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THE PROTECTION OF THE NOTTINGHAMSHIRE COALFIELD BY THE BENTINCK COLLIERY MINEWATER CONCENTRATION SCHEME

by

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ABSTRACT

The paper gives a brief description of the story of pumping arrangements along the South Western border of the Nottinghamshire coalfield. It outlines the size of the water handling problem to protect the Nottinghamshire Area, and the mining and civil works necessary to collect, pump and discharge all of this water. It describes recently closed collieries and their make of water, and details the migration of these quantities through a variety of roadways and goaf areas to the new lodgement facilities to be installed at Bentinck Colliery. Other pumping stations and total makes of water along the South

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Western Boundary are described to give the full picture of the size of the project to handle approximately fifty million gallons per week.

INTRODUCTION

The closure of numerous interconnected Collieries, along the outcrop, on the western edge of the Nottinghamshire coalfield has resulted in a continuous migration of minewaters in an easterly direction towards operating mines. Several centralised pumping stations surfacing millions of gallons of water per week, have been established to protect the working collieries (Figures 1 and 2).

Prior to closure of Moorgreen and Pye Hill Collieries, minewaters totalling 225 million gallons per annum (428 g.pm.) were being surfaced and discharged into the Erewash via three shafts and two surface drifts. This water could not be controlled at the shafts and is now building up in the disused workings and flowing eastwards towards the operating mines.

Minewaters flowing into the closed Babbington Colliery pit bottom are currently surfaced at Babbington and discharged into a tributary of the River Leen. Cessation of pumping at Babbington would result in a flow of these mine waters into adjacent working collieries.

It is British Coal's intention to positively control these minewaters by collecting them at a centralised pumping station. This would be established at Bentinck Colliery (Figure 3).

The combined minewaters will be passed through a series of water treatment ponds to remove suspended solids and iron compounds to within the river authorities normally accepted limits.

THE MINING HISTORY OF NOTTINGHAMSHIRES SOUTH WESTERN BOUNDARY

Over fifty collieries were operating in the 1930's in the southern half of the Nottinghamshire Area; of these there remains to date

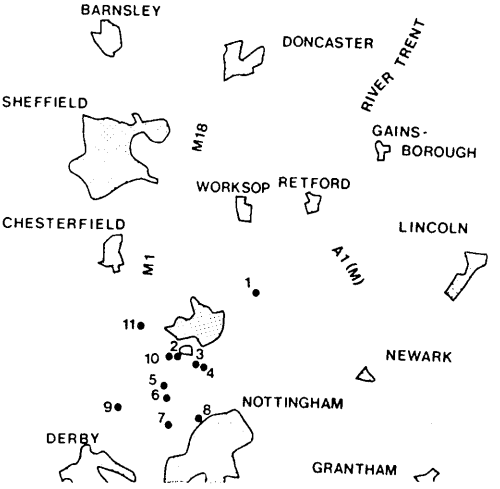

Figure 1 Area location plan

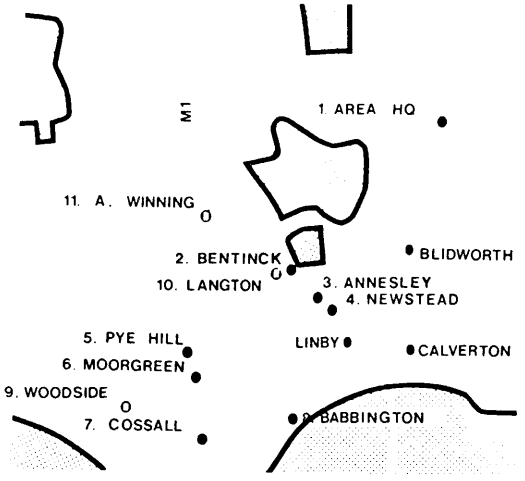

Figure 2 Colliery location plan

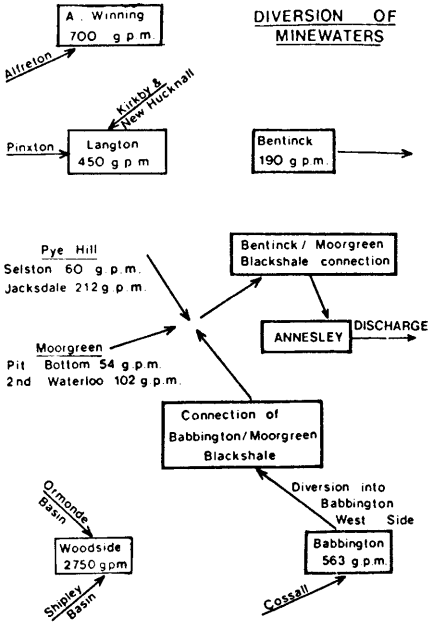

Figure 3 Migratory route of mine waters

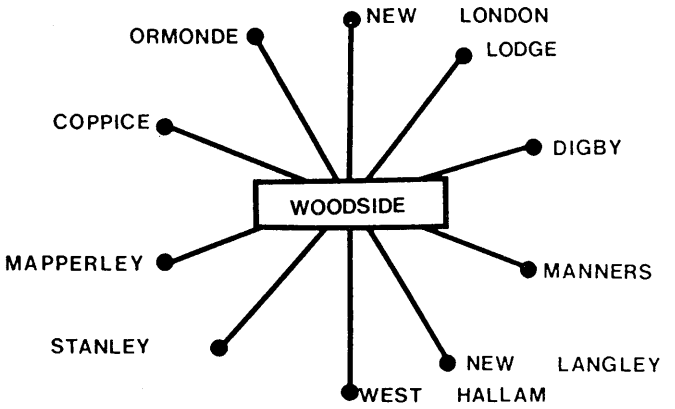

Figure 4 Abandoned collieries associated with Woodside Pumping Station

only seven namely:

- o Annesley
- o Bentinck
- o Calverton
- o Cotgrave
- o Gedling
- o Linby
- o Blidworth

Many of the abandoned collieries worked along the edge of the outcrop and were interconnected with other collieries. As the collieries closed and pumping ceased, there developed a network of underground connections along which minewater could migrate.

To protect some of the current working collieries from this migrating minewater, three closed collieries, those of Woodside, 'A' Winning and Langton have been retained for pumping operations.

Each of these three collieries formed the centre of a mining area which now accepts minewater from a number of different sources. Many of the collieries in these areas pumped only nuisance water but some had installed significant pumping schemes which have long since ceased to operate.

Woodside Pumping Station

Woodside pumping station as shown in Figure 4 is situated in an area known locally as the Shipley Basin and pumps minewaters migrating to Woodside No:2 shaft from over 20 abandoned collieries. Four submersible 1500 g.p.m. pumps surface minewater, at an average rate of approximately 28000 g.p.m. via a series of settlement ponds into the Nut Brook.

Cessation of pumping at Woodside would result in an overflow of minewaters via direct connections to Moorgreen colliery pit bottom. This water would then flow inbye from the pit bottom appearing at the proposed Bentinck/Moorgreen connection.

The quantity pumped in 1986 was 1180 million gallons (2245 g.p.m).

It is considered that this quantity is too great to handle at the

proposed Bentinck pumping station. Consequently Woodside pumping station must continue for the foreseeable future.

'A' Winning Pumping Station

'A' Winning submersible pumping station pumps water flowing to 'A' Winning shafts from the abandoned collieries of Tibshelf, Morton, Shirland, Wingfield Manor, Swanwick and Alfreton (Figure 5).

Four submersible pumps are suspended in No: I shaft between the Blackshale and Tupton Insets and pumps water at an average rate of approximately 700 g.p.m via a series of settlement ponds into the Normanton Brook.

The quantity recorded during 1986 wad 345 million gallons (657 g.p.m.). If pumping ceased at 'A' Winning the water would migrate via 'B' Winning, New Hucknall and Kirkby collieries to Langton Colliery which is connected to Bentinck colliery. The condition of the workings through which this water would migrate is not known and a restriction could result in a build up of a water followed by a flow into Langton of uncontrollable proportions. A goaf to goaf connection between Bentinck Tupton and New Hucknall Tupton could also be put under increased pressure with a potential flow into Bentinck pit bottom.

Because of the uncertainty of the migratory routes between 'A' Winning and Langton Collieries it is proposed to continue pumping at "A' Winning pumping station.

Langton Pumping Station

Minewaters at the rate of approximately 320 g.p.m. from the Pinxton and Brookhill area have been collected and surfaced at Langton shaft for many years (Figure 6).

In October 1986 additional minewaters migrating from the Hucknall and Kirkby Collieries arrived at Langton and combined with the current minewaters being discharged . The total rate now being pumped is approximately 450 g.p.m.

Langton pumping station is directly connected by open roadways to Bentinck Colliery and the minewaters must be controlled to prevent flooding of Bentinck and the adjoining collieries.

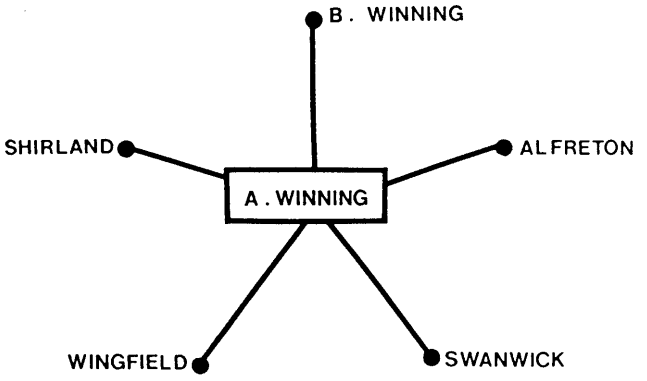

Figure 5 Abandoned collieries associated with 'A' Winning Pumping station

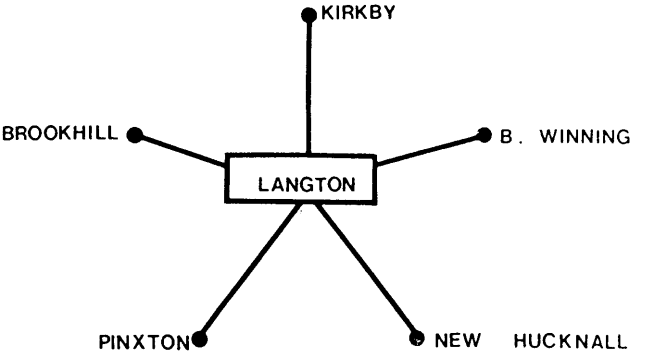

Figure 6 Abandoned collieries associated with Langton Pumping Station

It is proposed to continue with Langton pumping station.

PRESENT DAY SITUATION

Moorgreen Pye Hill Colliery

Prior to the closure of Moorgreen and Pye Hill Collieries, 225 million gallons of water per annum (428 g.p.m.) was being surfaced. The majority of this water was pumped from the working areas to the dip side, away from the shafts and could not be controlled by pumps situated at the shafts (Figure 7).

An investigation determined that cessation of pumping at Moorgreen and Pye Hill Collieries would result in a flooding pattern, which would eventually put at risk, areas of weakness in the strata between Moorgreen/Pye Hill and adjacent working collieries.

The possibility of the flooding at Babbington and Bentinck Collieries was identified, with a direct flow Bentinck to Annesley, Newstead and eventually Blidworth Colliery, if the minewaters remained uncontrolled.

It was decided to collect the water at a controllable rate by establishing a pumping station at Bentinck Colliery.

Babbington Colliery

The Cessation of pumping at Cossall colliery in May 1967 resulted in minewaters at the rate of 294 million gallons per annum (560 g.p.m.) migrating through disused Broxtowe Colliery Workings to Babbington Colliery pit bottom water lodge.

Babbington Pit Bottom is the highest point in the combined Babbington/Hucknall mine and the pumping arrangements are dependent on the maintenance of Babbington No: 4 Shaft, Hucknall No: 5 Shaft and some four miles of interconnecting railways.

Failure of pumping arrangements would result in an immediate overflow of minewaters towards adjacent working Collieries putting initially Bentinck and eventually Linby and Calverton Collieries at risk of flooding.

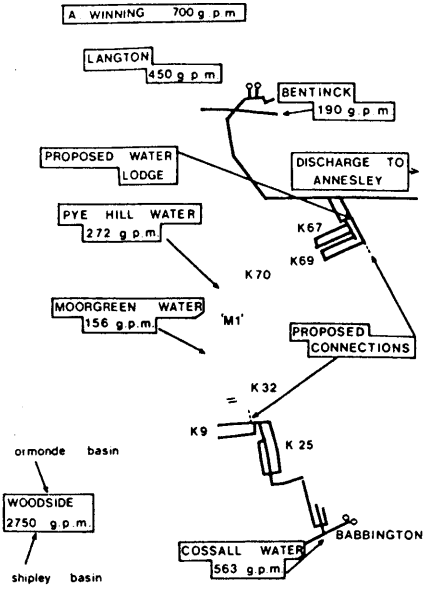

Figure 7 Underground roadway location plan showing lodge and connection position

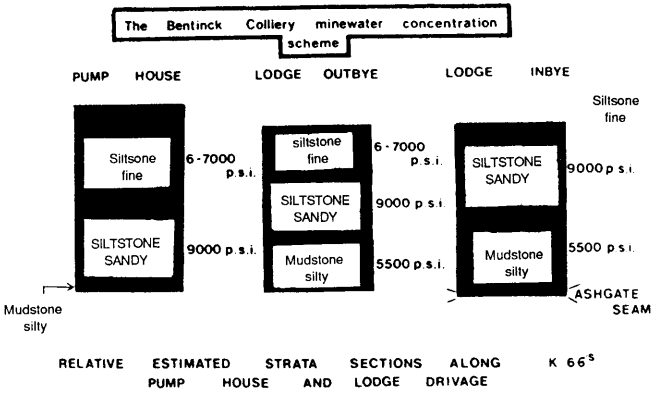

Figure 8 Strata sections along K.66's pump house and lodge drivage

Underground roadways are continually subjected to movement which causes them to deteriorate and gradually close up. It is considered that in time, the shafts and interconnected roadways will not satisfy the requirements of the Mines and Quarries Act, as to their condition for traveling, and the pumping arrangements in their current form would become impossible to maintain. The relative level of Babbington pit bottom prevents the installation of submersible pumps as an option to control the water and it is considered that the only long term guaranteed way to positively control the Cossall minewaters, is to divert them to combine with Moorgreen and Pye Hill minewaters to be collected at Bentinck Collieries.

MINING WORKS

At Bentinck Colliery a connection is required to join with Moorgreen Colliery so that migratory waters can be channelled into the newly constructed K66's water lodge. The drivage, as with the Babbington Moorgreen connection is 120 metres in length constructed 5' x 6' Hollybank contour for the collection of all the waters migrating from Babbington, Pye Hill and Moorgreen Collieries.

K66's water lodge will be situated in the Blackshale Seam adjacent to K66's old face. The strata sections encountered include siltstones, mudstones and goaf areas (Figure 8). The majority of the mining works will be constructed by outside contractors and the extent of the contractual works is the construction of three junctions, the drivage of approximately 400 metres of arch and square profile roadways and 100 metres of existing roadway repair works (Figure 9).

K66's Lodge Specifications

K66's Infeed Road

Water will flow into the lodge via a 16' x 12' roadway gravitating from Moorgreen connection. Any water passing through the goaf area of K66 will flow through migration pipes constructed in the infeed roadway and from there into K66's water lodge as shown in Figure 10.

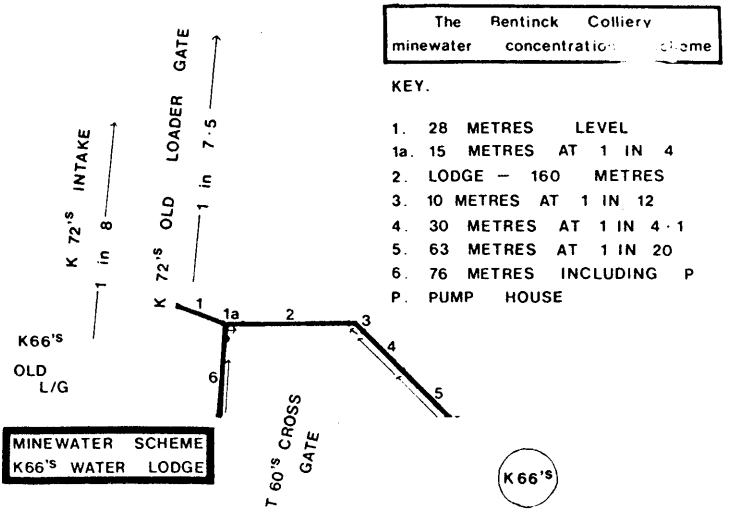

Figure 9 K.66's water lodge location plan

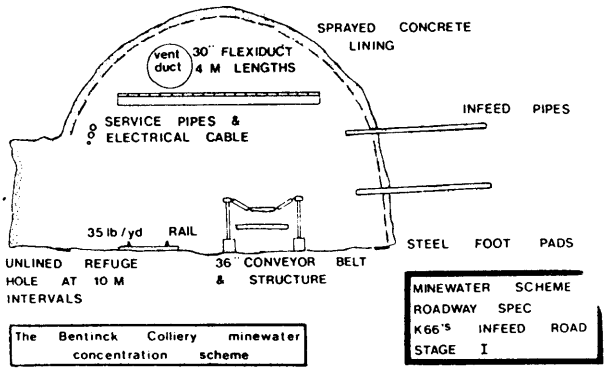

Figure 10 K.66's infeed roadway

K66's Water Lodge

K66's water lodge will be constructed in two stages and will include a sump for pump suction and a dam wall as shown in Figure 11.

Stage 1:

K66's water lodge will be driven on 18' x 13' arches and will be 160 m in length. The length of the lodge has been determined to give a 6 hour emergency capacity in the event of systems failure. The lodge will be driven using a Mark IIA Dosco with arch settings at 1 m centres. The roadways will be strengthened using strata bolts at the roadhead to prevent bed separation. The lagging will be wire mesh type and will be sprayed with concrete to half the arch web depth at this point (Figure 12).

Stage 2:

Once the initial roadway has been driven using the Dosco Mark IIA a second pass along the lodge roadway will be made making a dish profile in the floor. Floor bolting will take place at this time and will be followed by concrete sprayed to the full arch web depth with a lining in the floor. The specification of roof and floor bolting and concrete lining is to minimise distortion and make an effective seal (Figure 13).

Pumps and Control Systems

Comprehensive monitoring and control equipment will be installed from which status information will be relayed to the surface control centre. There are three Mackley 650 hp pumps planned, 2 duty and one standby each capable of pumping 1100 g.p.m. The three pump sets will be so arranged to allow remote selection of any of the duty units in the event of failure.

Pumping to the shafts will be via 8" diameter victaulic pipes internally coted to extend their life.

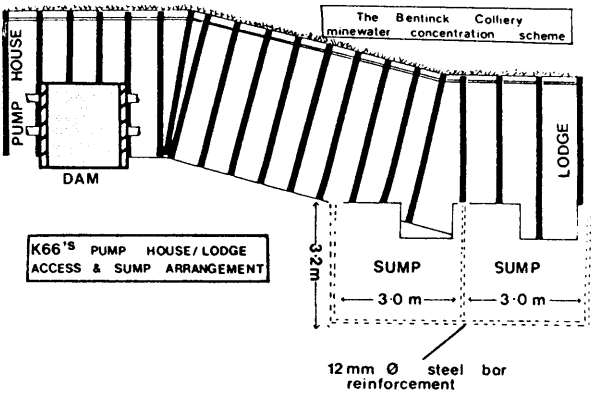

Figure 11 K.66's pump house/lodge access and sump arrangemer

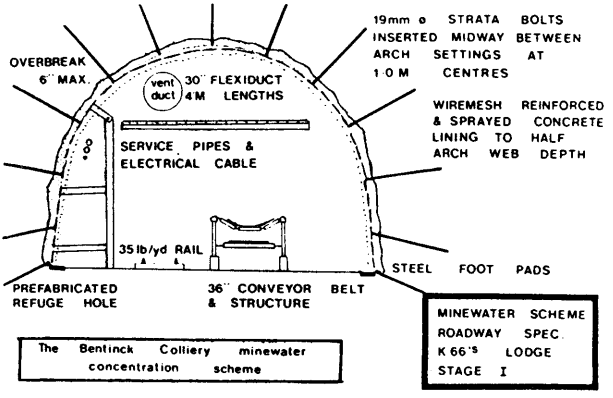

Figure 12 K.66's lodge roadway specification stage 1

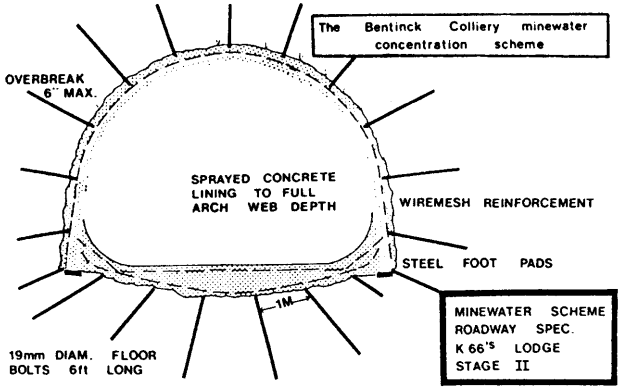

Figure 13 K.66's lodge roadway specification stage 2.

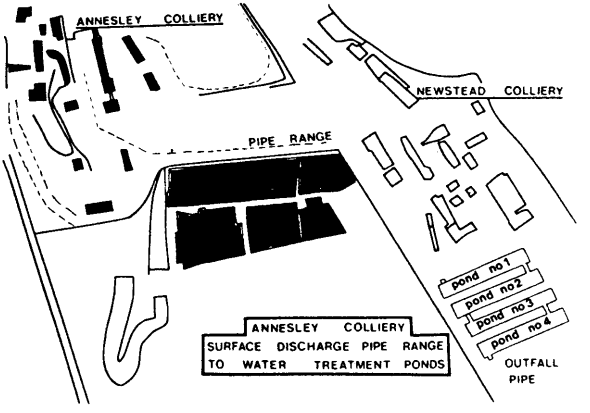

Figure 14 Annesley Colliery surface discharge pipe range to water treatment ponds

The Bentinck Colliery minewater concentration scheme

	£000's
SURFACE	
Preliminary site preparation & general expenses	100
Treatment pond construction & discharge pipework to Rasford	2000
Remote control / monitoring equipment	400
Electrical supply	100
TOTAL	2600
UNDERGROUND	
Mining drivages – water lodge & associated roadways	2000
Pumping equipment and piperange to surface	1300
TOTAL	3300
Estimated total expenditure	5900

Figure 15 Estimated project expenditure.

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