

# Comprehensive Geotechnical Solutions Transform Old to New

An abandoned rock quarry is transformed into a decorative landscape, opening up usable land for high-end condominium construction

By Russ Ringler, Solomon Reyes, and Lisa Wagman Glezer

**T**he Stoneyhurst Quarry project is an outstanding example of using collaborative ASA teamwork to complete a cost-effective and sustainable project producing maximum use of functional space.

The retired Stoneyhurst Quarry is located at the intersection of River Road and the Washington,



Fig. 1: Stoneyhurst Quarry in final stage of production



Fig. 2: Top wall being transformed with faux-rock finish

DC, Beltway. In use since the mid-1800s, rock was quarried from 8101 River Road in Bethesda, MD, for the construction of many prominent buildings in and around Washington, DC.

As part of the Maryland Environmental and Mine Reclamation program, the retired quarry has undergone a transformation to allow for the development of a new high-end mid-rise condominium project.

Because the quarry was cut into the side of the hill, rather than a deep excavation in the ground, a unique system of retaining walls was used to stabilize and support the quarry walls.

Consideration was given to many types of retaining walls for this project, but top-down construction of soil nail walls was selected, as they offered the maximum design flexibility and lowest cost. Furthermore, the soil nail wall system provided the safest solution for this challenging project by providing the slope stabilization and the permanent retaining wall in one combined system. In 2009, the design-build contractor for the soil nail walls contracted with Top Gun Commercial Gunitite of VA, Inc., led by Owner Russ Ringler\* and Superintendent Solomon Reyes, the primary ACI Certified Nozzleman on the project, to do the top wall in the highest section to prove the design and construction concept. The original plan was to then cover the wall with rock. However, when the top wall was completed with a very attractive high-quality faux-rock finish, the owner was so pleased with the finished product they decided to use that method on all 11 retaining walls for the project.

## Soil Nails Walls: Perfect Solution

Soil nail walls consist of soil nails (or anchors) combined with shotcrete structure and facing. They can be used in temporary or permanent

\*Member of ASA.

applications, providing an excellent finished product while stabilizing hillsides with complex geotechnical issues. One without the other would provide subpar reinforcement, but together, they provided the best possible combination for strength and stability of deep-cut walls. Nicholas J. A. White,\* Engineer of Design, stated, "Prior experience with Ringler's team on many other challenging projects made his team the only one considered to be qualified and capable to take on a project of this magnitude and complexity."

Ringler's work on this project included all of the shotcrete work for the installation of approximately 65,000 ft<sup>2</sup> (6000 m<sup>2</sup>) of permanent soil nail retaining walls for the reclamation of the old rock quarry. Work included in the reclamation plan was the stabilization of the perimeter quarry wall faces, which were up to 75 ft (23 m) tall, while coordinating with the new site development plans.

The owner of the quarry, W. M. Rickman Construction Company LLC, used quarry soils to provide a series of access roads and work platforms at varying heights to reach each level as required to construct each element of the retaining walls.

The design and construction of the soil nail wall system was done by Wolverine Contracting, Frederick, MD. The technique was used to build a "top-down" retaining wall system. As soil nail walls are built from the top down, they provide temporary and permanent earth support in a single-wall system. There was not enough room on this project to over-excavate to build conventional cast-in-place walls. If conventional walls had been used, there would have been extensive sheeting and shoring required to provide safe conditions for wall construction. The soil nail wall system was a great success on this project, saving the owner a considerable amount of money when compared to other wall systems that were considered. The walls on this project were terraced, with each wall ranging from 10 ft (3 m) to more than 20 ft (6 m) tall when completed. The soil nailing process requires working in soils which will self-support over the short-term from 4 to 5 ft (1.2 to 1.5 m) tall. The residual soils, disintegrated rock, and bedrock at this site were a good fit for soil nailing.

The general method of construction was to start at the top of the top wall in a given area and make a 5 ft (1.5 m) deep excavation to the back face of the new wall. Then, soil nail anchors were drilled and grouted in the exposed face. The nails used on this project were epoxy-coated high-strength all-thread steel bars. The nails were grouted into 4 in. (100 mm) diameter holes drilled back 20 to 40 ft (6 to 12 m). The nails were typically installed at 5 ft (1.5 m) vertical and 6 ft (1.8 m) horizontal centers. Chimney drains were installed at 6 ft (1.8 m) on center to



*Fig. 3: Completing lowest level*



*Fig. 4: Access roads were built and drilling commenced, closely followed by nail grouting and wire mesh installation*



*Fig. 5: Soil nailing*

handle any seepage behind the shotcrete. Next, a layer of wire mesh was installed and a layer of dry-process shotcrete at least 4 in. (100 mm) thick was sprayed over the cut face. This layer of shotcrete is referred to as the temporary layer. Once testing of the soil nails was complete, the excavation was continued 5 ft (1.5 m) deeper and the process repeated.



Fig. 6: Shotcrete placement

### The Perfect Finish

Once the excavation was to grade for a single wall, the permanent shotcrete facing was installed. This consisted of an additional layer of wire mesh and an additional 8 in. (200 mm) minimum layer of dry-process shotcrete.

The final 2 in. (50 mm) of the shotcrete facing was then placed and hand-carved to simulate the type and color of the rock that was mined from the quarry. Once the facing cured, it was stained and sealed to provide a faux-rock finish as desired, using various color blends of Aquastain T-96 by The Euclid Chemical Company.

For the entire dry-process shotcrete application process, the team relied on twin Airplaco/Gunite Supply & Equipment C-10's Rotary Guns as well

as Gunite Supply hoses and tools to place 85,000 ft<sup>3</sup> (2400 m<sup>3</sup>) of shotcrete over a 3-year span.

All application was accomplished by ACI Certified Nozzlemen, through the ASA education and ACI certification programs.

All shotcrete materials were produced using Strong Industries volumetric mixer trucks. Thousands of test samples showed consistent results ranging between 5000 and 5800 psi (34 and 40 MPa) in 14 to 28 days. During the 3-year period, there were only two irregular test samples with low values.

After the project was completed, the only maintenance required was touch-up of the wall colors, which were discolored by minor efflorescence. Most real rock walls would experience the same discoloration.

### Maximum Benefit: Cost Savings and Increased Usable Land

Ringler's team successfully completed all shotcrete work on this project in November 2012. This highly successful application of the soil nail wall system resulted in both substantial savings to the owner as well as an increase of an additional 30 ft (9 m) of open space for the condominium project. The design and construction of this project's walls using faux-rock-finished soil nail walls minimized the excavation required, eliminated any backfill, provided temporary and permanent excavation support, and customized the curved wall contours. The cost of this system was far less than using conventional cast-in-place walls and stone facing, and maximized the remaining surface area available for development.



Fig. 7: Overview of entire project

## Making Way for Condos

Construction commenced September 2012 for Quarry Spring Condominiums. Quarry Springs offers the best of town and country in Bethesda, MD, with exclusive neighboring country clubs, including the elite Congressional Golf Club, which is just 1/4 mile (0.4 km) away. The club house is nearing completion and 97 condominiums are expected to be complete in early 2014. These high-end condos start at \$1.8 million and feature elevators, garages, and fireplaces.

### The Outstanding Architecture Project

#### Project Name

Stoneyhurst Quarry Reclamation Project

#### Project Location

Bethesda, MD

#### Shotcrete Contractor

Top Gun Commercial Gunite of VA., Inc.<sup>‡</sup>

#### General Contractor

W. M. Rickman Construction Company, LLC

#### Architect/Engineer

Nicholas J. A. White, PE

#### Material Suppliers/Manufacturers:

The Euclid Chemical Company<sup>†</sup>  
Gunite Supply & Equipment Co.<sup>†</sup>

#### Project Owner

Stoneyhurst Quarries, Inc.

<sup>†</sup>Corporate Member of the American Shotcrete Association

<sup>‡</sup>Top Gun Commercial Gunite is no longer in operation. Key personnel and specialized equipment were acquired by G.A. & F.C. Wagman, Inc., in July 2013.



**Russ Ringler** is the Shotcrete Manager for G.A. & F.C. Wagman, Inc. Ringler has over 40 years of experience with shotcrete (gunite) and is an ACI Certified Nozzleman. Ringler works with owners and contractors to provide comprehensive geotechnical solutions. After spending the past 25 years as owner of Top Gun Commercial Gunite of VA., Inc., he was looking to grow to the next level, provide continuity for his staff, and provide more comprehensive services to clients. Ringler joined Wagman in July 2013 when Wagman was expanding their Geotechnical Construction Services Group to include shotcrete as well as investing in specialized talent and equipment. Combining years of experience and passion, Ringler states, "I like to find the jobs that nobody else will do, or nobody knows how to do, and do them."



**Solomon Reyes** is Superintendent at G.A. & F.C. Wagman, Inc. Reyes is an ACI Certified Nozzleman for both dry- and wet-mix shotcrete and has 12 years of shotcrete experience. He spent 8 years working with Ringler at Top Gun Gunite before joining Wagman in July 2013. Reyes has extensive experience in both wet and dry process in some of the most complicated and most demanding venues of application.



**Lisa Wagman Glezer** is Director of Communications for Wagman Companies, Inc. (Wagman Companies, Inc. is the holding and management company for G.A. & F.C. Wagman, Inc., and Wagman Construction, Inc.). Glezer is responsible for marketing as well as the companies' internal and external communications, including government and public relations. Glezer is part of the fourth generation of the 112-year-old family-owned business.