TECHNICAL MEMORANDUM

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TO:	Nechako White Sturgeon Recovery Team	**DATE:**	January 14, 2005
FROM:	Scott McKenzie	**PROJ NO:**	03-1323-058/4000
EMAIL:	smckenzie@golder.com		
RE:	**LBV PILOT STUDY – NECHAKO RIVER WHITE STURGEON**		

This technical memorandum provides the Nechako White Sturgeon Recovery Team with a summary of the results of the Little Benthic Vehicle (LBV) Pilot Study conducted by Golder Associates Ltd. (Golder) in the Nechako River in November 2004.

Study Objective

The objective of the study was to determine the viability of a remote operated underwater vehicle (the LBV) for collecting underwater digital video footage of white sturgeon and their habitats within known overwintering areas in the mainstem Nechako River. The unit has been used successfully in the Columbia River to observe the behavior of white sturgeon as part of ongoing Columbia River white sturgeon recovery efforts.

Based on discussions with the Nechako White Sturgeon Recovery Team, a small scale pilot study was designed by Golder to determine if the LBV could operate and provide useful data on Nechako River white sturgeon under the following conditions;

1) Reduced water clarity compared with Columbia River,
2) Potentially less dense concentrations of white sturgeon in the Nechako River compared to Columbia River,
3) Different habitat conditions (e.g., flow velocities) at sites in the Nechako River compared with Columbia River, and
4) Colder operational (weather and water) conditions in the Nechako River compared with Columbia River.

Study Methods and Timing

The SeaBotix Little Benthic Vehicle 300 (LBV) remote operated underwater vehicle was used for this pilot study. This unit consisted of the LBV with protective bumper frame, control console, surface power supply, and 300 m umbilical. The features of this LBV included: a four thruster configuration (2 forward, 1 lateral, and 1 vertical), 270° field of vision, 180° camera tilt, 2 video cameras (0.3 lux colour and 0.03 lux low-light black and white), halogen lights that track the cameras, and sensors for depth, heading, underwater audio, and temperature. Images captured by the cameras

were transferred to the surface monitor via a fiber-optic cable enclosed in an 8.4 mm diameter umbilical cord.

Before the LBV was placed in the water, the thrusters and cameras were tested and the unit was vacuum tested to ensure that it was watertight. This unit was then placed in the water to verify it was neutrally buoyant and to calibrate the depth sensor. The thruster controls were checked again in the water and then the LBV was sent down to the river bottom. The LBV was then maneuvered in the desired direction(s) to obtain the desired footage. This unit can be operated at depths up to 300 m and in current speeds of up to 150 cm/s (3 knots), although its mobility decreases as current speed increases (mainly due to increased drag on the umbilical).

The LBV Pilot Study occurred from 23 to 25 November, 2004. After travel and initial set up and testing of the equipment on 23 November, a field crew of three traveled down river by river boat from Vanderhoof on 24 November to investigate several known high use white sturgeon overwintering areas in the Nechako River.

Two sites were initially selected that included the high use overwintering sites at Km 116 and 124. Using a Lotek receiver and four element Yagi-style antenna, the crew confirmed the location of several radio tagged fish at Km 116 but not at Km 124. Consequently, Km 116 was selected as the initial site for the pilot study.

Study Results

A total of three surveys were done at rKm 116 from 1050h to 1450h on 24 November. Underwater footage from these surveys correspond to the following attached digital files:

- Survey 1 – File A
- Survey 2 – Files B and C
- Survey 3 – Files D and E

The weather was overcast in the morning and snowing. In the late morning, the snow turned to rain under partly cloudy skies. The Sechi depth was 2.5m whereas horizontal visibility while operating the LBV was approximately 2m. Water temperature was 1°C.

Clusters of 50 to 100 white sturgeon were recorded by the LBV during the second and third surveys. These surveys correspond to files B and C (Survey 2) and files D and E (Survey 3) on the enclosed CD-ROMs. Files C on disk 1 and E on disk 2 have the most footage of white sturgeon. We used both the regular and low light cameras, as well as the scaling lasers (i.e., to measure length).

Several white sturgeon with external tags and fin clips were observed on the footage; however, it appeared that many of the individuals may not have been previously captured by sturgeon

researchers. The vast majority of the individuals observed were adults and it was possible to obtain length data from some of the specimens using the LBV.

Most the individuals observed exhibited little or no activity during the 4 hour period of the survey. Some individuals were observed holding off the bottom while others were stationed on the bottom. The density of fish was high and within some areas, individuals were in very close proximity to each other. Within these high density areas, observed individuals were generally oriented in a uniform direction.

The substrate was visible using the LBV cameras. In areas where white sturgeon were observed, the substrate consisted of predominately fines (i.e., silt, sand), with some areas of coarser substrate material (i.e., gravel, cobble) intermixed with fines. This finding is consistent with that previously reported by RL&L (1997) for this site.

As far as potential limitations of the unit, cross currents and floating ice/debris reduced mobility of the LBV by placing drag on the umbilical cord. Further, cooler air temperatures (i.e., at or below 0°C) present challenges with respect to operation of the unit and the electronic equipment. These limitations and challenges, however, could be largely overcome through additional logistical planning and set up should sampling be pursued at sites with these characteristics or during cooler periods of the year.

Potential Future Applications

There a number of potential future applications for this technology in relation to the research and information needs identified in the Nechako White Sturgeon Recovery Plan. These include, but are not limited to, the following:

- Observation of white sturgeon spawning behaviour and site selection, including egg release, spawner enumeration, predator presence, habitat, spawner abundance, etc.
- Observation of specific white sturgeon life stages, previously impossible or difficult to observe; including egg deposition, yolk-sac larvae, larvae and juveniles.
- Juvenile white sturgeon deep water habitat use and detailed descriptions of this habitat
- Adult white sturgeon habitat use and critical habitat descriptions.
- Adult and juvenile white sturgeon density estimates in critical habitats such as overwintering locations.
- Success of release of cultured white sturgeon during recovery initiatives.
- White sturgeon life history (e.g., length) and mark/recapture (e.g., Floy or radio tag, fin clip) enumeration without the need for intrusive physical recapture and handling.

Summary

The results of the LBV Pilot Study indicate the unit can be successfully deployed in the Nechako River to gather general behavioural data on this population of white sturgeon, as well as site

specific data on presence/absence, capture history (e.g., Floy and radio tags, fin clips), life history (e.g., length), and habitat availability and use (e.g., overwintering). Additional tests would be needed to determine if the unit could be used to gather other useful information, such as data on spawning behavior and habitat, density, and early life history, as river and site conditions (e.g., flows, water clarity) would be different than those investigated in the present pilot study.

The results of the pilot study also suggest the potential for additional future applications, in concert with other white sturgeon sampling programs, to improve our understanding of the life history, habitat requirements/utilization of this endangered population.

If you have any questions or require additional details, please contact the undersigned.

GOLDER ASSOCIATES LTD.

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A copy of this correspondence and the two associated disks has been provided to each of the following members of the Nechako White Sturgeon Recovery Team:

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- J. Benckhuysen, Alcan
- S. McAdam, WLAP
- D. Cadden, WLAP
- C. Williamson, WLAP
- B. Nutton, DFO
- J. Hwang, DFO
- D. Sneep, DFO
- B. Toth, CSTC

Reference:

RL&L Environmental Services Ltd. 1997. Fraser River White Sturgeon Monitoring Program. Region 7 (Omineca –Peace) – 1996 Investigations. Report Prepared for BC Ministry of Environment, Lands and Parks, Fish and Wildlife Section, Prince George, BC. RL&L Report No. 520: 78pp + app.