

# Pūhoi to Warkworth



JACOBS

GHD

CHAPMAN TRIPP

PWC

BELL GULLY

## Stage 4 Geotechnical Investigations Information Sheet

Geotechnical specialists will use a range of equipment to examine ground conditions by either excavating small shallow test pits of soil, using a mechanical probe, and/or extracting cores of underlying soil and rock.

### Working hours, communications and access:

- Monday to Saturday (7.30am to 6.00pm). All on-site work will be supervised by a representative from the Pūhoi to Warkworth project team.
- Prior to any on-site testing, staff will liaise with property owners to determine the movements of stock or animals, any local hazards and the most appropriate access routes to the proposed testing locations. Improving existing access tracks and/or creating new access tracks may be required.
- Helicopters may be used to pick up and drop off equipment to locations where vehicle access is restricted to light vehicles due to ground conditions. Flight paths have been established to ensure that equipment is not flown over public roads and houses. Hovering of the helicopter is excluded within 65m of a house and duration restrictions exist within 300m of a house.

### Borehole Drilling:

Drilling rigs are used to drill a borehole in the ground and remove a sample of soil and rock. Boreholes are typically between 100 mm and 150 mm in diameter. Drilling rigs are usually transported on site on the back of a low-loading truck. Once on site, the rig can travel on its own tracks using the best route to access the proposed borehole locations. This may involve using an existing farm track, road or driveway or an alternative route that avoids steep slopes. Several other pieces of drilling equipment (such as pipes, pumps etc) are transported to the borehole location separately, either on a trailer pulled by the rig or on a separate small support truck or 4WD.

At any one time up to four vehicles may be on site during the drilling. These may include (1) the drilling rig, (2) a support vehicle, (3) a supervising geologist's 4WD and (4) a visiting manager's 4WD. Vehicle movements on and off site may occur during the day. Typically the drilling rig and larger equipment remain on site until the drilling is complete. Smaller equipment and vehicles are taken off site at the end of each working day and return the following morning.

For the purposes of this project, each borehole is anticipated to take on average approximately 2.5-3 days to drill.

### Cone Penetration Testing Rigs (CPT):

CPT rigs are used to push a 50 mm diameter test probe into the ground and measure the resistance of the soils. CPT rigs are also typically delivered to site on a low-loading truck. Once on site, the rig drives itself to the proposed test locations. CPT rigs are largely self-contained, therefore, unlike a drilling rig, they typically do not require support vehicles. Periodically a supervising geologist's 4WD and drilling manager's 4WD may return to the site to monitor progress.

A CPT rig can complete anything from 5 to 15 CPT tests per day, depending on access and testing requirements. At the end of each day the CPT rig will remain on site until the works are complete. Any support vehicles leave at the end of the day and return the following morning. On completion a marker stake may be placed at the test location to assist surveying at a later date.

### **Excavators:**

An excavator will be used on many sites to dig 'test pits' and/or create access tracks for other equipment such as a drilling rig or CPT rig. A 12 tonne or 20 tonne excavator is likely to be used. Excavators will typically be delivered to the site on a low-loading truck. Once on site, the excavator self-tracks to the proposed test pit locations via the best existing access or an alternative route. Additional vehicles on site may include 4WD vehicles of the geologist and other visiting geotechnical specialists.

Test pits are typically about 1.5m wide, up to 4m long and up to 5m deep. The depth is dependent on the size of the excavator, strength of the soils and stability of the hole. Normally the topsoil and the soil is placed to the side a safe distance from the pit until it is ready to be backfilled. During the excavation a geologist will inspect the soil encountered and may collect some soil samples.

The open test pit is then backfilled with the soil and compacted down with the excavator. Each test pit takes approximately one to two hours to dig and reinstate. Therefore, depending on access and distance between test locations, a number of test pits can be excavated in a single day. On completion a marker stake may be placed at the pit location to assist surveying at a later date. There may be occasions where site access may need to be improved or created to allow investigation locations to be reached by the site equipment. In this case the excavator will be used to cut, clear or improve access tracks. Any clearing or excavation for an access track will be undertaken using an excavator. If the track is likely to have frequent vehicle traffic then surfacing of the track with gravel may be required. This will be externally sourced and brought onto site with a truck.

### **Disturbance and reinstatement of land:**

There may be some minor disturbance and potential temporary disruptions during the works. The specialists will endeavour to undertake investigations with minimal impact and reinstatement will be undertaken where necessary. On completion of any boreholes, it is likely that a PVC pipe will be installed into the borehole to monitor groundwater levels (piezometer). In many cases in farmland, the PVC pipe will protrude approximately 0.5 m above the ground surface and a surrounding steel case cemented in place to protect it. Elsewhere the boreholes will be back-filled and reinstatement would involve levelling up any depressions that may have been created by the drilling and excavation. Any significantly disturbed grass surfaces would be re-seeded to help grass reinstate itself naturally.

Some farm fences may have to be cut to allow for access to some specific locations. Project staff will liaise with property owners before any cutting takes place and all fences reinstated once access is no longer required.

### **Borehole camera inspections:**

A camera inspection is planned for the majority of boreholes. This inspection will be undertaken between one and three weeks after the completion of the borehole. A crew of two people will access the site via 4WD to carry out the camera survey. The inspection involves feeding a digital and orientated camera down the drilled borehole. The survey generally takes about three hours per borehole.

### **Surveying:**

A topographic survey of the investigation locations will be carried out once the investigation has been completed. A specialist surveyor will access the site using a combination of 4WD access and walking access. Surveying is likely to take approximately half an hour per borehole/test pit/CPT location.

**Access for Other Monitoring:**

Ongoing groundwater monitoring will be carried out at borehole locations where a piezometer is installed. We anticipate an average of one monitoring visit per month for the initial six months, reducing in frequency thereafter. Monitoring of the groundwater involves a site geologist accessing the site via 4WD and undertaking a brief ground water measurement or installation of monitoring sensors.

**Summary of testing process:**

- 1) Property owner discussion regarding access
- 2) Inspection and creation of access track (if required)
- 3) Arrival of drill rig/CPT rig/excavator.
- 4) Machine borehole left with temporary PVC pipe protruding to allow for subsequent camera inspection
- 5) Camera inspection in boreholes
- 6) A crew returns (without any rigs) to install piezometer groundwater monitoring devices.
- 7) Survey crew accesses the site to locate and survey the investigation locations.
- 8) Ongoing groundwater monitoring at regular intervals.

**Safety**

The works involve heavy machinery, moving parts and excavations. In the interests of your own safety, please do not approach any closer than 30m from the work site, machinery or vehicles at any time. Our site supervisors will be nearby during the work so if you would like to contact them for any reason, please make sure to wave and get their eye contact from a safe distance, and they will come and meet with you as soon as possible.

**Types of equipment used:**

Below: Drill rig and equipment



Below: Reinstated borehole with a piezometer upstand



Below: Typical excavator that may be used to dig test pits



Below: CPT rig (to the right of the car) on the back of a low-loader transporter



Below: Helicopter work in the Pūhoi Estuary

