



## **CELTIC ENERGY LTD**

### **EAST PIT EAST REVISED SURFACE MINE SITE**

### **LAKES OF RHOSAMAN**

#### **SUBMISSION INFORMATION IN COMPLIANCE WITH THE REQUIREMENTS RELATING TO CONDITIONS 58 AND 62 OF PLANNING PERMISSION NUMBER P2012/1073 DATED 18 JUNE 2015**

*"(58) Within three months of the date of this permission an expanded surface water and groundwater monitoring programme as proposed in 15.152 of the submitted Environmental Statement (ref: 407.03894.00003) and including a scheme for the environmental monitoring of local watercourses should be submitted in writing for the written approval of the Local Planning Authority. The programme should be in line with the measures detailed in Chp 18, Section 18.78 of the ES and Section 2.16 of the Hydrogeological Impact Appraisal (Volume 4, Part B, Appendix 15/8 of the ES). The scheme shall be supported by detailed information including locations of features, method and frequency of monitoring, proposals for the control of such impacts and any mitigation identified as being required, and contingency plans if derogation is noted, and the monitoring programme shall encompass both the operational and post-operational phase of the development. The scheme shall be implemented as approved and any changes to the scheme will require the prior written approval of the Local Planning Authority."*

*" (62) Within three months of the date of this permission a scheme for the identification and monitoring of abandoned mine water discharges within and adjacent to the site shall be submitted in writing for the written approval of the Local Planning Authority. The scheme shall include proposals for the control of such impacts and any mitigation identified as being required. The scheme shall be implemented as approved."*

## **1. PROPOSED RESTORATION SCHEME**

The proposed restoration scheme will involve the re-contouring of the above ground tips, partial infilling of the final excavation void using overburden from the surrounding tips, with the remaining void space being allowed to fill with water thereby creating a lake feature.

The projected rest water level in the lake will be controlled by two over-spills, one at the northern end and the other at the south eastern end, with the invert level set at approximately 175 metres AOD.

The northern overspill will discharge water into the Afon Amman and the one located at the south eastern end into the Afon Llynfell. Most of the surface drainage within the site will be directed into the lake with the surface water from a limited area flowing into the existing water treatment area located in the south western corner of the site.

## **2. CURRENT SITUATION**

Currently all surface run-off and groundwater, the latter principally arising from abandoned mineworkings and to a very limited extent directly from the strata, is directed into the excavation void. Prior to the completion of coaling operations water was collected in the pit sump, then pumped to the various water treatment areas prior to being discharged off site.

There are x 4 No. discharge points which are currently active, the locations of which are shown in drawing number 07A04550.DWG , points A, A1, D2 and F [after Celtic Energy Ltd].

The discharge has been continually visually monitored on a daily basis by site personnel and periodically by NRW officers.

No contraventions of conditions have been recorded.

## **3. GROUNDWATER**

As the water level within the lake rises, any inter-connected abandoned mine workings which are exposed within the excavation walls may become flooded.

Up until the completion of coaling operations, water levels within the workings were artificially lowered by the mining operation, and consequently any historical water outflows from abandoned adits or shafts associated with the abandoned underground workings will have temporarily ceased. As a result of the cessation of mining operations, theoretically, the potential exists for a resumption of outflow from known mine entries and possibly other un-recorded locations.

A rebound in groundwater levels could potentially result in any of the following occurrences:

- i) A flush of acidified water (due to AMD).
- ii) A resumption of water flows from historic [mining related] locations, the volume of which, if it was to occur, could be significant
- iii) Potential for land drainage issues as a result of the renewed outflow, or seepages from new points of emergence.

Additional flows may occur from sandstone horizons (if any crop out at surface) which are contained within the mining sequence. Due to the generally tightly jointed nature of the sandstones it is considered un-likely that flows, should they occur, would produce volumes of any great significance.

In this area the Coal Measures strata are covered by a veneer of Glacial Till deposits which generally (apart from any loose sand horizons which may occur) will act as an aquitard preventing any significant re-charge of the strata, and therefore limit any potential outflows.

#### **4. PREVIOUS UNDERGROUND MINeworkINGS**

Significant underground mineworking has historically been undertaken beneath the site, many areas of which have been intersected as the successive opencast operations have progressed in an easterly direction along the seam outcrops from the west to the current final position in the east.

Detailed underground mineworkings plans have been assessed (by British Coal Geologists) which has enabled the workings to be split into several distinct groups – details of which are provided in the ES (Section 15.19 – 15.23). Recorded mine entries are shown in ES Appendix 7, Drawing No. 07/02 Historical Underground Mining.

In summary the workings can be grouped as below.

##### **Previous Underground Mineworkings - Summary**

Seven groups of underground mineworkings have been identified, i.e. Group A to Group G, summary details of which are as below.

- |         |                                                                                                                                                                               |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group A | Seams from Upper Pencraig to Lower Seam.<br>All inter-connected by shafts / staples and the Pengosto OCCS.<br>Hydrogeologically affect the far western part of the site area. |
| Group B | Seams from the Big Vein Seam down to the Middle and Lower Seams.<br>Workings removed by East Pit OCCS.<br>Adits destroyed by opencast operations.                             |
| Group C | Seams from the Big Vein Seam down to the Lower Seam.<br>Workings intersected by Pengosto, East Pit and East Pit Extension.                                                    |

- Adits on southern edge of site drain higher level seams / workings, therefore of no significance.
- Group D      Seams from the Upper White to Lower Pencraig Seam.  
Intersected by the current site.  
A 182m level outflow – adit is recorded which was destroyed during the current site operations.
- Group E      Red Vein Seam.  
Workings lie outside the southern boundary of the site.  
The workings are at a higher elevation than the site and therefore of no significance.
- Group F      Seams from the Big Vein Seam down to the Lower Seam.  
Workings lie on the east side of the Cwmllynfell Fault and are isolated from the site.  
There is hydraulic isolation and therefore the workings are considered to be of no significance.
- Group G      Seams from the Middle to the Lower Seam.  
Isolated by an underground in-situ [un-worked] barrier.  
Hydraulically isolated, therefore no significance.

## **5. ACID MINE DRAINAGE (AMD) POTENTIAL**

As a consequence of rising groundwater levels within the proposed restoration lake feature (which is designed to achieve a final rest water level of approximately 175m AOD) there will be a re-flooding of the abandoned mine workings which have been drained, and the water levels suppressed by many years of opencasting operations. The flooding of the workings will occur along with a gradual infiltration of water into areas of backfill and the establishment of a water table.

Pyritic material contained within coal seams and associated highly carbonaceous strata [principally shales] upon contact with air becomes oxidised, this produces an iron oxide which is soluble in water. Following water infiltration into the deposits, associated with groundwater re-bound, iron bearing and low PH value waters can commonly be produced.

A detailed analysis of the sections of strata encountered during the various phases of surface (and underground) mining has been undertaken to assess the acid generating versus acid neutralising potential of the various rock types. Details of, and the conclusions drawn from this analysis are contained within the ES.

In summary, the assessment concluded the following:

- i)      The neutralising potential of material contained within the opencast spoil far outweighs its acid generating potential.

- ii) Monitoring data for groundwater quality within the spoil do not indicate levels of sulphate, iron, zinc, copper, nickel or cadmium which exceed Drinking Water (DW) or Environmental Quality (EQ) standards.
- iii) Leaching tests which were undertaken on the mining sequence showed the only section of strata which could produce AMD was around the Upper and Middle Soap Seams. It was concluded that the proportion of rock within this section of the mined sequence with respect to the total mined section was such that dilution would totally remove any potential risk to groundwater quality associated with AMD.

### **5.1 Monitoring to Date**

To date, there has been no evidence of AMD having had any impact upon groundwater or receiving surface quality either within surrounding streams / rivers or in the site void sump / various water treatment areas.

### **5.2 Proposals to Address any AMD Problems**

In the unlikely event that any significant AMD seepages are identified the following measures are proposed

- Flows will be directed into locally constructed vegetated treatment areas which will be installed as required.
- Once the water quality is of acceptable quality, the treated flow will then continue via the constructed swales into the proposed lake feature.

### **5.3 Current Monitoring**

Water quality at the discharge points were, up to the point at which Covid 19 impacted upon normal operation, monitored on a monthly basis by NRW.  
Groundwater levels have been continually monitored on a monthly basis in boreholes located around the site- see drawing No.07A04550DWG for locations.

To date water quality as recorded by NRW has complied with the site discharge consent conditions.

## **6. EMERGENCES OF GROUNDWATER / MINE WATER FROM ABANDONED MINE SHAFTS OR DRIFTS – UNCONTROLLED FLOWS**

As groundwater levels rise to the proposed final rest water level of approximately 175 metres AOD, abandoned underground mine workings voids contained within the final excavation sidewalls will become flooded.

From an assessment of abandoned underground mine workings plans there is no evidence of any linkage between the abandoned mine workings located on either side of the Cwmllynfell fault which is a major structural feature defining the eastern limit of extraction of those

underground mine workings which have been intersected by site operations. As a result, there will be little if any drainage across the fault and consequently the re-bound water level within the workings are likely to mirror the final level within the lake. Drawing No.15/03 'Inferred Groundwater Contours' provides an indication of the interpolated location of the 'watershed'.

### **6.1 Current Emergences**

Many areas of abandoned underground mineworkings have been intersected as the various successive East Pit Opencast Sites have migrated from west to east along the coal seam outcrops- see drawing No.07/02 Historic Underground Mining.

From an assessment of groundwater levels within backfilled areas a 'watershed' lying within previously worked and restored ground is interpreted to lie at approximately 600 metres to the west of the current void. From this point groundwater flow on the western side will flow towards the west, and on the eastern side towards the east. See drawing number 15/03 'Inferred Groundwater Contours' (after SLR).

### **6.2 East Side of Watershed**

Adits and shafts located on the east side of the watershed [essentially the east side of the Cwm Teg Fault which approximately defines its location] are shown in Drawing No. 07/02 [after SLR] from which it is evident that adits and shafts between the interpreted watershed and the Cwmllynfell fault have portal or collar levels (respectively) which either lie above the proposed lake restoration level or have been removed by opencast mining operations.

Adits and shafts on the east side of the Cwmllynfell Fault (Group F) are hydraulically isolated from the strata on the west side and therefore it is considered highly unlikely that a re-bound in water levels associated with the lake will have any impact on these workings. Consequently, there will be no emergences from shafts or adits associated with the workings.

None of the recorded adits or shafts located at the northern end of the site and on the west side of the Cwmllynfell fault extend below the level of the Big Vein Seam and all have their portal / collar levels above the final rest-water level of the lake. It can therefore be concluded that there is no potential for any outflows from shafts or adits which are located beyond the excavation area.

The exception to this is at the far western end of the site where there are outflows from the Bounce and Brass vein levels. These features lie on the west side of a 'watershed' which is present (located approximately 600 metres to the west of the current site) within the backfilled area associated with previously restored opencast site areas.

### **6.3 West Side of Watershed**

Water levels on the west side of the watershed are controlled by:

- i) Two adits, the 'Brass Vein Level' and the 'Bounce Level', located at an elevation of approximately 139 metres AOD.

- ii) A further adit which lies approximately 150 metres to the south west of the above two adits, at a level of 155 metres AOD.
- iii) Due to inaccuracies often occurring in old mine workings abandonment plans, the potential possibly exists for there being a 'spill-point' at a level which is lower than 175m AOD. Due to the age and compacted nature of a very significant proportion of the opencast backfill, the rate of any ground water flow through it is likely to be extremely slow.  
Continual monitoring of rising water levels in the local area will provide an early indication of any issues which may arise and enable appropriate mitigatory measures , if necessary, to be implemented.

The locations of the above are shown in Drawing No. 07/02 [after SLR].

Periodic 3 monthly visual inspections of outflow rates and water quality will be made for a period extending from current to three years following the lake attaining its final rest water level.

A record of inspections will be kept and made available for inspection.

Should any anomalous conditions be identified NRW will be notified and a scheme of mitigatory measures to address the problem agreed.

## **7. A SUMMARY OF THE POTENTIAL RANGE OF IMPACTS ASSOCIATED WITH THE PROPOSED RESTORED LANDFORM**

The potential range of impacts which could arise associated with the proposed restoration are as follows:

- i) Emergence of groundwater from within backfilled areas - uncontrolled flows.
- ii) Emergence of groundwater / minewater from abandoned mine drifts or adits - uncontrolled flows.
- iii) Chemical composition of groundwater emergence and potential for contamination of surrounding watercourses.

## **8. EXPANDED PROGRAMME OF SURFACE AND GROUND WATER MODELLING**

### **8.1 Surface Water – Restoration Proposals**

The surface water management plan (Plan FRA-003) for the final restoration landform shows three proposed principal outflow points from the site. The one originally shown discharging into the existing site lagoonal system located to the south west of the lake is no longer proposed, and outfall from the lake will be via the two locations as indicated below.

- i) Outflow into the River Amman from an outfall located at the northern end of the proposed lake. Location E273617 N,213531.

- ii) Outflow via an un-named tributary of the Nant Llynfell from the south eastern end of the restoration lake feature. Location E.273945 N.212562.

The proposed internal drainage system formed on the restored slopes is generally designed to direct surface water run-off from easterly facing slopes into the lake with one inflow located at the southern end and one at the northern. The various restoration catchments are shown in drawing No.FRA-003.

## **8.2 Proposed Monitoring**

Monitoring of both surface water and groundwater will be undertaken to ensure that the chemical composition of the water flowing into receiving watercourses does not impact upon the ambient conditions.

Additionally, the rate of outflow will be visually monitored along the course of the receiving watercourses.

## **8.3 Water Analysis of Surface Water from Outfalls**

It is proposed to undertake routine surface water monitoring at two locations, namely:

- The southern outfall from the lake.
- The northern outfall from the lake.

The locations of the outfalls are shown in Drawing No. FRA 003.

### **Frequency**

Monitoring will initially be undertaken on a three-monthly basis.

### **Duration**

Monitoring will be undertaken for a period of 36 months following the achievement of final rest-water level in the proposed lake and once outflow commences.

### **Analysis**

Water will be analysed for the following:

- PH
- Conductivity
- Alkalinity
- Chloride
- SO<sub>4</sub> Dissolved
- Ca
- Mg

Na  
Ni  
Cd  
Cu  
Pb  
Zn  
Mn  
Iron (Total)  
Iron (Dissolved)  
Ammoniacal Nitrogen  
Nitrate  
Total Solid matter

#### **8.4 Monitoring of Inflows into the Lake**

The proposed surface drainage arrangements, as shown in Drawing No. FRA003 – Surface Water Management Plan, includes a number of locations where managed surface run-off will be directed into the lake.

At these locations water quality monitoring will be undertaken.

#### **Frequency of Monitoring**

It is proposed to take water samples for analysis on a three-monthly basis for a duration extending up to the point at which outflow from the lake occurs. Following the point at which discharge from the lake occurs monitoring will continue to be undertaken on a three-monthly basis for one year, after which it will be reviewed.

#### **Duration**

Irrespective of the above, the data sets will be reviewed on an annual basis and the frequency of monitoring re-assessed after the first year.

#### **Analysis**

Water will be analysed for the following:

PH  
Conductivity  
Alkalinity  
Chloride  
SO<sub>4</sub> Dissolved  
Ca  
Mg  
Na  
Ni  
Cd  
Cu

Pb  
Zn  
Mn  
Iron (Total)  
Iron (Dissolved)  
Ammoniacal Nitrogen  
Nitrate  
Total solid matter

### **Visual Inspections**

As the groundwater levels re-bound, the potential for inflow from emergence points located along restored slopes (lying above the lake rest-water level) will exist.

The proposed surface drainage arrangements, as shown in Drawing No. FRA-003 – ‘Surface Water Management Plan’, is designed to intersect such outflows and direct the water into either the lake or the retained water treatment lagoons located in the south western corner of the site.

### **Trigger**

Water quality will be measured against the published Natural Resources Wales [NRW] River Water Quality Data Summary issued for both the Afon Amman and Afon Llynfell. This NRW data will be used for the base trigger levels which if exceeded will prompt further mitigating measures to be agreed with NRW.

### **Reporting**

Reporting of the results of analyses will be provided in a tabulated form defining the levels of the various determinands.

Where any results which lie outside of the EQ / DW standards and NRW Amman / Llynfell maximum limits are recorded, a further assessment of the information will be presented with details [following liaison with NRW] of any proposed remedial measures to address the problem, if considered necessary.

Where significantly high levels of any of the determinant are identified the frequency of monitoring will be reviewed and if necessary revised.

## **8.5 Water Analysis of Borehole Samples**

### **Locations**

The following boreholes within which piezometers have been installed will be monitored.

- Borehole 1a
- Borehole 2

- Borehole 3 [aka SW14]
- Borehole 4 [aka SW15]
- Borehole 5 [aka SW16]
- Borehole A2 [aka SW17]
- Borehole B [aka SW18]
- Borehole C [aka SW20]

The above borehole / piezometer locations are shown in drawing No 07A04550.DWG.  
Currently the boreholes are monitored for water levels only on a monthly basis. The results are contained in the appendix to this document.

### **Comment.**

The monitoring data do not show any significant trends in the period 2012 to present, other than the normal seasonal fluctuations which may be expected.

There is no discernible increase or decrease in the 'normal' range of water levels.

### **Frequency**

Water level measurement and water analysis [ the latter which is currently not undertaken] will be undertaken on a three-monthly basis. As the water level within the lake progressively rises the frequency of monitoring will be reviewed to reflect significant trends should any develop in the analytical data. If necessary, the monitoring frequency may be amended either way.

### **Duration**

Sampling will be undertaken on the above frequency for a period extending to 36 months following the achievement of final rest-water level in the proposed lake.

### **Analysis**

Water will be analysed for the following:

PH  
Conductivity  
Alkalinity  
Chloride  
SO<sub>4</sub> Dissolved  
Ca  
Mg  
Na  
Ni  
Cd  
Cu  
Pb  
Zn

Mn  
Iron (total)  
Iron (dissolved)  
Ammonical Nitrogen  
Nitrate  
Total solid matter

### **Trigger**

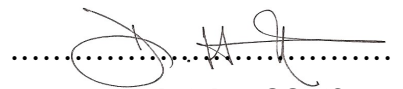
Water quality will be measured against the published Natural Resources Wales River Water Quality Data Summary issued for both the Afon Amman and Afon Llynfell. This NRW data will be used for the base trigger levels which if exceeded will prompt further action to be agreed with NRW.

### **Reporting**

Reporting of the results of analyses will be provided in a tabulated form as presented in Table 15 / 10 in the ES.

In addition, where any results which lie outside of the EQ / DW standards and NRW Amman / Llynfell maximum limits are recorded, a further assessment of the information will be presented with details of any proposed remedial measures if considered necessary.

Where significantly high levels of any of the determinands are identified the frequency of monitoring will be reviewed and if considered to be necessary, revised.

  
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December 2020

### **APPENDED INFORMATION**

Drawing No.07A04550.DWG. Piezometer and Discharge Locations [Condition 58].  
Drawing No. 07/02 Historic Underground Mining [after SLR Nov.2012]  
Drawing No. FRA 003 Surface water management plan

Piezometer readings 2012 to present [Excel spreadsheet]  
EPER Inferred Groundwater Contours and Mine Openings. Drawing No. 15/03