Bow River Reservoir Options

Phase 2: Feasibility Study

Activity Description Sheet – Geotechnical Drilling and Geological Field Mapping

Overview

Alberta Environment and Parks (AEP) continues to explore options to build additional reservoir capacity on the Bow River upstream of Calgary to reduce the impacts of flood and drought on Albertans and the economy. The Bow River Reservoir Options (BRRO) initiative is being approached in phases. The Phase 1: Conceptual Assessment was completed in spring 2020 and identified three reservoir options: Morley, Relocated Ghost Dam and Glenbow East. The Phase 2: Feasibility Study is now underway and will further evaluate the three reservoir options. As part of the feasibility study, AEP's consultant, Wood Environment & Infrastructure Solutions, will be completing geotechnical drilling and geological field mapping.

Why do geotechnical drilling?

Geotechnical drilling provides information about the subsurface soil, bedrock and groundwater conditions. The holes that are drilled are called boreholes. Information is gathered by:

- Observing the drill cuttings (the drilled materials brought to surface) and characterizing the material types as drilling occurs;
- Completing tests down the borehole to assess the strength of the materials;
- Collecting, visually inspecting and describing soil samples and bedrock cores;
- Completing off site laboratory testing on select soil samples and bedrock cores;
- Taking on-going groundwater elevation measurements in PVC pipes installed in select boreholes; and
- Preparing borehole logs to document the soil, bedrock and groundwater conditions observed at each borehole.

Geotechnical drilling and testing results will help establish geotechnical design parameters and contribute to the overall evaluation of the feasibility of each reservoir option.

Geotechnical drilling is only a part of the overall geotechnical investigation program, which also includes desktop studies, geophysical surveys, geological field mapping and general site reconnaissance. Only the geotechnical drilling and geological field mapping components are described in this sheet.

Photo: Wood

Example truck-mounted auger rig.

Photo: Wood

Example track-mounted downhole hammer drill with auxiliary air compressor (back left).

Photo: Wood

Example track-mounted rotary drill rig with water tank (left) and support truck (right).

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What does geotechnical drilling consist of?

Equipment

- Geotechnical drilling is typically carried out with either a truck-mounted or track-mounted drill rig.
- Drill rigs range in size from those that can fit through a standard doorway to those mounted on a single or tandem axle truck.
- The type of drill rig used depends on the anticipated subsurface conditions, for example:
  - Clayey or sandy soils – use a continuous auger drill.
  - Gravel or bedrock – use rotary or downhole pneumatic hammer drill.
- A support truck is needed to carry drill pipes and other supplies.
- Rotary-style rigs use water or drilling mud to lift the drill cuttings to surface, whereas downhole hammer rigs use compressed air.

The drill rigs shown in the example photographs are representative of the type and size of drill rigs expected for the BRRO drilling program.

What to expect

- Boreholes are typically 150 to 200 mm (6-8") in diameter.
- It will likely take about ½ to 2 days to drill a typical borehole for the BRRO geotechnical drilling program.
- It is essential that drilling is completed without striking an existing underground utility. Prior to drilling:
  - A call is made to Alberta One-Call, which provides utility information in the area and requires utility owners to locate and mark their utilities in the field; and
  - Borehole locations are surveyed and marked, and a secondary physical utility locate sweep is conducted within a 30 m radius of the drilling location by an independent company.
- Large trees will not be harmed, although some brush clearing may be required to permit access to some of the borehole locations.
- Drill cuttings are removed from the borehole to allow the drill bit to advance into the material below.
- Soil samples and bedrock cores are collected for detailed visual logging and laboratory testing.
- Once drilling is complete, the borehole is either backfilled immediately, or a slotted PVC standpipe (typically 50 mm or 2" diameter) is installed so that groundwater levels can be measured later.
- Boreholes are backfilled with a combination of drill cuttings and sand.
- Excess drill cuttings are collected and transported off site for disposal.
- When PVC standpipes are installed, bentonite is used to backfill around the top of the pipe to seal the borehole from surface water. At the ground surface, a steel casing with a lockable cap is installed around the PVC standpipe to protect it from damage.
- When the geotechnical evaluation is completed, and the standpipe has served its purpose, the standpipe is decommissioned by removing the casing and PVC pipe, and backfilling the borehole.
- Landowners should anticipate some truck or track marks from the drill rig accessing the site, but minimal disturbance is anticipated overall.

What is geological field mapping?

- Geological field mapping is conducted by parking at a suitable access point and walking to areas of interest.
- Geologists will observe and document the soils and bedrock visible at the ground surface and in the river valley walls. They will also observe and document any topographical features of interest, such as evidence of previous landslides. Photos will be taken.

Photo: Wood

Example Standpipe installation with protective steel casing riser.

Why do geological field mapping?

- Geological field mapping is done to help verify the types of soils and bedrock identified in desktop studies and further assess potential geological hazards, like areas of potential slope instability.

Will the results be shared with landowners?

The final Bow River Reservoir Options – Phase 2: Feasibility Study report will be made available to the public following the completion of the feasibility study in spring 2023. The report will include the findings of the geotechnical drilling and geological field mapping.

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