

Beale Air Force Base Water Line Rehabilitation

Existing Water Main Sliplined with Fusible PVC® Pipe

By: Jacob Ferreira, Underground Solutions

Beale Air Force Base (AFB) currently covers approximately 23,000 acres of rolling hills just north of Sacramento, California. The base has a rich military history dating back to World War II, when the facility was far busier than it is now. Through the years, Beale AFB's functionality has been reduced, and much like any infrastructure as age sets in, so does the need for repair. Even though a diminished active population reduces the stress on infrastructure, the 50+ year old water system at Beale AFB needed rehabilitation.

There is a large amount of space associated with Beale AFB and the water system that serves it. The overall scope of this project required the rehabilitation or replacement of approximately two and a half miles of their existing water system. Typically, aging pipes would be dug up and replaced in kind. However, current environmental concerns would not allow for simply digging up the old system and installing new pipe. To minimize environmental impact, Greg Haling of Haling and Associates, the design engineer for this rehabilitation effort, had to consider modern trenchless solutions.



Existing 18-inch concrete lined steel water pipe had an I.D. of 17.5 inches

Haling reviewed the viable trenchless options, including horizontal directional drilling, pipe bursting, cured-in-place pipe, sliplining, and other options. Several different trenchless technologies were utilized on various phases of this project, but Haling chose sliplining as the rehabilitation solution best suited for the design on this phase. Sliplining, or



Project site had wide open spaces for pipe layout

loose-fit sliplining, is when a new pipe is slid inside an existing pipe, reconnected at either end, and the new, smaller pipe is then used as the new asset.

This method limits excavation and surface disturbance because rehabilitating the old pipeline only requires digging at either end for entry and exit pits for the new pipe. This method drastically reduces land disturbance and subsequent environmental impact. For a loose-fit slipline solution to be acceptable, pipe flow area reduction must be acceptable. However, since Beale AFB has seen a historic decrease in overall functionality, its water system demand has also been reduced and the flow area reduction was manageable.

Typically, in loose-fit slipline applications, two replacement pipe material choices are used: high-density polyethylene (HDPE) or Fusible PVC® pipe. Both pipe materials are assembled into long, monolithic lengths using thermal butt-fusion and then pulled into the existing pipe during the sliplining process. While both pipe materials will work, the hydrostatic design basis of PVC is two and a half times that of HDPE. This means that for a given pressure

This project required the rehabilitation or replacement of approximately 2.5 miles of existing water system.



Pipe was pulled using the winch cable, which worked well

requirement, Fusible PVC® pipe has a thinner wall than HDPE pipe. When it comes to sliplining applications, the outer diameter of the new pipe is fixed by the inner diameter of the existing pipe. For a given outer diameter and pressure class, Fusible PVC® pipe has a larger flow area and capacity than HDPE pipe. In addition, less material means less material cost, leading to a lower cost alternative in using Fusible PVC® pipe. Ultimately, 14-inch DR 25 Fusible PVC® piping was chosen as the sliplining material for this phase of the project.

TEPA, LLC was awarded the water line rehabilitation work to slipline an existing 18-inch concrete lined steel water pipe at Beale AFB. The existing steel pipe had quarter-inch thick walls, which resulted in an inside diameter (I.D.) of 17.5 inches. The outside diameter (O.D.) of the 14-inch Fusible PVC® pipe was 15.3 inches, which allowed for just over two inches of annular space. A minimum clearance of two inches between the O.D. of the new pipe and the I.D. of the existing pipe is an industry standard best practice for loose-fit sliplining applications.

The project site provided the luxury of wide-open spaces for pipe layout, so the new pipe was pre-fused into long runs prior to pulling it into the host pipe. Entrance and exit pits were strategically located to minimize environmental impact and double as necessary excavations for valves, fittings and other appurtenances. In order to pull the pipe into place, TEPA chose to use a TT Technologies 12-ton constant tension winch with 2,300 feet of pulling cable, which worked well for the application.

While getting prepared to pull the pipe, TEPA found that the standard external pull head for the 14-inch Fusible PVC® pipe turned



Fusible PVC® pipe during the slipline insertion process

out to be slightly too large to fit inside the existing pipe. Instead of swapping it for a lower profile internal pull head, TEPA simply drilled bolts through the front of the Fusible PVC® pipe and hooked



Fusible PVC® pipe utilizes standard waterworks fittings for reconnections



**FUSIBLE PVC® PIPE
FOR TRENCHLESS
INSTALLATIONS**

858.679.9551

www.undergroundolutions.com



Pipe was installed in typical run lengths of 500-1,000 feet

the winch cable to the bolts for pulling the pipe. This setup worked well and they installed approximately 8,415 linear feet of 14-inch DR 25 Fusible PVC® pipe in typical run lengths of 500-1,000 feet.

After the Fusible PVC® piping was pulled into place, it was reconnected to the existing water main piping using standard waterworks fittings with restrainer glands, so tie-ins were simple with no special fusion equipment or knowledge required. Overall, the loose-fit sliplining technology proved to be an efficient and cost-effective means of rehabilitating a significant amount of existing water main piping at Beale Air Force Base. As Greg Haling concluded, "Underground Solutions provided excellent technical and onsite support throughout the project. Their proposal was thorough, complete and provided everything we needed to complete our design and feel confident with Fusible PVC® pipe." †

ABOUT THE AUTHOR:



Jacob Ferriera has sales responsibility for Northern California, Northern Nevada, and Hawaii. Prior to joining Underground Solutions/Aegion, he spent 2+ years as an Outside Sales Engineer selling pumps and pump service throughout California's Central Valley in the Industrial, Food and Beverage, and Municipal Water/Wastewater markets. Before that, Jacob spent 10 years as an Application Engineer with various responsibilities related to Pumps, Mixers, and Jet Aerators in the Municipal Wastewater industry. He has a BS in Manufacturing Engineering from California State University, Chico.

About GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation.

Company overview

Privately owned by our people, GHD provides engineering, environmental, and construction services to private and public sector clients across five continents and the Pacific region. Focused on creating lasting community benefit, our connected global network of 10,000 people delivers projects with high standards of safety, quality, and ethics.

Committed to sustainable development, GHD improves the physical, natural, and social environments of the many communities in which we operate.

North America

GHD has over 120 offices employing nearly 5,000 people in North America serving clients in all five of our global markets.



WESTT Contacts

Greg Watanabe, PE
E: greg.watanabe@ghd.com
T: +1 562 206 7979

Craig Camp
E: craig.camp@ghd.com
T: +1 858 633 4805



www.ghd.com