

BULLETIN

News from **SubTerra, Inc.**®

US Army Corps of Engineers Cougar Dam Gate Chamber Rock Support. 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, exposed rock in the Gate Chamber had degraded to the point of needing repairs. The contract to perform Gate Chamber Repairs was awarded to Natt McDougall Co. by the US Army Corps of Engineers.

SubTerra, Inc. brought underground engineering, rock reinforcement, and shotcrete experience to the team.



Consistent with the project specifications, **SubTerra** produced a detailed Shotcrete Work Plan and Rock Scaling Plan.

SubTerra also worked closely with the shotcrete supplier in selecting and submitting the Shotcrete Mix Design.

When the Gate Chamber was constructed, 10- and 20-foot rock anchors were installed to support the excavation with a layer of mesh fastened to the surface to catch any spalling rock. Prior to repairs, there was an estimated 10 CY of loose rock behind the mesh with about 4 CY in a

single overhead pocket. This pocket was full of intact pieces weighing in excess of 300 lbs each. The loose rock was released in a controlled manner and the mesh was reattached with 4-foot split set anchors.



The improved ground support included an initial layer of plain shotcrete followed by a final 4-inch shotcrete layer reinforced with steel fiber and imbedded 6" x 6", W2 x W2 wire mesh.



Left: Downstream end of the Gate Chamber prior to scaling loose rock.

Top: Nozzleman certification test panels.

Above: Placing shotcrete overhead from scaffolding more than 15 feet from the Gate Chamber floor.