The Coal Authority

Skewen Goshen Park Incident: Water Quality Summary

March 2021

Introduction

In the aftermath of Storm Christoph (18th – 20th January 2021), when between 75 – 150 mm of rainfall fell over a 48 hour period in South Wales (Met Office, 2021), a blow-out of mine water occurred at Goshen Park in Skewen, Neath, on 21st January 2021. The water discharging during the event was initially orange in colour before running clear.

In response to the incident, water sampling from the discharge at the junction of Goshen Park / Drummau Road commenced on 22nd January 2021 and continues to be collected on a regular basis for laboratory analysis.

The water samples are being analysed using a comprehensive water sampling suite on a 5 day turnaround time. Common onsite field measurements have also been taken of the water to supplement the laboratory data, this includes parameters such as temperature (°C), pH, conductivity (EC), total dissolved solids (TDS) and dissolved oxygen (DO).

Ochre (iron minerals e.g. rust) and flood sediment debris which caused the initial orange colouration was deposited in the immediate area and has been subject to separate sampling.

Origin of Water

A review of the field measurements being collected from the water discharge indicates that the water is from a groundwater source. This is based on the temperatures being in excess of 10 °C for at least two weeks after the outburst, and the high (> 500 µS/cm) conductivity readings indicating that the water has been in the ground for sufficient time for electrolytes (e.g. calcium, sodium, potassium etc.) to become dissolved in the water; for comparison, rain water typically has a lower conductivity below 200 µS/cm.

The concentrations of key metals often used to characterise waters (e.g. calcium, magnesium, sodium, potassium and sulphate) indicate that the dominant source of the water discharging from Goshen Park is a mine water.

Nitrate is often associated with surface waters, and is not typically present in mine waters at detectable concentrations. Some nitrate (~0.34 mg/L) was present in the water in the immediate aftermath of the blow-out, but this has now decreased to below the limit of detection of the analytical instrument. The presence of minor amounts of nitrate at Goshen Park in the initial days after the blow out, suggests that some minor surface water was mixing with the mine water in the immediate aftermath; this is not unexpected after all the heavy rain associated with Storm Christoph.

Water Quality

A summary review of the data indicates that the mine water at Goshen Park is circum-neutral (pH ~6.4) and net alkaline (~77 mg/L as $CaCO_3$), i.e. it is **not** acid mine drainage. Iron concentrations are low (<3.75 mg/L) with the majority of the iron being present in the dissolved phase; iron concentrations are sufficiently high that minor orange staining may occur in the immediate area where the water emerges at surface, but any impacts from this are likely to be very localised.

The water has low concentrations of chloride (~12 mg/L), calcium (~50 mg/L), magnesium (~44 mg/L), sodium (~24 mg/L), potassium (~12 mg/L) and dissolved manganese (~1.2 mg/L). Sulphate concentrations are higher (~281 mg/L) however this is below the non-statutory environmental quality standard (400 mg/L)

Trace metals are all below the level of detection of the instrument used for the analysis (Inductively Coupled Plasma Optical Emission Spectrometer - ICP-OES). Some trace amounts of nickel (~36 µg/L) and zinc (18 µg/L) are detectable in the mine water, but at very low concentrations that are close to the detection limit of the instrument (10 µg/L).

Public Health

Based on our experience with mine waters across the UK, the mine water from Goshen Park does not pose a risk to public health. However, we always recommend the use of appropriate PPE (e.g. wearing gloves) and that good personal hygiene practices (e.g. such as washing hands before eating / drinking etc.) is followed when coming into contact with any mine water, groundwater or surface waters. This is because other biological components (e.g. E. coli, Leptospirosis, Cryptosporidiosis etc.) that are present in the wider environment may also be present in surface waters or flood waters, especially where sewers may have been overwhelmed.