

GEOSPRAY® 61

Geopolymer Mortar



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First Aqueduct Water Pipeline Rehabilitated for Domestic Water with GeoSpray Geopolymer for San Diego County Water Authority

ISSUE

The San Diego County Water Authority (SDCWA) carries out regular inspections of its assets to ensure they are in the best working condition they can be. Following an inspection of the First Aqueduct water conveyance system in Valley Center of San Diego, CA, the SDCWA determined that rehabilitation was required. This was to maintain the tunnels' structural integrity and extend its service life.

The tunnels perform a vital service, carrying water to three million people in their service area.

SOLUTION

Michels Trenchless, Inc. was one of two contractors prequalified to develop design-build solutions for the First Aqueduct Treated Water Tunnels Rehabilitation Project. Michels Trenchless partnered with Stantec for engineering services with GeoTree added to the team to provide materials for two out of three tunnel alignments included in the project scope - GeoTree's GeoSpray 61 geopolymer mortar was used to rehabilitate portions of 2 x 72-inch horseshoe-shaped tunnels - known as the Lilac Tunnel and the Red Mountain Tunnel.

The third tunnel was rehabilitated using fiberglass-reinforced polymer pipe and grout via sliplining.

To carry out the required repairs, the authority identified three 10-day periods during which shutdown was possible. December 5 to 15, 2022, January 23 to February 2, 2023, and February 27 to March 9, 2023.

A 500-foot section of the Lilac Tunnel displayed minor water infiltration. A solution was developed to apply a 1.5-inch layer of geopolymer to the entire section after cleaning, filling the haunches with approximately 2-inches of GeoSpray.

PROJECT DETAILS

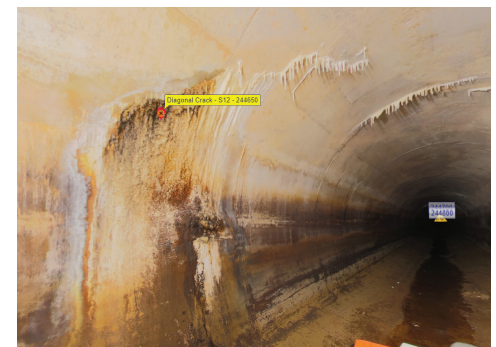
Location: Valley Center of San Diego, CA

Application: 3x Aqueducts

Installation: December 2022 to February 2023

Client: San Diego County Water Authority (SDCWA)

Installer: Michels



Deterioration identified within the aqueducts.

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The 3,100-foot section of the Red Mountain Tunnel also had moderate infiltration and again a 1.5-inch layer of geopolymer was applied after cleaning to mitigate the infiltration of groundwater. Haunches were filled with approximately 2 inches of GeoSpray.

The Lilac Tunnel rehabilitation was completed during the first shut down as well as the work to fully grout the Red Mountain Tunnel. Work on the Red Mountain tunnel was performed from two temporary access portal locations. The first half of the geopolymer application was completed during the second shut down and the second half was completed in the early portions of the third shutdown. Following the geopolymer applications, the Lilac and Red Mountain tunnel sections were completed and released back to the Water Authority on schedule.

GeoSpray 61 was chosen for the project for a range of reasons: The rehabilitation needed to meet NSF/ANSI/CAN-61 certification for drinking water contact - a standard met by GeoSpray 61. The physical properties of the material also played an important part, such as, 1500 psi flexure strength (ASTM C78), XRF (X-Ray Fluorescence), chemistry to self-bond when cold joints are made. GeoSpray has gone through a rigorous certification program through the Water Research Centre (WRC) including the material and design approach. GeoSpray 61 has proven application in deep water heads meaning it can be pumped a long distance without setting. This meant the temporary access points were sufficient to feed the workers inside the pipe carrying out the application.

The GeoSpray 61 was applied using Michels Trenchless' proprietary centrifugal application devices specifically designed for the 72-inch tunnel. For the Lilac tunnel alignment, GeoSpray was pumped approximately 750 feet to the application device and retracted at the appropriate calculated speed. The total thickness was applied in two passes, each of $\frac{3}{4}$ of an inch. For the Red Mountain alignment, the material was mixed topside and conveyed into specially designed diesel conveyance carts and delivered to the application device for installation.

Two crews consisting of 32 members total took 26 days to complete the project including preparation time.



Pipe access point



External job site



Michels' proprietary centrifugal application devices

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Completed rehabilitation of the First Aqueduct Water Pipeline Aqueducts



RESULTS

- Two tunnels, totalling 3,600 lineal feet, were rehabilitated within the three contract-designated 10-day shutdowns.
- The value of the contract was 20 percent lower than alternative relining technologies proposed.
- Infiltration was eliminated and water quality improved.

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