1 CASE STUDY OF OCEAN MODULES TUNNEL INSPECTION SYSTEM

The length of the tunnel was 3.5 km from the turbines to the tunnel exit. Since the ROV cable is 2000 meters the investigation was done from the turbine hall and from the exit.

The tunnel was mostly straight with some minor turns. The dimensons of the tunnel was approximatly 7.5 meters wide and 7 meters high.

Visability was 1-2 meters.

The water flow was shut of so there was no current.

The equipment used was an Ocean Modules ROV V8Sii with a Bluview sonar, a Tritech Superseaking sonar, 1-function manipulator and a Typhoon color video camera. The winch is a custom made winch with 2300 meter of tether loaded on a trailer.

The job was to locate where the tunnel had been blocked.

The investigation was started at the exit. The ROV managed to penetrate 1900 meters into the tunnel without any problems. No blockage was found. On the second day the ROV was dropped into the tunnel through a 10 meter shaft so tha the ROV could enter the tunnel after the turbines. After 400 meters the very obvious blockage was found.

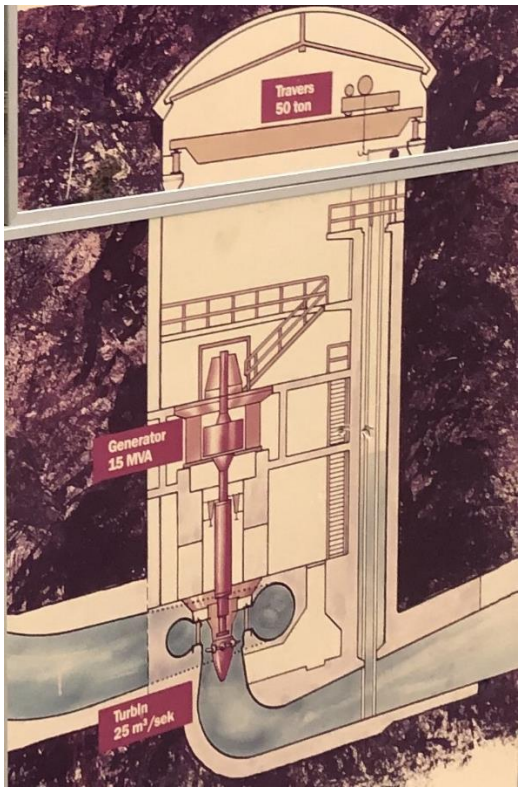

Figure 1. The ROV was lowered into the shaft seen to the right of the enerator and turbine.

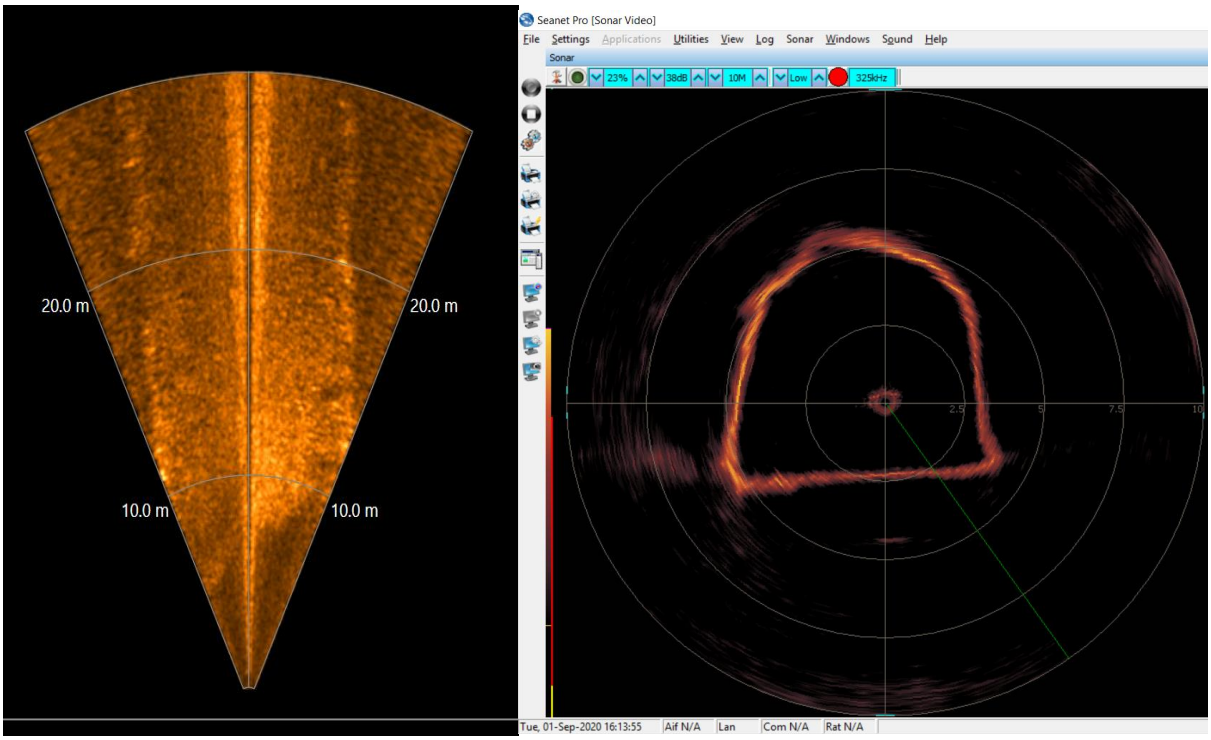

Figure 2. The BlueView sonar provided a forward-looking image of the tunnel which made navigation easy even though the visibility was bad.

Figure 3. The Ocean Modules motor driven winch with 2000 meters of cable in the turbine hall.

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Figure 4. Lowering the ROV into the shaft behind the Turbine.

Figure 5. The entrance was narrow, but since the ROV can maneuver with 360 degrees of freedom, it was not difficult to dive down into the tunnel.

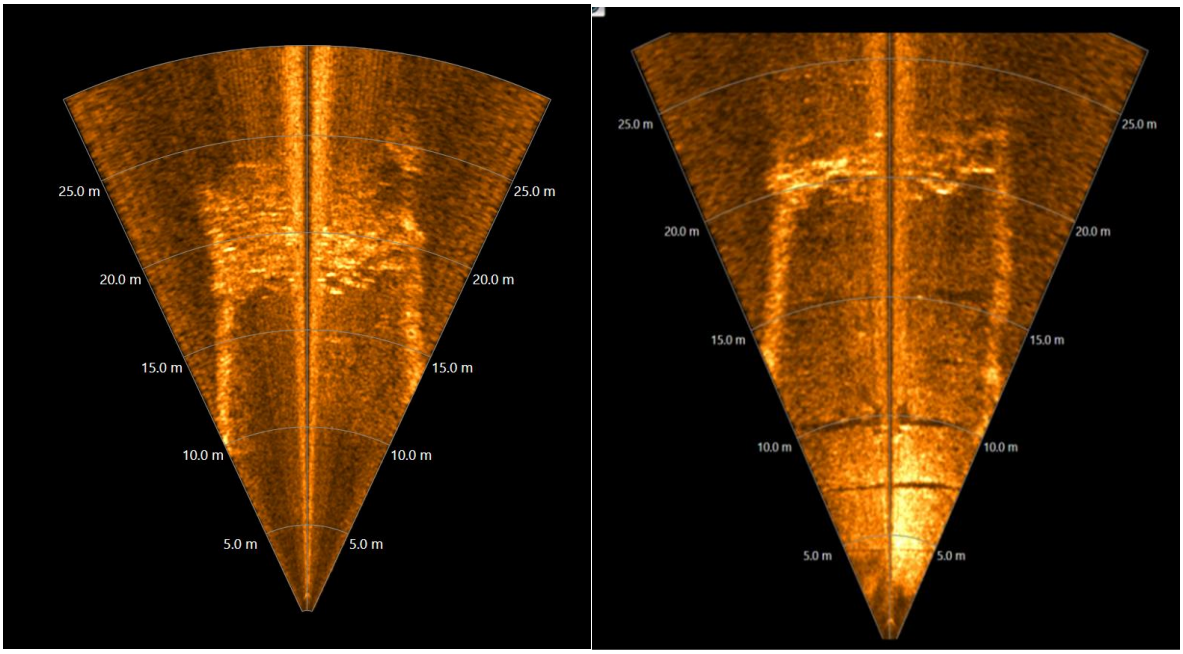

Figure 6. The blockage was clearly visable in the BluView sonar image.

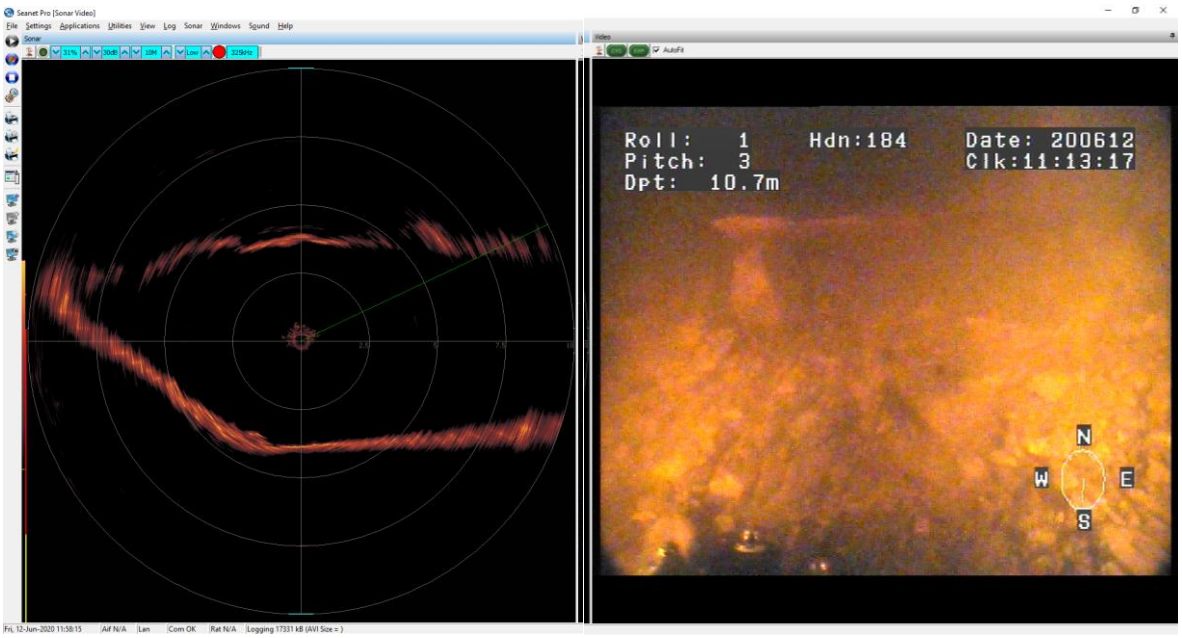

Figure 7. When the ROV was turned 90 degrees (perpendicular to the tunnel) the blockage was also visible in the profiling sonar. It was evident that the roof of the tunnel had collapsed. The visibility was extremely poor but driving close to the blockage we could visually identify the granite rubble.