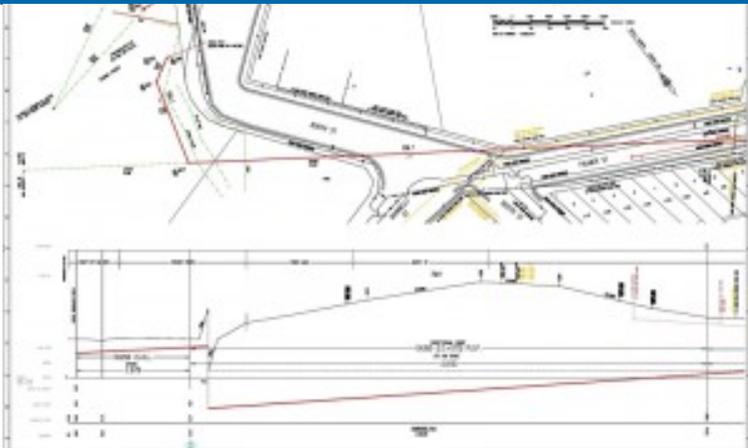


## BALMAIN SEWAGE PUMPING

OIL/GAS | SEWER | STORMWATER | POWER | WATER | TELCO

<b>LOCATION</b>	Balmain NSW	
<b>CLIENT</b>	Private	
<b>PIPE</b>	600mm mild steel enveloper	
<b>GEOLOGY</b>	Sandy clay	
<b>LENGTH</b>	66 metres	
<b>TECHNIQUE</b>	GBM, thrust boring	

### PROJECT OVERVIEW

UEA Trenchless was contracted to install a 600mm mild steel enveloper pipe for a 66 metre bore with a grade of 1.77 per cent, works which formed part of a diversion and decommissioning project for one of the Balmain sewage pumping stations in Sydney. The project was completed using its Guided Boring Machine (GBM) combined with a conventional Thrust Boring Machine.

Geotechnical information indicated the ground conditions were sandy clay – light grey with red-brown mottling, of high plasticity, and with medium to coarse grained sand (Alluvium). These ground conditions are conducive to guided boring, which requires material to be displaceable.

### PILOT BORE

UEA set up the GBM within the excavated launch pit and completed the pilot bore. Ground conditions were well suited to the GBM (displaceable), with thrust and rotation pressures remaining constant up to 60 metres out. However, a problem arose with six metres remaining when the thrust pressures rose to their maximum limit, preventing UEA from thrusting the pilot tubes to completion on-grade.

To determine whether the GBM had hit impenetrable ground or an obstruction, UEA pulled back the pilot tubes on numerous occasions and, following the withdrawal, resumed with reduced thrust speed. At each attempt UEA gained a small advance on the pilot bore's distance. This method confirmed the problem was tight ground and as the ground was no longer displaceable, UEA could not guarantee or maintain the desired grade following the current method of thrusting the pilot tubes to completion.

After review, UEA decided to thrust the pilot tubes to completion under constant rotation, as there was only six metres of the pilot bore remaining and the previous 60 metres were installed within the allowable tolerances of +/- 25mm. This was the only way UEA could guarantee accuracy of the pilot bore to target.



UEA and TRILITY agreed to use the abandoned bore which had to be re-surveyed during the pilot hole installation. The bore was deemed usable as long as the exit could be plugged and professionally grouted for a safe exit angle through the rock formation. Trican Pty was engaged to plug and grout a 150 metre section at the exit point 550 metres out, and once set UEA re-piloted the borehole and exited into the ocean floor at CH 610. Two reaming passes were completed out to 32 inches before a cleaning pass, and then the pipe was pulled back during a 12 hour pull back.

#### **THRUST BORE AND STEEL CASE INSTALLATION**

To undertake the thrust bore and steel case installation within these ground conditions, UEA choose to fit a splitter head to the lead case and set the lead auger back 50mm from the end of the case. This technique, combined with the excavation rate of the augers matching the advance rate of the steel pipes, eliminated over-excavation at the head and ensured that the bore remained supported.

#### **PRECAUTIONS AGAINST BORE FAILURE**

UEA opted to install a thicker walled case that would be structurally welded, should rotation and thrust pressures fail at the 60 metre point where the GBM encountered tight ground conditions. This provided UEA with a contingency plan in the event of auger failure – the augers could be retracted, the auger borer removed from the rails, and the remaining steel case pipe rammed into place using a pneumatic hammer.

In an ideal site set-up UEA prefers to install six metre cases at a time to maximise the daily progression rate, ranging from 18 to 22 metres in these types of ground conditions, however a six metre case installation required a 10.5 metre long launch pit. Unfortunately this site could not facilitate such a large pit and as a result the maximum case size was three metres, which doubled the welds required and slowed the progression rate.

#### **PROJECT COMPLETION**

As envisaged, during the case installation UEA encountered extremely tough ground conditions at 60 metres. This lifted the auger borers' thrust and rotation pressures to its maximum, at the point of near failure. UEA was able to avoid retracting all the augers, and managed to complete the bore with an average progression rate of 14 metres per day.

UEA ensured the client was informed about changes in ground conditions and their impact on the bore's design. The team's ability to re-design the machine set-up allowed all parties to deal successfully with the alignment issue and ensured the product pipe was installed within the agreed tolerances.