

# Environmental Report

Permit no EPR/EP3738NG

Improvement condition 4: Written protocol ref. soil & groundwater testing.

Improvement condition 5: Baseline conditions.

December 2016

Northwood & Wepa Ltd.

**BRIDGEND PAPER MILLS**

ISSUE DATE: Dec 2016

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## 1. Improvement condition 4

- i. Condition 3.1.1 of Permit no EPR/EP3738NG states that “Periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination”.
- ii. Since 2001, when the first report was carried out, soil monitoring has been carried out on the Bridgend site approx. every 10 years. Monitoring was first carried out on three locations, identified by Ove Arup and Partners following a desk study. The desk study is identified as reference 1 in the 2001 report. The three locations were identified as:
  - a. An area east of the railway line where aerial photographs indicated that some tipping had been carried out in the past
  - b. An area of pulverised fuel ash (PFA) tipped from the former Llynfi Power Station (In the South East corner of the site)
  - c. The area around the Fuel/Chemical storage facilities
- iii. A total of 13 trial pits and 4 window sample holes were dug during the survey together with 4 boreholes. Tests for contaminants were carried out and the results summarised in the report.
- iv. A recommendation was made in the report to continue groundwater monitoring at six monthly intervals (summer and winter) and this has been carried out up to the present time in line with the recommendations.
- v. A further soil report was carried out in 2012 by a company called Ground Investigation but did not include the Fuel/Chemical storage facilities. This area was subject to a separate report carried out by URS in May 2013 following the sale of the company to SCA and then again to Northwood & Wepa, the current owners. Extensive remediation and removal of plant and equipment was carried out 2013/4 which eliminated the possibility of hydrocarbon leaching into the nearby watercourse.
- vi. The next soil investigation is planned for 2022 and will include the areas already identified and surveyed previously. The methodology will be similar to those used previously but will take into account any further developments in sampling technology. Any further information that becomes available during this period will be incorporated into the soil monitoring programme which may cause it be extended to include areas previously not thought to be polluted. Groundwater monitoring will remain at the 6 month intervals previously identified. This will enable a consistent approach to analysis of the data collected historically and that collected in the future.

## **2. Improvement condition 5**

### **2.1 Outline of Baseline Report**

2.1.1 The baseline report was commissioned in 2001. Sampling was first carried out on three locations, identified by Ove Arup and Partners following a desk study. The desk study is identified as reference 1 in the 2001 report. The three locations were identified as:

- An area east of the railway line where aerial photographs indicated that some tipping had been carried out in the past
- An area of pulverised fuel ash (PFA) tipped from the former Llynfi Power Station (In the South East corner of the site)
- The area around the Fuel/Chemical storage facilities

2.1.2 A total of 13 trial pits and 4 window sample holes were dug during the survey together with 4 boreholes. Tests for contaminants were carried out and the results summarised in the report.

2.1.3 Soils were tested for Arsenic, Boron, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Selenium and Zinc. Also PH, PAH screening, cyanide (total), phenols (totals) and toluene extract.

2.1.4 Groundwater was tested for Arsenic, Boron, Cadmium, Chromium, Copper, Iron, Manganese, Mercury, Nickel, Lead, Selenium, and Zinc. It was also tested for Calcium, Magnesium, Potassium, Sodium, Sulphate, Total Phenols, Total Cyanide, Alkalinity, Chloride, Ammoniacal Nitrogen, Hexavalent Chromium, BOD, COD, Total Petroleum Hydrocarbons and Nitrates.

### **2.2 Observations during the Investigation**

#### **2.2.1 Soils**

##### **2.2.1.1 East of Railway**

The fill contained slag, ashes, demolition debris and reworked glacial deposits with small amounts of rubbish including polythene, other plastics, metal items, fabric, coal and wood. The comment is made that the soils are unlikely to be grossly contaminated but elevated levels of some of the heavy metals are considered possible in such materials. No asbestos waste was observed in the fill. There was also no evidence of the area having been used for wholesale deposition of general factory rubbish or other waste arisings such as empty chemical containers and no evidence of visual or olfactory evidence of contamination with hydrocarbons or volatile compounds.

##### **2.2.1.2. PFA Tip**

No wastes except PFA were observed in this area other than some brick and concrete in the capping materials.

### 2.2.1.3. Chemical/Fuel storage area

A small area of oily/tarry deposit was found together with a generally oily layer in another location. At the time of the report there was no evidence of oil contamination into the nearby Nant Gwyn. However this area was extensively remediated in 2014.

### 2.2.2. Waters

#### 2.2.2.1 Groundwater

There was no evidence of any visual or olfactory evidence of contamination, although the ground where water was discharging from Borehole K was slightly iron stained. The ground around the spring near the PFA tip was also iron stained.

#### 2.2.2.2. Surface waters

The Afon Llynfi was running at a fairly high flow typical of winter conditions but was not in spate.

## 2.3 Results of Chemical Analyses

### 2.3.1 Soils

The soils were screened principally by use of the Dutch Intervention Values. The Dutch guidelines do not list pH, hexavalent chromium or water-soluble boron, therefore the ICRCCL threshold trigger values have been used as screening values for these substances.

#### 2.3.1.1 East of Railway

Trial pit 1 - Copper, zinc and total cyanide were well above screening values, with total PAH and free cyanide slightly over the screening values.

Borehole 1 – contained water soluble boron slightly above the screening value.

#### 2.3.1.2 The PFA tip

All samples exceeded the screening value for arsenic but other determinands did not exceed screening values.

#### 2.3.1.3 The chemical/fuel storage area

None of the samples exceeded any of the screening values.

### 2.3.2 General Chemistries

#### 2.3.2.1 Major Ions and Electrical Conductivity

- Afon Llynfi – upstream – lower ionic strength/conductivity than other samples
- Afon Llynfi – downstream – higher ionic strength/conductivity due to higher concentrations of chloride, alkalinity, sodium and calcium. The sodium chloride content is derived from the mill which uses sodium hypochlorite for bleaching.

- Boreholes 1 & 3 were higher than the river due to prolonged contact with soil minerals.
- Borehole K was higher than BH 1 & 3 for the same reasons.
- BH 4 was again higher than BH 1, 3 & K indicating that mineralisation was occurring from the overlying deposits of fill.
- BH 2 and the spring below the PFA tip exhibited the highest levels indicating mineralisation from the PFA tip.

#### 2.3.2.2. Hardness

- Spring water described as “very hard” >300mg/l
- Afon Llynfi and BH 2 described as “moderately hard” between 50 and 150 mg/l
- Rest of the samples described as “hard” between 150 and 300 mg/l

#### 2.3.2.3 Nitrate

The nitrate content of all groundwater's and the spring water were similar at 6 to 7 mg/l whilst the Afon Llynfi contained 14mg/l i.e. fairly low levels and within those to be found naturally in Coal Measures areas.

#### 2.3.2.4 PH

The pH values of waters varied from 7.1 to 8.0 i.e. very slightly alkaline and are within the normal range expected for this determinand.

#### 2.3.2.5 Dissolved Oxygen

Afon Llynfi values were 85% upstream and 84% saturated downstream. Values above 80% indicate the highest quality for river water.

BH 2 was very low at 3% which was put down to the blanketing effect of the PFA layer cutting off contact with the air.

#### 2.3.2.6 Contaminants

The level of contaminants in water were compared with the Environmental Quality Standards (EQS), the Drinking Water Standards (DWS) and the River Quality Objectives (RQO).

- BH K – high manganese content (191ug/l) exceeding the DWS of 50 ug/l.
- BH 1 – high manganese content (3.3mg/l) again typical from a coalfield.
- PFA tip – high level of iron 10.6mg/l (DWS of 0.2mg/l EQS of 1.0mg/l, manganese was also elevated at 4.0 mg/l (DWS of 50 ug/l), ammoniacal nitrogen elevated at 4.8mg/l (DWS of 0.5mg/l) and chloride level elevated. Assumption that this was caused by possible contamination from another

source e.g. road run off/ dilute sewage/animal effluent. Boron was also significantly elevated at 243ug/l probably derived from the PFA.

- BH 3 – high level of iron 257 ug/l, manganese 1.1 mg/l, 103 ug/l of chromium all above the DWS. Conclusion was that it was of anthropomorphic origin.
- BH 4 – high level of iron 288ug/l, manganese 3.7mg/l, chromium 58ug/l, ammoniacal nitrogen 2.1 mg/l and phenols 701ug/l. BOD was 10mg/l with the COD significantly elevated at 137 mg/l. The BOD:COD ratio of 1:13.7 is indicative of organic pollution recalcitrant to biodegradation.
- Spring beneath the PFA Tip – high level of arsenic 58ug/l (DWS/EQS of 50ug/l), elevated levels of manganese 582mg/l, elevated level of boron 534 ug/l and BOD and phenols slightly up on limits.
- Afon Llynfi – Upstream sample had elevated level of manganese 65 ug/l. Levels of manganese, iron, zinc and boron were lower downstream of the mill. BOD was the same upstream and downstream indicating that the mill was not affecting this determinand.

## **2.4 Conclusions**

### **2.4.1 Risks associated with Soil Contamination**

#### **2.4.1.1 East of Railway**

Some remediation may be required if the area was used for a more sensitive end use such as domestic housing or parks. This is due to elevated levels of copper and zinc which could harm plants but not represent a significant risk to human health.

#### **2.4.1.2. PFA Tip**

Some remediation may be required if the area was used for a more sensitive end use such as domestic housing or parks. This is due to elevated levels of arsenic which could be toxic to plants and could represent a risk to human health.

#### **2.4.1.3 Chemical/Fuel storage area**

Although there was evidence of contamination of oil stained soil, oily fabrics and other rubbish none of the Dutch/ICRCL screening levels were exceeded. However this area was heavily remediated in 2014.

### **2.4.2 Risks to the Water Environment**

2.4.2.1 The groundwaters in the area were found to contain naturally occurring elevated levels of manganese and to a lesser extent iron, at levels that would preclude their use as a potable water resource without treatment.

2.4.2.2. The water quality of the bedrock aquifer beneath the mill site, which is under artesian pressure, was found to be unaffected by the mill.

2.4.2.3 Upstream of the mill complex the sub-artesian groundwater in the superficial deposits was also found to be unaffected by the mill.

- 2.4.2.4 Immediately downstream of the mill, at Borehole 3, the groundwater in the glacial deposits was found to contain a slightly elevated level of chromium (compared with the DWS, although the EQS was not exceeded). It is likely that this minor contamination has been derived from fill material placed in this locality. However as the water is not used for potable supply and is not likely to be so used due to the naturally high levels of manganese and iron, it is unlikely that this would require remedial action. No contamination was found with hydrocarbons.
- 2.4.2.5 Beneath the area of made ground east of the railway, the groundwater was found to contain significantly elevated levels of chromium, phenols, ammoniacal nitrogen and COD. This contamination has probably leached from the fill material placed in this area, which was found to contain ashes, slag, demolition debris and traces of rubbish such as metal, fabrics, plastics, rubber and wood derived from the mill site. Since the groundwater is not being used and the adjacent river water quality has not been impacted by these contaminants it is unlikely any action to remediate is required.
- 2.4.2.6 The water beneath the PFA tip was found to be significantly contaminated with iron and ammoniacal nitrogen. The presence of iron is unsurprising but the presence of ammoniacal nitrogen suggests that the PFA may not be the only source of contamination in this area. The spring that issues from close to the base of the PFA tip was found to contain slightly elevated levels of arsenic presumably leached from the PFA. In addition, this water also contained traces of phenols, again indicative of another source of pollution in this area. However the water quality of the Afon Llynfi is not impacted by these contaminants therefore no remediation is required.

## 2.5 Recommendations

It is recommended that groundwater's and surface waters continue to be analysed twice a year, once in the summer and once in the winter, to establish any trends in water quality.

Attached separately is a pivot table showing the historic groundwater analysis results and also a PowerPoint presentation where certain determinant results have been presented in graph form to illustrate the data trends.

These illustrate that general levels of major contaminants have diminished over the last few years. Further interrogation of the data will be progressed in 2017.