BULLETIN

News from SubTerra, Inc.®

US Army Corps of Engineers Cougar Dam Downstream Diversion Tunnel Baseline Condition Survey, Blue River, Oregon

Cougar Dam's original Diversion Tunnel constructed in the mid 1950s was plugged and abandoned after construction of the dam was completed. As part of the Willamette Temperature Control Project, the diversion tunnel was rehabilitated in the late 1990s and now, 10 years later, the tunnel lining has begun to degrade slightly. The contract to perform a Downstream Tunnel Baseline Condition Survey was awarded to Natt McDougall Company, already on site constructing repairs to the Diversion Tunnel Gate Chamber. ***SubTerra*** *brought our underground engineering and mapping experience to the team.*

The late 1990s improvements consisted of construction of flow control gates, a gate control chamber and a concrete lining dividing the tunnel into an upper Access Walkway and Unlined Tunnel and lower Downstream Tunnel.

SubTerra's scope of work was to produce a Baseline Condition Survey of the 635-ft Diversion Tunnel downstream of the Gate Chamber.

Performance of this task began with laying out the stationing in both upper and lower sections of the tunnel consistent with the original tunnel drawings. Dimensional effects of the curved alignment were accounted for measuring arc length along the inside wall and chord length along the outside wall.

The photographic survey included a ring of photos taken for every 10 feet of stationing. A surveyor's level rod was captured in each of the lower photos for scaling and a sign displayed the alignment stationing.

A comprehensive map of the tunnel located features such as construction joints, drain pipes, cracks, mineral deposits, and areas of delaminated concrete. To minimize distortion and to preserve dimensional accuracy, ***SubTerra*** unwrapped the tunnel skin onto a flat plane resulting in a work product that could be used in the field to quantify the extent of future tunnel lining degradation.

A scissor lift was used to access all surfaces up to the 23-foot-high crown. Features were measured and located with tape measures and plumb bobs and lining delaminations were found with a rock hammer.

Left: *Diversion Tunnel at the cross section change looking downstream.* ***Above:*** *The upper unlined tunnel looking upstream toward the Gate Chamber Access Walkway.*

PO Box 520, 218 East North Bend Way, North Bend, WA 98045
Phone (425) 888-5425 info@subterra.us Fax (425) 888-2725