

PROJECT PROFILE

HIGHLAND PARK RESERVOIR EMBANKMENT REPAIR

The Highland No. 2 Reservoir is located in the City of Pittsburgh, Pennsylvania, on top of a hill overlooking the Pittsburgh Zoo. The reservoir was constructed in the late 1800s by a combination of excavation and construction of perimeter earthen embankments. The reservoir has a surface area of about 16 acres and the capacity to store approximately 114 million gallons of potable water at a maximum depth of 29 feet.

In 1987, the reservoir was drained to remove sediment from the bottom and to repair the concrete liner. As the reservoir was subsequently being refilled in 1988, a failure occurred along the downstream slope of the embankment, resulting in the destruction of a 160-foot segment of the zoo railroad, which was located on a bench approximately halfway down the impoundment slope from the crest. The failure was apparently caused by elevated ground water levels in the downstream face of the embankment resulting from seepage.

D'Appolonia was retained by the City of Pittsburgh Department of Engineering (City) to perform a subsurface exploration program and to develop corrective measures for the bench supporting the railroad. D'Appolonia designed and supervised the construction of a geogrid-reinforced granular buttress to remediate the damaged slope and restore the bench on which the railroad track was located.



The City of Pittsburgh 114-million-gallon capacity Highland No. 2 reservoir.

After the original slope repair and reconstruction of the railroad bench had been completed, D'Appolonia was retained by the City to review the design of a planned 2,000-foot-long, 70-foot-deep slurry wall to be located through the embankment from the crest for the purpose of reducing seepage from the reservoir. D'Appolonia's scope of work for this study included a review of technical reports describing past subsurface exploration programs at the site and performing seepage and stability analyses to determine the effectiveness of the slurry wall following construction.



Placement of geogrids during reconstruction of the reservoir slope and bench for railroad track.



Reconstruction of 160-foot-long section of failed reservoir embankment.

Subsequent to construction of the slurry wall and prior to refilling of the reservoir in 1993, D'Appolonia performed a subsurface exploration and in-situ permeability tests in proximity to the reservoir influent and effluent pipes. The goal of this exploration program was to evaluate the effectiveness of jet and pressure grout zones around and underneath the pipes. Piezometers were installed in the boreholes associated with this exploration program to monitor the ground water level in the embankment during and subsequent to refilling of the reservoir.