

FFOS-Y-FRAN LAND RECLAMATION SCHEME - ALTERNATIVE RESTORATION PROPOSALS

RESPONSE AND COMMENTS TO THE WSP TECHNICAL NOTE 001 (Dated 15th April 2025).

The following comments refer to bullet points listed under the ‘*Significant Observations*’ section and follow the bullet point sequence in the document *WSP Technical Note 001 (WSP 001)*.

- **Bullet point 1.**

WSP 001 - *No details of material types contained within the tips has been provided, nor the method of construction.*

The overburden mounds (OBs) were constructed to the approved designs in compliance with the requirements of The Quarries Regulations 1999 (QR 1999) and monitored by a full-time geotechnical specialist based at the site from the date of commencement, 2007 to 2013 with responsibility for this site alone. Thereafter, the OBs were inspected in accordance with the QR 1999.

Construction details and survey information (in LSS) for the base preparation to include stripping of topsoil, subsoil, un-suitable materials and sub-tip drainage, along with construction methodology are available.

It should be noted that some areas beneath OB2 and OB3 were excavated down to solid measures around the Hafod Coal Seam.

- **Bullet Point 2.**

The western side of OB1 failed in 2022 as a direct consequence of the western facing toe of the mound being re-excavated to a temporary profile as part of preparatory works to extend the mining operations. Cracks were noticed in the excavated slopes and all machinery and personnel were withdrawn from the area to a safe location. The slope then failed over the weekend of 30th July 2020. A further monitoring and inspection scheme was implemented and documentary evidence comprising pre-failure and post failure survey data along with a series of field notes compiled by the appointed geotechnical specialist confirm the reason for the failure.

The temporary profile in this case was never intended to be a final restored slope and it is accepted that a detailed engineering specification is necessary for the remediation of this mound which will include regrading the western slopes to around 1 in 3.

No further site investigation works are proposed. The original SI is considered to be adequate and can be provided if required.

- **Bullet Point 3.**

A detailed assessment of site records for the construction phase may enable a zonation of the materials contained within the mound to be defined though it would be considered 'conservative' to assume the mound to comprise mudstones and siltstone which will form the vast proportion of the mound, as is typical of opencast sites in South Wales, some of which have retained OB's as part of the approved restoration design (e.g. Celtic Energy Sites at East Pit, Margam, Nant Helen & Selar).

Due to the nature of the construction method the tipped material can be expected to be effectively homogenous on a large-scale. This can be confirmed by an assessment of the extensive borehole data which covers the majority of the site and sub-divides the sequence of measures into specific lithological units.

- **Bullet Point 4.**

We would dispute the fact that OB1 represents a significant ongoing risk particularly due to its construction, content, and its geographical location in relation to its surroundings. By adopting conservative parameter values for the materials contained within the OB, and with appropriate engineering design for the re-construction of the western face, the likelihood of OB failure can be absolutely minimised. In the highly unlikely event that OB failure ever occurred in the future, in our opinion it would not be catastrophic and at worst, would only involve slow moving creep with an extremely low consequence of failure.

We would propose reviewing site records again, before undertaking a further review of stability analyses to confirm the long-term stability of OB1.

- **Bullet Point 5.**

The observed failures are of minimal scale and of no significance with respect to overall tip stability. They have occurred due to the localised effects of surface drainage or minor excavation works undertaken at the toe of slopes and have been inspected, monitored, and remediated. In addition, in excess of 95 million m³ of overburden has been placed in backfill tips during the operation of the site with no instances of any significant instabilities being observed. Further information can be provided indicating the location of the failures, their scale and form along with the likely cause.

As set out above, given the available information regarding the construction, content, supervision, and geographical locations, we would dispute the fact that OB2 & OB3 represent any significant long term stability risks and present extremely low consequences of failure.

- **Bullet Point 6.**

Details of previous instabilities can be provided along with the justification for considering them to be insignificant.

Due to their size & nature OBs would never be compacted to an engineering standard as required for example by a Civil Engineering project, which is what WSP 001 appears to imply is necessary. However, an OB can be described as a designed engineered structure which is constructed following site investigation work, signed off and inspected by a Geotechnical Specialist under the Quarries Regs 1999, in full knowledge of the rock and other materials contained within, which are transported directly from the mine and placed in 4 – 5 metre layers

and compacted by fully laden 160 tonne dump trucks and bulldozers, onto prepared ground with underdrainage as recommended.

- **Bullet Point 7.**

As stated above, in excess of 95 million m³ of overburden has been placed in backfill during the operation of the site with no instances of any significant instabilities being observed.

It is accepted that a method statement is required to include a detailed programme of de-watering the lake before the lower slope of backfill is reprofiled to its final slope, with particular emphasis on the toe to ensure long term stability. Further detailed stability analyses will be undertaken adopting a range of parameter values based on site records of the materials being tipped along with a sensitivity analysis before finalising this method statement.

The Coal Remediation Authority have actively monitored the site on an annual basis throughout mining operations and several times since the cessation of operations to check that the site has been operated in a responsible manner and left in a safe state in compliance with the conditions as defined in the Coal License. This includes the safe removal (and capping if necessary) of any shafts, adits, and old mine workings in the sites 'Area of Responsibility.'

- **Bullet Point 8.**

The proposals for remedial works for the residual rock sidewalls [southern and eastern] are based upon a firm understanding of the structural geological conditions and presence of abandoned underground coal and ironstone workings, along with extensive experience of the response of strata to the mining process.

Significant archival information relating to previous mining activity along with extensive borehole information for the site is available which have confirmed the geological model with a high degree of confidence.

From the point of commencement, the site has been continually monitored, initially by the resident geotechnical engineer then by the appointed geotechnical specialist in accordance with the requirements of QR 1999.

Two large -scale instabilities have occurred on the site the first at which the NNW /SSE trending Dowlais Fault intersected the southern sidewall and the second, a nominal scale displacement NNW/SSE trending fault which intersected the final advance excavation panels.

The first was excavated through several years ago under the guidance and approval of the Geotechnical Specialist and has subsequently been fully concealed by opencast backfill.

The second structure was initially intercepted at the southern end of the eastern advance excavation panels and resulted in the large-scale spalling of rock from the western 'free' rock faces. The maximum extent of spalling was the actual fault plane beyond which the strata has remained in place. As excavation panels advanced to the east, the fault migrated up the cuts towards the north and resulted in a continuation of strata spalling. Remedial works undertaken in the affected area have secured the sidewall with all works in this area taking place under a Safe Systems of Work.

The proposal to install rock gutters in areas which may be accessible to the general public, will be based upon the results of more detailed rockfall modelling.

There are no known recorded untreated adits remaining on the site. Any abandoned roadways which were exposed in residual excavation faces have been treated by compacting backfill material into the opening and then grading material up against the structure.

As has been observed throughout the working of this site, where several un-recorded adits and roadways have been encountered in excavation faces, the collapse of strata above the opening's chokes-off and rarely exceeds more than a few metres. The filling with backfill and buttressing of opencast material against the openings have secured them.

- **Bullet Point 9.**

The scree slope which has formed against the southern half of the final eastern sidewall is a result of major spalling from the fault affected sidewall plus additional material which has been excavated from the upper level of faces to remove significantly dilated strata.

The angle of the scree represents the friction angle of the materials [which it can be considered to have no cohesion] contained within the slope. The slope can be considered to have a Factor of Safety of around unity. Naturally formed slopes as can be observed in the 'natural environment' can be assumed to have a Factor of Safety of around unity.

The potential does exist for future creeping movements, which taking into account the location of the scree slope, i.e., immediately to the east of the proposed lake structure, will not pose a threat to public safety as the consequences of failure are very low.

- **Bullet Point 10.**

Further details of the lagoons, their location and nature of the ground upon which they are located will be supported by any available SI. The lagoons have all been inspected in accordance with the QR 1999 throughout the life of operations and there have been no recorded instabilities.

- **Bullet Point 11.**

Relating the documented tip failures in South Wales is a case of comparing 'apples and pears.' Colliery tips significantly differ from opencast backfill and OB in the following ways.

Colliery Tips.

1. Generally, are located on steep hillsides.
2. Most (if not all) do not have adequate pre-tip preparatory works or any associated SI or geotechnically based designs.
3. The materials will be dominated by mudstones, seatearths, lagoonal deposits, generally 'weak' materials which occur in close proximity to coal seam horizons. Many of these materials are tipped as washery discard with significantly elevated moisture contents.
4. Are likely to have been deposited by conveyor tipping with little or no compactive works having been undertaken.

Opencast Backfill and Overburden Mounds.

1. Are generally constructed on level or near level ground, gradients beneath the Ffos-y-Fran mounds were formed on ground with gentle gradients.
2. In the case of OB2 and OB3, parts of the mounds were formed on solid measures above the Hafod Coal Seam (OB2 in particular).

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3. OB1 was formed on glacial till deposits and involved the installation of an extensive sub-drainage system.
 4. The stripping of 'unsuitable' materials and the installation of sub-tip drainage systems was undertaken [records available].
 5. Materials comprised a mixture of Glacial Till, Mudstones, Siltstone, Sandstone, and Claystone Seatearths, excavated and transported directly to OB.
 6. The mounds were constructed by layer tipping involving cone tipping and dozing in layers using CAT D9 / D10 dozers with extensive tracking by fully laden CAT 777 160 tonnes dump trucks.

SUMMARY OF REQUIREMENTS (to be agreed by MTCBC).

1. ROCK FACES.

- Details of the instability which affected the east wall.
- Details on geological conditions
- Review of initial pre-commencement stability analyses and their relevance to the proposed restoration works.
- Comments on Adits/ abandoned roadways treatment and rock gutter provision, referring to specific locations.
- Review of climate change impact.
- Assessment of consequences of any slope degradation.

2. LAGOONS.

- Details of the locations and geometries of each set of lagoons.
- Relevant background SI
- Assessment of stability of each structure

3. OB1.

- Details of the geological / geotechnical information to include original topographical gradients, rockhead contours, Drift isopachyte etc. plus any laboratory test data.
- Details on the construction of the tip to include base preparation and tipping methodology.
- Supply of pre-failure and post failure survey information and provision of geotechnical field notes (July 2022 failure).
- A design for the re-construction of the tip with stability analyses.
- Review of climate change impact.
- Assess consequences of any potential instability

4. IN PIT BACKFILL.

- Methodology for the re-grading of the lower backfill tip and construction of the toe area.
- Stability analyses assuming a range of parameter values
- Assume various groundwater conditions to reflect 'climate change.'
- Assess consequences of any potential instability.
- Review of climate change impact.

5. OB2 AND OB3.

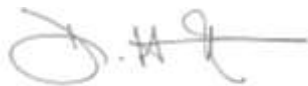
- Review previous SI. To include original surface, rockhead gradient, drift isopachyte and any lab test data.
- Review construction method, sub-tip preparatory works and operational details.
- Undertake sensitivity analysis varying parameter values and groundwater conditions [assumed].
- Assess consequences of any potential instability.
- Review of climate change impact.

6. COMPARISONS.

Provide examples of South Wales opencast coal sites where large overburden mounds have been left as a part of the final restoration.

Good examples are;

- **Celtic Energy East Pit** – large OB with only cosmetic restoration works, in place for 30 years [on an inclined hillside] and still stable.
- **Celtic Energy – Margam**, several OBs in place for in excess of 20 years -stable and remaining as a part of the final restoration.
- **Celtic Energy – Nant Helen**, large OB in place for in excess of 20 years, stable and is a part of the final site restoration.
- **Celtic Energy Selar**- Large OB, in place for 20 years, little alteration by restoration works. Stable. Lies adjacent to the ‘Parish Road,’ a public right of way.



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