

## Wrens Nest Area 14/16 and Castle Hill West Area 21/22 Abandoned Mine Infilling

<b>Client</b>	Dudley Metropolitan Borough Council (funded by English Partnerships Land Stabilisation Programme)
<b>Value</b>	£ 3,200,000
<b>Completion</b>	December 1998

Work involved bulk infilling, grouting and underground work to stabilise redundant limestone mine workings, in two areas of approximately 15 ha. of residential, open space, roads and canals.

The Wrens Nest area is a Site of Special Scientific Interest (SSSI) and much of Castle Hill is a Site of Importance of Nature Conservation (SINC). Work was also required in the areas occupied by Dudley Zoo and Dudley Canal Trust. Work in these areas was subject to extensive restrictions and controls. The main office and mixing compound was situated remote from the works sites requiring mixed grout/paste infill materials to be pumped up to 3000m to injection points.

The contract required;

- Drilling 115 no. high tolerance bulk infill and grout holes up to 100m deep, mainly in sensitive locations with difficult access and terrain.
- Bulk infilling with 196,000 tonnes PFA paste and grouting collapsed ground with 31,500 tonnes grout, in both flooded and dry galleries.
- Constructing new 54m deep, 3.0m dia. shaft to access workings at Wrens Nest site to construct contractor designed underground in situ concrete barriers prior to infilling and isolate workings from canal system. On completion the shaft was equipped with permanent ladders and landings for future use.
- Construction of in situ concrete underground barriers at Castle Hill to isolate workings from existing operational canal system.
- Establishment and operation of displaced mine water pumping wells and water treatment facilities.
- Utilise specialist down hole survey equipment to confirm investigation information and monitor progress of infilling work (i.e. ultrasonic surveys).



The infill paste and grout was mixed using computer controlled continuous mixing plant of 130m<sup>3</sup> per hour capacity and pumped using high output trailer mounted concrete pumps. For pumping distances in excess of 1500m, a stage pumping station was established with 10m<sup>3</sup> capacity holding agitator, with matched concrete pumps to re-pump to paste injection points. Grout was similarly pumped to a 7m<sup>3</sup> mobile agitator/pump unit, from where it was pumped to injection point.

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Extensive temporary infrastructure was established for the PFA storage and mixing plant area which was situated remote from works (container surrounded with mist spray facilities vehicle wheel wash provided) receiving 80 loads per day bulk PFA from Radcliffe Power Station.

Access to the barrier works in Little Tess and Hurst Cavern were via the existing operational canal system requiring agreement of timetables, methods, emergency procedures and safety systems with Dudley Canal Trust, who continued to use the canal system for tourist trips. Generally barriers were constructed using in-situ reinforced concrete with sacrificial blockwork back shuttering. Concrete was pumped from surface through purpose drilled and cased holes at barrier positions.



Continuous liaison was necessary with the Client and English Nature, Dudley MBC Environment and Leisure Services Dept, Dudley Canal Trust, Dudley Zoo etc covering accesses, site constraints (e.g badgers, bats) sequence of work, positioning of drill holes and pipelines resulting in absolute minimal intrusion or site clearance works in protected areas. This was also the case for sinking the new step shaft to access Wrens Nest Mines.

A proactive customer care approach was adopted by the site team (Client/Contractor) for liaison with the local residents which included public meetings and regular residents association meetings to provide information on progress, future areas of disruption and a forum for complaints but also to foster a high level of co-operation with the public.

Following completion of the main infilling scheme, the new access shaft – ‘Step Shaft’ - has been re-opened on a number of occasions for ongoing safety inspection and survey work to the disused mines canal system and a number of other unfilled galleries in the Wrens Nest mines system, in particular the Step Shaft Gallery, an 80m long x 20m high x 10 wide gallery in a near vertical seam of limestone.

Forkers have carried out enabling works, establishment of decking, accesses and walkways within the canal basin and mine galleries, provision of supervision and attendance, establishment of monitoring equipment, security, emergency facilities, craneage and manrider access, and lighting to shaft and underground areas. These works have been carried out under MASHAM Regs under the supervision of Dudley MBC’s Mine Manager Mr Ken Leach. Surveys have been carried out both by visual inspection and laser survey equipment to calculate the gallery volumes.

