MNW Shaft Excavation

Location: Rouse Hill, NSW | Project Value: $200M | Client: Ironbark JV | Duration: July to September 2025

KEYWORDS
Construction, Tunnel, Civil, Shaft, Excavation, Drilling, Ground Support, Rock Bolts, Shotcrete, walers, steel works,

INTRODUCTION

SU Tunnel and Civil were awarded the MNW shaft package which comprised the excavation and ground support of the WRRF and SP1022 shafts. The WRRF shaft began as a 9.93m x 8.73m rectangular shaft with sheet piles driven 3.6m deep. Waler beams were required to be welded onto the sheet piles for lateral support. The remaining 11m of the WRRF shaft was 8.6m x 6.6m for a total depth of 14.5m. While the SP1022 Shaft was approximately 11.9m x 11.98m for 4m deep, then reducing to 10.7m x 10.8m for the remaining 4.7m. The excavation was completed in sandstone ranging from Class IV to class III, ground support requirements were a single layer of fibre reinforced shotcrete and 3-4m GFRP threaded rod bolts.

CASE STUDY DETAIL

The excavation of shafts is challenging with limited space and the requirement to supply the excavation work front with various plant and materials based on the current activity often means large cranes to lift plant in and out of the shaft. The excavation of the shafts at Rouse hill was required to be completed in a short timeframe and the SP1022 site was situated in the suburb creating access issues for large machinery to get past the resident's cars. Considering these constraints SU developed a methodology that would maximise the excavation time and minimise the requirements for large cranes to remain on site.

Excavation in rock:
The WRRF shaft was dug to launch the TBM so the shaft size was kept to a minimum, 8.6m x 6.6m. However by using shortboom excavators the size of excavator available to be used in WRRF was able to be upsized to a 13T Excavator. This increased the production and shortened the program time. The hammer selected was a 1T hammer which maximised production in the harder sandstone encounter lower down and being capable of trimming the wall. The waler beams also restricted the space available as they had diagonal bracing which reduced the available space in the shaft.

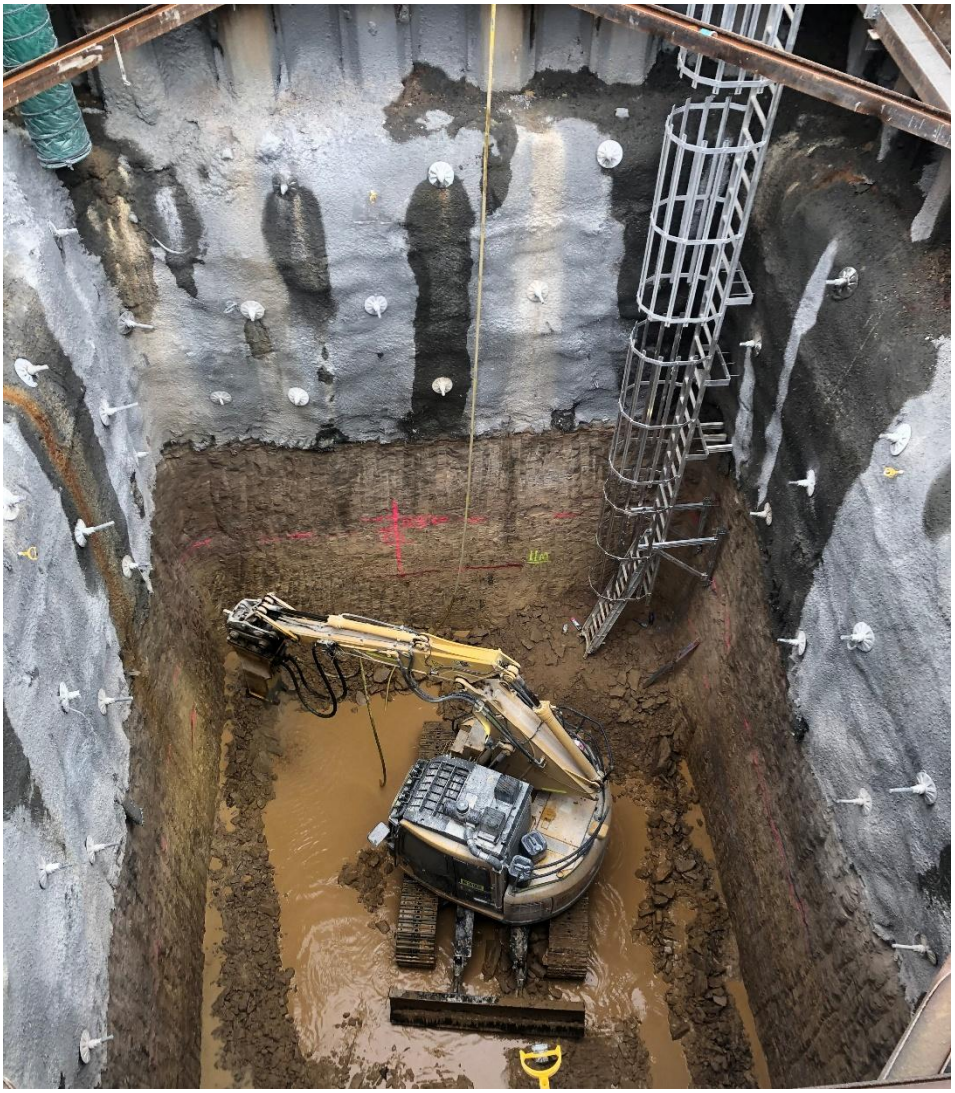

Figure 1. Excavation WRRF, 13T Shortboom

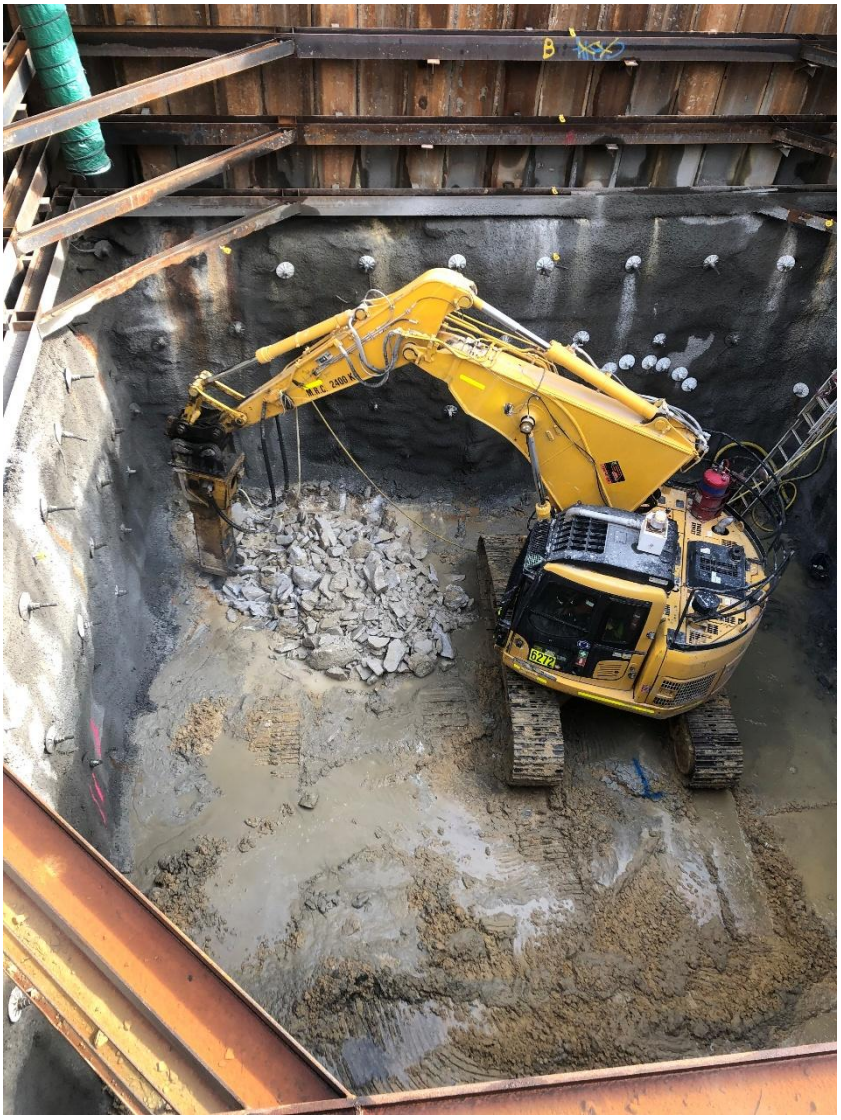

Figure 2 Excavation SP1022

Muck Out/Cranage

Previous shafts on the job had been completed using a crane and kibble to muck out the spoil. By utilising a telescopic excavator with clamshell bucket the need for a crane and mucking kibble to load out rock was removed. Cranage was only required for the removal of the excavator from WRRF as the machine was walked over the capping beam before digging began. A small franna was used on occasion to place the drill rig into the shaft.

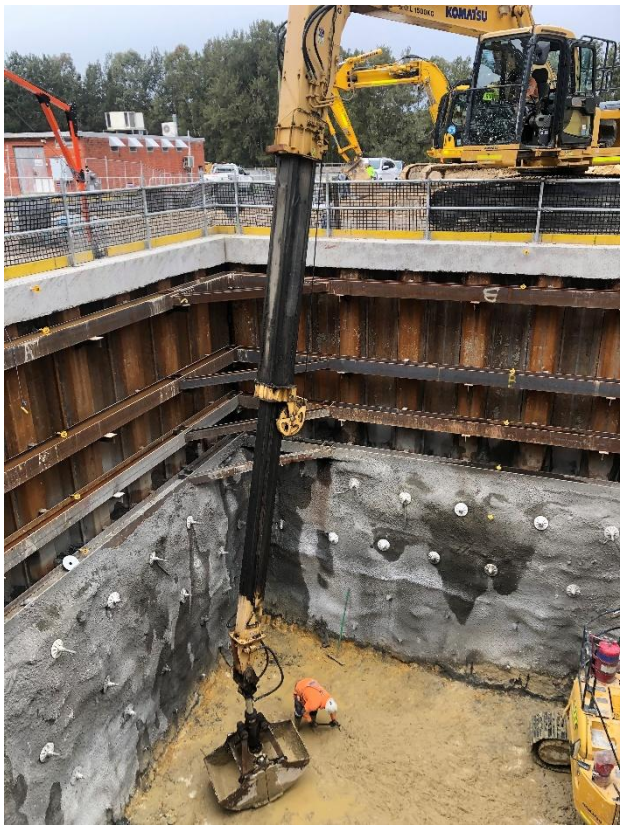

Figure 3. Telescopic Excavator Mucking Out

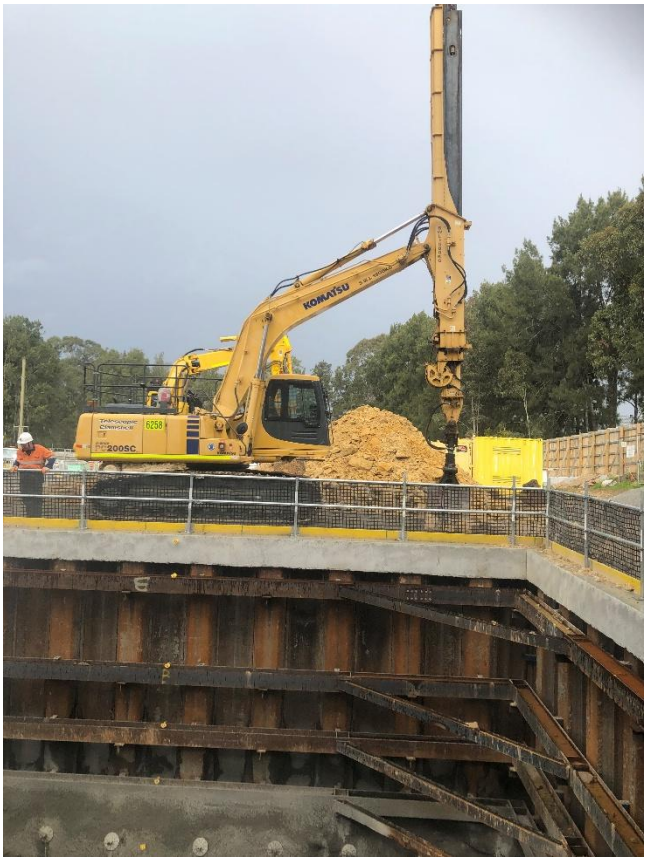

Figure 4 Telescopic on Surface

Access/Space constraints

The available surface space on the site was limited due the location within the Sydney water treatment plant. Due to these space constraints, it was not ideal to have any large cranes come onto site for any extended period. SU opted to use a drill attachment that could be connected to both the 13T Excavator and 24T Excavator, rather than an independent drill rig. This allowed a smaller franna to be used to lift the drill attachment into the shaft. The MEM drill itself could be moved between site using a towable trailer. This kept the requirement for large cranes to a minimum, only required to lift the excavator out at completion of the Shaft excavation.

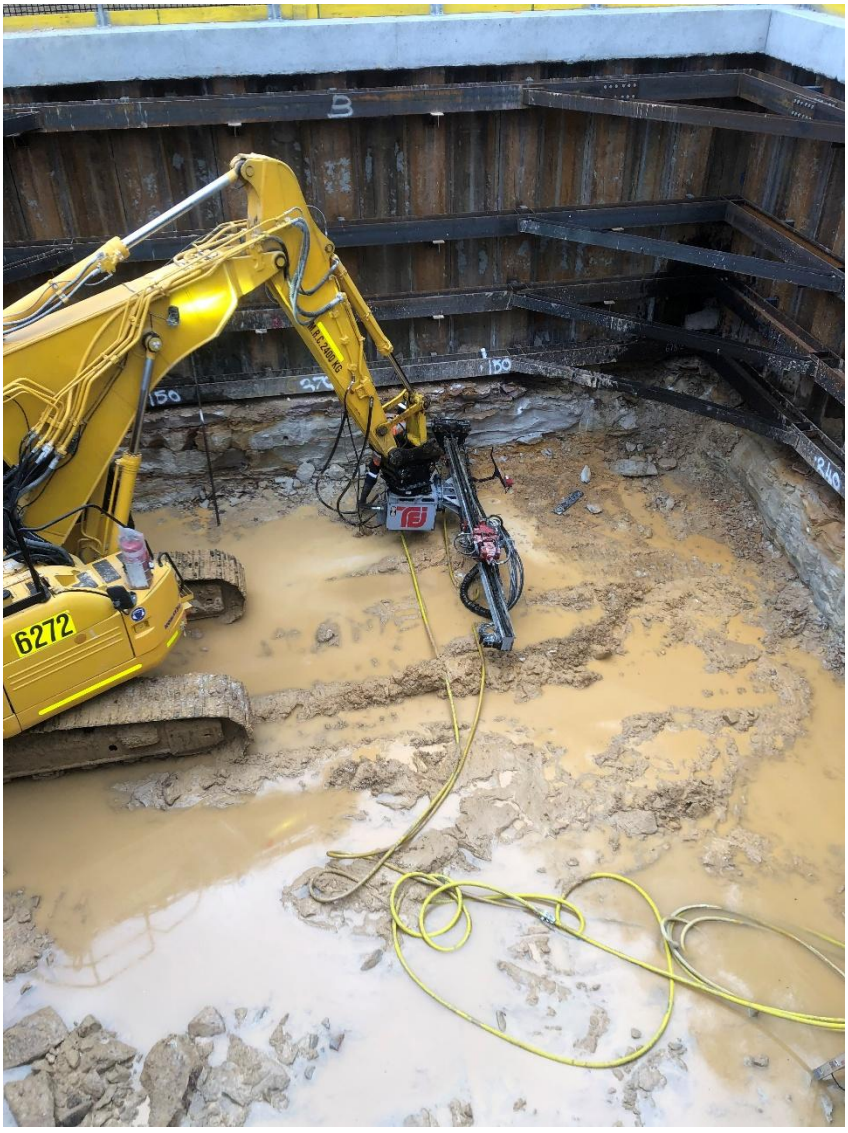

Figure 5. Drill Attachment on excavator

Shotcreting

A self-powered midjet was used to allow easy manoeuvring around the site. Hand spraying was opted for so the rig could remain on the surface and have concrete agitators feed directly into the hopper of the midjet. This minimised the requirement to bring a larger crane in to lift the shotcrete rig in, as well as the requirement to either have a crane and kibble supplying the shotcrete or a boom pump.

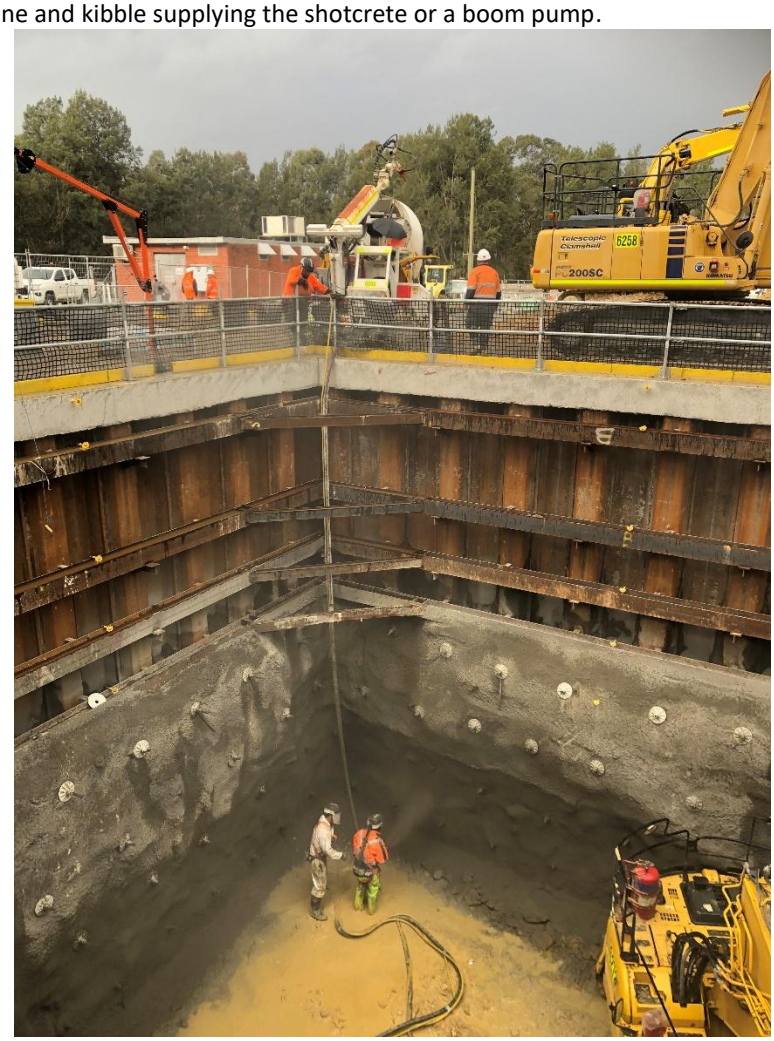

Figure 6. Hand spraying Shotcrete

Access/Emergency retrieval

The access into the shaft was with a prefabricated modular ladder. This allowed access into the shaft without encroaching on the available space as the shaft was very small. A davit arm with inertia reel was used to allow safe access down the ladder. While an additional davit arm was available for use in an emergency as a means to retrieve a stretcher

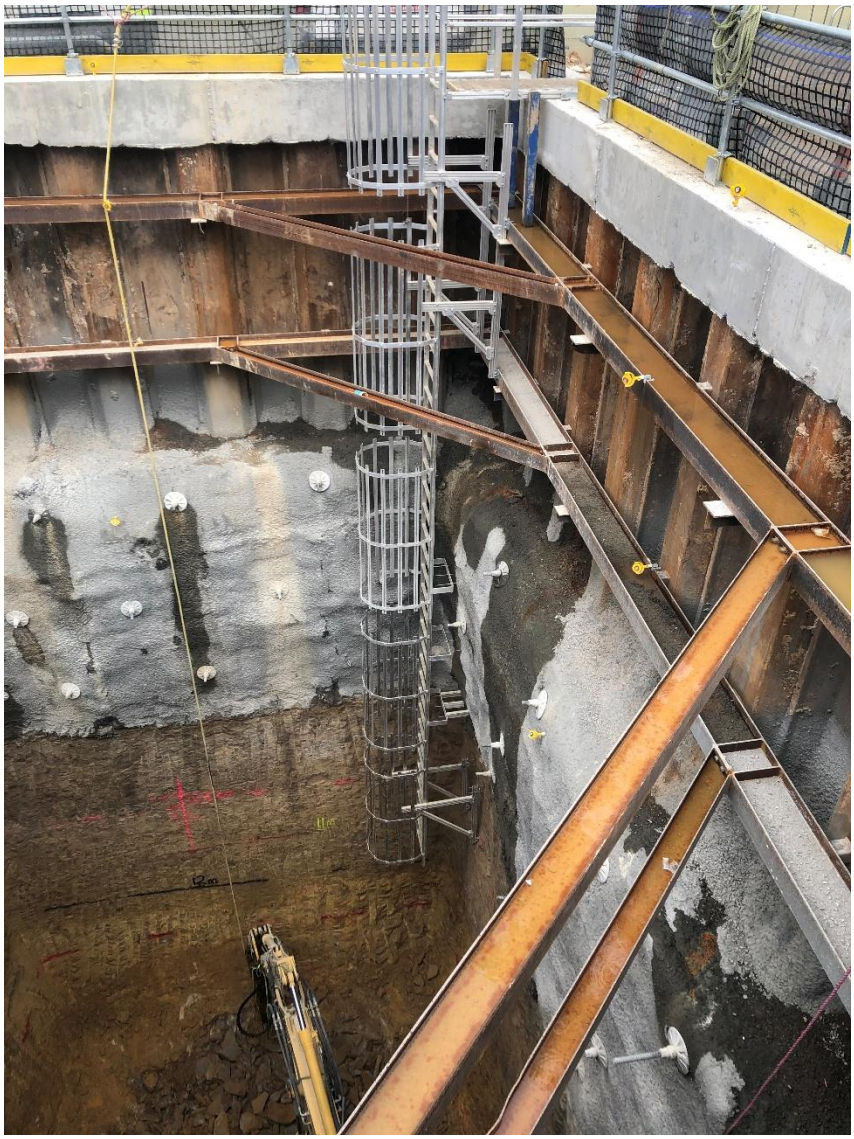

Figure 7 Access Ladder