

# Exploration Methods Explained: Drilling

*Drilling is often conducted as part of an advanced exploration program to obtain detailed information about the rocks below the ground surface. The drilling method and size of the drilling rig used depends on the type of rock and information sought. The most common drilling method is very similar to water bore drilling and is usually completed in a day. The degree of disturbance around the hole varies with each method. Strict environmental safeguards ensure all drill sites are rehabilitated after the completion of drilling.*

## Shallow drilling

There are two main types of shallow drilling:

**Auger Drilling** – Auger drilling uses either a hand-held power auger or one mounted on a small vehicle. Auger drilling is very similar to a post hole digger used by farmers when fencing and could also be compared to a jackhammer.

**Air Drilling** – There are two main shallow air drilling methods, **aircore** and **rotary air blast (RAB)**. These methods usually involve a utility or small truck-mounted drill rig with an air compressor carried onboard or towed separately. This type of drilling creates rock fragments or 'rock chips'. Compressed air is forced down the hole which lifts the rock chips to the surface. This type of drilling requires minimal site preparation and is usually completed in well under a day.

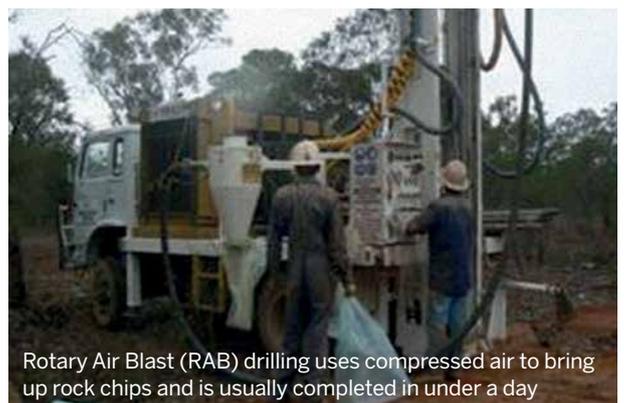
## Deep Drilling

There are three main types of deep drilling:

**Air Drilling** – There are two main types of air drilling used to drill deeper holes, namely **open hole percussion and reverse circulation (RC)**. These drilling techniques are very similar in equipment to water bore drilling.

Air drilling uses compressed air to drive a slowly rotating percussion drill bit, which operates in a similar manner to a jack hammer. The drill bit is typically fitted with numerous hardened protrusions that crush the rock at the bottom of the hole. It produces rock chips that are lifted to the surface by compressed air.

This drilling method is relatively fast, can penetrate hard rock and is capable of drilling holes up to 300 metres deep. These methods do not usually require significant site preparation. Truck-mounted rigs with one or two support vehicles, to carry drill rods and an air compressor, are typically required. Most drill holes can be completed in a single day. The rock chips brought to the surface are logged by a geologist and samples are sent for laboratory analysis.





RC drilling is similar to water bore drilling and the latest rigs are mounted on a 4WD vehicle



RC drilling may also be undertaken using a larger rig



Diamond drilling produces core of rock which is logged by a geologist with samples sent to a laboratory for analysis



RC drilling produces rock chips which are logged by a geologist with samples sent to laboratory for analysis

**Diamond Drilling** – Diamond drilling uses a truck-mounted rig with support vehicles to extract a continuous cylinder of rock. This method uses a rapidly rotating drill bit that uses water and drilling fluids, contained in either an in-ground sump or above ground tanks, to cool and lubricate the drill bit. As the drill rods advance, the cylinder of remaining rock gradually becomes enveloped by the drill rods. The core of rock is logged by a geologist and samples are sent for laboratory analysis.

Ground up rock material is transported to the surface by the returning drilling fluids and is separated from the fluids, typically in drill sumps or small ponds. Above ground sumps may be used in sensitive environments.

Diamond drilling is the most costly form of drilling and is capable of drilling holes many kilometres in depth. Each drill hole can take a number of days to complete and some programs drill over 24 hours a day if practical.

Depending on the duration of the drilling program, additional equipment such as portable shelters, storage containers and portable lighting plants may be required. This method requires significant site preparation and rehabilitation. Most advanced exploration for coal and minerals uses a combination of diamond and reverse circulation drilling.

**Rotary Mud Drilling** – Rotary mud drilling is most often used for deep stratigraphic drilling in coal exploration. This method produces fine rock fragments and uses water and drilling fluids to lubricate the drill bit and bring the rock fragments to the surface. Typically a down-hole motor is located behind the drill bit. This means that the drilling can be steered so this form of drilling is used for directional drilling of specific targets.

The drilling fluids are contained in either in-ground sumps or above ground tanks. The drilling rigs are usually larger than for other methods and require more support vehicles and site preparation. Each drill hole can take up to several weeks to several months to complete, dependent on the depth of the hole. Drilling is often undertaken 24 hours a day if practical.

### Regulation of Exploration Drilling

Exploration drilling is strictly regulated in the conditions of all exploration licences. Most drilling requires additional Government approval which must describe the current environment, proposed activity and environmental mitigation and management procedures. On private land, this work must be included in an access agreement prior to commencement.

### Rehabilitation of Exploration Drilling

Rehabilitation is a condition of every exploration licence and undertaken as soon as practical following surface disturbance. Planning for rehabilitation is undertaken before surface disturbance and in consultation with the landholder.

Rehabilitation of drill holes includes casing, sealing and capping the hole. Usually the hole is given a temporary cap prior to the results of the laboratory analyses. The hole is then plugged below ground with a concrete and metal plug so it can be found with a metal detector. The surface is backfilled and left slightly mounded, to allow for subsidence, then reseeded and fertilised as appropriate for the surrounding area.

### Further information

NSW Trade and Investment – Division of Resources and Energy  
[www.resources.nsw.gov.au](http://www.resources.nsw.gov.au)

NSW Minerals Industry Exploration Handbook  
[www.nswmining.com.au/menu/media/publications](http://www.nswmining.com.au/menu/media/publications)

For additional Exploration Fact Sheets,  
 see [www.nswmining.com.au/menu/media/fact-sheets](http://www.nswmining.com.au/menu/media/fact-sheets)

*These descriptions are primarily provided for those who may not be familiar with exploration operations. As a result they are, by their nature, general. The descriptions have been written in consultation with the NSW Trade & Investment - Division of Resources and Energy. Our thanks to Malachite Resources Limited, Oakland Resources Limited, Golden Cross Resources Ltd, Shenhua Watermark Coal Pty Limited, Silver Mines Limited and Alkane Resources Ltd for contributing photos to this fact sheet.*

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Above ground sumps are used in sensitive areas



Diamond drilling is used in advanced exploration



Rotary mud drilling is used in coal exploration



Rehabilitation is undertaken as soon as practical