Case studies on aquifer protection in rising mine water areas.

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• Preventative Case Study
• Durham Aquifer Protection
• Active and Passive treatment schemes
East of Wear Mining Block

River Wear

Mine water flow

North Sea

Dawdon

Easington

Horden

Ludworth Dyke

Mine water flow
2002: Rising Mine Water Levels

Water Level Projections for Sites East of Wear

Date

Water Level Projections showing impacts starting from 2004
The Pollution Threat in East Durham

River Wear Inland

Deep Coastal Shaft

Colliery Beach Adit

North Sea

Permian Magnesian Limestone Aquifer

Carboniferous Coal Measures
Key Contaminants

- Iron - up to 200 mg/l
- Salinity - Hypersaline
- Chlorides - 20,000 to 30,000 mg/l
- Sulphate – 3,000 to 5,000 mg/l
Permian Magnesian Limestone Aquifer

c. 36 Million Litres / day abstracted by Northumbrian Water Ltd:

150,000 people rely on this major aquifer for drinking water
Possible Impacts

Aquifer Pollution

Coastal Pollution

River Pollution
Horden Control of Water Levels

Water Levels for East of Wear - Coastal

Pumping commenced August 2004
Horden Temporary Active Treatment Scheme
Horden Temporary Active Treatment Scheme
Hydraulic Control Risks

Single Roadway Connection
- Recorded as dammed
- Currently flowing freely
- Could become restricted or blocked
- Horden would not be able to control the whole area.
Proposed Two Site Strategy

Main pump & treat site at Dawdon

- For hydraulic control North of Ludworth Dyke
- Dawdon shaft is deeper than Horden
  - Expect worse quality mine water
  - Higher chlorides, iron etc.
- Active treatment technology to remove Iron
  - 150 l/s capacity

Secondary pump & treat site at Horden

- Existing 100 to 150 l/s capacity temporary active plant
  - Chlorides high due to high pumping rate
- Reduce to 50 l/s when Dawdon commissioned
- If chlorides reduce replace with passive plant
  - Settling lagoons and reed beds
Process Construction

Multi disciplinary project

Over 30 different sub-contractors

Complex programming
Pumping at Dawdon

Dawdon Starts pumping

Control throughout coalfield confirmed
Status in 2008

- Preventing Aquifer Pollution by:
  - 2 Active Pump & Treat schemes:
    - Horden Temporary
    - Dawdon
  - Final Phase:
    - Replace Horden active with Passive
    - New Lagoons and reedbeds
    - Reedbeds depend on decreased Chloride
Horden Shaft Water Profile

Salinity and Iron increase with pumping.
Salinity and Iron peaked and decreased, as pumping decreased from c100 l/s to c50 l/s
Horden Passive forming of lagoon cells
Horden Passive – Lining the cells
Horden Passive – finishing reedbeds
Horden Passive – Water testing of Lagoon Liner
Horden Passive shortly after commissioning

Active Treatment Area = 0.1 ha
Passive Treatment Area = 1.7 ha
Passive Scheme since May 2011
Iron removal performance comparable to active scheme
Summary

• Pumping at 2 sites
• Dawdon Active treatment for:
  • High flows of poor quality water
• Horden Passive treatment for:
  • Smaller flows of better quality water
• Drinking Water Aquifer protected

• Future – other areas of UK at risk
  • E.g. Nottinghamshire