

## CASE STUDY

### PFA IN A CUT-OFF BARRIER AT LEE HOWL, SANDWELL

Lee Howl is a former industrial site which has been redeveloped by Sandwell M.B.C. to provide land for school, allotments and public space. Adjacent to the site is an old landfill facility, where principally domestic and some industrial waste, up to 10 metres in depth, had been deposited during the 1960s and early 1970s. To provide a first line of defence against the possible migration of gas from the landfill into the development area, a vent trench, together with an adjacent grout barrier, were constructed. Other measures were incorporated within buildings.



#### Site works

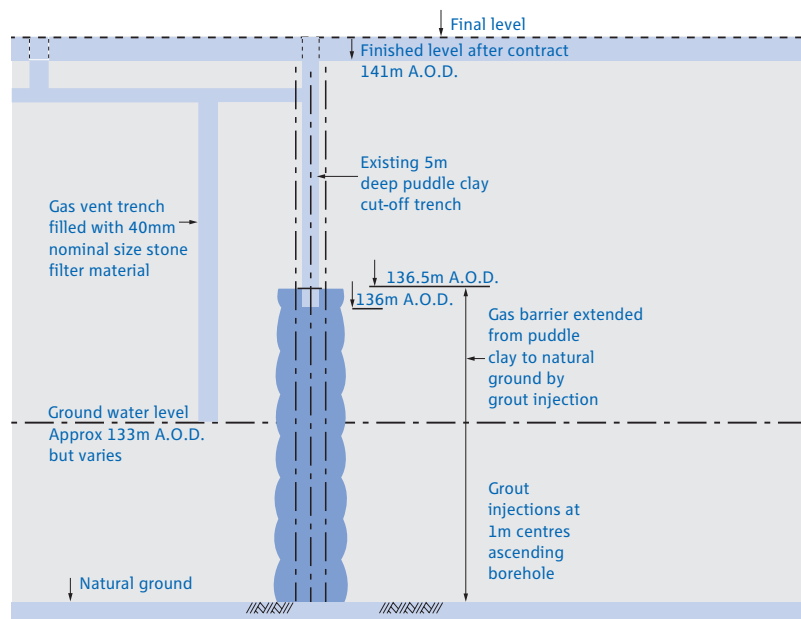
Subsequent to a detailed site investigation, the Department of Technical and Development Services, Sandwell M.B.C., designed a containment scheme as follows:

Using ground water level as a datum, a gas vent trench, backfilled with 40mm nominal size stone filter material, was excavated along the site perimeter. The trench, approximately 7 metres in depth, was capped with a subsurface layer of 40mm nominal size stone filter material, connected to atmosphere by a shallow perimeter vent trench and abutted on to an existing puddle clay cut-off trench.

The existing 5 metre deep puddle clay cut-off trench was extended down to the underlying clay stratum by the use of a 3 metre wide grouted gas barrier constructed directly below the puddle clay trench.

Three rows of boreholes at 1 metre centres, set out in a staggered pattern, were put down to provide

injection points for the grout curtain. The outer two rows were injected with a Pulverised Fuel Ash (PFA), Cement and Bentonite grout. The central row of boreholes directly beneath the puddle clay was grouted with PFA and Bentonite only. The mix design varied between boreholes as site conditions dictated.



Section through grout barrier

### PFA as grout

PFA was used as the major constituent part of the mix design. 800 tonnes of PFA were used, 70 tonnes of Cement and 60 tonnes of Bentonite.

Since PFA is approximately the same grain size distribution as cement, it is possible to use PFA as a filler in cement grouts without limiting the size of cracks or pores which can be injected. Addition of the more spherical PFA particles to a cement grout improves the flow properties and generally improves pumping and penetration. By varying the PFA: Cement ratio, a wide range of strengths and properties can be obtained. The ratios of PFA: Cement in common use vary from 1:1 to 15:1, depending on the strength permeability and elastic properties required.

### Why PFA?

Previous satisfactory performances of the material and its ability to penetrate small voids adequately, as well as its excellent pumpability characteristics, convinced Sandwell M.B.C. that PFA was the most suitable material for this job.

Colcrete Flowmeter and Marsh cone tests were carried out to measure fluidity and flow properties of the grout.

In addition, cubes were made and tested for strength at seven and fourteen days.

The mix design produced a material which has similar properties to a clay.



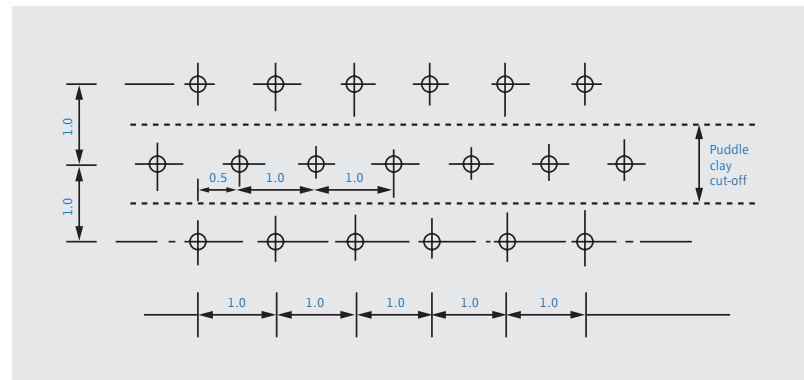
### Acknowledgements

#### Client:

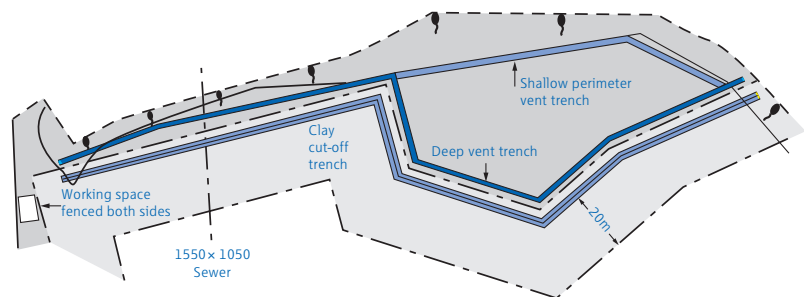
Director of Technical and Development Services Sandwell, Metropolitan Borough Council. Assisted in funding by Black Country Development Corporation

#### Contractor:

Midland Grouting and Drilling



Layout of boreholes for grout injection



Plan of cut-off trench

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