

Town of Brighton Dam Restoration Project



Brighton Original Reservoir Dam



- The original Brighton dam was constructed in the 1980's
- Towards the end of the decade the town started noticing leaks on the downstream base
- The town first considered the leaks minor but over time the problem escalated
- By 2007 the leakage had become so bad the town enlisted the help of Angus Bradley from Municipal Affairs to do a leak survey subsequently identifying 19 leaks.

Causes & Consequences of Leakage



Further investigation revealed two main causes for the excessive leakage problem in the old dam:

- The HDPE liner had been placed directly on rock fill with no protective sand & gravel bedding layer. This would eventually lead to failure of the liner.
- Improper sealing of the liner to the concrete spillway created a large leak under the spillway.

Causes & Consequences of Leakage



The loss of water caused major consequences for the town

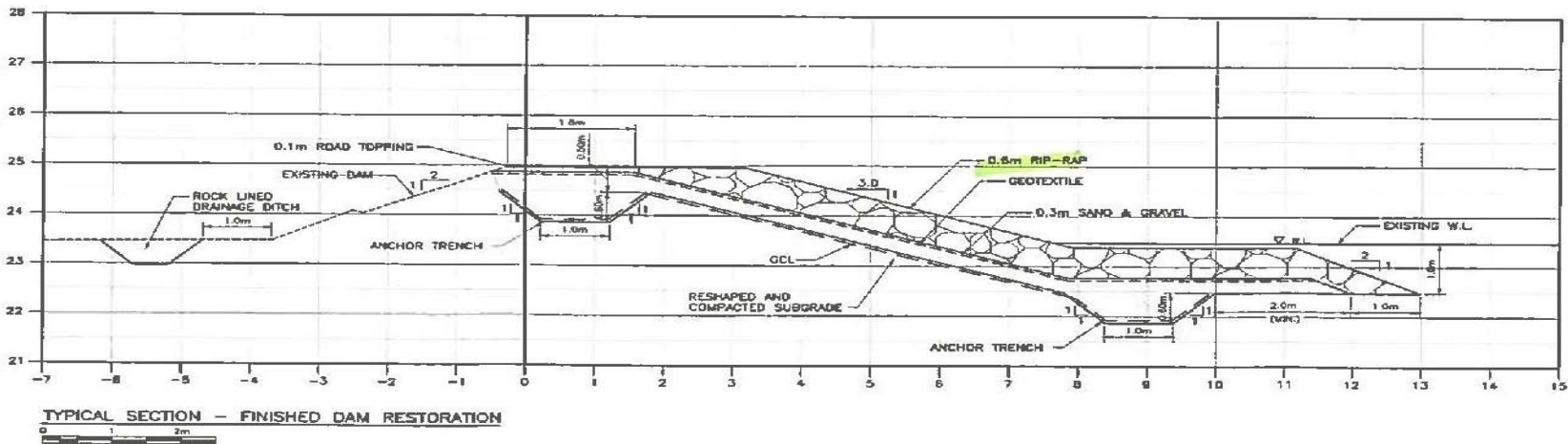
- The town came seriously close to running out of water during summer months
- The operator had to keep close watch on the pumps to ensure they did not run dry due to low water

Funding for Dam Restoration

Brighton was forced to take action and by 2009 had secured funding to start work in the amount of \$332,000. Tenders for the project came in too high so the town went back and applied again. It took until 2015 before we had money approved to retender, the total amount being \$569,310. This money allowed us to

1. Conduct a geotechnical survey, to determine the condition of the existing dam, through drilling boreholes.
2. Interpret the results of the survey to develop a scope of work for the restoration.
3. Generate the plans and specifications to complete the work.
4. Acquire the appropriate permits from applicable government departments.
5. Call for tenders.

Dam Restoration Design



The base of the old dam was acceptable for use in the restoration.

New design consisted of:

- Compacted subgrade reshaped to 3:1 slope
- 1.0 m anchor trench for liner top and bottom
- GCL liner covered with .3m sand and gravel
- Geotextile fabric covered with .8 m of rip rap

Brighton Dam Construction Phase



Grubbing work was carried out on both sides of the dam



Excavation of the dam itself involved the removal of these rock gabions and the old liner

Brighton Dam Construction Phase



This is how the dam looked after completion of the grubbing on both slopes.

Brighton Dam Construction Phase



- Cofferdam installation and pumping;
- a cofferdam had to be constructed
 - pumps were used to keep the work area dry



- Excavating and hauling away overburden while shaping dam slopes:
- all overburden had to be removed from upstream and downstream slopes

Brighton Dam Construction Phase



Working on section between far shore and spillway. The first picture shows the slopes prepared for Geosynthetic Clay Liner (GCL). The second picture shows the liner being installed up to the top anchor trench.

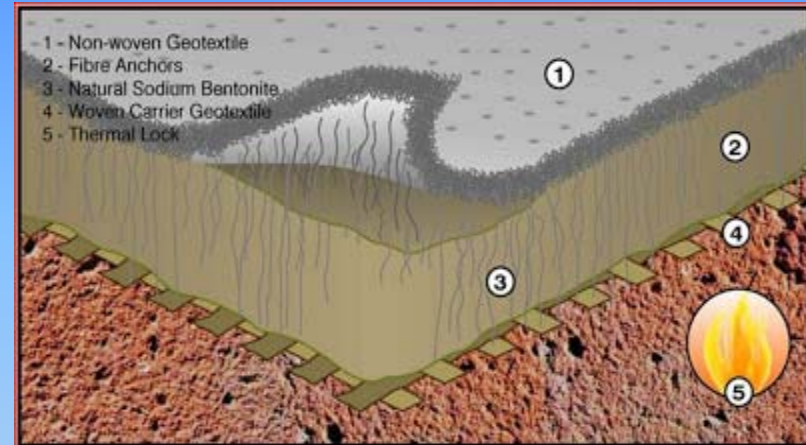
Brighton Dam Construction Phase



Tying in the dam liner to rock outcrop on far shore.

- Liner is sealed to bedrock using bentonite
- Sand and gravel being placed in the anchor trench

Brighton Dam Construction Phase



Geosynthetic Clay Liner creates the waterproofing for the dam:

- It is made by filling high swelling sodium bentonite between special composite geotextile fabric
- Water contact initiates the swelling of the bentonite up to 6 times its original volume to create a waterproof seal
- A layer of bentonite is also placed between the fabric at overlaps to seal the joints

Brighton Dam Construction Phase



Tying in the GCL liner to seal around the 400 mm drain pipe and the concrete face of the spillway structure. Proper installation is crucial to getting a water tight seal.

Brighton Dam Liner Installation



Maintaining waterproof seal around the spillway structure

- GCL liner is affixed to the spillway structure using lumber and anchor bolts at the top
- Anchor bolts have been spotted along the base to keep fabric tight
- Backfill is then carefully applied to the area.

Brighton Dam Liner Installation

Subgrade prepared for liner placement



Here you can see a large section of the upstream dam face prepared for the installation of the liner. The slopes have been dressed to 3:1. A uniform sand and gravel bed has been compacted in place.

Brighton Dam Liner Installation Using Excavator to roll out liner



Installation and covering of the GCL liner is shown here.

The excavator is using a special dispensing reel to unroll the fabric in place.

The 300mm sand & gravel cover is being placed over the liner following installation.

Brighton Dam Liner Installation



Placing bentonite sealant between horizontal and vertical joints in GCL liner. Once contacted with water the bentonite will expand creating a waterproof seal between the layers.

Brighton Dam Covering GCL liner with sand and gravel



- A 300mm sand and gravel layer is placed over the GCL liner for protection.
- Slope of the dam is increased to 3:1
- Liner is anchored in the bottom by 1 m wide anchor trench

Brighton Dam Finishing Slopes With Rip Rap



- An 800mm blanket of rip rap protects the face of the dam from erosion
- 150 mm sized rip rap is used for this phase

Brighton Dam Finishing Slopes With Rip Rap



Two excavators working in tandem to complete rip rap placement at the toe of the upstream slope.

Brighton Dam Finishing Crest of Dam With Class A Fill



- A 100mm layer of Class “A” fill is used to cap the crest of the dam.
- This was the final stage of construction

Before and After



Brighton Dam

Brighton dam was completed Nov 16, 2015.

There is a continuous flow of water through the spillway and Brighton no longer has to worry about low water levels or water shortages.

Questions?