GBM/THRUST BORE PROJECT WITHIN PORT BOTANY FOR ELGAS

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

LOCATION	Port Botany NSW
CLIENT	Private
PIPE	Steel case enveloper pipe (10mm wall thickness)
GEOLOGY	Water charged sand
LENGTH	120 metres
TECHNIQUE	GBM, thrust bore

SCOPE OF WORKS

UEA was contracted to undertake a 120 metre under bore and install a 457mm OD steel case enveloper pipe. Following the steel case insertion, a secondary enveloper pipe was installed - in the form of a 355mm SDR21 PN8 PE100 pipe - on metal centralisers with the annulus between the PE pipe and the outside steel enveloper grouted. Finally UEA installed the client's supplied and welded LPG pipeline on supplied centralisers within the PE enveloper pipe.

TECHNIQUES USED

- A laser guided boring machine (GBM) was used to undertake and complete a successful pilot bore on grade and within 25mm tolerance agreed at design stage. The GBM was also used to pull the pilot tubes during the augering and steel insertion process to ensure the pilot tubes were kept under constant tension to avoid sag in the bore hole.
- A conventional auger boring machine was used to install the steel enveloper and the secondary PE enveloper pipe.
- Dewatering spear points and sediment tanks were hired to manage the water within the launch and receipt pits.

TECHNICAL DETAILS

This bore presented numerous challenges from the onset – not only was it a grade critical 120 metre case bore in sand but it was also located in water charged tidal affected ground.

UEA decided to undertake the pilot bore with the GBM from the normal position – downstream shooting uphill, set up the auger borer and install the steel case from upstream (bore downhill). This technique enabled UEA to guarantee grade accuracy by using the GBM to pull the pilot tubes whilst installing the steel case. The normal process in other ground conditions is to create one launch and receipt pit where the GBM

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and auger borer shoot from the one pit – the launch pit. With this methodology UEA had to excavate a slightly larger receipt pit than normal, however the advantage of using the GBM to pull the pilot tubes outweighed the disadvantage of excavating a larger receipt pit. UEA's launch pit for the GBM was 4.5 metres deep with dewatering spears installed connected to a sediment tank to manage the water and keep the pit reasonably dry.

UEA commenced the pilot bore with the client's representative on site along with their designers. Part way through the bore two very large 1.5 metre diameter storm drains were encountered. The bore was re-designed in order to miss these previously unknown services, resulting in a grade change and UEA lowering the GBM launch pit by 2 metres. This change in depth had a massive impact on the water within the pit – UEA had to double the number of dewatering spears and bring in a second 6" pump and 15,000 litre sediment tank. Dewatering spears also had to be installed within the pit as well as around its perimeter.

THE PILOT BORE

UEA recommenced the pilot bore using the standard cutting head for the GBM designed for this type of ground with a 15mm over cut. When UEA reached 17 metres – beneath the first of the two storm drains – the team lost half of the target and both rotation and thrust pressure dropped, indicating unstable soft water saturated ground. UEA decided to continue with the pilot bore with half a target.

Unfortunately, when UEA reached the additional storm drain at 40 metres, the thrust pressures increased dramatically – a result of entering stiffer/harder compacted sand. In normal circumstances, this is a manageable problem, however when UEA increased thrust pressure to get through the harder ground the pilot tubes bowed under strain within the non-supporting ground beneath the first storm drain, thus losing the complete target and preventing further progress. UEA tried three different drill heads to resolve the issue and hopefully the pilot bore but all attempts failed between 40 and 50 metres.

To complete the pilot bore UEA used its HDD experience and technology. The team improvised by building a crossover fitting in house which enabled the GBM pilot tubes to be connected to a sonde housing and rail head drilling head. With this installed UEA used a conventional Digitrak walkover device to steer the bore to completion and on grade – within 17mm of the design grade at exit.

COMPLETION

UEA completed the remaining works within five days – installed a secondary PE enveloper pipe, grouted the annulus, installed of the client's product pipe, backfilled and compacted both pits. The client was very satisfied with the completed works and UEA's capabilities to overcome issues.