

# Shaw Residence

By Andy Duck



Fig. 1: Finished Project—The “Great Wall of Tuckahoe.”

**H**ow does one provide a backyard transformation that includes a water-in-transit pool, complete with all the outdoor living amenities one could ask for when facing a 75° waterfront sand cliff located on an ever-shifting chain of barrier islands susceptible to a multitude of severe weather patterns?

Through intensive design and engineering consultations, we discovered that to produce a beautiful, resilient, long-lasting investment for our client, this project would include 96 helical pile foundations, 48 tons (910 kg) of steel reinforcement, and 345 yd<sup>3</sup> (264 m<sup>3</sup>) of shotcrete placed in 8 yd<sup>3</sup> (6 m<sup>3</sup>) loads over a period of 12 months.

This complete backyard transformation includes several concrete retaining walls up to 21 ft (6.4 m) in height, a strategically placed underground storage area, a concrete vault for the watershape equipment and a bathroom, an extension

of their livable space through an outdoor kitchen, and a custom concrete swimming pool that features a 19 ft (5.8 m) radial vanishing edge.

In Duck, North Carolina, the “Great Wall of Tuckahoe” stands as a demonstration of the expertise and advanced techniques employed in tackling unique terrain with significant logistical and space demands. This project is engineered not only to withstand hurricane force winds and flooding, but also supports the existing residence above. Permanence was at the forefront of the engineering approach to this project.

The construction process utilized a bottom-up approach to address the project’s unique topographical landscape, as well as material access. The stability of the completed structure hinged on the installation of the helical coil piles, which were then connected by concrete grade beams. These grade beams played a crucial role in enhancing stability



Fig. 2: Side view of 19 ft Radial Vanishing Edge.



Fig. 3: Before construction.



Fig. 4: After construction.

and creating space for the essential internal infrastructure necessary to the functionality of the pool. The neighboring property, whose backyard created a valley with their own 70° cliff, was protected with steel sheet pile shoring during construction and was then used as a back form for the shotcrete retaining walls that completed the project.

The concrete supplier's location was 1 to 2 hours away depending on traffic that was highly influenced by the time of year because the site is in a predominantly tourist area (beach town); therefore, this project demanded a stop-and-start approach to the concrete installations. We were limited to the number of trucks we could rely on making it to the jobsite on a daily basis. The decision to use wet-mix shotcrete as the process for concrete delivery and consolidation was quickly made, and the entirety of the project was shot in daily segments of 8 or 16 yd<sup>3</sup> (6 to 8 m<sup>3</sup>) increments using certified nozzlemen with a 250 CFM compressor and blow pipe (air lance).



Fig. 5: View of bottom-up approach at ground level.



Fig. 6: The bottom-up approach from above.

Meticulous shotcrete practices on this stop-and-start process allowed us to achieve the type of consolidation and compaction needed to create a monolithic, watertight structure. The monolithic aspects of the shotcrete in this project underwent thorough vetting as a large section of the pool is exposed in one of the underneath storage areas. Despite visible stop-and-start “seams,” this exposed area has zero signs of moisture migration, confirming the effectiveness of the shotcrete application.



Fig.7: Backfilling shotcreted walls.

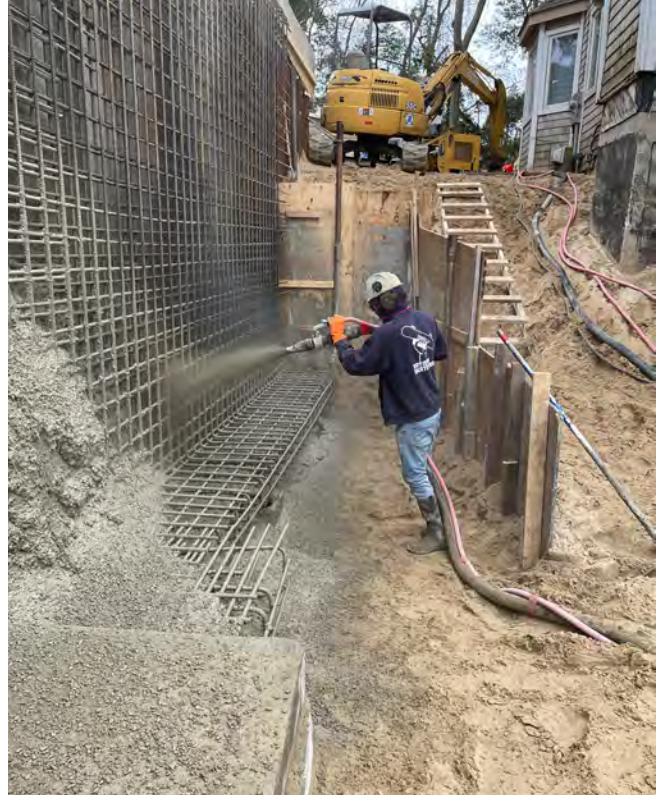


Fig. 9: ACI-Certified Nozzleman shooting wet-mix on the 21 ft retaining wall.



Fig. 8: View of curved forms and rebar for the bottom-up approach.



Fig. 10: Finished shotcrete view of the vanishing edge.

Aside from construction, we were able to shift our client's perspective on the viability of shotcrete. As the owner of a commercial construction company that specializes in large cast-in-place concrete structures for wastewater tanks and pumping stations, the client now recognizes the potential advantages of properly executed shotcrete in his own ventures.

The challenges and triumphs of the design, engineering, and construction of this project clearly demonstrate the type of ingenuity, skill, and precision that can be achieved when the right team plans and executes a comprehensive vision. By incorporating both aesthetic appeal, functionality, and durability, this project stands as a testament to how a beautiful outdoor space can be achieved using the shotcrete method of concrete placement.

Waterforge Inc. was tapped for the project design and construction documentation. Kitty Hawk Engineering supplied both the civil and structural engineering for this project.



Fig. 11: Pallets of stone moved via crane due to site accessibility issues.



Fig. 12: The “Great Wall of Tuckahoe.”



Fig. 13: Outdoor kitchen with the retaining-wall-turned-fireplace and a pizza oven.



Fig. 14: Sunset in Duck, NC.

## 2023 OUTSTANDING POOL & RECREATIONAL PROJECT

*Project*  
**Shaw Residence**

*Project Location*  
**Duck, NC**

*Shotcrete Contractor*  
**Artisan Pools NC**

*Materials Supplier*  
**CnL Concrete**

*General Contractor*  
**Artisan Pools NC**

*Owner*  
**Greg and Vicky Shaw**



Artisan Pools NC encompasses nearly 25 years of expertise in pool design, construction, and project management. Our mission blends vision, style, robust construction methods, and modern technologies to craft our world class projects. **Andy Duck**, President, is a registered member of the Society of Watershape Designers, an International Watershapes Professional, and an American Concrete Institute Certified Shotcrete Nozzleman.