



INSPECTING THE Hone Quarry Dam Conduit Structures

In 1982, the Virginia Soil and Water Conservation Board established the *Virginia Dam Safety Act* of the Code of Virginia Dam Safety Impounding Structure Regulations (Dam Safety Regulations). In essence, the Act "... ensures that impounding structures in the Commonwealth are properly and safely constructed, maintained and operated." Since the 1980s, dam safety regulations have been largely untouched, except in 2001, when the Virginia Acts of Assembly broadened the definition of a regulated "impounding structure" to include smaller dams that were previously unregulated. This change significantly increased the number of regulated dams in Virginia.

In 2008 and 2010, Virginia's Dam Safety Regulations were again revised to further advance the safety and welfare protection of the public and their property from the impact of dam failures. The key elements of the latest regulations revised the dam hazard potential classification system, modified spillway design requirements, established dam break inundation zone mapping and expanded emergency action and preparedness plans. The hazard potential classification system required that each dam be classified based on potential loss of human

life or property damage if it were to fail. This classification is unrelated to the physical condition of the dam or its probability of failure. Safety standards become increasingly more stringent as the potential for adverse impact increases. The proposed regulations also track federal standards more closely in an effort to improve public safety.

In addition to the increased safety measurements, it should also be noted that the latest regulations provided additional environmental benefits. Many of these impounding structures are constructed as retention devices for silt and other materials. By ensuring their safe operation and maintenance, these pollutants are prevented from being released into downstream bodies of water and environments; thus improving water quality.

In 2010, Hurt & Proffitt (H&P) performed a dam breach and inundation study for the Hone Quarry Dam, which was classified as a High Hazard Dam. Originally designed for flood control in 1965, the impoundment is a 94-foot tall earth embankment dam. It is located on Hone Quarry Run, a tributary to the North River, in Rockingham County, Virginia near the Town of Bridgewater. The study determined that the dam had insuffi-

cient spillway capacity to meet the new Virginia Dam Safety Regulations. The study also concluded that numerous farms and a portion of the Town of Bridgewater would be flooded if the Hone Quarry Dam were to fail. H&P was retained by the Virginia Department of Conservation and Recreation, Division of Design and Construction to develop design alternatives and recommend the most effective rehabilitation.

Before H&P could develop an appropriate capacity upgrade rehabilitation design, the condition of existing dam structures needed to be assessed. Specifically, the interior of the riser, the transition section and conduit barrel through the dam needed to be inspected. Throughout the United States, there are tens of thousands of conduits through embankment dams that are aging and deteriorating. Many of these conduits were poorly constructed and are not frequently inspected, if at all. Deteriorating conduits pose an increasingly greater risk for developing defects that can lead to embankment dam failure.

H&P hired Hydromax USA (HUSA) to perform closed circuit television (CCTV) inspection services within Hone Quarry Dam conduit structures. The conduit barrel was

a 480-foot long, 36-inch diameter reinforced concrete pipe (RCP). The riser was a 40-foot tall, 72-inch x 48-inch rectangular structure. The most practical inspection technology was a remotely operated vehicle (ROV) CCTV crawler, but there were some obvious logistical challenges. Due to the location of the dam, a portable system was required. Since debris and sediment in the structure was unknown, a larger ROV tractor was the best assurance against getting stuck in the pipe. Downstream access through the barrel was restrictive due to excessive overgrowth and the steep embankment. The best access was through the riser structure, but it was 20 feet offshore, so a boat was necessary; however, since the area was considered environmentally sensitive, a battery-powered motor was required. Any generator used to operate equipment needed its own fuel containment system. To top it all off, field work was performed in June, which is peak rattlesnake season in the Virginia Appalachia.

HUSA performed the CCTV inspection in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP). The PACP protocol provides a mechanism for providing reliable quantitative descriptions of pipe conditions, including ratings based on total defects, as well as ratings based on defect severity. For the Hone Quarry inspection, there were no severe defects that required rehabilitation immediately or for the foreseeable future. However, there were some moderate defects associated with visible surface aggregate in numerous locations, as well as some minor surface cracks. Overall, the riser and barrel conduit are in good structural and operating condition, especially considering the over 45-year age of the structures. H&P is currently designing the rehabilitation plan in order to increase the dam's spillway capacity and bring the dam into compliance with the new Dam Safety Regulations. H&P will also oversee construction of any rehabilitation. e

AUTHORS:

Jeffrey Griffiths
Regional Manager
Hydromax USA, Newport News, VA
O: 757-353-1521
E: jeffrey.griffiths@hydromaxusa.com

Shannon Cotulla
Dept. Manager, Geotechnical, Materials Testing & Environmental
Hurt & Proffitt, Lynchburg, VA
O: 434-847-7796
E: sdc@handp.com



FIGURE 1:
Hone Quarry Dam in Rockingham County



FIGURE 2:
Location of Hone Quarry Dam



FIGURE 3: Hoisting inspection equipment onto riser structure

www.rkk.com 800.787.3755

With offices in Richmond | Fairfax | Virginia Beach | Newport News

Water Supply / Distribution / Treatment

Wastewater Conveyance / Treatment

SWM / LID

H&H / Scour

NPDES / Permitting

Flood Control

Stream Restoration / Design

Water Quality

Creating Value ...

... Delivering Solutions

Water • Wastewater • Water Resources

Creating value by delivering innovative and sustainable solutions for infrastructure and the environment.

Baker

Alexandria 703.960.8800 • Baltimore 410.689.3400 • Falls Church 703.639.1694
 Manassas 703.334.4915 • Virginia Beach 757.463.8770
www.mbakercorp.com