GRIFFITHS

civil engineering and construction

Infrastructure Division Case Study

Prior Park Dams

Prior Park Landscape Gardens in Bath, owned and operated by the National Trust. Grade I listed, partially designed by Capability Brown

At first sight, seemed a relatively straightforward engineering scheme. Three lakes separated by two dams and an outlet structure at the downstream terminus, in need of repair and upgrade. All in a garden open to the public and owned by the National Trust.

American Signal Crayfish had eroded the middle dam and the embankment on the East side of the lower lake to such an extent that the dam was unsafe and the embankment eroded to a sheer face in places. The scope was to rebuild the middle dam and line the lower lake with plastic piling to prevent damage by crayfish and also to up-grade the lower outlet structure to be able to cope with a 1:10,000-year weather event.

Challenges

The garden is of National importance, being Grade I listed and dating from the early-mid 1700s. The whole site is in a valley with a steep gradient leading down to the lake system. Access to the lower site, where the works were taking place, was so narrow that nothing larger than a transit van could get through it. Once drained, the lower lake, happened to have a 2-metre depth of silt in it rather than the 0.5m we had been expecting, which changed the entire methodology we had planned.

The gardens have three ponds, impounded by the palladian bridge, middle dam and lower dam respectively.

The middle dam was in poor condition and suffered failures resulting from voids within the structure, party caused by non-native crayfish species burrowing into the banks. The middle pond was drained to reduce loading on the damp. The lower dam was found to have insufficient overflow capacity and would overtop in the design flood event, risking a potential failure. The National Trust were undertaking works to upgrade the middle and lower dams and restore the surrounding landscape.

The works to the Middle Dam consisted removal of outlet and cascade, replacement of existing dam with new clay core and compacted selected fill with 1 in 3 downstream slopes. New sheet pile cut-off below the dam core on the western limb; Raising of embankment level by 0.2m-0.3m to bring it to a consistent level. The repair of upstream masonry wall and construction of new where no existing wall was present; The construction of new letterbox weir and cascade with stone cladding, the construction of a new outlet pipe and arched culverted outlet, with stone cladding; path and embankment detailing and plastic sheet piles with timber cladding along downstream toe.

Works to the Lower Dam consisted of removal of the existing structures; construction of a new outlet structure with stone cladding to increase overflow capacity, raising the embankment crest level by 0.6m-0.7m, path and embankment detailing and reinstatement of stilling basin and associated works.

Reconstruction of existing east bank with 1 in 3 downstream slopes and plastic sheet piles with timber cladding along downstream toe.

Associated works consisted of dredging the lower pond, construction of silt shelves in lower pond for marginal planting, the associated tree and vegetation removal and the construction of a temporary access route. Landscaping works including planting and grass seeding along with archaeological recoding and dismantling of key features.

It is worth noting this work was carried out when the park was open to the public and we had to maintain crossings for garden visitors for the duration of the works. Also due to the site constraints we had to have areas of shared access with the National Trust to allow them to carry out their daily tasks to maintain the park.

Solutions

All bulk materials would have to be delivered to the entrance at the top of the valley and transported down a 600mtr haul road we constructed down the valley, whilst avoiding archaeology in its centre. This route was too steep for conventional wheeled dumpers and crossing sensitive tree roots meant we were limited to 3 tonne tracked dumpers which could carry 1 cubic metre of material at a time. Concrete for the FRC lower outlet structure had to pumped from the main road 136m away, down a 1:2 embankment.

All of these challenges, along with covid-19 and four 10-year weather events in the first 6 months of the project, were overcome. In total we transported :-

3060t	Stone (various)
1320	Soil (top & sub)
1420	Clay (dam cores)
283m3	Concrete

The team worked hard to return Prior Park Landscape Garden lakes to their former beauty.

Middle Dam

East Bank

The Dell stilling basin

Middle dam prior to works

Project details at a glance

Client: **National Trust**
Location: **Bath**
Completed: **August 2020**
Value: **£2.07m**
Contract: **NEC ECC**