

## A465 Heads of the Valleys (Gilwern to Brynmawr) — Mine Workings Consolidation (Phase 1 & 2)

**Client:** Costain working for the Welsh Government  
**Designer:** CH2MHILL & Atkins  
**Value:** £900,000  
**Period:** Phase 1 (January 2016 — May 2016)  
Phase 2 (August 2016 — September 2016)

Contract to undertake shallow mine workings consolidation along the route of the A465 Heads of the Valleys road improvements being constructed by Costain in a DBFO contract for the Welsh Government.

The project to upgrade 8km of the existing A465 between the Glanbaiden junction at Gilwern and the Brynmawr roundabout to 2 lanes in each direction included a number of areas that were affected by shallow coal workings.

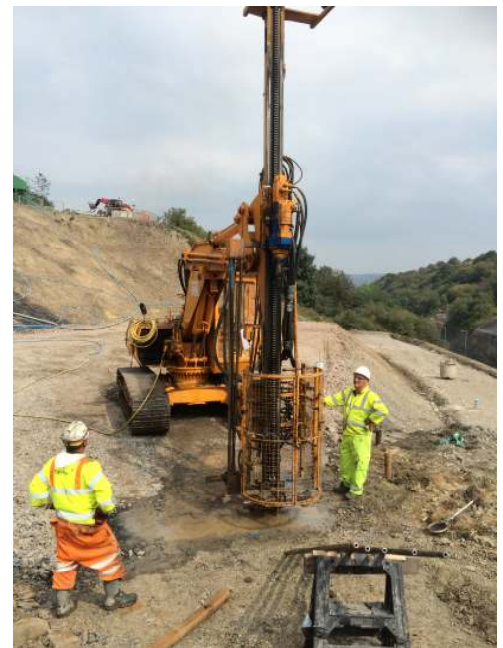
Treatment of the affected areas was undertaken by grid drilling and grouting to consolidate the worked seams generally to a maximum depth of 30m. Treatment designs, specifications and drilling grids were determined by designer CH2MHILL & Atkins.

During the workload peak 3 drilling rigs were resourced to site together with 1 grout mixing set up requiring 14 personnel. All drilling and grouting plant and equipment was resourced from our specialist in-house plant fleet.

The scheme was split into 4 working zones. Phase 1 contained three of the four zones and then Phase 2 contained the final fourth zone.

In summary the work completed included;

- **Mineworkings Treatment (Phase 1)**
  - ◇ 956 boreholes drilled (20,375 metres of drilling)
  - ◇ 1483 tonnes 3:1 Perimeter grout (Sand/OPC)
  - ◇ 1151 tonnes 5:4:1 Infill grout (PFA/Sand/OPC)
  - ◇ Site Works Duration—16 Weeks



## A465 Heads of the Valleys (Gilwern to Brynmawr) — Mine Workings Consolidation (Phase 1 & 2)

- **Mine Workings Treatment (Phase 2)**

- ◇ 164 boreholes drilled (1,309 metres of drilling)
  - ◇ 160 tonnes of 3:1 Perimeter grout (Sand/OPC)
  - ◇ 40 tonnes of 5:4:1 Infill grout (PFA/Sand/OPC)
  - ◇ Site Works Duration— 5 Weeks
- Treatment grids were serviced with water feed and grout pipelines from centrally established compounds in each zone. The central batching and servicing concept reduces the need for multiple grout mixing, water treatment and water supply set ups and gives full control over grout materials deliveries, storage, mixing and quality control.
  - Preparation of working areas was completed by Costain and included installation of drill flush and surface water collection trenches & sumps, silt fencing and creation of drilling platforms.
  - Holes were drilled with 101mm OD rotary percussive steel casing drilled and sealed into rockhead followed by drilling a 75mm open hole allowing insertion of a 50mm MDPE grout tremmie pipe. Use of steel casing drilled to rockhead was a specified requirement.
  - A significant amount of inclined drilling was required (16%) to treat under the proposed structure footprints with angles of up to 20° being accommodated by the versatile drilling resources on the site.
  - Water flush was used with water piped to drilling rigs via a delivery main along the treatment areas. The rigs are also equipped with on board water pumps to ensure optimum hole flushing.
  - Drilling & grouting treatment was carried out in an agreed sequence with down-dip perimeter holes generally being completed first.
  - Grout was mixed in a 2.5m<sup>3</sup> hydraulically driven batch mixer and distributed directly to treatment area grout holes via pumps.
  - Grout mixes were 3:1 sand/cement for perimeter holes & 5:4:1 PFA/sand/cement for infill holes.
  - Continuous monitoring and recording of injected quantity and pressure was carried out together with extensive quality control and testing of mixed grout.
  - The River Clydach flows between the four treatments zones — continuous liaison took place with Costain and Natural Resources Wales to ensure our procedures and facilities for grouting and the collection and disposal of drill flush returns and surface water run-off were discussed, approved and continually monitored.
  - Works were co-ordinated and phased carefully with our Client to ensure that there was no impact upon bulk earthworks, drainage and foundation operations.

