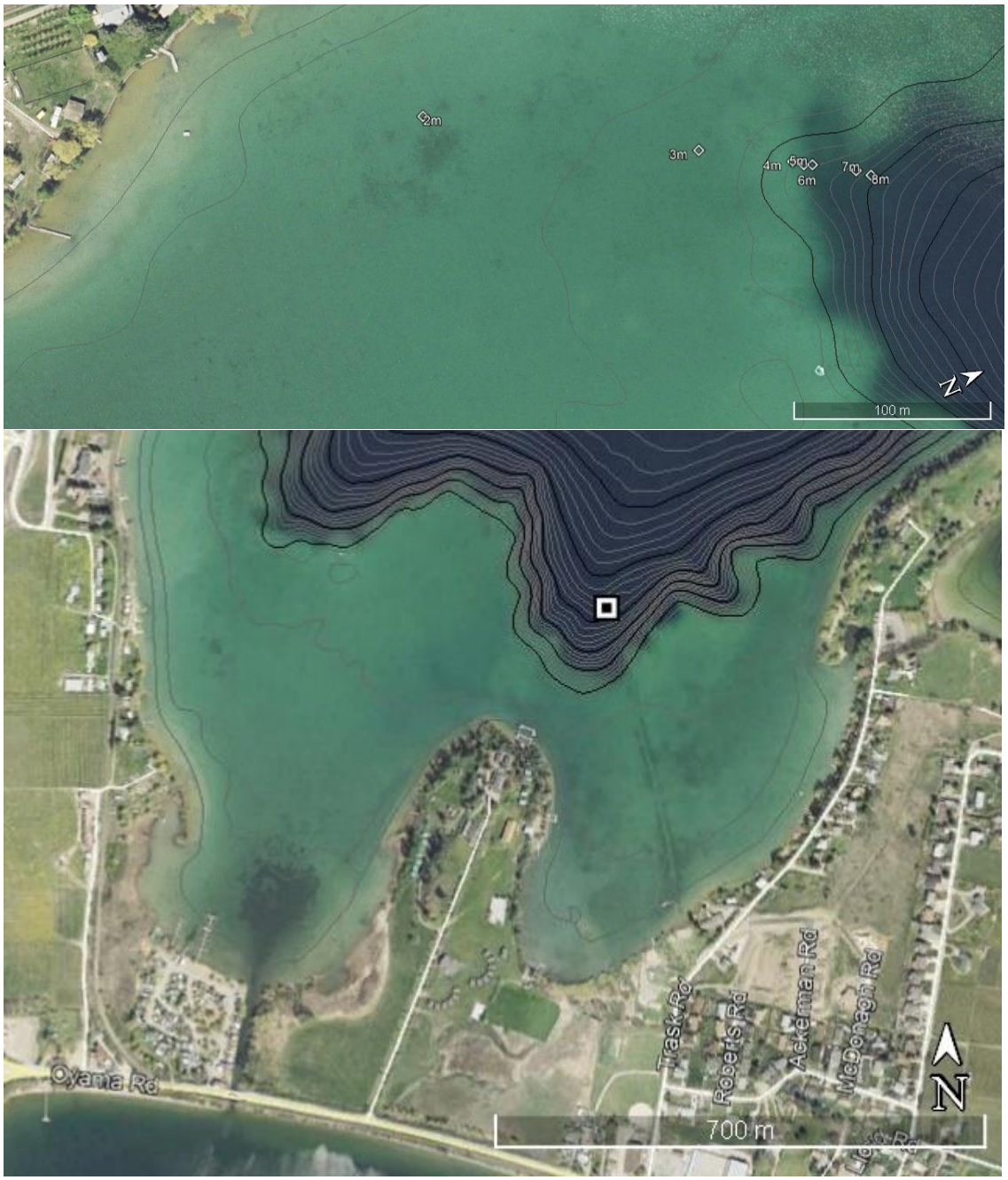

Figure 1: Map of buoy locations and bathymetry contour lines in the south bay of Kalamalka Lake (top) and location of DLC intake (bottom)

The test used a wake-surf boat producing typical wakes along the buoy line and measuring the impact of the vertical wake turbulence on the sediment using underwater and aerial imagery.

The sediments of Kalamalka Lake are very fine and resuspend readily. This was clearly demonstrated during the trial in the aerial imagery (Figure 2-4). Over the course of the trial the boat created a dramatic plume of re-suspended sediment along the buoy-line (Figure 3). This plume was also visible from the water but it was less clear and would not be noticed unless the boat returned to where they had been and stopped (Figure 2). The fine nature of Kalamalka Lake sediments mean this plume would be slow to resettle and would move into deeper water based on its relatively higher density compared to surrounding water. Given the location of the District of Lake Country intake, there is significant potential for a plume generated by a boat operating in the shallows to impact the intake (Figure 1).

Figure 2: Re-suspended sediment visible from the wake-surf boat

Figure 3: Buoy line through Kalamalka Lake Bay from 1 m to 8 m.

Using aerial imagery, the dual impact of the prop-wash and boat wake on the sediment were demonstrated (Figure 8). The prop-wash created a very intense plume of sediment that clouded the entire water column and was visible at the surface (Figures 2, 3, and 4). The wake impact was not visible from a boat but was clear from the air and underwater.

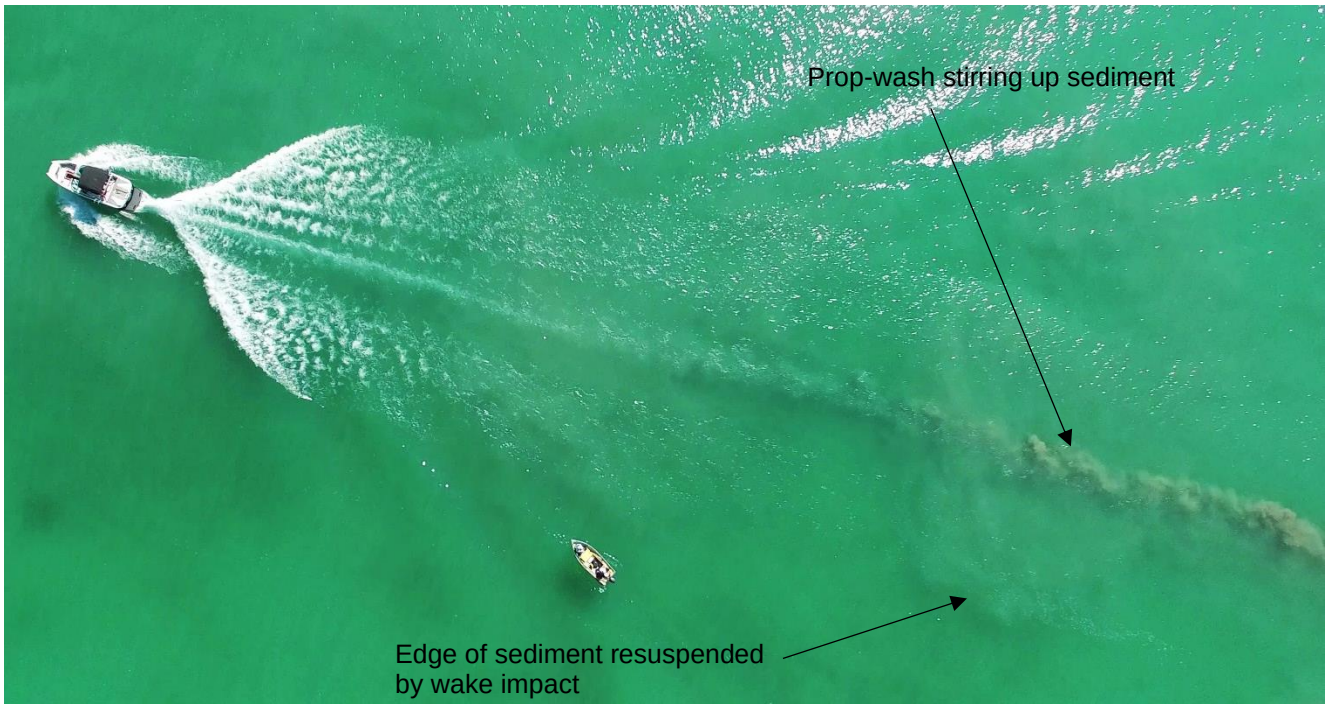

Figure 4: Aerial image of boat, wake, and active sediment re-suspension caused by the prop-wash and wake.

The impact of the wake from the wake-surf boat was dramatically observed impacting the sediment in 3 m or less of water (Figures 5 and 6). This represents nearly the entire southern bay.

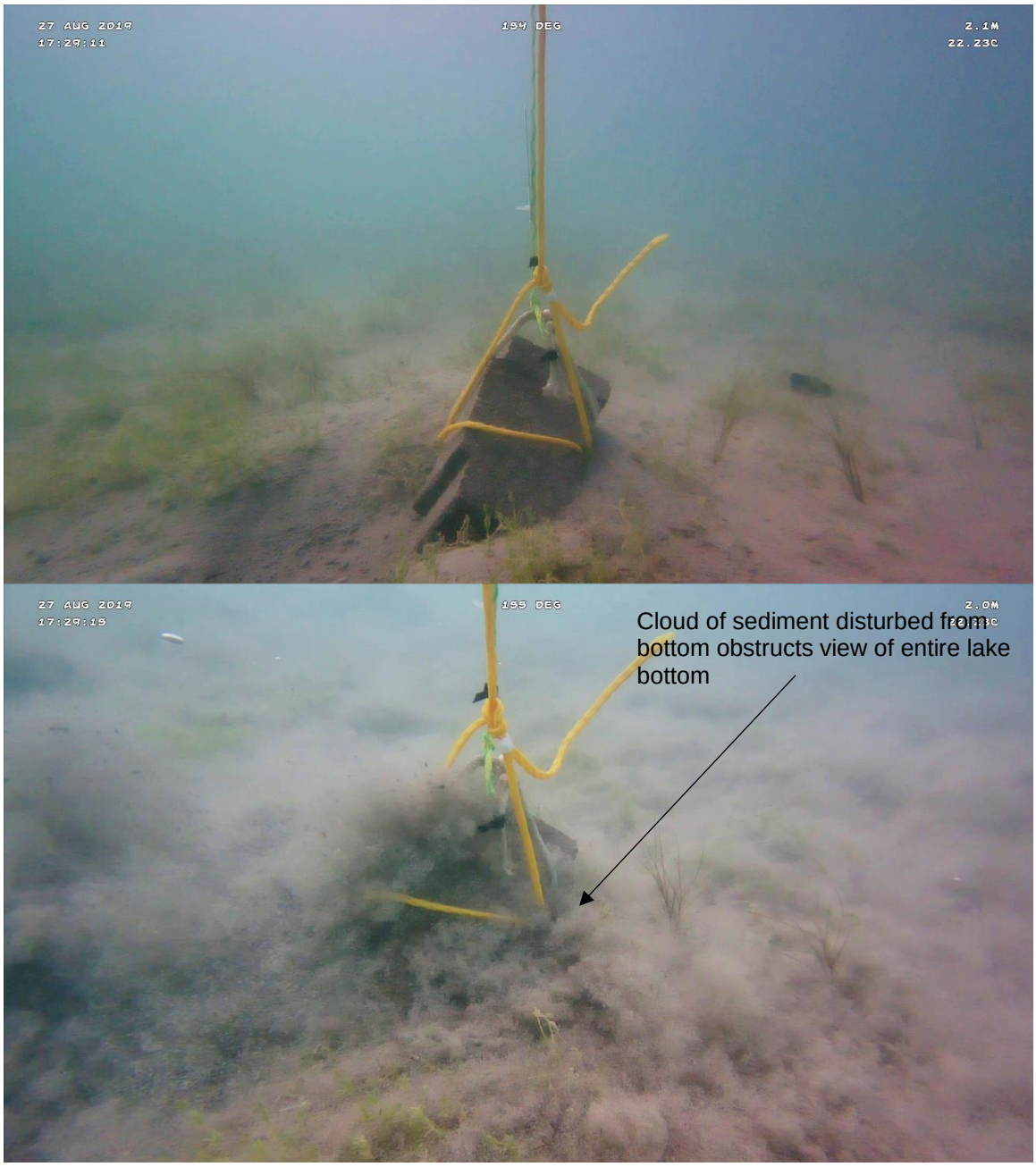

Figure 5: Before (top) and after (bottom) impact of boat wake on sediments at 2 m

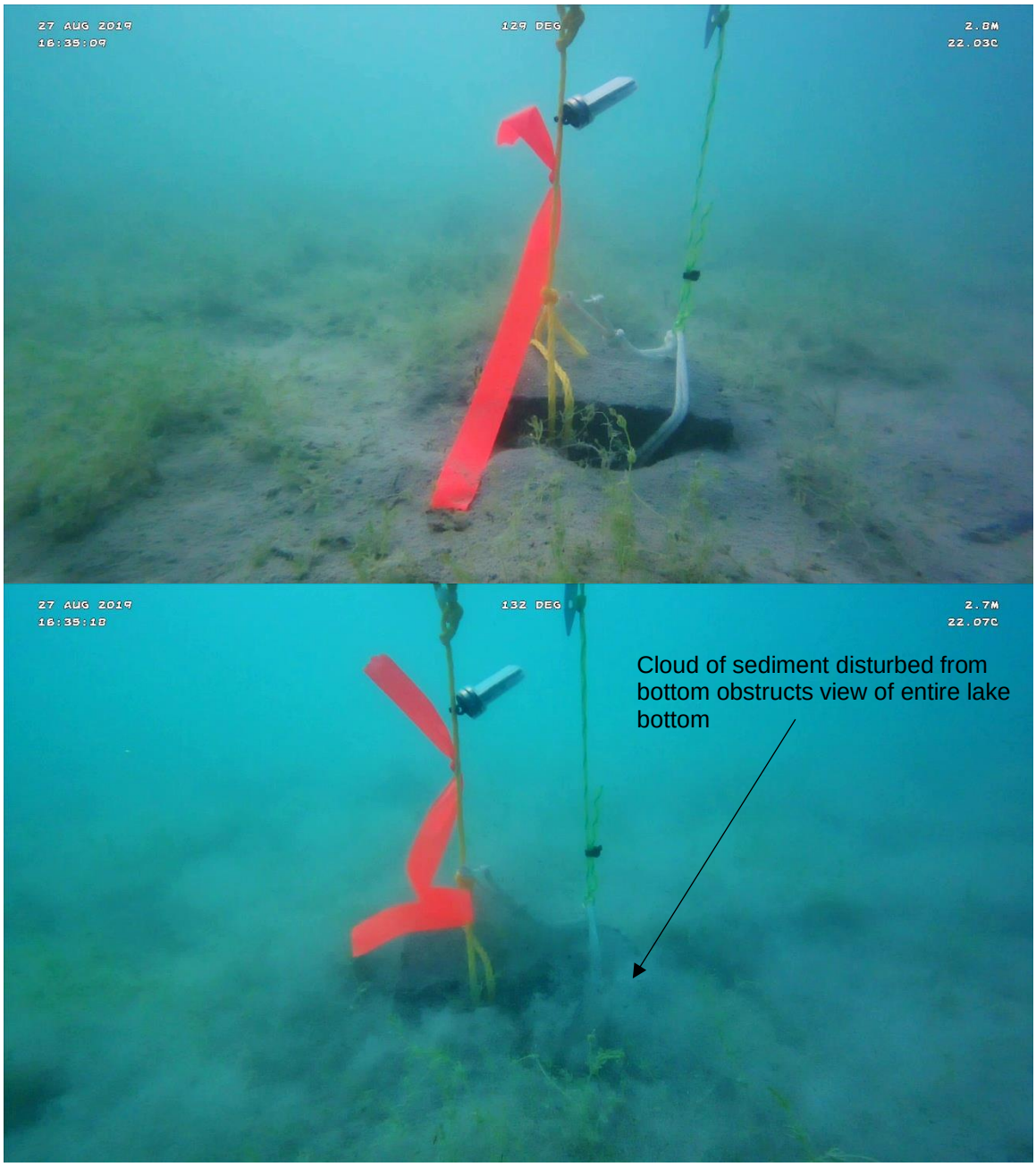

Figure 6: Before (top) and after (bottom) impact of boat wake on sediments at 3 m

Sediment re-suspension was also observed at 4 m but the impact was less significant than at 3 m. The 4 m anchor block was resting on the drop-off slope and sediment could be seen moving down the slope with each successive wave impact.

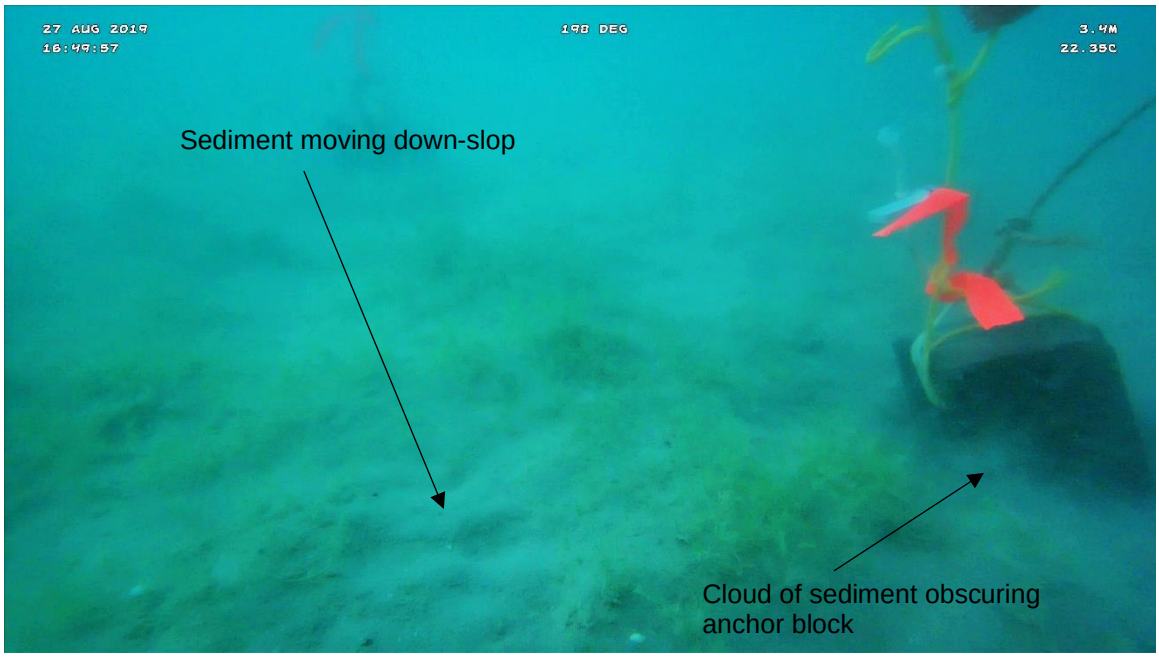

Figure 7: Re-suspended sediment at 4 m

At 5 m and deeper, there was no observed sediment re-suspension, but the wake was clearly seen impacting the bottom at 8 m, the deepest buoy deployed.

In addition to impacts generated during the trial, aerial imagery revealed the presence of scars on the lake bottom caused by previous boat disturbances.

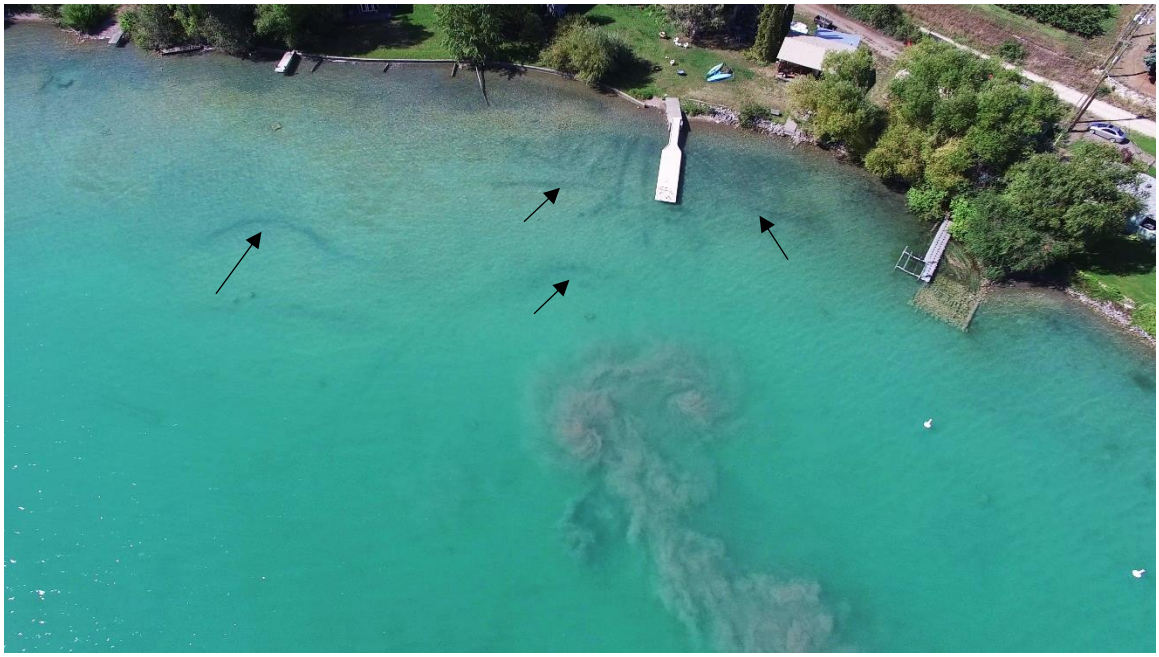

Figure 8: Scars in the sediment from previous boat disturbances

Conclusion

The wake vertical turbulence from the wake-surf boat was observed causing major disturbances in water 3 m deep or shallower. Sediment re-suspension was clearly documented as deep as 4 m and the impact of the wake was measured as deep as 8 m. The very fine sediment in Kalamalka Lake is very easily re-suspended and the entire south bay is highly vulnerable to re-suspension.

Recommendations

Boat operation in water <5 m deep should be conducted at low power with minimal wake generation to prevent sediment re-suspension from the boat wake turbulence and the prop-wash. Water as deep as 8 m can still be impacted by the wake. Large particulates settle quickly, sediment contaminants and bacteria settle very slowly (days) and form sediment plumes that travel down-slope to deeper water where they could impact drinking water quality at adjacent intakes.

Since the potential for sediment re-suspension is greatest in shallow bays with gentle slopes where fine sediments accumulate and stormwater discharges can contribute contaminants, power boat operators should be encouraged to avoid operating in these bays. The south bay of Kalamalka Lake is unfortunately a perfect candidate for major sediment re-suspension and the proximity to the Lake Country intake increases the risk that re-suspended sediment could impact drinking water quality.

Report prepared by: Larratt Aquatic Consulting Ltd.

Jamie Self: B.Sc, R.P.Bio