CRAIG YR HESG QUARRY
Western Extension

Environmental Statement
Volume 1

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ENVIRONMENTAL STATEMENT

VOLUME 1

CRAIG YR HESG QUARRY

Extension and Consolidation Application

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1.0 INTRODUCTION

1.1 Background

This Environmental Statement (ES) sets out the results of an Environmental Impact Assessment (EIA) which has been undertaken to accompany a planning application, submitted to Rhondda Cynon Taf County Borough Council (RCT) which seeks planning permission for:

(i) A western extension of Craig yr Hesg Quarry; and

(ii) The consolidation of the current planning permissions at Craig yr Hesg Quarry into a single permission regulating quarrying, restoration and ancillary operations at the overall quarry site.

A plan illustrating the location of the Craig yr Hesg Quarry including the extension area is produced as figure 1.1.

Craig yr Hesg Quarry is a long established quarry situated on the western side of the Taff Valley, some 1km north of the built up area of Pontypridd. The Quarry is producing aggregate from a deposit of Pennant Sandstone, which has properties of skid resistance and abrasion which make it particularly suitable for road surfacing in situations where a high degree of skid resistance is needed to minimise the risk of skidding related accidents. These properties are measured as 'polished stone value' (PSV), where aggregate with a PSV of over 60 is regarded as a high skid resistant aggregate. Material with a PSV of over 65 is needed for particularly stressed sites such as certain sections of motorway, interchanges, airport runways etc.

The Pennant Sandstone at Craig Yr Hesg quarry has a PSV of +68 to 70, making it one of the highest quality sources of skid resistant surfacing aggregate not only in South Wales, but the UK. Production at the quarry over the last 10 years has averaged some 400,000 tonnes per annum, and such output volumes are anticipated to continue. The products are marketed over a relatively wide geographical area, where stone from Craig yr Hesg has been used in major highway projects in the south east of England, and more locally, the material has been used on recent projects at the Porth by-pass and the Newport southern distributor road.

However, remaining reserves of sandstone at the Quarry are now limited, and in order to provide for continuity of production and supply, the quarry owners, Hanson UK, wish to seek planning permission for a western extension of the quarry into land currently comprising rough grassland used for grazing. The extension site is identified in the RCT Local Development Plan as a 'preferred area' for future quarrying, where the Plan acknowledges that the resources at the quarry "are in high demand" ref para 6.184). The Craig yr Hesg Quarry preferred area is the only preferred area for quarrying identified in the LDP.

The application site boundaries have been drawn to encompass the proposed extension area and existing Craig yr Hesg Quarry as part of a 'consolidation application'. This is designed to facilitate the issuing of a single planning permission, covering all extraction, restoration, processing and related operations at the Quarry. These issues are discussed further in the accompanying Planning Application Statement (PAS) which further explains the rationale of the planning application and its consolidation function.

The overall development scheme, which is described in detail in Section 6.0 of the Planning Application Statement, and summarised in Chapter 3.0 of this ES makes provision for:

(i) The construction of a landscaped screening landform around the eastern and northern boundaries of the extension area, prior to the commencement of extraction within the extension area;

(ii) The construction of a soil screen bund along the western boundary of the quarry, again prior to the commencement of extraction;

(iii) The phased extraction of some 10m tonnes of Pennant Sandstone from the extension area;

(iv) The use of existing processing plant, ancillary plant and infrastructure to process the reserves from the extension area and the remaining reserves at the existing quarry; and

(v) An overall restoration scheme for the existing quarry and extension area designed to facilitate landscape amenity and nature conservation afteruses.

1.2 The Application Site

As noted above, the application site boundary has been drawn to encompass the permitted area of Craig yr Hesg Quarry, and the proposed north-west extension site. The total area of the planning permission boundary of the current Craig yr Hesg Quarry is 28.27 hectares. Certain areas of the original planning permission boundary are no longer part of the quarry operational area and have been excluded from the boundary of the current application. The boundary of the current consolidation and extension application defined by a red line on plan ref CYH/E2 is 36.7 hectares in extent, of which the western extension area comprises 11.24 hectares. Within the extension area, the net quarry extraction area defined by a dashed green line on plan ref CYH/E2 is 5.52 hectares. The northern screening landform within the extension area, shown as B1 on plan ref CYH/E4 would occupy an area of 2.1 hectares. The total area of land currently in the control of Hanson, and defined by a blue line on plan ref CYH/E2 is 38.08 hectares.

Craig yr Hesg quarry is situated on the western side of the Taff Valley, some 1km north of the built up area of Pontypridd. The village of Glyncoch lies beyond the northern boundary of the quarry. Locally, the quarry is bounded to the north by the Glyncoch football ground and clubhouse; to the northwest by grazing land which comprises the proposed extension area; to the west and southwest by the prominent wooded ridgeline of Coed Craig Yr Hesg, which overlooks the town of Pontypridd; and to the east by a narrow corridor of woodland between the site and the B4273 Ynysybwl Road.

The quarry processing plant in the eastern area of the site comprises a crushing and screening plant. The main quarry area lies to the west, with a series of quarry faces and benches which are being developed in a general north-westerly direction within the limits of the planning permission. Additional permitted reserves lie within land between the processing plant and main quarry void. This area currently contains stockpiles of processed fine aggregate, but following the relocation of those stocks, the area will be quarried as part of the approved development scheme.

The western extension area comprises grazing land with some pockets and linear strips of rougher vegetation. A number of intermittent dry stone walls are present but they are generally in poor states of repair. The area rises to a gentle dome to the north west of the current quarry, and then falls gently to the east and north, with steeper slopes to the west down to Darren Ddu Road.

1.3 Planning and EIA Context

The most recent planning permission for quarrying was granted in August 1993. The planning permission (reference 56/86/0827) was accompanied by a Section 106 legal agreement which, inter alia, provided for the relinquishment of the right to quarry and remove vegetation from a defined area of land to the south of the quarry (thereby protecting the integrity of the Craig Yr Hesg ridgeline above Pontypridd).

The Environment Act 1995 makes provision for quarrying planning permissions to be reviewed on a 15 year cycle to allow the planning conditions which regulate operations to be updated and modernised. An Environment Act Review application was duly submitted to RCT in 2010 which was designed to update and modernise the planning conditions regulating operations at the Quarry. The application was accompanied by an EIA / Environmental Statement (ES), a series of updated quarry development plans, and a restoration strategy.

The ES comprehensively addressed the environmental and amenity issues associated with the permitted ongoing quarry operation and related activities, and provided a context for the preparation of a detailed schedule of modern planning conditions which will control operations for the 15 year Review period.

The application was determined in March 2013, with the decision notice issued on 24th April 2013 (ref 08/1380/10). A copy of the schedule of updated planning conditions is produced as **Appendix 1.1**. The updated schedule of 49 detailed conditions is comprehensive in terms of its coverage of environmental issues, with conditions regulating the working scheme; hours of working, including restricted hours of working for rock drilling and blasting; noise limits for normal and temporary operations; limits on ground and airborne vibration from blasting; detailed controls and requirements designed to minimise dust emissions; requirements for noise, blast vibration and dust monitoring; measures to minimise the potential for ground and surface water contamination; measures to protect ecological / wildlife interests within the site; requirements for interim restoration and woodland planting; and a requirement to implement a detailed restoration scheme for the overall quarry.

These conditions are modern and up to date and provide an important context for the extension application in two respects. Firstly they provide a template for controls which could reasonably be imposed on a planning permission for the extension development, in terms of, in particular, noise and blast vibration limits. Secondly, given that such up to date controls are in place at the exiting quarry, there is no necessity or benefit for the EIA to substantially re-visit environmental issues associated with the approved and already well regulated operations within the existing quarry.

The focus of the current EIA has thus been on environmental and amenity issues associated with the extension development, and the way in which the identified environmental and amenity effects of the extension development can be mitigated. Nevertheless, as noted above, the boundary of the planning application site has will be drawn to include the existing quarry and the extension areas within a 'consolidation application'. This is to ensure that those elements of the existing quarry which will be relied upon as parts of the extension development are included within the development scheme (e.g. the processing plant and access), and are considered as part of the overall EIA.

The consolidation application approach also seeks to address a procedural issue which will be associated with subsequent Environment Act Reviews by avoiding the quarry being subject to two separate sets of planning conditions permissions, with potential confusion between controls and conditions set out in the two permission decision notices, and uncertainty as to which of the planning permissions will trigger the next Environment Act Review requirement. In the event of planning permission being granted for the extension development, the opportunity will be available to RCT to issue a single comprehensive planning permission which covers the extension site and the exiting quarry, and which reproduces, where appropriate, the existing planning conditions for the existing quarry together with new conditions regulating relevant issues within the extension area.

1.4 Local Development Plan

In March 2011, RCT adopted their Local Development Plan (LDP). As part of the preparation of the LDP, Hanson promoted an extension to Craig yr Hesg quarry as a candidate 'preferred area' for future quarrying on the basis that reserves at the existing quarry were likely to be exhausted during the Plan period, and additional reserves needed to be released to allow continuity of production of this important aggregate material. These representations were accepted, and the adopted Plan makes provision for a western extension to the quarry within a '*preferred area of area of known mineral resources*' (ref Policy SSA 25) hereafter in this document referred to as 'the Preferred Area' . An extract from the LDP Proposals Map is produced as **Appendix 1.2**. The Craig yr Hesg Preferred Area is the only Preferred Area for quarrying identified in the LDP, which the Plan relies upon to make RCTs contribution to regional supplies as required by Minerals Technical Advice Note 1: Aggregates (MTAN1) and the Regional Technical Statement (RTS) produced by the South Wales Regional Aggregates Working Party and endorsed by the constituent Local Planning Authorities and Welsh Government.

The text of the LDP confirms that the identified area is "*an area of known resource with commercial potential.... (*which*)... is in high demand"* (ref para 6.184). It also notes that "*The Regional Technical Statement 2008 identifies a need to allocate additional reserves in Rhondda Cynon Taf to ensure a supply of hardstone resources over the period of the LDP....*" (ref para 6.129). The 2008 RTS was revised and updated in 2013, and recommends that the LDP should make provision for a minimum allocation of a further 4.25m tonnes of crushed rock reserves.

The proposed extension area is based upon the 'preferred area' identified within the LDP, but where the proposed surface area of quarrying would be confined to a smaller area than the overall 'preferred area' identified in the LDP.

1.5 Craig yr Hesg Quarry: Current Circumstances.

The operation at Craig yr Hesg Quarry is geared towards producing single size chippings which will be used either within an on-site asphalt plant to be erected during 2015), or marketed off site as "dry aggregate" for use in the manufacture of asphalt at plants elsewhere. Sales of the high quality PSV aggregate average some 400,000 tonnes per annum, and subject to market fluctuations the demand for the aggregate is anticipated to continue at these average levels.

The quarry is being developed into the area approved in the August 1993 planning permission, and it has now reached the full lateral limits approved as part of that permission. The remaining reserves are thus largely confined to the lower levels of the quarry, and beneath existing haul roads and benches. The approximate total reserve remaining to be worked at the quarry is some 5.7 million tonnes as at 1st January 2015.

However, if the remaining reserve is fully quarried in accordance with the approved scheme, then it will be necessary to work the various faces and benches back to their final positions, and remove the haul roads and benches as part of these works. The effect of such operations would be to preclude access into the extension area, since the required internal access roads would no longer be available.

The application for the extension is thus being prepared at this stage in order to allow an orderly transition from the existing quarry into the extension area, in a way which is operationally appropriate in terms of internal access to the reserves. It is also geared towards satisfying an objective of the LDP to ensure continuity of supply of hardstone over the LDP plan period.

1.6 The Scope of the EIA

The EIA Regulations 1999 set out a procedure whereby Applicants can seek advice from the Planning Authority as to the issues which should be covered as part of an EIA. The advice is referred to as a 'Scoping Opinion' and, as the term implies, the opinion sets out the advice on the 'scope' of the EIA. The Applicant was keen to obtain such an opinion from RCT, and in order to assist the exercise, the Applicant prepared a 'Scoping Report' which provided a summary of the proposed quarry development scheme, and which set out the Applicant's preliminary views on the issues which should be addressed as part of the EIA. The Scoping Report was submitted to RCT in June 2014, and a copy is produced as **Appendix 1.1** (within ES Volume 2).

RCT issued their 'Scoping Opinion' in November 2014. The Opinion confirmed that the topics identified in the Scoping Report and the suggested approaches to the impact assessments were appropriate, but that attention should be given to a number of specific elements within the topic studies. A copy of the Scoping Opinion is produced as **Appendix 1.3** (ES Volume 2). The issues have been addressed as part of the EIA, and are reported in the ES, as confirmed in the Scoping Schedule produced as **Table 1.1**.

1.6.1 Technical Studies

The content of the EIA and respective technical studies has been informed by the Scoping Opinion. In order to ensure that the topics are comprehensively addressed, the Applicant has commissioned a number of specialist consultants to deal with the identified issues, namely:

- Landscape and Visual Impact and Restoration Design – WYG;
- Ecology – SLR Consulting Ltd;
- Agricultural Land Classification and Soil Resources – Richard Stock
- Hydrology and Hydrogeology – ESI Ltd;
- Noise – WBM;
- Blast Vibration – AMEC;

- Air Quality – Smith Grant LLP;
- Traffic – Hurlstone Partnership;
- Cultural Heritage – Cotswold Archaeology.

In addition, technical inputs on geology, phased quarry development, working practices and operational mitigation measures have been prepared by in-house expertise available to the Applicant.

The EIA and preparation of the ES has been coordinated by SLR Consulting. SLR is a member of the Institute of Environmental Assessment and Management with an awarded ‘Quality Mark’, and has specialist capability in mineral planning.

1.7 The Environmental Statement

The ES has been prepared to fulfil the requirements set out in the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 regarding the content of environmental statements (Schedule 4), and to follow the further advice set out in the Welsh Government booklet ‘Environmental Assessments – A Guide to the Procedures’.

The ES has been prepared to reflect these requirements. It has a clear structure and reads as a concise single document. It is sub-divided into a number of sections and Chapters, namely:

1.0 **Introduction** which sets out the background of the preparation of the ES and the procedural requirements.

Part I: Baseline Studies.

2.0 **The site and its surroundings**, which provides a baseline description of the site from which the environmental effects of the development are assessed.

Part II: The Quarry Development Scheme

3.0 **The quarry development**, which describes the details of the phased quarry development scheme and the alternatives which have been considered.

4.0 **The Restoration Strategy**, which provides a description of the concept for the restoration of the overall site upon cessation of quarrying.

Part III: Environmental Effects

5.0 - 14.0 **Environmental effects and mitigation measures**, which describes, in detail, the potential effects of the development under the sub-headings of landscape and visual effects (6.0); ecology (7.0); agricultural land and soil resources (8.0); hydrology / hydrogeology (9.0); noise (10.0); blast vibration (11.0); dust / air quality (12.0); traffic (13.0); and cultural heritage (14.0).

Part IV: Summary and Conclusions

15.0 **Summary of Environmental Effects**, which draws upon the content of the preceding chapters 6.0 – 14.0 in providing a resume of the main findings, prposed mitigation measures and residual effects; and

16.0 **Conclusions**, followed by a glossary of technical terms used in the ES.

1.8 Submitted Documents

The ES seeks to provide an objective account of the environmental effects of the overall proposed development. The aims of the statement are to:

(a) Describe the baseline conditions at the site against which changes and effects can be assessed.

(b) Describe the details of the respective elements of the overall scheme.

(c) Consider the potential environmental effects of the development.

(d) Describe the measures which are available to mitigate those effects.

(e) Assess the likely effectiveness of the mitigation measures.

(f) Draw conclusions which will assist in the drafting of planning conditions controlling the ongoing operations at the quarry.

The Environmental Statement (Volume 1) draws together the inputs from the specialist technical consultants who have undertaken the EIA, and is intended to be a self-contained document which covers all relevant topics. It does however cross-refer to a number of background documents and technical appendices prepared by the consultant team, which have been bound into ES Appendices Volume 2. The appendices have been numbered to accord with the ES chapter number such that appendices accompanying the LVIA Chapter 6.0 are numbered 6.1, 6.2 etc.

The ES reproduces a series of figures which have been prepared by the EIA project team as part of their inputs into the ES. These are referred to within the respective chapters of the ES and follow the chapter numbering sequence of the ES, such that, for example, figures within Chapter 9.0 are numbered 9.1, 9.2 etc. The respective figures are produced either within the ES chapter or in the appendix cross referenced by the technical chapter. The figures in support of the Landscape and Visual Impact Assessment Chapter 6.0 are produced separately as ES Volume 3. A full list of figures is provided within the contents schedule of the ES.

A Non-Technical Summary of the ES has been prepared as a separate document (ES Non Technical Summary Volume 4) as a means of enabling the findings and conclusions of the ES to be more readily understood.

The quarry development and restoration plans are produced within a Planning Application Statement. The Planning Application Statement includes a detailed description of the proposed quarry development and restoration scheme, and represents the scheme which comprises the formal planning application.

For ease of reference, and to formalise the ES, a summary of the quarry development and restoration scheme is provided within Chapters 3.0 and 4.0 of the ES and forms the basis of the EIA. The Planning Application Statement also includes a review of national planning policy, and policy in the local development plan against which the application will be judged. The brief references to planning policy in the technical chapters of the ES are provided for reference purposes only as a context to the respective studies, with analysis of compliance with policy requirements confined to the Planning Application Statement.

Table 1-1 Scoping Compliance Schedule: ref RCT Scoping Opinion

Scoping Issue	Response	ES Reference
Supporting Statement		
The application supporting statement should include an analysis of existing national policies and guidance and of the local development plan policies relevant to the consideration of the application. Any variations from national policy and guidance or from the local development plan will require to be comprehensively justified, particularly taking into account the environmental effects of such variations. One such variation already apparent is where development is proposed within 200 metres of existing sensitive development.	Detailed assessment of planning policy provided in Chapter 8.0 of the supporting Planning Application Statement (PAS), including issues associated with quarrying operations within 200 metres of residential property.	PAS Chapter 8.0, section 8.4.2.
Consideration should be given to the Regional Technical Statement (RTS) First Review dated 01.04.14. which has been endorsed by member Authorities of the South Wales Regional Aggregate Working Party (SWRAWP).	The advise set out in the RTS is considered within the Planning Policy Chapter of the PAS, which notes the reliance placed by the RTS upon the release of additional reserves at Craig yr Hesg to meet future demand for rock over the RTS period	PAS Chapter 8.0, section 8.4.1.
Quarry Development Scheme		
Full details of the design, phasing and timescale assumptions (based upon anticipated output/markets) of all the works proposed within the proposed extension area should be provided, i.e. the design of each phase of the quarry development, provision of screening bunds, fencing, access routes, vegetation removal/planting and/or ecological mitigation, diversion of water mains and how the aggregate dust generation is to be dealt with. Any implications on the existing quarrying features such as the plant, stockpiles, machinery and storage areas should be provided.	A detailed description of the quarry development scheme is provided in Chapters 3.0 of the ES, with additional detail provided in Chapter 6.0 of the PAS, which addresses all required issues associated with the phased development scheme, screening landform and screen bunds, fencing, internal access, planting proposals on the screening landform / screen bund, diversion of the east west water main and protection of the main along the western boundary, accommodation of dust within the existing quarry void, and the use of existing plant and infrastructure in the current quarry, which would not be changed as a	ES Chapter 3.0 and PAS Chapter 6.0.

	consequence of the extension development.	
Alternatives		
The Environmental Statement (ES) should include an outline of the main alternatives studied within the proposed quarry design and mitigation measures providing an indication of the main reasons for the choices made, taking into account the environmental effects.	Alternatives are addressed in Section 3.8 of the ES, although for the reasons outlined, the issue of alternatives needs to be considered in the context that the extension area is the only land allocated for future quarrying in the adopted RCT Local Development Plan, with no other alternatives, and that there are limited alternative means by which the identified area might be worked and restored.	ES Section 3.8
Application Site		
It is suggested that the red line of the application should be drawn around all previous mineral permissions, related operations, accesses and facilities, in the event that the application is proposed as a consolidation application.	The application is submitted as an extension and consolidation application, with the red line boundary of the application site drawn accordingly to include all remaining operational land within the existing Craig yr Hesg Quarry.	PAS Chapter 1.0, Section 3.3 and application plan ref CYH/E1
Landscape and Visual Assessment		
A detailed assessment of landscape and visual effects should be undertaken in accordance with good practice guidance. The current versions of guidance include the LVIA Guidelines (LVIA3 2013) and LANDMAP Information Guidance Note 3, NRW dated April 2013.	A detailed LVIA has been undertaken, in accordance with up to date guidance on methodology.	ES Chapter 6.0 section 6.1.2.
The assessment should also include the impact on the adjacent Special Landscape Area (SLA) identified in Policy NSA 25 of the Rhondda Cynon Taf Local Development Plan (LDP) and known as Cwm Clydach.	Potential effects on the SLA included as part of the LVIA	ES Chapter 6.0, with description of LVIA within section 6.4.3, and effects considered in section 6.4.7 and Table 6.4.6.e

The Zones of Theoretical Visibility (ZTV) should be OS based. A comprehensive set of viewpoints should consider nearby designated landscapes, public spaces in settlements, key residential areas as well as nearby individual residential properties, public footpaths, promoted routes, access land and roads, to include worst case and representative viewpoints.	ZTV included as part of the visual assessment and illustrated on OS plans accompanying the assessment. A total of twenty-one views were taken as 'appraisal photographs' to illustrate the site and its appearance in publicly available views; refer to **Figures LVIA.08** and **LVIA.09**. From the viewpoint studies, a representative selection of six views is taken forward to the visual impact assessment as 'assessment photographs' (see **Figure LVIA.08**).	ES Chapter 6.0, section 6.6 and Figures LVIA-04/1 – 04/4.
A ZTV should be carried out to establish the potential for significant effects and to define the key landscape and visual receptors that may undergo significant effects in the defined study area and then define a number of viewpoints for assessment and where photomontages are necessary, all for agreement with the Council.	See comments above. For the visual impact assessment, a ZTV study area of a 3 kilometre radius from the site was investigated and mapped; refer to **Figure LVIA.04**. Potentially sensitive visual receptors include people visiting areas covered by landscape designations, areas or sites of historic interest, public footpaths, bridleways and cycle routes, and visitor attractions. During the field study the extent of the ZTV was confirmed and features such as vegetation, buildings or localised topographic variation, which define actual visibility, were identified. Representative viewpoints were selected for the visual impact assessment as the appraisal and assessment photographs.	ES Chapter 6.0, section 6.6 and Figures LVIA-04/1 – 04/4
A summary table would be useful to get a full picture of effects quickly and easily.	Summary table of landscape and visual effects included within Chapter 6.0 of ES	Landscape effects summary table 6.4.6. Visual effects summary table 6.7.1

Restoration Strategy		
A high quality restoration and aftercare scheme should be integral to the application proposals and should aim to achieve phased restoration at the earliest opportunity and the use and suitable treatment of all available soils and natural regeneration to achieve a suitable beneficial use of all the land involved in the application. The ES should include the restoration and aftercare requirements as set out in Section D of MTAN 1. The re-instatement of the existing derelict dry stone walls and provision of new similarly constructed walls should be considered as a site specific landscape feature. Also, the connections to adjacent nature walks and the Pontypridd Circular Walk should be considered. The means for the management of the ecological and landscape mitigation measures should be considered to secure their long term provision over the life of the permission.	Detailed restoration scheme included within Chapter 4.0 of the ES and Chapter 7.0 of the PAS, with the proposals illustrated on application plan ref numbers CYH/E12 and CHY/E13. Scheme includes provision for construction of new dry stone wall along the outer edge of the screening landform, and for the proviso of new permissive paths linking Glyncoch to the Local Nature Reserve and Pontypridd Circular Walk. Restoration scheme focuses on nature conservation measures to enhance the biodiversity value of the area, with proposals for aftercare management.	Ref ES Chapter 4.0 and PAS Chapter 7.0.
Ecology		
The extent of ecological survey (proposed in the Scoping Report) is considered acceptable and should be carried out at an appropriate time of the year by a suitably experienced surveyor using recognised survey methodology. The ecological assessment should assess the impact of the quarry workings on the immediately adjacent site of importance for nature conservation,(SINC), identified in Policy AW8.77 of the LDP and known as Craig Yr Hesg/Lan Wood.	Details of Phase 1 Habitat Survey and species surveys set out in the ES with ‘target note descriptions.	ES Chapter 7.0, section 7.5.4 and Figure 7-1
The ES should also consider the impact on UK and Local Biodiversity Action Plan (BAP) Habitats and Species, any ancient semi-natural woodland and legally protected species. The assessment should consider the following matters, where appropriate: -	Full consideration given to the current habitats and species; the potential impacts; mitigation measures; residual impacts; creation of new habitats in the short term via the screening landform, screen mound and natural re-colonisation; and via the progressive implementation of the restoration scheme in the longer term	ES Chapter 7.0, sections 7.6; 7.7; 7.8; and 7.10.

▪ identify any rare, declining, protected or otherwise important flora, fauna or habitats within the site; ▪ assess the importance of the above features at a local, regional and national level; ▪ identify the impacts on those features; ▪ propose mitigation for any adverse ecological impacts or compensation for loss; ▪ demonstrate how the development will avoid or minimise adverse impacts; ▪ propose wildlife habitat enhancement measures; ▪ propose management plans and management responsibilities with details of how biodiversity enhancement will be incorporated into the restoration scheme and maintained over the long term.		
It is noted that a Phase 1 habitat survey of the quarry area is to take place together with an assessment of the presence of any protected or notable species. It is considered that the existing grassland should be surveyed using Phase II Vegetation methodology and referral to the national Vegetation Classifications of grassland communities.	Phase II vegetation undertaken, and illustrated on Figure 7/2.	ES Chapter 7.0, section7.5.4, table 7.6, and figure 7/2.
A tree survey should accompany the application to include all trees to be affected and the proposals should prevent any unnecessary losses due to access, vehicular movements, fencing along the boundary and wind blow.	Tree Survey undertaken and results included as Appendix 1 within the Planning Application Statement. The position of the western soil screen mound and perimeter fence has been defined to avoid any interference to the existing trees.	Planning Application Statement Appendix 1.
It is considered that the survey should also include non native invasive species such as Japanese Knotweed and Himalayan Balsam. If found, a management plan for their control and/or	Survey included a review of the presence of invasive plant species, at optimum time periods for botanical recording, but no invasive species were recorded within the	ES Chapter 7.0, section 7.5.4

eradication would be required.	application area.	
It is noted that cross reference will be made to the approved restoration scheme within planning permission ref 08/1380/10 but it is considered that opportunities for biodiversity gain should be considered. In particular, it is considered that the development of calcareous grasslands, the natural regeneration for woodland/trees, the planting of locally native species of certified local origin and the safeguarding of areas for the protection of nesting bird and bat habitats should be sought within the final restoration of the site.	The quarry development scheme and restoration strategy makes provision for the establishment of new woodland corridors along the screening landform, linking to existing areas of woodland; the establishment of a natural re-colonisation woodland corridor along the soil bund and adjoining land along the western side of the extension area; with new habitats created as part of the restoration scheme which would provide a resource for bats and nesting opportunities for birds.	ES Chapter 7.8 ,ecological mitigation measures, and the restoration strategy set out in Chapter 7.0.
Agricultural Land Quality and Soil Resources		
It is noted from the scoping report at Paragraph 6.4.1 that the ES will include an Agricultural Land Classification of the extension area and an assessment of the soil resource for re-use in the restoration of the site. The 5 hectare extension area lies within an area of agricultural land of generally Agricultural Land Classification grades 4 and 5 (poor and very poor), so it is unlikely that best and most versatile agricultural land will be affected. However, as the mineral development affects agricultural land, account should be taken of Paragraphs 32 and 33 of Minerals Planning Policy Wales. Further, the handling of soils during mineral operations should be undertaken in accordance with Annexes B and C of Minerals Planning Policy (Wales) Minerals Technical Advice Note (Wales) 1: Aggregates.	Agricultural Land Classification and Soil Survey undertaken and reported in ES Chapter 8.0. Reference made to the issues associated with mineral developments affecting agricultural land set out in MPPW and the soil handling advice set out in MTAN1.	ES Chapter 8.0 sections 8.4; 8.5; and 8.8.
The approved after use of the existing quarry, under Condition 48 of the 08/1380/10 permission, is amenity to promote the use of the site for nature conservation. The after use of the extension area has not been specified in the scoping report, but it is perhaps likely to extend the amenity after use of the existing	Confirmation provided that the approved nature conservation restoration after uses for the existing quarry are to be developed into the extension area as part of an overall restoration scheme for the application site. Further consultation relating to agricultural after use will not be	ES Chapter 8.0., section 8.8 and ES chapter 4.0, Restoration Strategy.

quarry working area. This should be clarified in order to determine whether consultation will be required if an agricultural after use is to be proposed for all or part of the quarry workings, under Schedule 5 of the Town and Country Planning Act 1990, and as per consultation arrangements described at Annex B3 of Technical Advice Note 6:Planning for Sustainable Rural Communities.	required.	
Hydrology and Hydrogeology		
The EIA scoping report indicates that impacts on ground and surface water are to be included as part of the EIA. It is recommended that the scope of the study should include water quality elements. The ES should provide information to verify the current understanding that there will be no increase in flood risk, both to and off site, and that there will be no requirement to alter the existing surface water management arrangements.	The hydrological and hydrogeological assessment includes potential impacts on ground and surface water quality. The study also includes a flood risk assessment which concludes that the development would not give rise to any increase in flood risk.	ES Chapter 9.0, section 9.6.
Any suggested use of infiltration drainage techniques to achieve compliance with the requirements of TAN 15 will need to be accompanied by a preliminary site investigation report confirming that the underlying ground conditions will support the use of infiltration techniques and that seasonal groundwater levels will not encroach within 1 metre of the underside of the infiltration structure.	The hydrogeological study reviews the existing arragngements for accommodating water derived from rainfall and groundwater from perched water tables within the excavation and the current means of allowing the water to infiltrate into the underlying strata and water table which lies beneath the floofr of the quarry (below 100m AOD).	ES chapter 9.0 and Surface Water and Drainage Assessment Report produced as Appendix 9.3
The assessment should detail whether any works would affect any existing watercourses within the site boundary or immediately adjacent. If so, this will require provision of a detailed hydrological/ hydro-geological assessment. In the first	A water features survey has been undertaken as part of the assessment where all major surface water features within a 1 km radius of the quarry and smaller features within 750 m were observed. Major surface water features are shown in	ES Chapter 9.0, section 9.4.3 and figure 9.3; and impact assessment section 9.6.

instance, a plan detailing any hydrological features within the development boundary and within a buffer of 50m of the development site should be provided to determine their existence.	Figure 9-3. The assessment of potential effects on surface water features forms part of the hydro impact assessment.	
The rate of discharge should be agreed with Natural Resources Wales. However, the County Borough Council will require this information for review. The discharge rate will be subject to the nature of the proposed surface water management regime and the utilisation or otherwise of infiltration drainage techniques.	Quality and rate of discharge from the existing quarry site is controlled by an on-site attenuation and settlement system and regulated by the existing discharge consent to the River Taf (Consent Number AF4029101). There would be no increase in the rate of discharge as a result of the quarry extension and the existing system would not need to be varied as a consequence of the extension development.	ES Chapter 9.0, section 9.6.
Noise		
The proposed monitoring locations as set out below would seem appropriate, and the focus of the assessment should relate to those sensitive developments within the 200 metre buffer area. All noise measurements /assessments should be undertaken in accordance with MTAN 1, as well as having regard to the current planning conditions regulating noise at the existing quarry (Conditions 18 – 22 of 08/1380/10). The additional locations (5, 6 and 7 below) need to be representative of the nearest noise sensitive properties to the extended quarry area. 1. Conway Close 2. Pen Y Bryn 3. Garth Avenue 4. Rogart Tce 5. Cefn Lee Farm	A noise assessment has been undertaken in relation to the agreed representative local receptors, with the methodology in accordance with the advice set out in MTAN1, but also with reference to TAN 11, MPG11 and the planning conditions which impose noise limits at the existing quarry. Noise predictions made for each of the properties, with consideration given to noise mitigation measures and appropriate noise limits.	ES Chapter 10.0, section 10.2; 10.7; and 10.8.

6. Cefn Primary School 7. Darren Ddu Road		
Blast Vibration		
The blast vibration assessment should comply with the requirements of MTAN1 and take into account the existing conditions regulating vibration from blasting, which are referred to in Para 6.7.1 of the scoping report. The Public Health and Protection Division of the Council has advised that there needs to be a degree of flexibility in the choice of location for monitoring vibration, as the proposed noise monitoring locations may not be the most appropriate in respect of the suitability for measuring vibration. The Consultant will need to visit and identify the suitability of such locations, particularly, in respect of the assessment of vibration from blasting within the 200m buffer area. In addition, it is considered that details of the procedure for dealing with complaints concerning vibration should be provided within the study.	Consideration has been given to the number and types of properties that should be used as the basis of the blast vibration assessment and a shortlist of six locations have been selected for assessment. These are generally consistent with the properties selected for the noise assessment, and this is logical in selecting receptors in closest proximity to the existing quarry and extension area. Particular consideration has been given to potential effects on the small number of properties at Conway Close within 200m of the extension area, and the mitigation measures required to ensure adherence to the existing blast vibration limits. Hanson operates an ISO14001 accredited EMS on which all complaints are logged and investigated.	ES Chapter 11.0, sections 11.4; 11.5; 11.8; and 11.9.
Dust and Air Quality		
The ES should detail any changes to ambient levels of local particulate matter. In particular, regard should be had to the impact upon local levels of PM_{10} and, consideration should also be given, if relevant, to levels of $PM_{2.5.}$	A detailed review of existing air quality is included as par of the air quality study with predictions of the changes which may arise as a consequence of the extension development.	ES chapter 12.0 sections 12.5.2, 12.8.2 and 12.10.
In determining impact, consideration should be given to the influence of the proposed development on the future compliance with the relevant Air Quality Objectives [AQOs], set in	UK Air Quality Objectives for PM_{10} and $PM_{2.5}$ are highlighted, and the study includes a review of allavaiable air quality monitoring data, including the most up to date	ES chapter 12.0 sections12.3.1 and 12.5.2.

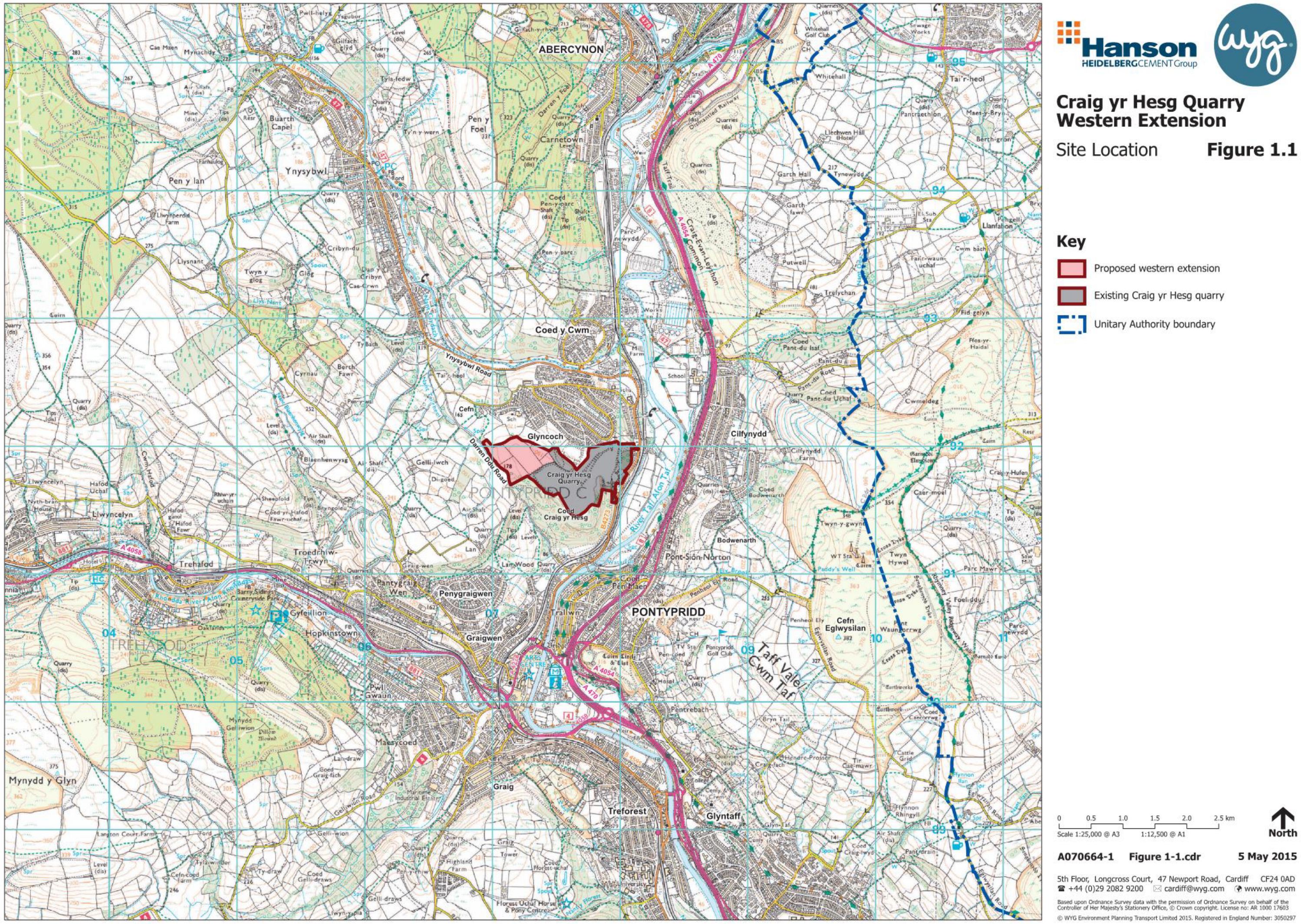
regulations, within the immediate locality. Account should also be taken account of all available relevant information on existing local air quality including the 2014 Detailed Assessment of Fine Particulate Matter at Glyncoch, dated April 2014. In undertaking this consideration, it may be appropriate to have regard to the 'proposed development/no proposed development' assessment method and its direct (i.e. new worse case exposure locations) and incidental consequences (i.e. the extension of life expectancy of the related current development. To assist in this evaluation, it would be appropriate to consider relevant baseline data and published interpretation.	2014 air quality assessment and progress report, and a study undertaken by the University of the West of England, commissioned by RCT, of PM_{10} measured at 2 locations in Glyncoch. Existing baseline data and published interpretation included as part of the study.	
The method for undertaking air quality monitoring should be provided to facilitate its documented approval. If indicative monitoring methods are proposed to be used, it would be desirable for the methods to be proportionate to the required resolution of uncertainty associated with the significance of the impact. The locations of any air quality monitoring equipment should be agreed in advance and should be evidenced to confirm they represent the 'worse case' locations taking account of the proximity of potential future receptors and, in addition, particularly sensitive classes of receptors which may be affected.	Current Local Authority PM 10 monitoring data, Hanson PM 10 monitoring data, and Hanson Frisbee dust deposition monitoring data described in the study with methodologies of data capture.	ES chapter 12.0 section 12.5.2.
Where air quality monitoring data is used, the data should as far as possible be validated, ratified and representative, with regard to any seasonal influence. Where it is necessary to extrapolate monitoring data, the method used should be in accordance with that stated in Box 3.2 of LAQM.TG (09). Should it be deemed necessary to undertake modelling (stochastic simulation), the model should be recognised as appropriate and, where possible, verified against local monitoring data. Where meteorological data is used, every	Monitoring data extends back to 2009 with annula data capturing seasonal influences. Additional modelling not deemed to be necessary given the reasoned conclusions drawn from existing local data.	ES Chapter 12.0, section 12.5.2.

effort should be made to either use local representative meteorological data or, if that is not possible, correction of regional meteorological data.		
In having regard to the understanding of any potential adverse impact, the ES should provide informed recommendations about potential mitigation measures, including evidence of their effectiveness. Should there be uncertainty associated with the proposed mitigation measures; details of any continued surveillance should also be provided.	Sources of dust identified, risk of dust from proposed extension in the absence of mitigation measures described, mitigation masures described and residual effects following mitigation considered.	ES Chapter 12.0, sections 12.7, 12.8, 12.9 and 12.10.
The scoping report acknowledges that whilst there is adequate PM10 data available for the site, there is no existing information on levels of nuisance dust deposition and no monitoring for the areas adjacent to the primary school or Conway Close. It is considered that short term nuisance dust monitoring should be undertaken at locations to the north and west of the existing void with the opportunity to collect a sufficient period of monitoring data to be representative of future conditions. It is considered that the short term dust monitoring exercise should include the potential impacts of dust sources that are not regulated under other regimes and mitigate any such impacts. For instance, it should be noted that the remit of the Permit does not extend to initial mineral extraction activities such as blasting. The locations for such monitoring and suitable assessment methodology should to be agreed with the Public Health and Protection Division of the Council, before it commences.	Dust deposition monitoring undertaken at 4 locations as a short term dust monitoring exercise over the period October – December 2014 using Frisbee type gauges.	ES chapter 12.0, section 12.5.2, table 12.13.
Traffic		
The ES should include a Transport Assessment (TA) carried out in compliance with IHT Guidelines. As well as the seven bullet points set out in Para 6.9.4 of the Scoping Report, the Traffic	The Traffic Assessment includes a detailed review of traffic conditions and flows on the local highway network, and the HGV movements associated with the existing Craig yr Hesg	ES Chapter 13.0, sections 13.4; 13.5; 13.6; and 13.7.

Study should include all the traffic generation of the site with consented planning permissions (08/1380 and 13/0825 - Asphalt Plant). Traffic management proposals should be included indicating the impact and any mitigation measures which may be proposed for the existing highway network.	Quarry, which would not change as a consequence of the extension development. No specific traffic management proposals are included given that there will be no changes to current arrangements, and no mitigation measures are proposed other than routine maintenance of the new quarry access and its visibility splays.	
Cultural Heritage		
It is noted that the existing archaeological desk-based assessment will be updated and the work undertaken to the Standards of the Institute for Archaeologists (www.archaeologists.net) and that this will inform the mitigation strategy following consultation. This is considered appropriate by the Council's Archaeological Advisors, Glamorgan Gwent Archaeological Trust.	The Cultural Heritage Study has been undertaken in accordance with conventional guidance, with a mitigation strategy proposed in the form of an archaeological watching brief during soil stripping operations.	ES Chapter 14.0 sections 14.2; and14.7.
Community Benefits		
It is considered that the identification and timescales for the provision of any community enhancements/benefits should be provided within the application supporting statement.	Community Benefits are discussed in section 6.8 of the PAS, and include the provision of a new right of way from Glyncoch connecting to the rights of way in the countryside to the west; the potential extension to the Craig yr Hesg Local Nature Reserve; the new woodland corridors along the screening landform providing landscape conections to exsiting woodland, and general landscape enhancements including the construction of new dry stone walls.	PAS Section 6.8.
Water Main		
It is considered that the impact on the trunk/distribution water mains should be clearly indicated within the submission, as there is a 250mm trunk/distribution water main which runs along	The locations of the water mains are illustrated on plan ref CYH/E4. The scheme makes provision for the diversion of the east – west water main which crosses the extension area within a corridor of land along the eastern and	ES Chapter 3.0, section 3.3.3.

the western boundary and one which crosses through the extension area. The EIA should indicate whether it is feasible to divert these pipelines and take into account the environmental effects of doing so. Dwr Cymru Welsh Water (DCWW) have advised that these pipelines should be adequately protected from the impacts of blasting and that they should be located and marked up accurately in order to provide a minimum separation distance from the development to allow a 3m distance from the centre line of DCWW's apparatus	northern boundaries of the extension area. The precise alignment of the water mains has been mapped via a survey by Subscan Ltd and the scheme makes provision for a standoff between the water main along the western side of the extension area and the limit of quarrying, with no works (soil bund) within a 3m minimum separation distance.	

Figure 1-1 Site Location



2.0 THE APPLICATION SITE

2.1 Site Location

Craig yr Hesg quarry is situated on the western side of the Taff Valley, some 1km north of the built up area of Pontypridd. The village of Glyncoch lies beyond the northern boundary of the quarry. Locally, the quarry is bounded to the north by the Glyncoch football ground and clubhouse; to the northwest by grazing land which comprises the proposed extension area; to the west and southwest by the prominent wooded ridgeline of Coed Craig Yr Hesg, which overlooks the town of Pontypridd; and to the east by a narrow corridor of woodland between the site and the B4273 Ynysybwl Road.

2.2 Landscape Context

The proposed extension site is approximately 400m long and 300m wide at its widest part. It is located along a ridgeline with a highpoint located at the western boundary of the existing quarry. The higher part of the site is around 200m AOD where it joins the top of the northwest face of the quarry. From this point the land falls away in all directions to a low point of around 170m AOD in the westernmost corner of the site.

The site is currently semi-improved pasture with acid grassland and it includes two large fields and part of two other small fields. Field boundaries are dry stone walls; these are generally discontinuous with frequent gaps and partly collapsed sections.

Along the northern boundary of the site there is an area of plantation woodland and a row of trees, which are probably an overgrown hedgerow. This vegetation provides some screening from Cefn Primary School and adjacent properties at Cefn.

A continuous band of deciduous woodland extends along the southwest site boundary which is associated with Darren Ddu Road. This woodland links to Coed Craig yr Hesg through an area of rough grassland, bracken and scrub. The road is inaccessible to vehicles but is used as a public footpath. Publicly accessible, low level views of the site are available from Darren Ddu Road.

To the northeast of the proposed extension site there are two fields, similar in character to those within the site. Beyond these fields to the northeast is an area of rough grassland, bracken and scrub which provides screening between the site and the Glyncoch Rugby Ground, which is not visible from the site. The settlement of Glyncoch is located to the northeast of this area at a lower level than the site. Although house roofs are visible, views from the settlement towards the site, without mitigation / additional screening, would be limited to first floor windows due to the topography, garden boundary fences and vegetation.

The landscape character of the area is strongly influenced by the pattern of topography with steep, wooded valley side slopes rising from the valley floor. The main topographical feature in the area, the River Taf valley, is defined by Cefn Eglwysilan to the east which rises to a height of 382m AOD. Land to the west of the valley, upon which the proposed extension site is located, rises to over 240m AOD. The hilltops and ridgelines are typically agricultural pasture with either small scale fields or large, open areas with no enclosure. The enclosure field pattern is common throughout the upland area to the west of Craig yr Hesg quarry, while extensive area of open land occur at Cefn Eglwysilan. Fields have a variety of boundary types including tall, overgrown and discontinuous hedgerows, fences and dry stone walls. The levels of maintenance for walls, hedges and fences vary considerably between areas.

Hedgerow trees, small areas of woodland and larger blocks of deciduous woodland on valley side slopes are characteristic of the area. Coed Craig yr Hesg, adjacent to the southern boundary of Craig yr Hesg quarry, is a densely wooded ridge rising from the valley floor at around 80m to a height of 200m AOD.

There are no public rights of way within the proposed extension site, and no public right of way links from Glyncoch westwards into open countryside. The nearest public route in the vicinity of the site is Darren Ddu Road, a track which is impassable to vehicles, believed to be a public right of way which runs generally north – south from Ynysybwl Road to the south west of the existing quarry, northwards to Ynysybwl. Public footpaths cross agricultural pasture land to the west of the site and connect with the minor road between Penygraigwen and Ynysybwl.

Land designated as open access by the CROW act includes large areas of Urban Common to the east at Cefn Eglwysilan and north-east at Craig-Evan-Leyshon Common. To the north and west are areas of Public Forest and to the south much smaller areas of Open Country access land lie adjacent to the settlement of Pontypridd.

Other public routes within the study area defined in ES Chapter 6.0 include the National Cycle Route 8 'The Taff Trail' which follows the river north from Pontypridd to Abercynon and is at its nearest at 350m to the east of the quarry. National Cycle Route 47 'The Celtic Trail' follows the minor road north west from Penygraigwen at a distance of 1km at its nearest from the quarry with a separate branch of The Celtic Trail connecting Ynysybwl to the Taff Trail, running to the north of Glyncoch, some 650m from the site.

The Taff Trail long distance footpath follows the line of National Cycle Route 8 to the east of the quarry. Further east the Rhymney Valley Ridgeway Path runs north from Mynydd Meio to Nelson.

2.3 Ecology

The application site itself is not subject to any statutory designations.

One statutory designated site occurs within the 2km search area defined in the Ecology study (ES Chapter 7.0). Craig-yr-Hesg Local Nature Reserve lies immediately to the south of the existing quarry.

The application site includes a small area of the Craig yr Hesg / Lan Wood SINC which comprises an extensive area to the south west of the application site, although the small area included within the application site does not form part of the quarry extension area.

A further three SINC's occur within the 2km wide search area, namely Lower Clydach Woodland SINC, Llys Nant and Craig Twyn-y-glog SINC and Taff and Rhondda Rivers SINC.

These SINC's have been selected as sites of County-level ecological importance i.e. they are important within RCT, although unlikely to meet the criteria for selection as a site of national importance and receive a statutory designation.

The application site largely occurs within two fields enclosed by dry stone walls. The fields contain a sward of predominantly semi-improved grassland, which was found to be dominated by relatively species poor in terms of herbaceous species.

The majority of the grassland area was found to be very closely grazed by horses at the time of both the Phase 1 and Phase 2 surveys, showing signs of more intensive agricultural improvement in places through the localised dominance of white clover (*Trifolium repens*). The south-western field was found to contain localised areas where the sward showed increased floristic diversity, although remained heavily grazed and dominated by grasses, with areas of bracken (*Pteridium aquilinum*) also present with scattered scrub species.

The perimeter field boundaries were marked by dry stone walls, which were generally intact, with bracken fringing the walls in places. The internal field boundaries are in a poorer state of repair and are absent over certain stretches.

The wider surroundings comprise of the existing quarry void broadly to the south, semi-improved grassland and small woodland blocks to the north and east, with Craig-yr-Hesg/Lan Wood SINC extending slightly within and to the west of the application site.

The extension area lacks potential bat roost sites, and as such, has no value to roosting bats.

The extension area has been assessed as having limited opportunities for bats to forage and commute, due to the nature of habitats present and general setting/elevated position and exposure that the application site has. The habitats adjacent to the extension area i.e. woodland, represent higher value foraging habitats and provide more sheltered commuting linkages for bats.

No evidence of badger has been recorded although a very low level of evidence was recorded in the wider site area during the 2009 surveys.

The occasional presence of badgers, as part of foraging in a wider territory, is a possibility. However, based on the absence of any field signs within the extension area itself, it is considered unlikely at the current time. As such, the extension area is assessed as having no value to badgers.

The presence of reptiles has been confirmed within the extension area, as one common lizard was observed during the Phase 1 survey.

The 2009 surveys also recorded adder and slow worm in the wider site, with the potential for grass snake to occur also being a possibility.

The extent of habitats that are suitable for reptiles to use within the extension area is limited, as the majority of the extension area comprises of closely grazed grassland that lacks the features required by reptiles.

Based on the extent and connectivity of suitable reptile habitats within the extension area, it is likely that relatively low numbers of common lizard and slow worm are present. The occasional presence of individual adders cannot be fully discounted as they are known to occur in the wider site.

Opportunities for birds to nest within the extension area are limited, due to the relatively low occurrence of scrub and the predominantly open/closely grazed nature of the grassland which is of low suitability for ground-nesting species.

The presence of meadow pipit was recorded during the Phase 1 survey and it is likely that this species breeds within the extension area at low densities in the localised areas where grazing is less intensive as a result of bracken cover reducing sward palatability.

Green woodpecker was recorded and is likely to forage within the extension area as part of a wider territory, as would be expected for a range of common and widespread bird species.

As such, given that areas of higher quality habitat for birds occur in the wider Craig-yr-Hesg quarry, the extension area itself is assessed as being of less than site level value for birds.

2.4 Geology

Craig-yr-Hesg quarry is located in the south of the South Wales Coalfield, close to the axis of the syncline that forms the predominant geological structure of the region.

The regional solid geology comprises predominantly Upper Carboniferous rocks, with the Upper Pennant Series present in the vicinity of Craig yr Hesg.

The Upper Pennant Measures typically comprise bluish grey, weathered, brown, thick massive or cross-bedded fine to coarse grained (locally pebbly) sandstones.

In the area of Craig-yr-Hesg the Hughes Beds (180–270 m thick), Brithdir Beds (110-270 m thick) and the Rhondda Beds (160-335 m thick) of the Upper Pennant Measures are present and consist predominantly of conglomerates, medium to coarse grained sandstone and local finer grained units of fluvial origin.

2.5 Agricultural Land Quality and Soil Resources

The extension area and land to be occupied by the northern screening landform and western soil bund comprises land of grade 4 quality, with a relatively thin soil profile of sandy clay loam topsoil 0.15 to 0.3m deep overlying a variable depth of orange brown sandy clay loam subsoil containing sandstone cobbles and slabs.

2.6 Hydrology

The River Taf forms the major surface water drainage feature in the vicinity of Craig yr Hesg Quarry, flowing from north to south approximately 350 m to the east. The stage of the River Taf ranges from 80 m AOD in the vicinity of Abercynon to 49 m AOD in Pontypridd. The Afon Cynon joins the River Taf at Abercynon, approximately 3 km north (upstream) of Craig-yr-Hesg Quarry. Downstream of the site, the River Taf continues to flow south, joined by the River Rhondda approximately 1.6 km south of the site, through the suburbs and inner city of Cardiff, to discharge to Cardiff Bay.

The Nant Clydach flows from west to east approximately 850 m to the north of the Craig yr Hesg Quarry, at an elevation of between 80-90 mAOD. The Nant Clydach joins the River Taf 850 m north of Craig-yr-Hesg Quarry, east of Coed-y-Cwm. The river is largely sourced from compensation release from Clydach reservoir located 6.6 km north-west of the quarry, and is augmented by numerous spring fed springs originating on both eastern and western valley slopes upstream of the confluence with the River Taf.

Numerous smaller features were identified during the water features survey, and are described in section 9.4.3 within Chapter 9.0.

2.7 Hydrogeology

The Pennant (Upper Coal) Measures are designated by the Environment Agency as a Secondary A aquifer.

Groundwater levels in the Pennant Measures within the quarry are monitored via an observation borehole which supports the conclusion that the elevation of the regional water table is lower than the permitted base of the excavation (100 m AOD) with maximum water levels of 96.77 m AOD being observed.

Several minor streams were identified during the water features survey in the direct vicinity of the quarry. These originate from spring flows on the mid slope areas. Stream flows are ephemeral, with lengths of dry channel, sinking and re-emergence behaviour identified in the upper reaches.

Groundwater levels recorded in a monitoring borehole immediately north-west of the quarry are between 15-25 m below the elevation of the springs at Cefn (165-167 m AOD). This indicates that these springs are likely fed from an upper groundwater system on the north-western slopes of Craig yr Hesg which is independent of that adjacent to the quarry.

2.8 Access and Traffic

At the time of submitting this application, the Quarry has two connections to the B4273 Ynysybwl Road / Berw Road, which are approximately 440m apart. The B4273 is subject to a 40 mph speed limit in the vicinity of the site.

The southern connection forms the main site access for all vehicles and also the egress for light vehicles. The northern connection is the egress for HGV traffic leaving the site.

Planning permission (13/1039/10) was approved in March 2014 to improve the southern access to provide for two way HGV traffic, which when completed, will allow the HGV traffic currently using the northern access to be diverted to the southern access. The southern access currently has a superior level of visibility than that to the north, and the existing splays will be further improved as part of the works to achieve 120m in either direction from a 4.5m set-back position, in association with kerb revisions and general widening of the bellmouth and the bend in the access road beyond. The improvements to the southern access will be completed by Spring 2015, and they will thus be fully commissioned prior to the commencement of any extraction within the extension area.

Almost all HGVs travelling to/from the Quarry do so via the B4273 to the south of the site, where they continue to Pontypridd before heading east to join the A470 where they distribute primarily towards the south, where the larger conurbations in South Wales and M4 Motorway may be accessed.

2.9 Cultural Heritage

There are no World Heritage Sites or sites included on the Tentative List of Future Nominations for World Heritage Sites issued by the Secretary of State for Culture, Media and Sport situated within the site or its environs.

There are no Scheduled Ancient Monuments, Registered Parks or Gardens, Registered Battlefields or Landscapes of Outstanding and Special Historic Interest within the site or the study area.

There are no Listed Buildings within the 500m study area around the boundary of the site. However, a small number of Listed Buildings are located within the wider environs of the site.

There are no heritage assets recorded within the site. Within the surroundings of the site, evidence for pre-modern activity is limited and includes a chance find of a Neolithic axe head. The reviewed historic cartographic evidence has also indicated that modern industrial and transport activity, recorded within the study area and in the wider environs of the site, did not extend into the site.

There is a low potential for the presence of as yet unknown archaeological features within the site. The value of these assets cannot be established at present and it remains unknown, although, based on the available information, the potential for remains of high value is considered unlikely.

2.10 ES Baseline

The above summary of baseline conditions represents a brief overview of the much more detailed consideration of current circumstances set out in the environmental impact assessment chapters, notably:

- Chapter 6.0: landscape and visual baseline (section 6.4.2);
- Chapter 7.0: ecology baseline (section 7.5);
- Chapter 8.0: agricultural land quality and soil resources (sections 8.4 and 8.5);
- Chapter 9.0: geology, hydrology and hydrogeology baseline (sections 9.4);
- Chapter 13.0: transportation (section 13.3); and
- Chapter 14.0: cultural heritage (section 14.4).

However, this Chapter 2.0 provides a brief outline of current circumstances as a context for the description of the quarry development and restoration scheme which is described in the following chapters 3.0 and 4.0.

3.0 THE PROPOSED DEVELOPMENT

3.1 Introduction

The EIA Regulations require that ESs should include a description of the development, which then provides a context for the assessment of the aspects of the environment likely to be significantly affected by the development, and the measures available to prevent, reduce and where possible offset any significant effects on the environment (ref Schedule 4 to the EIA Regulations).

This chapter therefore provides a description of the development as an introduction to the environmental impact assessment chapters which follow as Chapters 6.0 – 14.0. For ease of reference, and for compliance with the requirements of Schedule 4 to the EIA Regulations, this chapter repeats parts of Section 6.0 of the Planning Application Statement (PAS) in terms of the description of the development, and Chapter 4.0 of the ES drawing upon the key elements of the restoration strategy which are described in Chapter 7.0 of the PAS. Other detailed elements of the development scheme relating to schedules of tree and shrub planting species etc are retained within the PAS as part of the more detailed description of the proposed development.

3.2 General Overview

3.2.1 Current Circumstances

The quarry is being developed into the area approved in the August 1993 planning permission, and it has now reached the full lateral limits approved as part of that permission. The remaining reserves are thus largely confined to the lower levels of the quarry, and beneath existing haul roads and benches. The approximate total reserve remaining to be worked at the quarry is some 5.7 million tonnes as at 1st January 2015.

If the remaining reserve is fully quarried in accordance with the approved scheme, then it will be necessary to work the various faces and benches back to their final positions, and remove the haul roads and benches as part of these works. The effect of such operations would be to preclude access into the extension area, since the required internal access roads would no longer be available.

The application for the extension is thus being submitted in order to allow for an orderly transition from the existing quarry into the extension area, in a way which is operationally appropriate in terms of internal route access to the reserves.

3.2.2 Extension Design Principles

As stated in Section 1.4 above, RCT adopted their Local Development Plan (LDP) in March 2011, and the LDP makes provision for a western extension to Criag yr Hesg Quarry within a ‘preferred area of area of known mineral resources’ (ref Policy SSA 25). . The Craig yr Hesg Preferred Area is the only Preferred Area for quarrying identified in the LDP, which the Plan relies upon as part of RCTs contribution to regional supplies.

As part of the design process for the quarry extension, careful consideration has been given to the limits of extraction within the defined ‘preferred area’ identified in the LDP. In particular, consideration has been given to the advice set out in Minerals Technical Advice Note 1 (MTAN1) that a minimum buffer zone of 200 metres should be established to hard rock quarries “*unless there are clear and justifiable reasons for reducing the distance*” (ref MTAN1 paragraph 71).

The existing development scheme for quarrying at Craig yr Hesg will involve quarrying operations taking place within 140 metres of residential property at Coed y Lan Road, and the ongoing use of the primary crusher sited some 60 metres from the closest residential properties at Garth Avenue. The current planning application would not change these circumstances. The ‘preferred area’ identified in the LDP lies at a distance of some 125 metres from residential property in Glyncoch (Conway Crescent) at the closest point, and some 160m from the closest building within Cefn Primary School.

Information presented by Hanson as part of the evidence base of the LDP confirmed that blasting operations could proceed in closer proximity to residential properties than the notional 200m buffer zone, whilst complying with conventional blast vibration criteria (ref Vibrock 2004). Further information supplied by Hanson (Briefing Note 2008) highlighted the special characteristics of the high specification aggregate available at the quarry and extension area, and the importance of avoiding the sterilisation of resources via unnecessary stand-off distances. Nevertheless, the Minerals Background Paper (2009) accompanying the LDP indicates that "*the designation of the site does not afford the land, and specifically the entire boundary of the site guaranteed permission for extraction......further evidence will be required to show how much of the site could be developed*", and the extent to which "clear and justifiable reasons" justify a reduction in a 200m separation distance (ref Background Paper section 2.8).

The key element of the design of the extension development has thus been to reconcile the need to (i) ensure no significant adverse effects on the amenities of residential properties in the vicinity of the extension area, and (ii) avoid the unnecessary sterilisation of the high quality sandstone resource.

The result has been a detailed iterative design process which has considered alternative quarry design layouts, boundaries and mitigation measures, with inputs from the EIA project team in terms of advice on noise and blast vibration levels and landscape / screening measures. The limits of quarrying within the extension area have been defined to reflect this advice, with separation distances between the nearest residential properties and the closest point to the proposed limits of quarrying within the extension area of:

- 251m to the closest property at Cefn Lee Farm;
- 243m to Cefn Primary School;
- 175m to Conway Close; and
- 221m to Pen y Bryn.

The assessment of the environmental effects of quarrying to such separation distances has been a key element of the EIA, notably in terms of the ability to undertake operations at such distances whilst complying with the noise and blast vibration criteria which have been recommended in Chapters 10.0 and 11.0 of the ES. It should also be noted that such distances represent the closest distance between the limits of quarrying and the closest residential property, and that for much of the operational period, operations would be at greater distance, and at depth within the extension quarry void.

The process of defining the limits of quarrying within the extension area has been fully integrated with the design of landscape screening measures which have been designed with the four fold purpose of providing a visual screening function; a noise attenuation barrier; a physical barrier which encloses the quarry; and a landscape / ecological corridor which would provide a landscape nature conservation benefit to the locality. The northern screening feature has thus been designed not as an engineered bund, but as a new ridgeline screening landform which ties into the adjoining contours and which would be tree seeded as a new woodland feature linking with existing woodland areas in the locality. The appearance of the landform would be further enhanced by the construction of a new stone wall on its outer side again linking with existing stone walls in the locality. The effectiveness of this screening landform in minimising visual effects is discussed in the Landscape and Visual Assessment Chapter (ES Chapter 6.0).

Subject to these key design principles, the extension development would proceed as a conventional phased extraction and restoration programme, working generally from south to north across the extension area in three phases, developing the existing faces and benches along the northern side of the existing quarry into the extension area. Soils would be stripped from phase 1 and used to surface dress the screening landform. Thereafter, as the development progresses, the soils would be used for ongoing restoration in areas of the existing quarry which have reached their operational limits and are available for restoration (ref ES Chapter 4.0).

The restoration works within the existing quarry and extension area would be implemented progressively as an integral part of the development, with the restoration strategy designed to create a variety of habitats and nature conservation orientated uses (ref ES Chapter 4.0).

3.2.3 Development Overview

The boundaries of the planning application site have been drawn to encompass the extension area together with the boundary of the existing permitted Craig yr Hesg Quarry. If permission is granted for the extension development, the resulting planning permission will provide for a comprehensive approach to regulating development at Craig yr Hesg Quarry, with a single planning permission, and an overall restoration scheme which covers the existing quarry and the extension.

The extraction area (shown as a green dash on Drawing CYH E2: Application Site Plan) extends to 5.52 hectares and has been designed to provide for a logical extension the quarrying scheme approved in 2013 as part of the Environment Act Review.

The key features of the scheme comprise:

(i) The construction of a landscaped screening landform around the eastern and northern boundaries of the extension area, prior to the commencement of extraction within the extension area;

(ii) The construction of a soil screen bund along the western boundary of the extension area, again prior to the commencement of extraction;

(iii) The phased extraction of some 10m tonnes of Pennant Sandstone from the extension area;

(iv) The use of existing processing plant, ancillary plant and infrastructure to process the reserves from the extension area and the remaining reserves at the existing quarry; and

(v) An overall restoration scheme for the existing quarry and extension area designed to facilitate landscape amenity and nature conservation land uses.

Extraction of the reserves from the existing quarry is on-going and would continue throughout initial preparation works required to implement the extension area. These works would include the diversion of the Dwr Cymru/Welsh Water main that currently passes in a north-east to south-west direction through the middle of the extension area. The diversion would route the water main along the outer edge of the northern screening landform, to re-join the existing pipeline alongside Darren Ddu Road.

The preliminary works would then focus on the creation of the northern screening landform and western screen bund. The main screening landform would be tree seeded, with the western bund allowed to naturally re-colonise.

The final preliminary works would involve the construction of some 220 metres of traditional stone walling along the northern boundary, and the erection of an internal galvanised steel palisade fence to ensure the security of the proposed extraction area.

The existing faces and benches would be worked through from the north-western extent of the current working area through Phase 1. Soils and overburden would then be stripped in turn from phases 2 and 3, with the material used for progressive restoration works within worked out non operational areas within the exiting quarry. These phases are shown on Drawings CYH/E7 to E10 inclusive and provide for quarrying to the defined lateral limits of extraction, and to a maximum depth of 100m AOD.

The development would yield a reserve of some 10 million tonnes of sandstone from the extension area, which would be worked in conjunction with the remaining reserves of some 5.7m tonnes within the existing quarry.

Drawings CYH/E12 and CYH/E13 illustrate the proposed restoration concept and quarry bench treatments. The proposed restoration strategy would follow the principles of the approved scheme for the existing quarry, and is intended to enhance the ecological and nature conservation features of the site. As noted above, on-site soils would be used for restoration planting in selected locations to reflect the pattern of existing woodland adjacent to the site, quarry benches and faces would be restored with a variety of treatments; and the quarry floor would be restored using fine grained material and quarry waste.

3.3 Quarry Development Scheme

3.3.1 Introduction

The northwest extension development would progress in three phases, as illustrated on the block phasing plan reference CYH/E3, reproduced in this chapter as Figure 3.1.

The current circumstances at the quarry are illustrated on plan ref CYH/E7, reproduced as Figure 3.3. The anticipated progress of extraction within the respective phases is illustrated on plan reference numbers CHY/E8 – CHYE10, all produced within the PAS, and reproduced at a smaller size at the end of this chapter as figures 3.4 – 3.6.

3.3.2 Preliminary Operations

The infrastructure for the transport of sandstone from the extension area to the processing plant site is already in place via the system of internal haul roads which are in place between the northern edge of the exiting quarry and the plant site. These haul roads would simply be developed into the extension area at the respective quarry bench levels.

No changes are proposed to the existing processing plant, and thus no preparatory works involving plant will be required to initiate operations within the extension area.

Preliminary works within the extension area are illustrated on plan ref CYH/E4, and comprise

a) The provision of a protection layer above the east - west Welsh Water water main in the location of the northern screening landform to allow the screening landform to be constructed, or the diversion of the water main to a defined route prescribed by Welsh Water around the northern side of the extension area;
b) Construction of the core of the northern screening landform using sandstone fines from the exiting quarry;
c) Stripping of soils and overburden from phase 1 and use of the material to (i) establish a soil profile on the northern screening landform; (ii) construct the northern screening landform; and (iii) construct the western screen bund;
d) Erection of dry stone wall along outer edge of eastern section of the northern screening landform; and
e) Erection of palisade fencing on the inner sides of the northern screening landform and western screen bund, linking to existing palisade boundary fencing around the boundary of the current quarry.

3.3.3 Diversion / Protection of Water main

The extension area is crossed by a 150mm ductile iron water main which connects from 200mm ductile iron main which runs north to south along the eastern side of Darren Ddu Road. The east west section of the main will need to be diverted to allow the extension operations to progress, and conventional methods are available to allow such diversion works to be undertaken by Welsh Water.

The current route of the pipeline (measured accurately by survey by Subscan Technology Limited in March 2014) and diversion route (identified by Welsh Water in 2012) are illustrated on plan CYH/E4, reproduced as Figure 3.2.

In order to construct the northern screening landform, it will be necessary to either place a bridging structure over the route of the pipeline, to allow the landform to be constructed above the pipeline, or the pipeline will need to be diverted prior to the construction of the screening landform.

If a bridging arrangement is put in place then this would be a simple concrete structure, circa 1.5 metres wide with foundations constructed parallel to and either side of the pipeline, running for a distance of circa 35 metres.

The alternative is the early diversion of the pipeline to the alignment illustrated on plan CYH/E4 (figure 3.2). This would involve laying a new pipe from a point circa 10 metres from the end of the Conway Close cul de sac, running west south west towards the boundary of the application area, then south west along that boundary to connect to the 200mm water main to the east of Darren Ddu Road. The engineering works associated with the new main would be conventional and straightforward with the excavation of a trench, circa 1 metre deep, to allow the laying of a length of 440 metres of 160mm High Performance Polyethylene Pipe (HPPE) between the existing 200mm main at Darren Ddu Road and the re connection point to the east of Conway Close. The new main would then be pressure tested and commissioned prior to the redundant main being capped-off and abandoned. The trench excavated for the new diverted main would be backfilled using with the originally excavated soils, with the surface restored to grassland.

3.3.4 Northern Screening Landform

The northern screening landform will require some 50,800m^3 to create the profiles illustrated on plan ref CYH/E4. The 'core' of the landform, comprising would be constructed from sandstone fines from the existing quarry (some 30,840m^3), and sub soil / overburden stripped from phase 1 (some 11,90m^3). The top soils from the footprint of the bund would be stripped in advance of construction of the bund (some 4,400m^3), and this material together with a proportion of the top soils stripped from phase 1 (some 3,580m^3), would be used to dress the surface of the bund to provide a profile of 600mm of overburden and 400mm of top soil. (The remaining soils and overburden from the phase 1 strip will be accommodated in the main quarry soil storage area together with the soils to be relocated from the existing soil storage area at the north eastern edge of the existing quarry, as discussed in section 3.3.5 below).

Plan ref CYH/E4 illustrates the profiles of the screening landform in relation to existing contours and the way in which the new landform would be assimilated into the existing topographical profiles. The landform would be a maximum of some 5m above original ground level, but would gently merge into existing ground levels on its eastern side.

The operations associated with the construction of the screening landform would be completed within a maximum period of 8 weeks.

The landform would be seeded with trees during the first planting season following its creation, and appropriately maintained for the duration of quarrying operations at the site. This landform would be retained permanently as part of the restorations scheme, and, if necessary, the tree planting would continue to be maintained as part of the after-care scheme.

3.3.5 Soil/Overburden stripping

Soil and overburden stripping operations would take place in a westerly direction from the current northern boundary of the quarry towards the northern limit of Phase 1 of the extension area. The soils and overburden from phase 1 would be stripped in sequence, releasing some 7,350m^3 of soil (at an average depth of 0.25m), and some 14,700m^3 of overburden (at an average depth of 0.5m).

All operations would be undertaken in accordance with standard good practice for soil stripping, including operations only being undertaken during suitable weather conditions (ref ES Chapter 8.0). In addition, in line with Condition 41 of the 2013 permission, at least 14 days notice of commencement of soil stripping operations will be given the local planning authority, and the operator will afford access at all reasonable times to archaeologists nominated by the local planning authority who shall be allowed to observe the excavations and record any items of interest and finds (ref ES Chapter 13.0).

3.3.6 Western Screening Bund

The western screening bund would run parallel with Darren Ddu Road along the southern boundary of the site. This would be a smaller bund, with a maximum height of 2m above existing ground levels, and formed from some 1,200m^3 of overburden and some 800m^3 of top soil.

This bund would be grass seeded but would otherwise be allowed to regenerate naturally and retained as a permanent feature.

3.3.7 Stone Wall

A new dry stone wall would be constructed along part of the outer edge of the screening landform to link with existing dry stone walls. The wall would run parallel with the outer edge of the northern screening landform and would be some 220m in length.

3.3.8 Palisade fencing

The existing extraction area is enclosed by a 2.4m high palisade fence, and this would be continued along the boundary of the extension area as shown by the brown dashed line on plan ref CYH/E4. The fence would be positioned on the inner, quarry side of the screening landform and western screen bund which would ensure that it is not visible from the majority of external vantage points. The total length of the additional fence would be some 950m, and it would be maintained for the duration of extraction and restoration operations.

3.4 Phased Working Scheme

3.4.1 Introduction

The extraction operations within the north-western extension would tie-in with the operations within the current quarry area and would comprise a straightforward progression of the quarry faces and benched from the existing quarry into the extension area as three broad development phases.

All current operational elements associated with the processing plant, surface water drainage lagoons and ancillary site infrastructure would continue unchanged within the existing processing plant site.

3.4.2 Phase 1

Operations in Phase 1 (plan ref CYH/E8, reproduced as **figure 3.3**) would develop the existing quarry faces and benches north westwards into the extension area. This would involve the development of the 154m AOD, 168m AOD and 184m AOD benches from the existing quarry into the defined phase 1 area. Cross sections through Phase 1 are shown on plan ref CYH/E11: Cross Section - Quarry Phases: Sections B-B’, C-C’ and D-D’.

3.4.3 Phase 2

The soils and overburden within Phase 2 (some 18,300m^3) would be stripped within the final year of extraction operations in Phase 1. These materials would be used for the progressive restoration of benches and faces elsewhere within the quarry, primarily those on the southern and eastern areas where extraction will have been completed.

Plan ref CYH/E9 (reproduced as **figure 3.4**) illustrates the continued development of the quarry faces and benches in a north westerly direction with the creation of the bench levels at 128m AOD, 139m AOD, 164m AOD, 161m AOD and 176m AOD. The lower bench levels in the west reflect the reducing original ground levels as the development works towards the western site boundary. The cross sections associated with Phase 2 are also illustrated by sections B-B’, C-C’ and D-D’ on Drawing CYH/E11.

3.4.4 Phase 3

The final phase would extend the quarry north westwards towards Darren Ddu Road. The stripped soils and overburden (some 8,400m3) would be used in the further progressive restoration of existing benches and faces within the site.

This phase will involve the excavation of the final benches to 100m AOD, with faces of between 11m and 15m high to the surrounding ground levels.

The cross sections through the completed quarry landform are illustrated on Drawing CYH/E11.

Upon completion of this final phase, a period of a further two years will be required to clear all remaining sandstone stocks, decommission all plant and remove it from the site. The implementation of the restoration scheme is described and illustrated within Chapter 4.0 below.

3.5 Hours of Working

It is proposed that operations will be undertaken in accordance with the hours of working set out in the Environment Act Review schedule of conditions (ref permission ref 08/1380/10, April 2013) summarised below:

Operations	Monday to Friday	Saturday	Sunday/Public Holidays
Quarrying Operations (except in emergencies)	07:00 to 19:00 hrs	07:00 to 16:00 hrs	No working
Blasting	10:00 to 16:00 hrs	No blasting	No blasting
Drilling (above 180m AOD)	10:00 to 16:00 hrs	No drilling	No drilling
Drilling (below 180m AOD)	07:00 to 18:00 hrs	No drilling	No drilling
Soil stripping or bund creation/removal	08:00 to 17:00 hrs	08:00 to 13:00 hrs	No operations
Other than vehicles associated with manufacture of coated road stone, production of ready mix concrete or servicing etc of plant, no vehicles to enter/leave quarry except between hours:	07:00 to 19:00 hrs	07:00 to 16:00 hrs	No vehicle movements other than as specified opposite.

3.6 Processing Plant

The proposed extension scheme does not propose any variation to the current processing arrangements. The stone quarried from the current working area and extension site would continue to be transported to the processing plant by dump trucks from where it is discharged into a primary crusher feed hopper located at the northern end of the plant site, at a level of 135m AOD. The primary crusher reduces the stone in size, from where it is fed by enclosed conveyor to a secondary crusher and series of screens, which produce a range of single sized aggregate. The processed stone is moved by enclosed conveyors to a series of hoppers for loading out to road going vehicles, or to product stock piles within the plant site.

In addition to the quarry processing plant, the plant site quarry has also historically provided aggregate for an asphalt plant. The most recent asphalt plant was decommissioned and removed from site in 2009 and at present the quarry supplies dry aggregate which is transported, in part, to asphalt plants elsewhere in Wales and England. However, in 2014 approval was granted for the erection of a replacement asphalt plant which is currently being erected. It is anticipated that the plant will be commissioned during 2015. An Environmental Permit for the plant has also been obtained from RCT, which will regulate emissions from the plant (as discussed in ES Chapter 12.0).

A ready mixed concrete batching plant was decommissioned and removed from the plant site in 2014.

3.7 Output and Traffic Routing

There are no restrictions imposed on the existing planning permission relating to the rate of output from the quarry, or on the number of vehicles entering or leaving the site.

Almost all HGV's are routed southwards along the B4273 to Pontypridd, where the majority turn left at the traffic lights with the A473 to travel the short distance to the A470 grade separated interchange. Vehicles then either travel northbound or southbound on the A470 to their market destinations. There are no alternatives to this routing pattern since, with the exception of very occasional local deliveries, there are no markets northbound along the B4273. There are also width and height restrictions on the "Grovers Road" to Abercynon.

Recent and historic output has averaged some 400,000 tonnes per annum and this established rate and pattern of movement is not anticipated to change as a result of the extension development. Based upon a 275 day working year, and average vehicle carrying capacities of 20 tonnes, this generates an average of 70 deliveries per day.

3.8 Water Management

The current water management system at Craig yr Hesg Quarry comprises:

- The drainage system for the northern side of the quarry comprising main haul road and processing plant area / office complex area ;
- The water management system associated with the main excavation and dust stockpile area.

Processing / office complex

Surface water from this area is dealt with via an existing system of settlement lagoons and an off-site discharge regulated by NRW by a consent issued in 2013 (Consent Number AF4029101).

Main excavation and waste tip

Seepage from perched groundwater and rainfall / runoff into the main excavation makes its way to the quarry floor, via drainage channels and flows along haul roads. Runoff from the adjacent dust stockpile area is collected in a drainage channel at the base of the tip and gravity fed to the base of the quarry at approximately 107 m AOD. The water collected at the lower floor level freely seeps into the Pennant Sandstone and migrates downwards to the underlying regional water table.

Proposed Development

The proposed development will be a continuation of the existing programme of working the quarry benches and faces in a north-westerly direction to the limit of the current excavation footprint and then beyond into the extension area. The base level of the quarry will not extend below a floor level of 100 m AOD, although the extent of the void area at this level will be significantly enlarged.

The assessment of potential inflow in to the enlarged excavation undertaken as part of the EIA (ref ES Chapter 9.0) concludes that groundwater flow into the quarry is, and will continue to be, minimal, and related to perched water tables within the Pennant Measures. Water derived from rainfall and perched sources will thus continue to be accommodated at the base of the quarry void from where it will seep into the underlying strata and water table.

The soakage capacity of the main excavation will need to be maintained to ensure efficient operation of the quarry, and the hydro study (ES Chapter 9.0 and accompanying surface water and drainage assessment (ref ES Appendix 9.3) recommends the retention of the existing soakage area and the encouragement of the continued efficiency of the soak-away by installing a drainage blanket (which has already been done).

Following the cessation of operations, management of surface water run-off within the quarry would cease. It is anticipated that the quarry void will not flood but that inflow will continue to freely seep into the Pennant Sandstone and migrate to the underlying regional water table.

3.9 Alternatives

The Town and Country Planning (Environment Impact Assessment) Regulations 2011 indicate that where alternatives to a proposed development have been considered, then these should be outlined in an ES (reference Schedule 4, Part 1 (2) and Part 2 (4). This has been interpreted as meaning that if actual alternatives have not been considered by the promoters of a development then there is no necessity to address such issues within an ES.

As an analogy, in Scotland the advice is more explicit in confirming that "the *Regulations do not require the Applicant to 'invent' alternatives when none have been considered"* (reference Planning Advice Note 58, Paragraph 71).

In this instance, the Applicants have not explored the merits of alternative sources of sandstone, since this has been an exercise carried out by RCT as part of the preparation of their Local Development Plan LDP (ref PAS Chapter 8.0).

The consideration of alternatives has thus not sought to review other alternative sources of sandstone, but instead, the focus has been on alternative development and mitigation schemes based upon the 'preferred area' for quarrying identified in the LDP. This exercise has in turn focused on the minimum distances between the limits of quarrying and the nearest sensitive properties, and the measures which should be included within the development scheme to ensure that the amenities of the occupiers of those properties are properly safeguarded within the limits of conventional environmental criteria. The proposed scheme has been formulated accordingly as part of an iterative design process and has been tested in particular against noise, blast vibration and air quality criteria defined as part of the EIA and reported in Chapters 10.0, 11.0 and 12.0 of the ES.

Detailed consideration has also been given to the way in which the extension area could be physically separated from, and screened from, nearby receptors, with again an iterative process of designs for screen bunds, culminating in the proposal for a more substantive permanent screening landform (rather than a temporary engineered bund) which would integrate into the adjoining landform and thereby be retained as a permanent feature. The landscape treatment of the screening landform has also been reviewed against a number of options from simple grass seeding to tree planting, with the chosen option of tree seeding / natural re-colonisation deemed to offer the best solution in terms of creating a landscape feature which maximises its biodiversity potential.

Within the extension site which has been defined, there are no real alternatives in terms of direction of working since this is governed by the configuration of the faces and benches in the adjoining existing quarry. However the boundaries of the three phases have been defined to minimise the visual impact of the quarry on views from the west. Thus, Phase 1 would be confined to the 'plateau' area, maintaining a landform screen along the western boundary, beyond which the land falls towards Darren Ddu Road. This would be continued as Phase 2 which would also occupy higher ground in the northern area of the phase. By the time extraction takes place in the western area of Phase 2 and within Phase 3, it is anticipated that a substantial woodland screen would have established along the western boundary of the site as natural re-colonisation, supplemented by the 2m high screen bund.

The restoration strategy is largely governed by the approved restoration scheme for the existing quarry, and given the acceptability of that scheme it has been considered logical to embrace the principles of the scheme and introduce the same restoration treatments into the extension area. No alternatives have thus been considered in terms of restoration, and the scheme which has emerged is considered to represent the most appropriate design solution, which is consistent with the approved scheme for the existing quarry.

These matters are reflected in the content of the proposed development scheme which forms the basis for this ES and the inbuilt mitigation measures which are embedded within the extraction and restoration scheme, which are referred to in the respective assessment chapters.

Figure 3-1 Current Situation

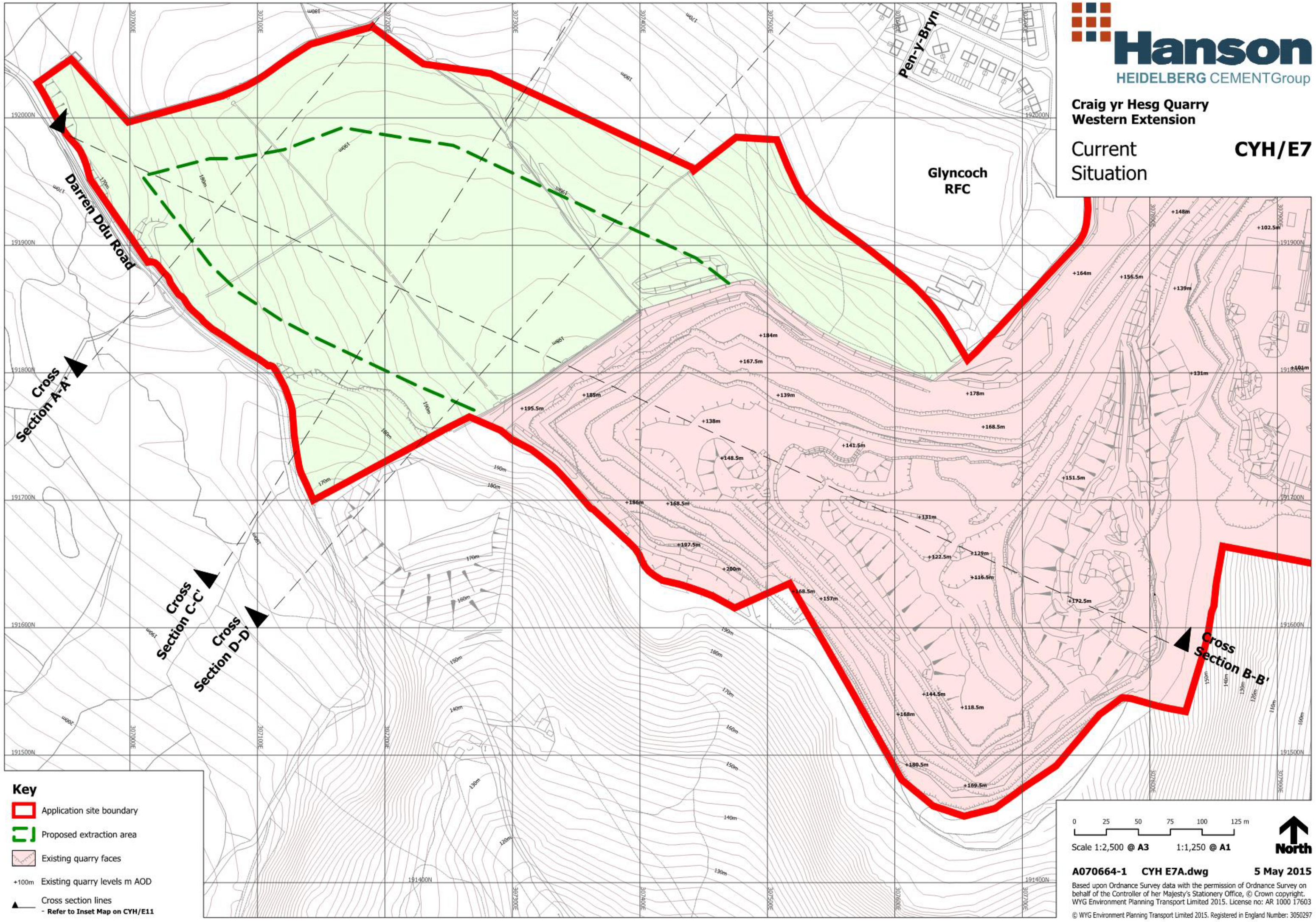


Figure 3-2 Initial Works

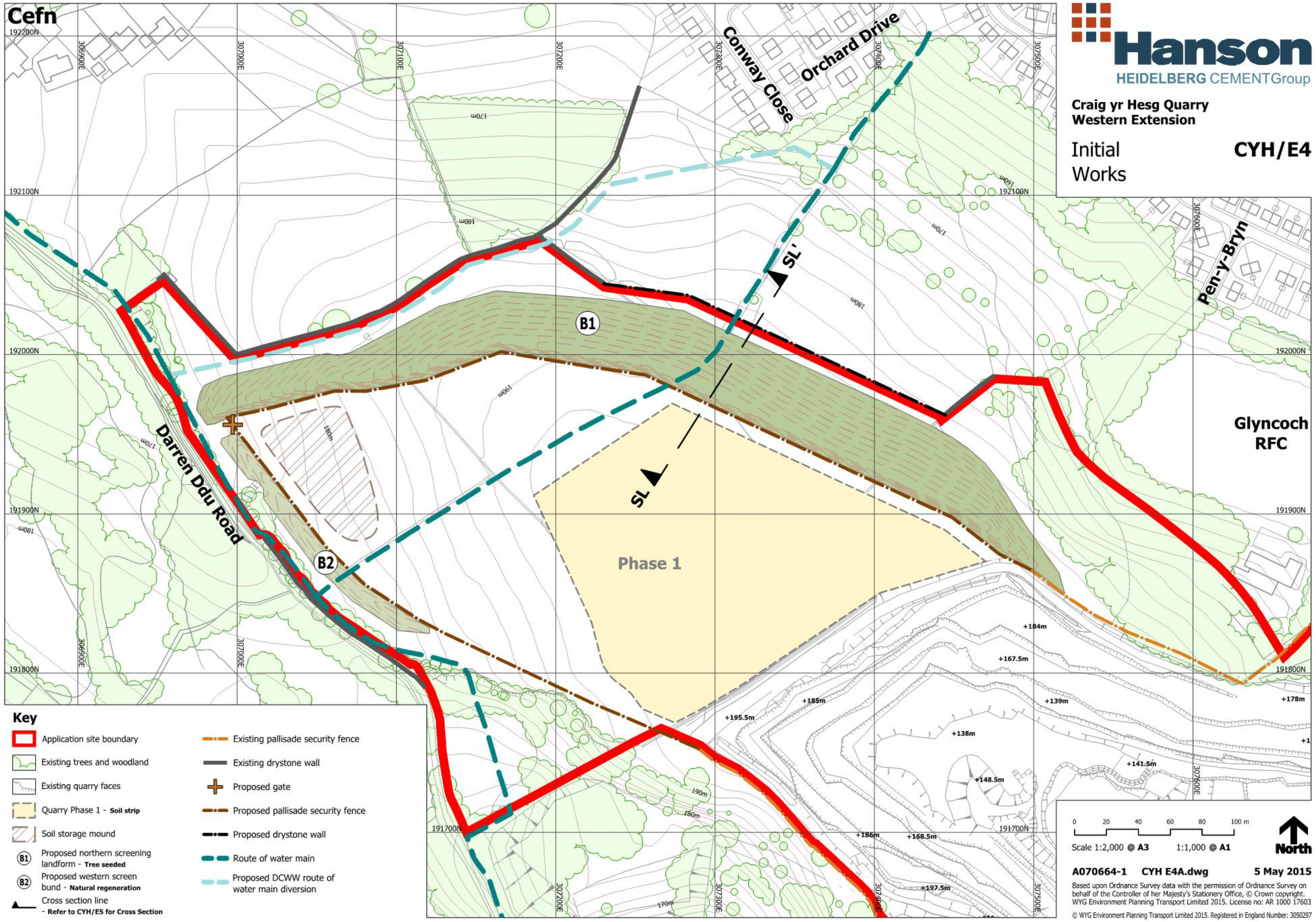


Figure 3-3 Phase 1 and Screening Landform

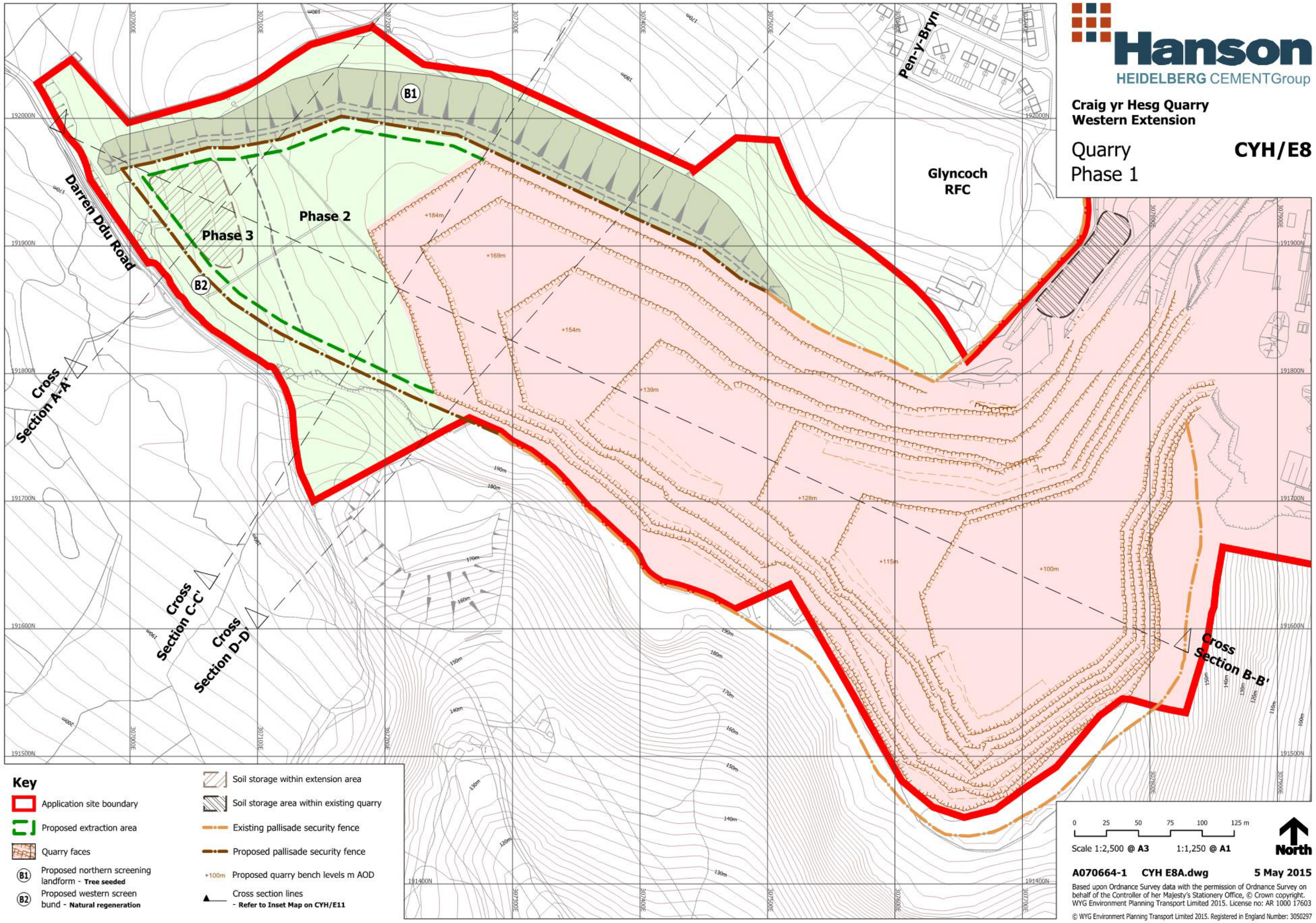


Figure 3-4 Phase 2

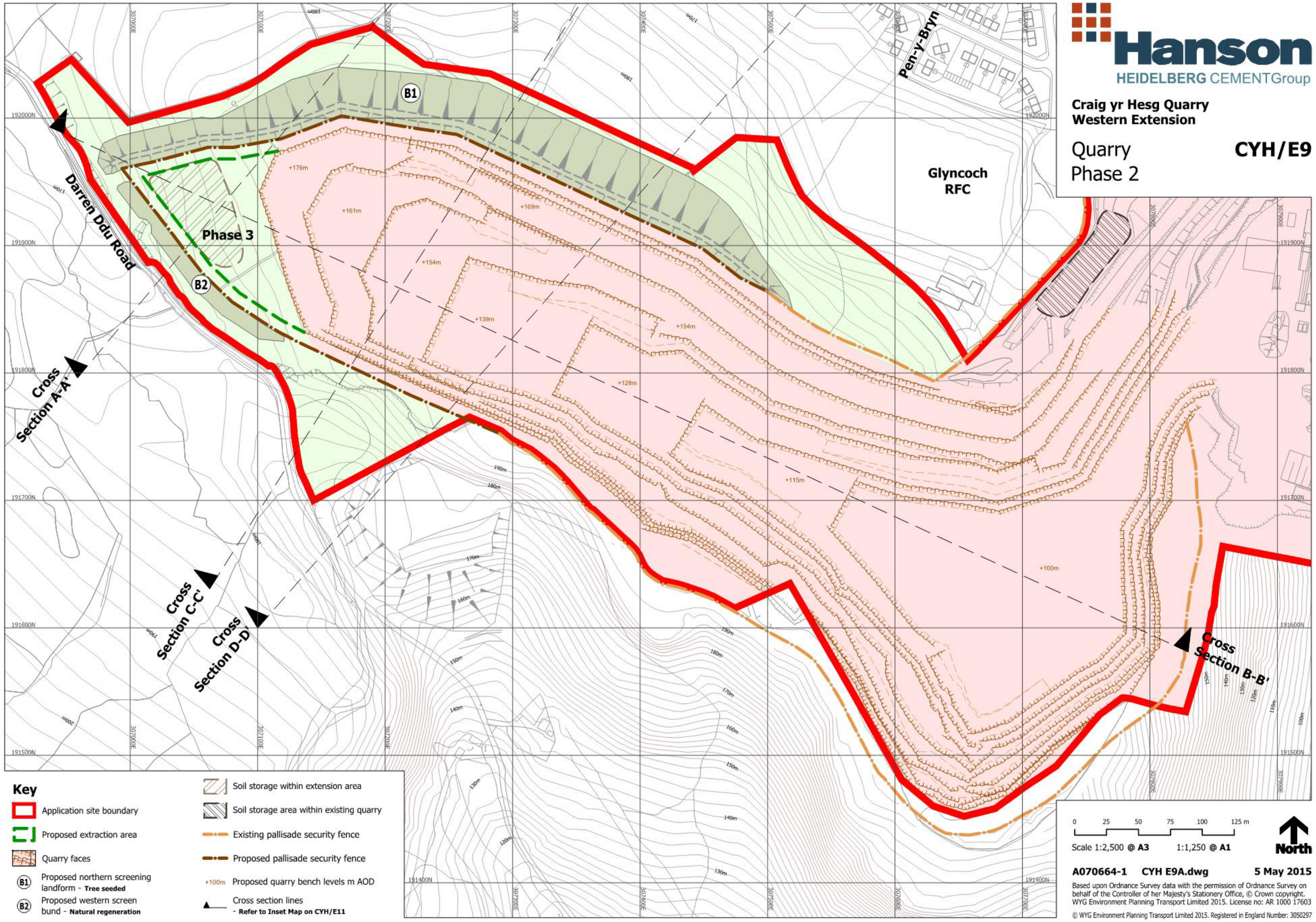
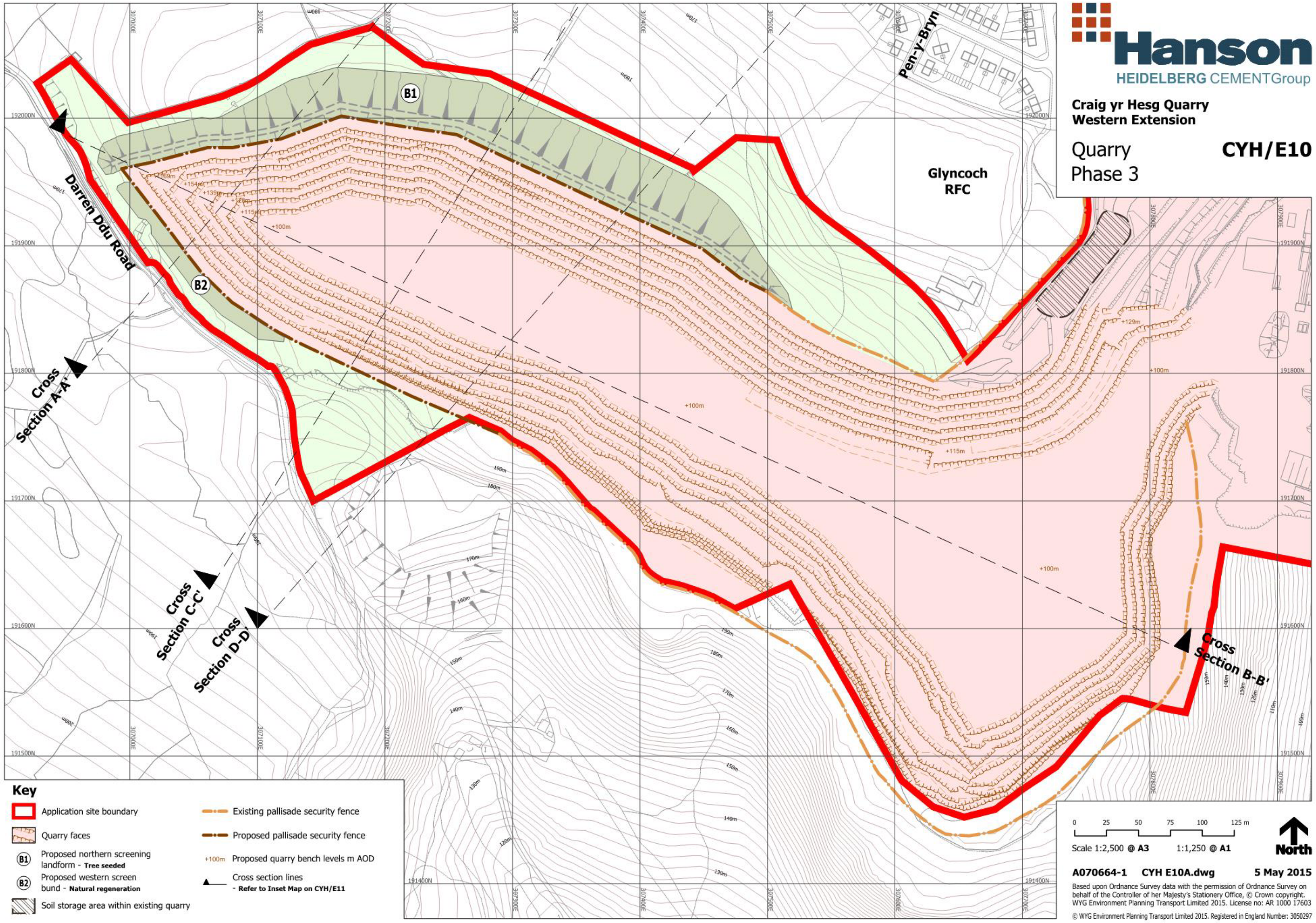


Figure 3-5 Phase 3



4.0 RESTORATION STRATEGY

4.1 Introduction

The restoration concept plan has been prepared to guide the long term restoration of the quarry, and to assist in establishing restoration principles and restoration treatments. The finer details of the restoration works are likely to evolve as the quarry develops, and would be subject to amendment depending on the physical nature of the quarry benches, faces and slopes created. The strategy is therefore based upon a number of treatments or the retention of key features which would be used to create a diverse mix of habitats, as defined in Minerals Technical Advice Note 1: Aggregates (MTAN1).

The strategy has also reflected advice in MTAN1 regarding the duration of developments, with the suggestion that for sites likely to work for a long duration, an initial restoration scheme should be submitted for approval at the outset, with regular review of the restoration scheme during site operations (ref para 97). The point is re-iterated in para 119 of MTAN1 which recognises that for longer term workings, early agreement on the details of at least the later stages of reclamation may not be appropriate, but that a general outline of the final landform and intended after use should be provided.

MTAN 1 also recognises that there is an increasing emphasis on the need to improve biodiversity, and where restoration to agriculture is not possible, as in this case, there are real opportunities for nature conservation (para 134). It further notes that one of the options may well be to encourage restoration by natural regeneration over parts of the site, so that a mosaic of habitats is established naturally (ref para 135). These overarching principles have been reflected in the design of the restoration strategy.

4.2 Restoration design principles and objectives

The broad principles of the restoration strategy are illustrated on **Figure 4-1,** which reproduces plan ref CYH/E12 at a smaller scale, and incorporate three main elements, namely:

(a) on-site soils would be used for restoration planting in selected locations to reflect the pattern of existing woodland adjacent to the site;

(b) quarry benches and faces would be progressively restored during quarry phases, where consistent with operational requirements, with a variety of treatments to enhance the ecological and landscape value of the site; and

(c) the quarry floor would be restored using fine granular material / quarry waste, and soils stripped from the extension area. .

In view of the recognised ecological potential of restored mineral workings, the main objectives of the restoration proposals are focused on landscape amenity and nature conservation. This is consistent with Mineral Planning Policy Wales and paragraphs 134-135 and 137 of MTAN1, as discussed above natural regeneration is proposed wherever practicable within the restoration strategy for the site, an approach encouraged by Rhondda Cynon Taf Council during pre-application discussions. Proposals for planting are also included to supplement or assist the process of natural regeneration and give greater habitat diversity to the restoration strategy.

The restoration strategy is also consistent with the approved restoration strategy for the existing Craig yr Hesg Quarry. It reflects nature conservation after use objectives, and the scheme accompanying the extension / consolidation application is based upon applying the same restoration treatments and principles within both the existing quarry and extension area as part of a comprehensive and consistent approach to restoration of the overall site area.

4.3 Restoration Details

The restoration strategy has been based on the anticipated final form of the quarry upon completion of quarrying. Detailed specifications and proposals for the treatment of individual quarry faces and benches will be produced during the development of the quarry when the respective faces and benches are formed and available for restoration in the latter stages of the overall development.

Detailed proposals for the individual faces and benches would therefore be determined at a later stage, when the structure of the rock exposures become evident, but those finer details would be based upon the overall restoration strategy which has been prepared, and the 'treatments' set out below. This approach is consistent with the advice set out in MTAN1 para 120.

Following the use of overburden and soils from phase 1 to construct the northern screening landform and western screen bund, the scheme will yield:

- Approximately 11,800 m3 of top soil from the phases 2 and 3 strips, and a residual volume of some 2,900m3 from phase 1;
- Approximately 8,100m3 of overburden from the phases 2 and 3 strip and a residual volume of some 1,500m3 from phase 1; and
- Approximately 8,200m3 of soils from the existing stockpile located at the north eastern corner of the existing quarry (which will be relocated to the main quarry storae area).

This material would be used partly for restoration of the quarry faces and benches via restoration treatment 2 and 4 discussed below, and for the restoration of the quarry floor. A detailed audit of available restoration material would be undertaken at a later stage of the quarry development programme, when precise volumes are known and decisions can then be made as to the most appropriate an sustainable use of that material for restoration.

4.3.1 Quarry Faces: Restoration Treatments

Opportunities are likely to be available to retain attractive rock outcrops as crags, and to retain naturally occurring crevices and pockets where different types of vegetation will collonise. Quarry faces would generally be left to regenerate naturally, the potential extent of which are shown as QF on Figure 4-1 (application plan ref **CYH/E15)**. Set within existing and proposed woodland, the retained faces would appear similar to natural outcrops occurring within woodland along the steep valley side slopes of the Taf, for example, within Coed Craig yr Hesg to the south of the site.

Localised small scree slopes and pockets of loose rock would create different conditions with a variable and uneven surface texture creating suitable ground conditions to facilitate ecological succession, encouraging natural regeneration of a diverse range of species, as described in MTAN1, paragraph 135. The resulting variety of vegetation types would avoid uniformity of restoration treatment, increasing biodiversity, geodiversity and landscape interest.

4.3.2 Quarry Benches: Restoration Treatments

Restoration work would commence on benches as soon as possible after they have been worked to their final position, and are no longer required for access purposes. The quarry benches would predominantly be restored through natural regeneration, see MTAN1, paragraph 135. Habitat diversity would result from the variety of conditions created by the bench treatments during restoration.

Quarry benches would be restored using a combination of the following treatments, depending on the specific requirements of the area to be restored. In all cases a geotechnical rock trap profile will be established along the edge of the bench to catch rock fall from the quarry faces. This rocktrap comprises a 1.5m high bund at the front edge of the bench with a trough behind it where the restoration treatments defined below will be applied. The selection of the most appropriate treatment is based on landscape, visual and ecological considerations. Through the use of different treatments the development of a variety of plant communities would occur. Coarse rock and fine granular material remaining from quarrying would either be retained on the benches as a substrate, or form the basis of one of the alternative treatments set out below. This would provide a variable and uneven surface texture creating suitable ground condition to facilitate ecological succession.

All bench treatments would also incorporate placed material for rock trap profiles for geotechnical and health and safety reasons where access is available and it is safe to do so.

Quarry Bench Treatment 1 (T1 on Figure 4.1)

In a number of areas around the site the benches would be left as bare rock with the rock trap bund and any existing remaining loose material, with no further treatment, allowing vegetation to re-colonise naturally. Areas proposed for this treatment are those which are less visible due to the likely timescale over which re-vegetation would take to occur. Existing quarry benches in the southern part of the existing quarry, where further access is not possible, are suited to this approach.

Low fertility and poor growing conditions would result in gradual colonisation through natural ecological succession. This typically promotes the growth of less common species, which often appear following re-colonisation by more common pioneer species. These faces are generally north facing and are already regenerating and would be suitable for colonisation of mosses, ferns, bryophytes and lichens.

Quarry Bench Treatment 2 (T2 on Figure 4.1)

In a number of areas around the site the bench surface behind the rock trap bund would be covered with a layer of granular material and fines taken from the quarry waste stockpile. There would be no further treatment of this material once deposited, allowing vegetation to re-colonise naturally. The material with be deposited with a minimum depth of 150mm, including undulations in the surface. These would form hummocks and hollows, leading to more diverse growing conditions than would otherwise be the case. Particular care would be taken during the spreading of fine grain sized material to avoid trafficking as this would lead to compaction, slowing down the process of natural colonisation by shrub and tree species.

Bench treatment 2 is also proposed in less visible parts of the quarry due to the likely timescale over which re-vegetation would take to occur. Similar to bench treatment 1, the use of quarry waste on benches would create low fertility and poor growing conditions. It would result in gradual colonisation through natural ecological succession. This typically promotes the growth of less common species, which often appear following re-colonisation by more common pioneer species.

Quarry Bench Treatment 3 (T3 on Figure 4.1)

The benches in the northern-most part of the quarry have reached their final position and are beginning to weather. Part weathered rock and loose material in this part of the site would form the substrate for soiling. Quarry waste and subsoil available on site would be spread over the surface of the benches to variable depths up to 500mm. Particular care would be taken during the spreading of the growing medium to avoid trafficking as this would lead to compaction, slowing down the process of natural colonisation by shrub and tree species. The benches would then be left to re-vegetate naturally.

Quarry Bench Treatment 4 and northern screen landform (T4 on Figure 4.1)

Bench treatment 4 would be of particular value in visually prominent locations where more rapid re-vegetation would be beneficial. It is also important for providing a substrate suitable for more demanding species that are required to link and buffer the existing semi-natural woodland blocks. The bench would be prepared with quarry fines spread over the surfacebehind the rock trap bund to a depth of 250mm. This material would facilitate the drainage of the subsoil and topsoil, which would be taken from the on-site stockpiles and spread to a depth of up to 500mm. Undulations in the surface of the soil would create hummocks and hollows, leading to diverse growing conditions. Particular care would be taken during the spreading of the soils to avoid trafficking as this would lead to compaction, limiting the establishment of planting.

The soiling of the benches would achieve relatively low-nutrient levels, suitable for establishing native shrub and tree planting, and for natural colonisation whilst being less attractive to broadleaved weed species. A proportion of the area shown would be planted leaving other areas to infill with natural regeneration. Planting would be undertaken in selected locations where the long term approach of natural colonisation may not be suitable. There is limited space available for machine access to rip these areas prior to planting, therefore the material will be loose placed by excavator and any large stones removed during this process. There will be no other cultivation.

Quarry Floor

On completion of quarrying the processing plant, offices, and ancillary buildings would be removed. The area would be re-profiled to smooth flowing contours of a suitable gradient using quarry fines and soils available from the soil stockpile. Similarly, the quarry floor within the quarry void would also be graded to smooth flowing contours using quarry fines and soils. The proposed landform is illustrated on figure 4.1. Having a consistent fall across the quarry floor will aid site drainage however some undulations and depressions would be retained and enhanced to provide seasonal pools and wetland areas.

Given that the quarry floor is not visible from publically accessible locations, a long term approach can be taken to its restoration. The long term aim of the restoration strategy would be to establish species rich grassland across the quarry floor in the long term. A rye grass species mix may be necessary in the short-term to ensure surface stability and erosion prevention.

As noted in section 4.3 above, preliminary estimates have been made as to the likely available soil and overburden resources which will be available for restoration. The precise volumes will be the subject of an audit following the completion of the phase soil stripping operations. A decision will then be made as to the most appropriate use for that material, balancing the use for restoration bench treatments 2 and 4 with the need to retain a proportion of the material for the restoration of the quarry floor. Remaining soils available on site and potentially an imported source of organic matter would be mixed into the surface of the graded quarry fines across the quarry floor. A rye grass nurse mix will subsequently be seeded to create a sward that would stabilise the surface to prevent erosion and gullying. Following the initial stabilisation of the surface, the rye grass will decline due to the progressive reduction in the nutrient content of the growing medium. Natural colonisation will then occur and species diversity would increase during subsequent years as the fertility of the growing medium declines. If the establishment of species rich grassland is not effective then sowing a locally sourced grass seed mix or using green hay would be considered.

Northern screening landform and western screen bund

The screening landform to the north established within the Initial Works shown on Drawing **CYH/E5** would be retained following tree seeding, which would continue to establish over time. It would form a woodland block which will provide a visual and ecological connection with the woodland block to the north of Cefn Primary School and the established woodland along the Daren Ddu Road, as well as the woodland south of the rugby ground. The proposed western screen bund would be retained along with the natural regeneration which it is anticipated would have occurred on this bund and adjoining land.

Stone walls

The proposed stone wall established within the Initial Works on Drawing **CYH/E5** would be retained as a landscape feature, restoring the field pattern of the area. Suitable walling stone will be salvaged from the demolition of the existing field boundary walls within the quarry extension site. This stone will be used to construct the proposed field boundary walling in a style consistent with tradition agricultural field boundary walls in the locality. The proposed stone wall will link retained sections of existing walling to form a consistent north-eastern boundary to the extension site, as viewed from the retained fields to the southwest of Glyn Coch.

4.4 Planting proposals

Planting would be undertaken along selected sections of the quarry benches as described above, and shown on the quarry restoration plan, figure 4.1.

All planting would be of native species, specified in accordance with the HTA National Plant Specification: 1997. In order to ensure that all planting is compatible with the local gene pool of the area, all woody plant species would be of local Forestry Commission provenance zone 303 as outlined in Forest Practice Note No. 8, entitled 'Using Local Seed Sources for Planting Native Trees and Shrubs', produced by the Forestry Commission (1999).

In order to provide feeding opportunities for birds outside of the breeding season, planting would incorporate berry and seed-bearing tree and shrub species, for example, Hawthorn, Blackthorn and Common Alder. Other suitable species that occur in abundance locally, for example Elder and Bramble would naturally colonise the planting. Management would be undertaken where necessary to prevent over dominance of the plant mix by self seeded plant species. Rabbit activity in the area would be reviewed before the use of rabbit guards is confirmed. If fitted, guards would be checked annually and replaced when necessary as part of the maintenance of the planting areas.

Soil amelioration is not proposed within areas to be planted. Tree establishment would involve traditional methods of planting using forestry transplants and root trainers. Planting would be undertaken between mid-October and April and individual plants would be at 2.0m centres in single species blocks of 3-5 no. per group. Plants would be notch planted and include the following suitable native species, reflecting the species composition of existing woodland and hedgerows in the area:

- Betula pendula (silver birch) 10%
- Betula pubescens (downy birch) 5%
- Corylus avellana (hazel) 20%
- Crataegus monogyna (hawthorn) 20%
- Fraxinus excelsior (ash) 15%*
- Ilex aquifolium (holly) 5%
- Prunus spinosa (blackthorn) 5%
- Quercus petraea (oak) 20%

* Planting of ash will be reviewed prior to implementation and, if ash is not appropriate, the remaining species will be planted in greater proportions to compensate for the removal of ash.

Other species occur locally in hedgerows, for example Elm and Bramble. These species are not included in the plant list above but they would self seed and become a part of the species mix over time, helping to maintain the local provenance of the establishing vegetation.

4.5 Direct Tree Seeding

Direct tree seeding would be undertaken along northern screening landform, as shown on the quarry restoration plan, figure CYH/E12. The method of seeding would be consistent with the publication ‘Creating new broadleaved woodland by direct seeding, Forestry Commission Practice Guide, 2004’. This document provides guidance on a suitable sowing rate and species composition.

A key advantage of direct trees seeding in this location is that ‘canopy closure’ typically occurs 3–5 years after sowing, compared with 10 or more years for traditional transplanting at a wider spacing. This approach is also less likely to result in vandalism because it is a less visually apparent way of establishing woodland. The species mix for the tree seeding will be the same as the planting mix identified above and all seed will be subject to stratification to ensure even germination between species.

Sowing will occur during the autumn months into the cultivated soil of the northern screen landform at a rate of 200 000 viable seeds per hectare. A birch dominant seed mix or as a single species would be appropriate to establish tree cover, although selected areas with Oak would be beneficial in the longer term. Selected areas of understorey shrubs including hazel and field maple would also add to the diversity of the resulting woodland, although it is accepted that such species would establish naturally over time.

All direct seeding would use native species of pre-treated seed. In order to ensure compatibility with the local gene pool of the area, all seed would be of local Forestry Commission provenance zone 303 as outlined in Forest Practice Note No. 8, entitled 'Using Local Seed Sources for Planting Native Trees and Shrubs', produced by the Forestry Commission (1999).

Management would be undertaken where necessary to prevent over dominance of the plant mix by self seeded plant species. Weed control would also be necessary, particularly in the first two years. Herbicide treatment as part of site preparation and a pre-emergence treatment in the form of regular circles of stripes will help to remove competition to the establishing seedlings from undesirable weed species.

4.6 Fencing

All planting areas are located away from existing grazing by livestock, along quarry benches. Any potential livestock grazing would only occur on the quarry floor. Whether or not livestock fencing is required would depend on the future potential of the habitats created to support light grazing. The need for fencing would be reviewed if grazing is proposed. If fencing is provided it would be stock-proof fencing to BS1722 Part 2 Table 2 (C8/80/15W). Stiles and gates would be located within fence lines to allow for maintenance access.

4.7 Aftercare proposals

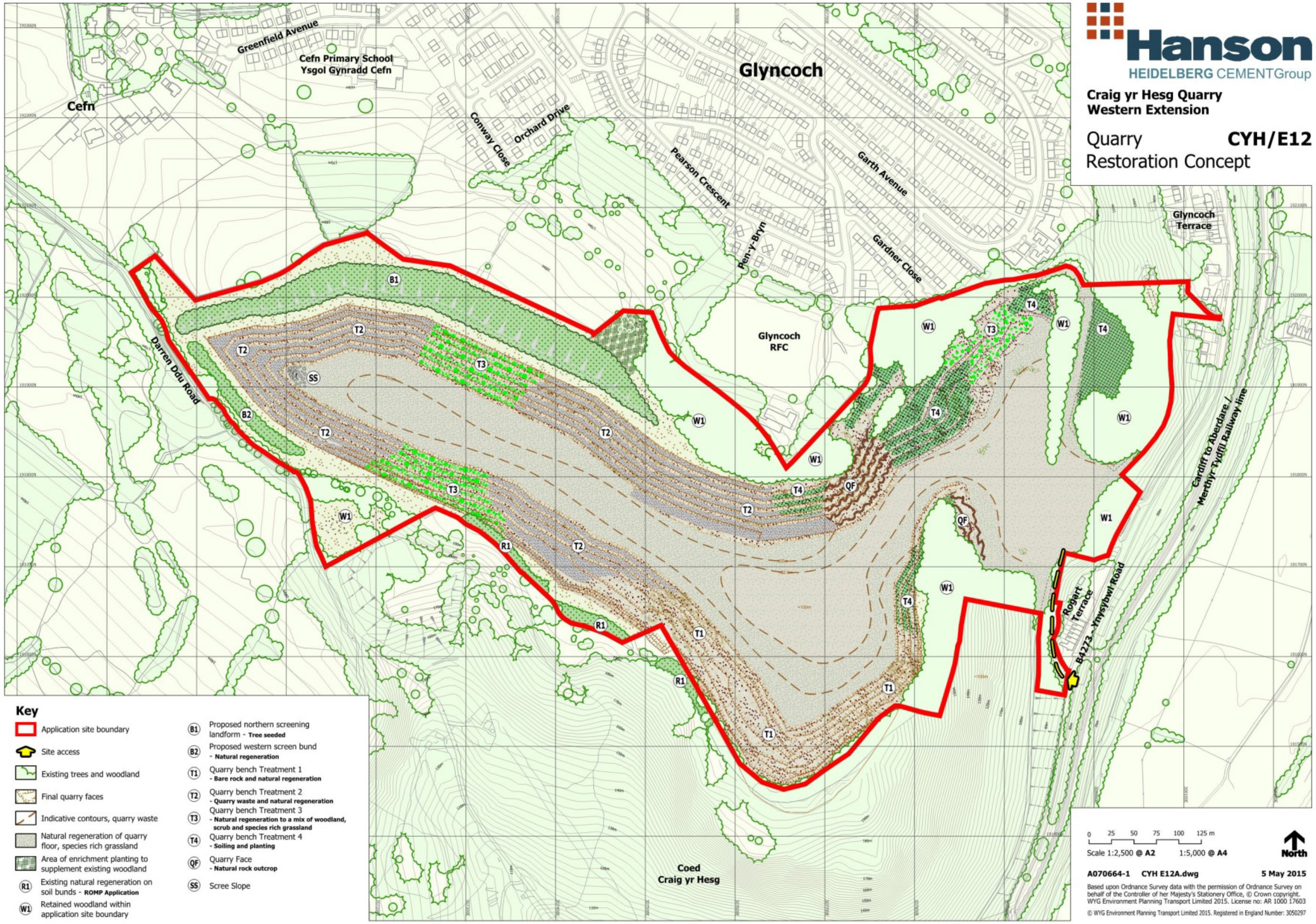
Details of the proposed aftercare management works are set out in Section 7.5 of the PlanningApplication Statament.

4.8 Coordination, monitoring and management

It is anticipated that the timing and location of restoration works would to a certain extent be flexible. All restoration work would be governed by detailed specifications, which would detail the locations selected for each restoration treatment. The ROMP Review schedule of conditions imposes an obligation to submit a scheme for the interim restoration of benches located outside of the active quarry area. The submitted scheme provides the required details, but also proposes a rolling programme of interim restoration works which will be updated during the life of the development (ref condition 43 of 08/1380/10). This again acts as an appropriate model for the implementation of a programme of ongoing restoration works during the life of the development.

Management of the areas would be important to the development of the ecological potential of the site. This would include a management plan setting out the objectives for the different habitat types, and guidance for the treatment of the vegetation to ensure desirable species are encouraged and undesirable species are prevented from becoming established.

Figure 4-1 Restoration Strategy



5.0 ENVIRONMENTAL IMPACT ASSESSMENT

5.1 Introduction

The potential environmental effects of the proposed western extension to Craig yr Hesg Quarry has been informed by (i) the formal scoping opinion issued by RCT Council; (ii) the EIA studies which have been undertaken; (ii) the Applicants' experience of environmental and amenity issues associated with the operations at the existing Craig yr Hesg Quarry (iii) informal discussions with RCT Council; and (iv) by feedback from a public exhibition of the proposals held on 31st March 2015, and reported in the PAS.

The result has been a comprehensive study which has addressed each of the individual topics, and, where relevant, the inter-relationship between topics and the potential for indirect effects.

5.2 Methodology

Each technical chapter sets out the methodology adopted in the assessment, to include, where appropriate:

- Desk based data collection, site survey, etc
- Guidance to be adopted [*GLVIA, BS4142 etc*];
- Sources of information;
- Scoping and a cross reference to the Scoping Opinion;
- Relevant Planning Policy or Strategy referred to;
- How "*significance*" is defined;
- The 'characteristics' of the impacts;
- The 'sensitivity' of receptors;
- The 'nature' of the effects (e.g. direct/indirect, temporary (reversible) / permanent (irreversible). Further definitions are provided in the ES Glossary.
- How timescales (short, medium, long term) are defined in the assessment;
- Any interaction with other topics; and
- Any technical difficulties associated with the assessments.

5.3 Assessment Structure

There are differences of approach in undertaking the respective assessments, which for certain topics are prescribed in detail by external guidance, but where others follow less prescriptive approaches.

The Chapters do however follow a generally common approach with, where appropriate, sections which deal with:

- **Baseline conditions**;
- **Key Receptors**;
- **Summary of development,** highlighting those issues of relevance to the technical topic;
- **Design Mitigation,** highlighting the 'built-in' or 'designed-in' mitigation measures;
- **Assessment,** relevant to the technical chapter and following specific technical guidance, but with a description of the sensitivity of receptors, character of impact, and significance;
- **Mitigation measures,** which are identified as a means of addressing identified impacts;

- **Residual impacts,** after taking into account built in and additional mitigation measures;
- **Summary of effects**
- **Recommendations,** which can be translated into planning conditions; and
- **Conclusions.**
- **Glossary**: the ES includes a central glossary covering all topics.

5.4 EIA and ES

A key focus of the EIA has accordingly been to assess the comprehensive nature of the development proposal and where relevant the inter-relationships between the main elements. The studies have sought to provide a sound level of understanding of the environmental effects, upon which reasoned assessments can be made regarding potential direct and indirect effects, and the mitigation measures which might be available to address any residual uncertainties regarding effects.

In undertaking the EIA and preparing the ES, it has been recognised that there is no statutory provision as to the form of the ES, but it must contain the information specified in Part II of Schedule 4 of the EIA Regulations 1999, and such of the relevant information in Part 1 of Schedule 4 as is reasonably required to assess the effects of a project. The ES may consist of one or more documents, but it must constitute a 'single and accessible compilation of the relevant information' (ref Berkeley v SSETR, 2000). The ES has been prepared to ensure compliance with these requirements, with Volume 1 (this document) intended to be read as a single document, with cross references to technical appendices and data (ES Volume 2).

Whilst only applicable in England, it is also useful to note the recent advise set out in the Planning Practice Guidance (March 2014), to the National Planning Policy Framework (NPPF) (March 2012) which provides further advice on the information to be included within an ES. It notes that whilst every ES should provide a full factual description of the development, the emphasis of Schedule 4 is on the "main" or "**significant**" effects to which a development is likely to give rise. It confirms that an ES "should be proportionate and not be any longer than is necessary to assess properly those effects. **Where, for example**, **only one environmental factor is likely to be significantly affected, the assessment should focus on that issue only. Impacts which have little or no significance for the particular development in question will need only very brief treatment to indicate that their possible relevance has been considered"** (ref Planning Practice Guidance ID4-033).

The potential environmental and amenity effects are considered in turn, in this context, namely:

- Landscape and Visual Impact (Chapter 6.0)
- Ecology (Chapter 7.0)
- Soils and Agricultural Land (Chapter 8.0)
- Hydrology and Hydrogeology (Chapter 9.0)
- Noise (Chapter 10.0)
- Air Quality (Chapter 11.0)
- Transportation (Chapter 12.0)
- Cultural Heritage (Chapter 13.0)

An overall summary of the environmental effects is set out in Chapter 14.0 which draws upon the main environmental issues set out in preceding chapters, and the recommendations for mitigation measures. This provides a link between the conclusions and recommendation of the topic studies, and the overall conclusions of the ES.

Further context is provided by the consideration of planning policy against which the application will be determined (see PAS Section 8.0), which highlights, inter alia, environmental issues which need to be addressed to satisfy planning policy requirements and advice.

6.0 LANDSCAPE & VISUAL IMPACT

6.1 Introduction

6.1.1 Scope of the assessment

This Chapter of the ES has been prepared by the Landscape Team of the Cardiff Office of WYG who have extensive experience of undertaking LVIAs for mineral projects. WYG undertook the LVIA as part of the EIA carried out in support of the Craig yr Hesg Environment Act 'ROMP' Review, and they are thus fully familiar with the quary and its landcspae and visual context.

The first stage of the LVIA is the landscape and visual appraisal, which provides the baseline against which the effects of the proposed development, on the landscape of the site and its context, are assessed. The design of the proposed development and the identification of mitigation measures incorporated to minimise adverse effects, is informed by the findings of the appraisal.

During the assessment, effects on features identified as important to the landscape quality, or effects on the landscape character of the site and its setting are assessed. Effects on views of the site and its setting, or visual amenity, are also assessed.

For the purposes of assessing the landscape and visual effects of this proposal, study areas have been defined:

- The "site" extends to the boundaries of the site shown on Figure LVIA.01; and
- The "landscape context" extends to a radius of about 3km from the site.
- The visual study area extends up to 3km from the site boundary. For this assessment, viewpoints within 2.5-3km of the site boundary have been considered as representative of views from within the local area.

The objectives of the assessment are to:

- Describe and evaluate the landscape of the site and surrounding landscape context and visual amenity of the surrounding area, which might be affected by the proposed development;
- Provide an input into the quarry design and development scheme, and to make recommendations for mitigation measures which can be incorporated into the development scheme;
- Examine the development proposals and analyse the potential effects on the landscape and visual amenity associated with the scheme's design or operation;
- Provide an assessment of the significance of the landscape and visual effects of the proposed development with integral mitigation measures in place; and
- Consider the need for any mitigation measures additional to those included as in built design mitigation measures.

The LVIA is presented with separate chapters dealing with effects on landscape, effects on visual amenity.

The LVIA is illustrated by plans and photographs as follows:

- Figure LVIA.01 Site Location Plan
- Figure LVIA.02 Designations
- Figure LVIA.03 Visual Appraisal
- Figure LVIA.04 Zone of Theoretical Visibility (ZTV)
- Figure LVIA.05 LANDMAP Overall Evaluations
- Figure LVIA.06 LANDMAP Level 3 Classifications
- Figure LVIA.07 LANDMAP Thematic Evaluations
- Figure LVIA.08 Assessment photographs
- Figure LVIA.09 Appraisal Photographs

The figures are produced within the **ES Volume 3**.

6.1.2 Methodology

The methodology used for assessing the landscape and visual effects is based on the recommendations in Guidelines for Landscape and Visual Impact Assessment 3rd Edition published by The Landscape Institute and the Institute of Environmental Management & Assessment in 2013 (GLVIA3).

The assessment process comprises a combination of desk studies and field surveys, with subsequent analysis, and involved:

- A review of landscape designations and planning policies for the landscape, and of other landscape studies relevant to the area, as indicators of landscape value, including national and local landscape character assessments
- A review of the LVIA undertaken as part of the Environment Act ROMP Review of Craig yr Hesg Quarry (2010)
- A survey of the site and landscape context study areas and inspection of views of the site from publicly accessible viewpoints, including a photographic survey
- Evaluation of the features and elements of the landscape and their contribution to the landscape character, context and setting, based on these studies
- Analysis of the development proposals and consideration of potential landscape and visual effects of the proposed development
- Assessment of the sensitivity of the landscape to the changes likely to arise from the development
- Identification of the extent of theoretic visibility of the development and potentially sensitive viewers or view locations, supported by a viewpoint analysis
- Consideration of proposals for mitigation and enhancement measures to avoid, reduce or offset significant adverse effects
- Assessment of magnitude of change and significance of effects on the landscape and on visual amenity, with the mitigation proposals in place.

Assessment and Mitigation

The effects of the development, whether beneficial or adverse, may vary in nature and degree through its lifecycle and, where feasible, mitigation measures are proposed to be incorporated in the design of the development. Where design measures cannot address identified likely significant adverse effects, measures such as management of the construction and operational processes are proposed. The purpose of mitigation measures is first, to prevent or avoid the potentially adverse effects identified, and if that is not possible, to reduce the potential adverse effect. Where significant adverse effects are unavoidable, the purpose is to offset or compensate for the effect.

Details of the methodology for assessment of landscape effects and visual effects are set out in the respective sections below.

Weather

The weather is a factor affecting the assessment, especially of visual impacts. The Met Office publish average statistics for weather patterns for the region, monthly and annual, for maximum and minimum temperatures, days of air frost, hours of sunshine, amount of rainfall - both generally and the number of days when rainfall is above 1mm. For Tredegar, the nearest Climate station to where the site is located:

- Rainfall above 1mm per day, which limits visibility, occurs on an average of 166.5 days in the year, about 45.6% of the year
- There are on average 58.7 days when air frost occurs, which can produce hazy conditions limiting visibility, about 16% of the year

- There is an average of 1381.2 hours of sunshine per annum, less than the South Wales and South West England district average of 1519.7 hours).

Guidance

In addition to GLVIA3, the Landscape Institute's Advice Note 01/11 Photography and Photomontage in Landscape and Visual Impact Assessment was referred to.

Relevant policy, landscape character assessments, and other contextual information sources were also referred to, including:

- LANDMAP Methodology: Guidance for Wales published by Natural Resources Wales
- Policies relevant to the landscape and visual amenity in national and regional policy including the Rhondda Cynon Taf Local Development Plan 2006-2021

Photography

Photographs have a special role in describing landscape character and illustrating key views. In order for photographs to be representative and to create an image that is as similar as possible to that which is seen with the human eye, accepted practice is to use a lens with a focal length equivalent to 50 mm for a 35 mm Single Lens Reflex (SLR) camera, and a horizontal field of view of a little under 40 degrees. The camera used for the appraisal photography was a Canon 5D Mark iii digital SLR camera with a single frame sensor. Photographs were taken with a focal length of 50mm.

Landscape photography includes wide angle or panoramic views requiring a sequence of photographs to be taken across the view. Where this approach is taken, a series of overlapping photographs are digitally spliced together in Adobe Photoshop CS using a cylindrical projection to provide a panorama approximating to the normal field of view in a landscape context. Where necessary the contrast and brightness of individual photographs is slightly manipulated in order to create a consistent panorama without visible joins. The viewpoints are located with their Ordnance Survey grid reference and height above Ordnance Datum.

A total of twenty-one views were taken as 'appraisal photographs' to illustrate the site and its appearance in publicly available views; refer to **Figures LVIA.08** and **LVIA.09**. From the viewpoint studies, a representative selection of six views is taken forward to the visual impact assessment as 'assessment photographs' (see **Figure LVIA.08**).

6.2 Landscape Policies and Designations

6.2.1 National Policy

Mineral Planning Policy Wales (MPPW), 2000, sets out the land use planning policy guidance of the National Assembly for Wales in relation to mineral extraction and related development in Wales, which includes all minerals and substances in, on or under land, extracted either by underground or surface working (Town and Country Planning Act 1990, section 336). Two of the main aims relate specifically to landscape and views; these are:

i) Social progress which recognises the needs of everyone: to provide for the benefits of increased prosperity through an adequate supply of minerals that society needs now and in the future, together with protecting and improving amenity; and

ii) Effective protection of the environment: to protect things that are highly cherished for their intrinsic qualities, such as wildlife, landscapes and historic features; and to protect human health and safety by ensuring that environmental impacts caused by mineral extraction and transportation are within acceptable limits; and to secure, without compromise, restoration and aftercare to provide for appropriate and beneficial after-use.

MPPW also states the key principles of sustainable mineral development. A number of these principles relate specifically to landscape:

ii) protect areas of importance to natural or built heritage (paragraphs 21 to 33);

iii) limit the environmental impact of mineral extraction (paragraphs 34 to 47); and

iv) achieve high standard restoration and beneficial after-use (paragraphs 48 to 54).

Mineral Technical Advice Note 1 (MTAN) Wales: Aggregates (2004): The overarching objective of MTAN in planning for aggregates provision is "to ensure supply is managed in a sustainable way so that the best balance between environmental, economic and social considerations is struck, while making sure that the environmental and amenity impacts of any necessary extraction are kept to a level that avoids causing demonstrable harm to interests of acknowledged importance"

MTAN 1 is structured to reflect the key principles of sustainable minerals planning set out in MPPW (listed above) and provides advice as to how the principles can be secured.

6.2.2 Local Policy

The site lies within the boundaries of Rhondda Cynon Taff. Local planning guidance of relevance to the proposed development of the site is provided by the **Rhondda Cynon Taf County Borough Local Development Plan (LDP)**. Relevant policies relating to the landscape elements of the proposed development are outlined below. Details of these policies can be found in **Appendix 6.1** (ES Volume 2).

Area Wide Policies

- Policy AW 8 - Protection and Enhancement of the Natural Environment
- Policy NSA 25 - Special Landscape Areas

6.2.3 Designations

Landscape designations provide an indication of landscape value; they are areas that have been recognised for the scenic beauty and recreational potential of the landscape. Designations are shown on **Figure LVIA.02**.

Nationally Important Landscape Designations

The site is not located within a nationally important landscape designation, such as a National Park or Area of Outstanding Natural Beauty (AONB). The nearest national landscape designation is the Brecon Beacons National Park, located some 16km to the north.

Open Access Land

Open access land is a statutory national recreational designation. It includes land managed by Natural Resources Wales (NRW) and areas with public access rights under the Countryside and Rights of Way Act, 2000. The right of access does not extend to camping, cycling, horse riding or driving a vehicle, nor does it apply to developed land, gardens or cultivated land. The extent of open access land is shown on new editions of the Ordnance Survey (OS) Explorer maps and on the NRW website. Public rights of way are also shown on (OS) Explorer maps.

Land designated as open access by the CROW act includes large areas of Urban Common to the east at Cefn Eglwysilan and north-east at Craig-Evan-Leyshon Common. To the north and west are areas of Public Forest and to the south much smaller areas of Open Country access land lie adjacent to the settlement of Pontypridd.

Historic and Cultural landscape designations

Landscape of Special Historic Interest

The site is located 2.7km to the east of the Rhondda Landscape of Special Historic Interest which 'contains one of the largest and best known mining conurbations and coalfield communities in Britain' and is considered to be 'the most important industrial and cultural landscape of its kind in Wales.'

Conservation areas and listed buildings

The nearest Conservation Area to the site is 300m to the south and covers Trallwn in Pontypridd adjacent to the River Taff. Other Conservation Areas within 2km include Pontypridd Town Centre, Graigwen, Troedrhiwtrwyn, and Broadway in Treforest.

A number of listed buildings are located within 5km of the site; with 10 listed buildings located within a distance of 1km. The nearest of these are the Taff Vale Railway Viaduct and Railway Bridge over Graig-yr-Hesg Road (both Grade II), and the Grade II* White Bridge, all of which are located approximately 400m to the south. The remaining Listed Buildings (all Grade II) within 1km are:

- Railway Viaduct over Nant Clydach
- Taff Vale Railway Bridge over Cwm Clydach
- Road bridge over Nant Clydach
- Coed y Lan Comprehensive Lower School
- Cilfynydd War Memorial
- Eglwysbach Surgery (formerly Capel Goffa)

Scheduled Monuments

Scheduled Monuments are shown on Figure LA02. There are 4 Scheduled Ancient Monuments (SAMs) located within a 2km radius of the site. Pontypridd Bridge (GM015), completed in 1756 is the nearest at just over 1km away to the south. The others are a prehistoric ring cairn and two standing stones on Coedpenmaen Common (GM510), Y Garreg Siglo Bardic Complex (GM507), both lying to the south, and Hetty Pit (GM459) 1800m to the south-west.

Registered Parks and Gardens

Ynysangharad Park in Pontypridd is a Grade II Registered Historic Park and Garden located 1100m south of the quarry. It is considered to be a well preserved 1920s public park, with numerous sports facilities and ornamental features.

Ecological designations

There are no Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), or National Nature Reserves (NNR) within the immediate vicinity of the site.

The wooded slopes immediately to the south of the active quarry site were designated in 2008 by Rhondda Cynon Taf County Borough Council (RCT) as Craig yr Hesg Local Nature Reserve (LNR), incorporating land gifted by Hanson to Taff Ely Borough Council as predecessors to RCT.

Craig yr Hesg / Lan Wood Site of Importance for Nature Conservation (SINC) covers an extensive area of land to the south and west of the quarry, and includes the area of the Local Nature Reserve, the woodland to the south and west, the woodland area within the southern area of the existing quarry, and a small area which extends into the western area of the application site, south of the extension area (but not affected by the extension area).

Local Landscape Designations

With the exception of part of the quarry access road and non operational land to the west of the quarry, the existing Craig yr Hesg Quarry and the extension area does not lie within a designated 'Special Landscape Area, as defined in policy SSA24 of the RCT LDP. However, land immediately to the west and south west of the application site forms part of an extensive area of land defined as the Llwyncelyn Slopes SLA.

Minerals Extraction Designations

The extension area is designated in the RCT LDP as a "preferred area" of known mineral resources, and represents the only such designation in the LDP (ref SSA25).

6.2.4 Interim Summary

In terms of the landscape planning context the following locally specific issues need to be considered in the assessment of effects:

- Development should retain the local character of the landscape (AW8);
- Development within Special Landscape Areas should conform to the highest standards of design, siting, layout and materials appropriate to the character of the area (NSA25)
- The amenity of residential areas should be protected (AW15);
- Development should also consider recreational amenity values (AW7);
- Careful consideration should be given to the potential effects the development proposals may have on setting of historic assets including listed buildings, scheduled monuments and Registered Parks and Gardens (AW7);
- The extension site is identified as a Preferred Area of Known Mineral Resource (SSA25);
- Restoration and aftercare measures should be incorporated into minerals proposals (CS10); and
- Ecological designations, although not specifically related to landscape amenity, are an indication of landscape value.

The next section of the LVIA provides a summary of the development proposals for the application site with particular reference to those elements of the scheme which relate to landscape / visual issues.

6.3 The Proposed Development

Details of the proposed development are provided on the planning application drawings and within the planning supporting statement. This section describes the main aspects of the proposed development which could potentially affect landscape and/or visual amenity. It also identifies features of the proposals which will assist in mitigating adverse landscape and visual impacts.

Sources of Potential Landscape and Visual Effects

The main features of the development proposal which could potentially result in landscape and visual impacts (both positive and negative) are:

- Continued extraction with the existing quarry void and expanding the void into the extension site to the northwest;
- Extraction of a narrow corridor of land within the existing quarry between the quarry plant site and main quarry void as part of the currently approved quarry development scheme;
- Ongoing operation of the quarry plant site including the primary crusher;
- Site clearance operations involving clearance of small areas of scrub, the stripping of soil and its storage for re-use during site restoration;
- The creation of a screening landform on land to the north and east of the extension area as a permanent landscape feature, with tree seeding and natural regeneration designed to establish a woodland corridor linking to adjoining established woodland features;
- The implementation of landscape enhancement measures in the form of a new dry stone wall at the outer edge of the northern screening landform, linking with existing dry stone walls in the locality;

- The creation of a low soil screening bund along the western edge of the extension area, designed to minimise views of the extension area from Darren Du Road, with the corridor of land containing the screen bund to be allowed to re-colonise with woodland as a landscape / biodiversity enhancement area;

- Proposed natural regeneration of woodland on soil bunds along the southern boundary of the quarry void to reinforce the edge of Coed Craig yr Hesg;

- The creation of a new permissive path to enhance access to the countryside with links to existing permissive paths and public rights of way;

- The implementation, in the longer term, of a variety of restoration treatments, designed to create a range of conditions and habitats which would foster the biodiversity and geodiversity potential of the site, and assist is integration into its landscape context. This will include the emplacement of quarry waste on selected benches, the retention of crags and rock outcrops in appropriate locations and the creation of scree slopes;

- The restoration of the site to a nature conservation and wildlife enhanced feature, which recognises and exploits the biodiversity potential associated with worked-out quarries, and the range of habitats which can be created; and

- The restoration of the quarry floor using quarry waste and soils to allow natural regeneration of species rich grassland.

Mitigation Measures

Mitigation measures incorporated into the scheme aim to reduce the adverse visual impacts upon views from Darren Ddu Road and properties at Cefn and Glyncoch. The measures are summarised below:

- A screening landform would be established along the eastern, and northern site boundaries, with a smaller soil screen bund to be established along the western boundary. These bunds would be designed to encourage tree growth and natural re-colonisation and create a new woodland corridor to link with adjoining woodland. The screening landform and soil screen bund are particularly important to screen views from Darren Ddu Road and properties at Glyncoch and Cefn.

- The proposed extension will result in the removal of approximately 500m of dry stone field boundary walls, much of which is in a poor state of repair. In addition to the potential loss of what may be reptile habitat, this will result in adverse landscape impact because these walls are a distinctive feature of the area. The walls are also visible in near and distant views of the site. It is proposed to re-use the stone recovered from these walls to build a section of wall along the northeast side of the site. This will restore the field pattern and assist with screening of low level views from Glyncoch.

- Although there is a security issue at Craig yr Hesg quarry which has necessitated the erection of steel palisade fences, it is not desirable to have fences visible along the extension site boundaries. Such fences would be visible from some distance and be obviously out of character with the landscape setting. In order to maintain security within the extension site a palisade security fence would be located on the inner quarry side of the screening landform and soil screen mound.

- It will be desirable to protect the retained vegetation along Darren Ddu Road and the western site boundary. A corridor of land averaging 35m wide would thus be retained between the quarry edge and Darren Du Road which would accommodate the soil screen bund, and which would be allowed to re-colonise with trees as an enhanced woodland corridor.

Restoration

The final restoration and after use proposals for the site represent the principal long-term measure in mitigation of potential landscape and visual effects. The quarry benches and faces would be restored when no longer required for operational purposes. A variety of treatments would be used to enhance the ecological and landscape value of the site. These are summarised below and described in detail in **Chapter 4**, and are shown on **Figure 4-1**. Natural regeneration is also proposed along the south-western boundary of the quarry, to supplement the existing woodland at Coed Craig-yr-Hesg.

In summary, the principal features of the restoration would be, as follows:

- There is significant potential for biodiversity enhancement during the restoration of site, including quarry faces, benches and the quarry floor. The upper quarry benches and faces would be restored when no longer required for operational purposes.. A variety of treatments would be used to enhance the ecological and landscape value.

- Quarry faces present an opportunity to retain attractive rock outcrops as crags, and to retain naturally occurring crevices and pockets in which different types of vegetation can locally establish. Quarry faces would generally be left to regenerate naturally, which would in part be encouraged by low scree slopes and crushed rock placed at the toe of faces. The resulting variety of vegetation types would avoid uniformity of restoration treatment; increasing biodiversity, geodiversity and landscape interest.

- Restoration work would commence on quarry benches as soon as possible after they have been worked to their final position, and are no longer required for access purposes. Once a section of bench has been ear-marked for restoration, no further physical disturbance would occur at that location. A variety of bench treatments are proposed. Coarse rock and scree remaining from quarrying would either be retained on the bench as a substrate, or form the basis of one of the alternative treatments to provide a variable and uneven surface texture creating suitable ground condition to facilitate ecological succession. In selected locations soiling of sections of quarry bench would take place to allow native scrub planting to be undertaken. Natural regeneration of vegetation would be more desirable in terms of the likely species diversity that would result in the longer term.

Management of the site, including the establishing vegetation, would focus on its nature conservation interest and amenity potential, resulting in substantial beneficial impacts on the biodiversity of the site. The landscape and visual appearance of the site would be improved as the tree planting and natural re-colonisation establishes and matures.

6.4 Landscape Assessment

This section deals with the effects on the landscape of the site and its context arising from the proposed quarrying and restoration operations and after completion of aftercare.

6.4.1 Assessment methodology

The assessment process is described generally in section 6.1 and the details of the methodology for assessing the significance of the likely effects are set out below.

Sensitivity, or susceptibility to change

The sensitivity of landscape receptors[1] is dependent on their resilience to or susceptibility to the changes that would be brought about by the proposed development. Judgements as to sensitivity take into account the following considerations:

Table 6-1 Factors affecting assessment of Landscape Sensitivity

Quality or characteristic	Indicative criteria
Value	The importance of the landscape, or the perceived value of the landscape to users or consultees, as indicated by, for example, international, national or local designations; Intrinsic aesthetic characteristics, such as

[1] The term used for elements and aspects of the landscape that might be affected by the proposals and people with views of the development

	scenic quality or sense of place, including providing landscape setting to other places; Cultural associations in the arts or in guides to the area, popular use of the area for recreation, etc.
Context	The importance of the landscape receptors in the landscape character of the area or in their contribution to the landscape setting of other areas The presence and scale of detractors in the landscape or existing development within the area; the degree to which they are susceptible to improvement or upgrading

Landscape sensitivity

The following categories of landscape susceptibility to change are used, with the criteria applied:

Table 6-2 Indicative criteria for assessing Landscape Sensitivity

Category	Indicative criteria
High sensitivity	A landscape of national or international importance Landscape character particularly vulnerable to disturbance or particularly susceptible to improvement or upgrading A valued landscape with no or limited potential for substitution or replacement
Medium sensitivity	A landscape of regional importance Some features or qualities sensitive to disturbance or capable of improvement or upgrading Potential for substitution or replacement
Low sensitivity	A landscape of local importance Few features or qualities sensitive to disturbance or capable of improvement or upgrading Good potential for substitution or replacement

These are the criteria against which receptors are considered in order to arrive at a judgement as to their sensitivity, but it is not necessary for all the criteria set out for a category to apply.

Assessment criteria

The degree of the likely landscape effects of the proposed development is determined by relating the sensitivity of the receptors, or ability of the landscape to accommodate the changes arising from the development proposals, and the degree and nature of the changes in the landscape arising from the proposals. The scale of magnitude of the changes is graded, as follows:

Table 6-3 Indicative criteria for assessing Magnitude of Landscape Change

Magnitude of Change	Landscape Change
Large	Great or extensive change in or loss of landscape characteristics or intense change over a smaller area
Medium	Considerable changes in or loss of landscape characteristics
Small	Discernible change in or loss of components of the landscape
Negligible	Little change to landscape characteristics or character

The degree of effect, whether adverse or beneficial, is assessed by relating the sensitivity of the receptor and the magnitude of change, by considering the following indicative criteria:

Table 6-4 Indicative criteria for assessing Landscape Effects

Landscape effect	Indicative criteria
Major	Highly sensitive landscape completely degraded Considerable adverse change to the features, elements, qualities or character of a highly sensitive landscape Long term or permanent change Little or no scope for mitigation Great improvement, sufficient to upgrade overall landscape character
Moderate	Discernible adverse change to landscape character, features, or elements of medium-high sensitivity landscape or lesser change in highly sensitive landscape Medium term change Scope for mitigation Improvement to the landscape over a wide area sufficient to alter perceptions or larger improvement over a smaller area
Minor	Localised or limited adverse change to the existing landscape character Short term change Considerable scope for mitigation Discernible or localised improvement to the existing landscape
Negligible	Little change to the existing landscape character The change is difficult to discern

Effects assessed as “Major” or “Moderate-Major” are considered “significant” in the terms of the EIA Regulations and other effects as “not significant”.

Intermediate conditions may be described, such as Moderate-Major, where the criteria for Moderate may be exceeded but not qualify as Major.

Effects may be adverse or beneficial. In some instances the effect may be offset by other considerations, for example, through the mitigation or landscape proposals, and the resulting effect is neither beneficial nor adverse. In such cases, the effect is assessed as neutral.

6.4.2 Landscape Baseline

The landscape baseline is a description and analysis of the existing landscape, against which the effects are assessed, first, by reference to landscape character assessments for the area in which the site is located, at national and local levels and, then, from site-specific surveys and analysis carried out for the purposes of this assessment.

LANDMAP

Landscape Assessment, following the LANDMAP methodology, has been undertaken for Rhondda Cynon Taf and the Vale of Glamorgan. The assessment uses the Natural Resources Wales (NRW) / Wales Landscape Partnership Group approach which separates the defining aspects of the landscape into five categories, or aspects; geology, habitats, visual & sensory, historic and cultural landscape. It considers the relationship that exists between people and places; how people have given meaning to places through time and how the physical landscape has shaped their actions, or how their actions have shaped the landscape.

The detailed descriptions for the most relevant aspect areas are summarised below. The findings of the LANDMAP studies have formed the basis of the landscape and visual appraisal which forms the baseline for the landscape and visual impact assessment.

LANDMAP: Visual and Sensory

The site is located within LANDMAP Visual and Sensory (VS) aspect area **CynonVS141: Ynysybwl**. The extreme north-western edge of the operational site is included within aspect area **CynonVS709: Pontypridd** which includes the urban area adjacent to the River Taf which is bisected by **CynonVS596: A470** running north to south. On the opposite side of the valley lies aspect area **CynonVS143: Llanfabon** and the areas of common land on **Mynydd Eglwysilan & Mynydd Meio** that constitute **CynonVS317**. The VS aspect area classification, summary descriptions, and justification for the overall evaluation of the VS aspect areas occurring within 2.5km of the site are as follows:

LANDMAP Visual and Sensory			
Aspect area	Classification and description	Overall Evaluation	Justification
CynonVS 141: **Ynysybwl**	Classified (Level 3) as hillside & scarp slopes mosaic. Essentially upland in character with built development/ associated elements (pylons, telecom masts). Open landscape of rough grazing with conifer plantations, small woodland/broadleaf clumps creating a mosaic pattern, combined with strong rhythmic undulations of minor ridge/crests and valleys provides visual movement and cohesion. Away from main valleys, it remains one of the most tranquil parts of county.	**Moderate**	Locally important, due to some attractive views and areas of upland character, but this importance is compromised/ diminished by the urban associations that are present in parts of the area.
CynonVS 709: **Pontypridd**	Urban. Series of towns/villages set within a larger valley landscape. Dominant form is the transport corridors that pick out the valley trend running along the valley floor. Development on valley floor and valley sides. Some views up to upland areas on valley tops. Traffic noise from the A4054 and A473 is constant background sensory factor in central areas adjacent to road corridors.	**Low**	No qualities of merit, visual and sensory qualities dominated by the unattractive views of built form and traffic noise from several main roads.
CynonVS 596: **A470**	Road corridor. Trunk road with 2 lanes going in each direction. Embankments and cuttings with dense structure planting, bordered by crash barriers. Over-bridges punctuate the dominant linearity of the road as it cuts through a largely built up landscape with little integration.	**Low**	The moderate sense of place and rarity are for "negative" qualities (noise, manmade structure that cuts across the landscape fabric, therefore of some distinction) and as such are not seen as relevant to the overall value.

LANDMAP Visual and Sensory			
Aspect area	Classification and description	Overall Evaluation	Justification
CynonVS 143: **Llanfabon**	Hillside & scarp slopes mosaic. A pleasant landscape, with some attractive rolling farmland away from the built form urban edges of Nelson, Blackwood and Treforest. This incongruous mix of combination of elements of rural field patterns, isolated settlements/farmsteads and built form urban edge and pylons/masts leads to a complex overall character. Essentially rural with upland feel. Broad views across valleys, and up to upland hills/outliers of Mynydd Eglwysilan and Meio that dominate inward views.	**Moderate**	Without any notable quality, but parts of this area certainly have high scenic quality and integrity.
CynonVS 317: **Mynydd Eglwysilan & Mynydd Meio**	Upland grazing. Open upland ridge, land cover of rough grazing and bracken, with some old stone walls. Panoramic and sometimes dramatic views over upland and adjoining valleys. Some visual clutter of pylons slightly detracts from this otherwise wild/exposed typical upland. Strong sense of place. Not remote as close to valleys and their associated urban areas.	**High**	Upland area with strong sense of place and accessible views, slightly spoilt by visual detractors, but sufficient qualities to remain high value.
CynonVS 337: **Treherbert**	Urban. Urbanised area within relatively narrow valley with upland feel on valley tops. Valley floor dominated by housing and commercial/industrial development. Urban area appears to lack a focus/central area and rather spreads along the valley floor and up subsidiary valleys. Enclosed elongated feel slightly relieved by the views up the valley sides. Background noise from the A road. Lower Rhondda Fach bypass has added to movement in this part. The windfarm on valleys side is prominent from Ystrad.	**Low**	Urban edge/relatively narrow valley landform... Recent housing and school development at Penygraig/Tonypandy has expanded the area at change detection.

LANDMAP: Geological Landscape

The quarry lies entirely within Geological Landscape (GL) aspect area **CynonGL015: Taff Valley**. The aspect area classification, summary description, and justification for the overall evaluation for other aspect areas within 2.5km of the site are as follows:

LANDMAP Geological Landscape			
Aspect area	Classification and description	Overall Evaluation	Justification
CynonGL 015: **Taff Valley**	Classified as glacial mountain valley (level 3). N-S valley, glacially eroded into high-level plateau in North and South dipping Pennant sandstones (Upper Carboniferous) & controlled by NNW-SSE Darren Ddu Fault S of Pontypridd, Hanging tributary Nant Caer Dudwig & Nant Llan valleys. Boulder clay in hollows in high ground & beneath sand/gravel in valley floor. Alluvium extensive in terraces... Major colliery tips, some restored & several closed mine shafts... Large working Glyncoch (Craig yr Hesg) Pennant sandstone quarry.	**Moderate**	Part of extensive, dissected Pennant sandstone plateau of lower Taff valley - working quarry unassessed, but may be of at least regional geological significance.
CynonGL 029:**Lower Rhondda Valley**	Glacial mountain valley. Lower part of U-shaped Rhondda valley, deeply incised into Pennant sandstones (Upper Carboniferous) of the high-level plateau, with prominent cliff lines & steep slopes... NW-SE faults cut valley obliquely... Valley floor with extensive boulder clay & alluvium in broad flood plain with terrace in lower part... Boulder clay-filled tributaries, with that at Trebanog representing ice overflow into Ely valley... Numerous disused sandstone quarries, closed colliery shafts & waste tips.	**Moderate**	Glacial valley underlain by widespread Pennant sandstone geology - some quarries/exposures of potential interest present however.
CynonGL 016: **Nant Clydach**	Glacial mountain valley. Tributary hanging valley to the Taff, dissected into gently NE-dipping Pennant sandstones (Upper Carboniferous) & partly controlled by NW-SE fault... Interbedded siltstones form terraced hillsides to NE of valley... Valley with boulder clay in higher part & in hanging tributaries, with Old Red Sandstone (Devonian) erratics, & glacial sand/gravel in lower reaches overlain by river alluvium... Major landslip at Cyrnau, with distinctive release scar.	**High**	Geomorphologically important fault controlled glacial hanging valley in Pennant sandstone succession.

LANDMAP: Landscape Habitats

The Craig yr Hesg quarry extension lies within landscape habitat aspect area **CynonLH091.** A small section of the operational site with a small section of the access road lies within aspect area **CynonLH061**. To the north lies landscape habitat aspect area **CynonLH060**. The LH aspect area classification, summary descriptions, and justification for the overall evaluation of the LH aspect areas within 2.5 km of the extension site are as follows:

LANDMAP Landscape Habitat			
Aspect area	Classification and description	Overall Evaluation	Justification
CynonLH 091	Classified as broadleaved woodland (level 3). Broadleaved woodland and bracken dominated ffridd slopes grading into wooded river valley and including Ynysybwl. Area includes ancient woodland and small marshy fields, especially at Buarth Capel.	**High**	Some valuable, relatively scarce habitat that supports a number of key species.
CynonLH 061	River corridors. Upper valley with riparian woodland intact floodplain with occasional sheltered pools and semi-improved neutral/marshy grassland.	**High**	Some priority habitat woodland and a number of key species are present.
CynonLH 060	River corridors. River and derelict areas provide focus for biodiversity.	**Low**	Low value habitat
CynonLH 083	Improved grassland. Agriculturally improved grassland with areas of semi-improved acid grassland. Patches of marshy grassland, broadleaved woodland stands and conifers are present.	**Moderate**	Generally low value habitat but some Priority habitat is present and Great Crested Newt are present.
CynonLH 085	Largely improved grassland. Some excellent lowland marshy grassland and semi-improved grassland	**Moderate**	Generally low value but some habitat of higher value is present.
CynonLH 086	Coniferous Woodland. Conifer plantation with patches of broadleaved woodland. Some bracken and semi-improved neutral grassland.	**Moderate**	Generally low value but there is some more valuable broadleaved woodland and potentially Red Squirrel present.
CynonLH 090	Residential/Green Space. Heavily urbanised river corridor. Limited semi-improved neutral grassland and scrub.	**Low**	Low due to the fact that area is very urbanised with very little valuable habitat apart from river.
CynonLH 095	Coniferous Woodland. Conifer plantation with limited marshy grassland and bracken. A heronry is present within the	**Moderate**	No records of protected species but presence

LANDMAP Landscape Habitat			
Aspect area	Classification and description	Overall Evaluation	Justification
	plantation.		of Heronry is of significance.
CynonLH 096	Mosaic. Broadleaved woodland and bracken ffridd with marshy grassland. Includes Nant Gellli-wion woodland SSSI and two SINCs with wet woodland, marshy grassland, valley mire, acid flushes and dry heath.	**High**	A number of valuable habitats are present including some Priority habitats.
CynonLH 097	Mosaic. Ffridd with broadleaved woodland/grassland mix on lower slopes. Acid grassland/heath/marshy grassland largely in the North and amenity grassland (golf course) on higher grounds to the South.	**Moderate**	Two commonest habitats are Improved grassland and Bracken which are relatively low value, this is balanced by presence of Priority habitats and Pearl Bordered Fritillary.
CynonLH 098	Improved grassland. Agriculturally improved grassland. Patches of broadleaved woodlands, bracken, semi-improved grassland and rarely marshy grassland occurs, especially along riparian fringe.	**Moderate**	Great crested newt are present and although much of habitat is low value improved grassland there are some more valuable habitats present.

LANDMAP: Historic Landscape

The extension site is situated within historic landscape aspect area **CynonHL833: Llanwonno and Cwm Clydach** with the eastern part of the operation quarry site within aspect area **CynonHL352: Nant Clydach (Ynysybwl)**. The eastern boundary of the operational quarry is adjoined by aspect area **CynonHL977: Pontypridd and the Afon Taff**. HL aspect area classifications, summary descriptions, and justification for the overall evaluation of aspect areas within 2.5km of the extension site are as follows:

LANDMAP Historic Landscape			
Aspect area	Classification and description	Overall Evaluation	Justification
CynonHL 833:	Irregular fieldscapes. This area is characterised as an	**High**	A reasonably well preserved irregular

LANDMAP Historic Landscape			
Aspect area	Classification and description	Overall Evaluation	Justification
Llanwonno and Cwm Clydach	agricultural landscape dominated by irregular fieldscape of drystone and hedged enclosures. The area has seen significant changes from the 19th century, when industrial development of the surrounding valleys occurred; a process accelerated particularly following the development of the Rhondda during the latter part of the 19th century for coal. The decline in traditional upland agriculture and subsequent abandonment, dereliction, and during the 20th century, afforestation, has all left a mark on the character of the area.		fieldscape of medieval/post-medieval origin with evidence of human activity dating back to the Neolithic; the coherence of this landscape has been partially reduced as a result of extensive modern forestry plantation, detracting from the overall value of the aspect area, which has been assessed as high.
CynonHL 352: **Nant Clydach (Ynysybwl)**	Classified as other settlement (level 3). An urban aspect area centred on the Nant and Cwm Clydach. It is defined by the extent of urban growth and industrial activity expanding in the surrounding areas. The aspect area is almost entirely surrounded by the rural fieldscape of Llanwonno and Cwm Clydach to the north, west and south, the Pontypridd and Afon Taf transport corridor defines the aspects eastern limits. Industrial workings such as the Lady Windsor Colliery and the earlier Levels to the south characterise this aspect. The settlement of Ynysybwl grew up around these activities with ribbon development clinging to the upper portion of the valley. The nucleated settlement of Glyncoch defines the extreme south of the aspect where the extensive quarrying can be found. Although a predominantly Post-medieval and Industrial aspect area this valley was also occupied in prehistory. A Neolithic axehead "rough-out" was discovered in a builder's foundation trench, northwest of Glyncoch, with a fragment of a later Bronze Age axe; thus indicating occupation continuity, of sorts, from these periods into the present.	**Low**	Shares common characteristics with neighbouring aspect areas Cynon HL117 and HL977, forming one of several industrial communications/settlement corridors within the central part of the Caerphilly/RCT historic landscape.
CynonHL 977: **Pontypridd and the**	Nucleated settlement. A heavily industrialised urban aspect area representing a transport and communications corridor between the docks to the south, and the industrial valleys to the north.	**Outstanding**	This area has been assessed as being of outstanding value based on the fact that it represents a long-established

LANDMAP Historic Landscape			
Aspect area	Classification and description	Overall Evaluation	Justification
Afon Taff	The aspect area follows the Afon Taf from Abercynon in the north to Taffs Well in the south. The aspect area is now characterised by large manufacturing instillations distributed along the length of the valley floor.		industrial/communications corridor of considerable historic importance, including significant, nationally important remains of early industrial activity, represented by the Pontypridd Bridge and the Glamorganshire Canal.
CynonHL 497: **Ynysangharad Park**	Urban Park/ public space. Ynysangharad Park, Pontypridd, opened on 6 August 1923 by Field Marshal Viscount Allenby as a war memorial park, is included on the Register of parks and gardens (Cadw) as a good example of an early 20th century public park laid out in Edwardian style.	**High**	The layout and framework of Ynysangharad Park as established in the early 1920s has remained mostly intact, retaining many original built features and much of its original tree and herbaceous planting, although the construction of the A470 road encroached on the eastern side of the park resulting in the demolition of Ynysangharad House... This area has been assessed as high rather than outstanding due to the loss of coherence resulting from the construction of the A470.
CynonHL 448: **Cwm Taf Enclosed Valley Side**	Irregular fieldscapes. A rural agricultural landscape characterised by the limit of the enclosed fieldscape along the eastern flank of the Cwm Taf.Ancient and semi-natural woodland is distributed in small scatters along the length of the aspect area; two larger areas of woodland can be found to the north, Coed Pant-du Uchaf and Coed Bodwenarth. Settlement throughout this aspect area consists of isolated and dispersed Post-medieval farmsteads... Industrial activity is represented several small quarries, Coal Tips and Levels distributed along the western flank of the aspect and the large disused opencast workings to the extreme south of the aspect... A prehistoric cist was recovered during ploughing of the fields around Pen y groes Farm indicating settlement occupation of sorts during the Bronze Age... Most of the housing within this rural landscape	**Moderate**	A reasonably well preserved irregular upland fieldscape and a dispersed settlement pattern of post-medieval origin; the overall score of this area as 'moderate' reflects the limited nature of the archaeological record for this area.

LANDMAP Historic Landscape			
Aspect area	Classification and description	Overall Evaluation	Justification
	belongs to the Post-medieval period, although whether this is a continuation in settlement from the Medieval period into the present remains uncertain.		
CynonHL 648: **Mynyddau Cymmer a Glyn**	Marginal Land. This area is characterised as marginal unenclosed upland or mountain sheepwalk, with areas of modern reclamation and forestation: the area is dominated by relict upland agricultural features such as sheepfolds and upland boundaries of drystone and post-and-wire construction; prehistoric funerary use, isolated or limited post-medieval settlement, agricultural and industrial features.	**Moderate**	A discrete area of unenclosed mountain sheepwalk with evidence of relict agricultural features of post-medieval date; 19th-early 20th century industrial extractive activities (quarrying, coal mining) significantly impacted on the periphery of this landscape, although few traces of industrial activity remain, having been subject to extensive modern reclamation and afforestation... The moderate overall value assigned to this landscape is therefore based on the limited nature of the archaeological resource identified within this area and the fact that little trace now remains of the extensive industrial activity that once dominated this landscape, having either been reclaimed or destroyed by modern afforestation.
CynonHL 378: **Rhondda Settlement Corridor**	This aspect area is considered to retain particularly important landscape qualities and forms the core of the Rhondda Historic Landscape on the Register of Historic Landscapes (Cadw)... The area is characterised by a tightly integrated industrial urban settlement (dominated by 19th and 20th century terraced houses, chapels, churches and Working Men's Institutes), and industrial/public transport system, together with remains of associated industrial features (eg collieries, and waste tips), which are characteristic of the Rhondda Fawr and Rhondda Fach. The overriding characteristic of today's landscape is the urban fabric provided by the industrial housing.	**Outstanding**	The outstanding value assigned to this area is because it represents an historically important industrial landscape; the product of an exceptional period of industrial growth between c.1850-1920. Most of the collieries that gave rise to the development of this settlement corridor have been demolished but the extensive, visually striking remains of associated workers' settlements (characterised by terraced houses, chapels, churches and workingmen's institutes) remain the dominant feature within this aspect area.

LANDMAP: Cultural Landscape

The quarry extension site is entirely located within Cultural Landscape (CL) aspect area **CynonCL056: Designated Landscape Areas.** The northern and eastern fringes of the operational site are located within **CynonCL036: Pontypridd**. The CL aspect area classifications, summary descriptions, and justification for the overall evaluation for areas within 2.5km of the site are as follows:

LANDMAP Cultural Landscape			
Aspect area	Classification and description	Overall Evaluation	Justification
CynonCL 056: **Designated Landscape Areas**	Classified as institutions (level 3). Large expanses of (mostly) upland and moorland landscape that are present throughout the Study Area. The area contains variously historic and contemporary evidence of human occupation and exploitation in the form of prehistoric monuments, redundant industrial workings and transport systems, and of forestry. As such they are a commodity for leisure enjoyment as well as providing very extensive "green lungs" to supplement those identified in urban landscapes that they surround.	**High**	High as examples of policy determination to protect the natural and visual attributes of large areas of landscape from being overrun by development, and for the benefit of both people and wildlife.
CynonCL 036: **Pontypridd**	Institutions. Pontypridd is a long-established market town and industrial centre standing at the confluence of the Rivers Taff and Rhondda. It grew as a result both of the development of the Rhondda Valleys and the building of communications routes up the valleys to Merthyr Tydfil (notably initially the Glamorgan Canal from Cardiff northwards). Industrial expansion led to the attraction of a mixture of social classes, resulting in fine villas for the middle class and a concentration of Nonconformist chapels. In recent years there has been major new building, both in the	**High**	High for its historical and strategic importance as an industrial, residential and emerging arts centre, and for its associations with singer Tom Jones.

LANDMAP Cultural Landscape			
Aspect area	Classification and description	Overall Evaluation	Justification
	town and on its outskirts. The Aspect Area contains Cilfynydd, Glyncoch, Coed-y-cwm, Ynysybwl and Buarth Chapel as these settlements now form part of its residential infrastructure.		
CynonCL 030: **The Rhondda**	Other Institutions. The Rhondda epitomises the strenuous efforts of the industrial workforce during the region's heyday as close-packed linear mining communities in the heart of the South Wales Valleys coalfield. Since the demise of the industry these communities have been shorn of their raison d'être and now are somewhat forlornly awaiting regeneration. Pride and determination is on the wane in the face of a growing dependency culture. Efforts to provide regeneration through industrial estates and starter-unit parks are broadly unsuccessful. Social deprivation is on the increase.	**Outstanding**	One of the few relict industrial landscapes recorded in the Register. Outstanding because of The Rhondda's contribution to the image of industrial development, and their contribution to the external perceptions of South Wales.
CynonCL 035: **Treforest Industrial Estate**	Industrial. Treforest Industrial Estate (established under the Special Areas Act 1934) is one of the earliest such in Wales, and represents the basis of the economic powerhouse in the Taff Vale north of Cardiff, and is home of the centre for development, inward investment and regeneration for Wales. There are few parts of Wales that have not felt the effects of the Agency's ministrations. Set just inside the Objective 1 area of West Wales and the Valleys, the area is again subject to expansion with the development of business premises at Nantgarw, itself renowned for the presence of the Nantgarw Pottery - now a museum absorbed into a new commercial and business estate.	**Outstanding**	Outstanding as the economic and regeneration powerhouse for Wales, and containing the Welsh Development Agency.
CynonCL 038: **Abercynon**	Infrastructure. Abercynon stands at the confluence of the Cynon and Taff rivers. Once the terminus for the Trevithick Penydarren tram road from Merthyr Tydfil, it contained a canal basin on the Glamorgan Canal to embark freight from the tram road. Today, its tightly-packed grid plan of terraced streets has lost the dominance of the Workmen's Hall and Institute, but the surviving	**Low**	Abercynon's reputation as a communications hub appears now to be in terminal decline.

LANDMAP Cultural Landscape			
Aspect area	Classification and description	Overall Evaluation	Justification
	single arch of the aqueduct (built in the 1790s) continues to reflect its previous cultural character. Above the town, just off the A470, the small business estate is used as a central point for business meetings - an echo of Abercynon's previous strategic importance based on topography.		

A summary of the LANDMAP classification and evaluation for the aspect areas within which the extension site is located is provided in **Table 6.5** below. Plans showing the extent and location of the relevant aspect areas are reproduced on **Figure LA.04** within **ES Volume 3.**

Table 6-5 LANDMAP Evaluation: Site

LANDMAP Aspect	Aspect area and classification	Evaluation - Overall
Visual & Sensory	CynonVS 141: **Ynysybwl** Hillside & scarp slopes mosaic	**Moderate**
Geological Landscape	CynonGL 015: **Taff Valley** Glacial mountain valley	**Moderate**
Landscape Habitats	CynonLH 091: unnamed Broadleaved Woodland	**High**
Historic Landscape	CynonHL 833: **Llanwonno and Cwm Clydach** Irregular fieldscapes	**High**
Cultural Landscape	CynonCL 056: **Designated Landscape Areas** Institutions	**High**

6.4.3 County and District level landscape assessments

The Rhondda Cynon Taf Special Landscape Area Study (2007) identifies Special Landscape Areas (SLAs) which have been designated to protect areas of fine landscape quality within Rhondda Cynon Taf. The designation of these landscape areas has been undertaken at local level using a regionally agreed methodology. The methodology used to identify the SLA's in Rhondda Cynon Taf builds on the Countryside Council for Wales LANDMAP methodology (now NRW) and considers factors such as:

- Prominence;
- Spectacle – dramatic topography and views; Unspoilt areas - Pre-industrial patterns of land use;
- Remoteness and Tranquillity;
- Vulnerability and sensitivity to change;
- Locally rare landscape;
- Setting for special landscapes.

The area to the immediate southwest of the proposed extension site boundary and to the south of the existing quarry site covering Coed Craig-yr-Hesg (the area as defined by LANDMAP aspect area CynonVS141) is covered by **SLA3 Llwyncelyn Slopes,** but the application site covering the existing Craig yr Hesg Quarry and extension area is not included within the SLA. The primary landscape qualities and features of the area are defined as:

- Length of steep hillsides at turning point in Rhondda valley, overlooking Porth.
- Backdrop to views from Porth, Rhondda Heritage Park and main valley road and new bypass.
- Attractive pattern of small fields with stone walls and hedges, accessed by winding lane
- Some areas of rhos pasture amongst improved grasslands
- Prominent masts and tanks on mid slopes.
- Areas of broadleaf woodland on steep side valley.

Key policies and management of the area are to:

- Conserve pattern of farmland, un-spoilt by industrialisation.
- Conserve unimproved grassland and woodland habitats
- Ensure developments do not encroach up hillsides.

6.4.4 Landscape Context of the Site

The landscape of the site

The landscape and visual appraisal **Figure LVIA.03** illustrates the main features, settlement pattern and transport network. The proposed extension site is located adjacent to Craig yr Hesg quarry, between the settlements of Pontypridd to the south and Glyncoch to the north.

Features of the site

The proposed extension site is approximately 400m long and 300m wide at its widest part. It is located along a ridgeline with a highpoint located at the western boundary of the existing quarry. The higher part of the site is around 200m AOD where it joins the top of the northwest face of the quarry. From this point the land falls away in all directions to a low point of around 170m AOD in the westernmost corner of the site.

The site is currently semi-improved pasture with acid grassland and it includes two large fields and part of two other small fields. Field boundaries are dry stone walls; these are generally discontinuous with frequent gaps and partly collapsed sections.

Along the northwest boundary of the site there is an area of plantation woodland and a row of trees, which are probably an overgrown hedgerow. This vegetation provides some screening from Cefn Primary School and adjacent properties at Cefn.

A continuous band of deciduous woodland extends along the southwest site boundary which is associated with Darren Ddu Road. This woodland links to Coed Craig yr Hesg through an area of rough grassland, bracken and scrub. The road is inaccessible to vehicles but is used as a public footpath. Publicly accessible, low level views of the site are available from Darren Ddu Road.

To the northeast of the proposed extension site there are two fields, similar in character to those within the site. Beyond these fields to the northeast is an area of rough grassland, bracken and scrub which provides screening between the site and the Glyncoch Rugby Ground, which is not visible from the site. The settlement of Glyncoch is located to the northeast of this area at a lower level than the site. Although house roofs are visible, views from the settlement towards the site without mitigation / additional screening would be limited to first floor windows due to the topography, garden boundary fences and vegetation.

Characteristics and aesthetics

The landscape character of the area is strongly influenced by the pattern of topography with steep, wooded valley side slopes rising from the valley floor. The main topographical feature in the area, the River Taf valley, is defined by Cefn Eglwysilan to the east which rises to a height of 382m AOD. Land to the west of the valley, upon which the proposed extension site is located, rises to over 240m AOD. The hilltops and ridgelines are typically agricultural pasture with either small scale fields or large, open areas with no enclosure. The enclosure field pattern is common throughout the upland area to the west of Craig yr Hesg quarry, while extensive area of open land occur at Cefn Eglwysilan. Fields have a variety of boundary types including tall, overgrown and discontinuous hedgerows, fences and dry stone walls. The levels of maintenance for walls, hedges and fences vary considerably between areas.

Hedgerow trees, small areas of woodland and larger blocks of deciduous woodland on valley side slopes are characteristic of the area. Coed Craig yr Hesg, adjacent to the southern boundary of Craig yr Hesg quarry, is a densely wooded ridge rising from the valley floor at around 80m to a height of 200m AOD.

6.4.5 Public access

The principal attractions for informal outdoor recreation in the area include cycling and walking the network of cycle ways and public footpaths. Public rights of way extend from certain parts of the settlements, providing good links to open access land, but such links are intermittent. The extent of the open access land is shown on **Figure LVIA.02-2.**

There are no public rights of way within the proposed extension site, and no public right of way links from Glyncoch westwards into open countryside. The nearest public route in the vicinity of the site is Darren Ddu Road, a track which is impassable to vehicles, believed to be a public right of way which runs generally north – south from Ynysybwl Road to the south west of the existing quarry, northwards to Ynysybwl. Public footpaths cross agricultural pasture land to the west of the site and connect with the minor road between Penygraigwen and Ynysybwl.

Land designated as open access by the CROW act includes large areas of Urban Common to the east at Cefn Eglwysilan and north-east at Craig-Evan-Leyshon Common. To the north and west are areas of Public Forest and to the south much smaller areas of Open Country access land lie adjacent to the settlement of Pontypridd.

Other public routes within the study area include the National Cycle Route 8 'The Taff Trail' which follows the river north from Pontypridd to Abercynon and is at its nearest at 350m to the east of the quarry. National Cycle Route 47 'The Celtic Trail' follows the minor road north west from Penygraigwen at a distance of 1km at its nearest from the quarry with a separate branch of The Celtic Trail connecting Ynysybwl to the Taff Trail, running to the north of Glyncoch, some 650m from the site.

The Taff Trail long distance footpath follows the line of National Cycle Route 8 to the east of the quarry. Further east the Rhymney Valley Ridgeway Path runs north from Mynydd Meio to Nelson.

6.4.6 Landscape baseline summary

Following the desk top studies and fieldwork the following elements and features are considered to be important in creating the landscape character of the site and its setting:

- The strong pattern of topography with steep, wooded valley side slopes rising from the valley floor.
- The open nature of the hilltops and ridgelines, which are typically agricultural pasture.
- Small scale fields with a variety of boundary types including tall, overgrown and discontinuous hedgerows, fences and dry stone walls.
- Discontinuous, partly degraded dry stone wall field boundaries within the site.
- Hedgerow trees, small areas of woodland and larger blocks of deciduous woodland to the southwest and northwest of the site.

6.4.7 Effects on the Landscape

This section examines the significance of the landscape effects arising as a result of the proposed development with reference to:

- the potential operational effects on landscape fabric within the site;
- the potential operational effects on landscape character, including consideration of the significance of effects on designated landscapes; and
- The potential effects on the landscape amenity of local residents, users of public rights of way and roads.

Potential Effects on Landscape Fabric

Effects of the landscape fabric may occur where there are either direct or indirect physical changes to the landscape. Direct changes to landscape fabric would only occur within the application boundary.

Potential Effects on Landscape Character

The effect of the proposed development on landscape character will depend on key characteristics of the receiving landscape; the degree to which the proposed development are considered consistent with or at odds with them; and how the proposed development would be perceived within the setting, with perception being influenced by:

- the distance to the site;
- weather conditions; and
- the appearance and 'fit' of the proposed development within the landscape.

There is an overlap between the perception of change to landscape character and visual amenity, but landscape character is derived from the combination and pattern of landscape elements within the view. The effects of the proposed development on landscape character would arise from its relationship to these combinations and patterns. The following assessment is undertaken with reference to **Figure LVIA.05** to **Figure LVIA.07** which includes the LANDMAP aspect area analysis. The descriptions of the areas are included within section 6.4.2.

Sensitivity

In considering the impact of the proposed development on the site and its context, the most sensitive features in the landscape are the existing vegetation surrounding the site and the open character of the adjacent rural areas. The main issues are the effects of proposed development on the features which contribute to landscape character.

Vegetation pattern

The character of the landscape is partly derived from the vegetation pattern including visually prominent blocks of deciduous woodland and other small areas of mature vegetation. The summary description for the LANDMAP Visual and Sensory aspect area within which the site is located, **CynonVS 141: Ynysybwl,** refers to woodland/broadleaf clumps creating a mosaic pattern, combined with strong rhythmic undulations of minor ridge/crests and valleys provides visual movement and cohesion'. Therefore the degree of impact on the landscape resource of the area would relate in part to the impacts on this pattern which is regarded as a receptor of ***high sensitivity***.

Landscape features and character

The character of the landscape is linked to the pattern of landform and prominent landmark topography. Coed Craig yr Hesg is located on an area of higher ground that is an important element in the local context of the Taf Valley. The summary description for the LANDMAP Visual and Sensory aspect area within which the site is located, **CynonVS 141: Ynysybwl**, refer to 'woodland/broadleaf clumps creating a mosaic pattern, combined with strong rhythmic undulations of minor ridge/crests and valleys provides visual movement and cohesion'. Stone boundary walls are a distinctive feature of the area. Therefore the degree of impact on the landscape resource of the area would relate in part to the impacts on the pattern of landform and landscape features which is regarded as a receptor of ***medium sensitivity***.

Public access and settlement

Recreation and enjoyment of publicly accessible places is inextricably linked to the landscape character of the wider area which is regarded as a receptor of ***medium sensitivity***. The landscape amenity, as experienced by people who use the public footpaths, roads and particularly the Taff Trail, within the immediate vicinity of the site and to a lesser extent nearby residents, is of ***medium sensitivity***. People would be aware of ongoing quarrying activities and site restoration. The landscape amenity of residents within the site context is related to landscape amenity and is a receptor of ***high sensitivity***.

Designations

There are no designated landscapes within the site boundary. Other designated landscapes within 2.5km of the site boundary are shown on **Figure LA.02**, and include the areas of ancient and semi natural woodland to the west and southwest of the site, listed buildings, ancient monuments and The Rhondda Landscape of Special Historic Interest. The degree of impact on these designated landscapes, which are of ***high sensitivity***, would relate in part to the potential change in their landscape setting with the introduction to the quarry extension.

Magnitude of change

Small areas of vegetation within the site boundary, including the hedgerows and hedgerow trees forming the field boundaries on the eastern side of the extension area, would be removed. Other vegetation around the site boundary, including that at Coed Craig-yr-Hesg and along the Darren Ddu Road would be retained. The overall magnitude of change would be **small**.

There would be a **medium** change to the local landscape character of the site with the proposed introduction of quarrying activities into the extension site, with the removal of field boundary walls, vegetation and the acid grassland covering the site, along with the extension of the quarry void into the topographic pattern of the area.

There would be a change to the landscape setting of public footpaths in the area. The magnitude of change is dependent on the degree of dominance of the extension site within the landscape setting of the path. This ranges from **large** for those footpaths located close to the site boundary, reducing to **medium** for those footpaths outside the site with close proximity views, or views where the extension site is a more dominant element within the wider landscape setting, to **small** for those sections of footpath where the extension site is a small element within the wider landscape and where the development would have minimal impact on the setting of the path.

The impact on the Special Landscape Area SLA3 Llwyncelyn Slopes would be small, as the proposed quarry extension would be **small**, as discussed in further detail below.

There would be no change to the setting of the long distance footpath the Taff Trail and the National Cycle Route, as views of the extension site from these routes are screened by the valley landform.

There would be **no change** to the landscape setting of the ancient monuments in the study area. There would be **no change** to the landscape setting of listed buildings and landscapes of Special Historic Interest and Conservation Areas within the study area.

Assessment

Vegetation pattern

The character of the landscape is partly derived from the vegetation pattern including visually prominent blocks of deciduous woodland linked by other small areas of mature vegetation. This pattern is regarded as a receptor of high sensitivity.

During the initial phases of quarrying, existing vegetation within the site boundary, including a small number of hedgerow trees would be removed resulting in some limited disruption to the vegetation pattern. The areas of vegetation to be removed are small and their contribution to the vegetation pattern is minor. Coed Craig yr Hesg and mature vegetation along the east and north boundary of the site would be retained in its entirety.

The impact on the vegetation pattern would be ***slight adverse*** during the early stages of quarrying in the extension area. This would reduce to ***negligible/slight beneficial*** in the long term when the establishment of new vegetation during the landscaping and restoration of the site becomes part of the pattern of woodland in the wider landscape.

Landscape features and character

The character of the landscape is linked to the pattern of landform and prominent landmark topography. Coed Craig yr Hesg is located on an area of higher ground that is an important element in the local context of the Taf Valley. The pattern of landform is regarded as a receptor of medium sensitivity.

The proposed extension would result in the removal of approximately 500m of dry stone field boundary walls, although a significant proportion of the walls have either partially or completely collapsed. In addition to the potential loss of what may be reptile habitat, this would result in adverse landscape impact because these walls are a distinctive feature of the area. The walls are also visible in near and distant views of the site. It is proposed to re-use the stone recovered from these walls to build a 220 metre long section of wall along the northeast side of the site. This would restore the field pattern and provide screening of low level views from Glyncoch, softening the appearance of the screening landform prior to the establishment of vegetation / trees on the landform.

Adverse landscape impacts would occur when quarry faces advance from the existing site into the extension site, enlarging the quarry void into the topographic pattern, which would be out of character with the adjacent landform, creating a ***moderate adverse*** impact.

Once quarry faces reach their final position interim restoration proposals would commence where these areas are no longer required for access. Proposed planting undertaken during the restoration of the site has been strategically located to integrate the quarry void into the landscape. Where rock faces are retained in more prominent locations, these would have a naturalistic form, similar to the rock faces that naturally occur on the steepest parts of the Taf Valley side slopes. Adverse landscape impact on the topographic pattern would steadily reduce following the restoration of the site to ***negligible*** impact in the long term. Retained section of quarry faces would appear within a wooded setting, consistent with Coed Craig yr Hesg.

Amenity of local residents, users of public rights of way and roads

Recreation and enjoyment of publicly accessible places is inextricably linked to the landscape character of the wider area which is regarded as a receptor of medium sensitivity. The potential adverse impacts on the amenity of the nearby residents during quarrying operations are reduced by careful design and phasing of the quarry. There would however be periods of increased disturbance during soil stripping works and creation of the screening landform / screen bunds and during quarrying of the upper bench.

The resulting changes would be perceptible by people who use the public footpaths and roads within the immediate vicinity of the extension site. Residents at properties to the east of the site in Cilfynydd and Bodewenarth, to the north in Coed-y-Cwm and along the site boundary in Cefn and Glyncoch would also be able to perceive change.

Adverse impact for properties in Glyncoch would only occur when the construction of the screening landform would be a perceptible element in the setting of the property, resulting in a ***slight adverse*** impact. Following construction of the screening landform, this impact would reduce to ***negligible*** as quarry activities would be screened by the landform.

A similar impact would occur for properties to the north in Coed y Cwm with the construction of the screening landform resulting in a ***slight adverse*** impact, see **Appraisal Photograph 7**. Following construction of the screening landform, this impact would reduce to ***negligible*** for residents in this area as quarry activities would be screened by the landform. Following restoration, the seeding of the screening landform would have a ***slight beneficial*** impact.

Adverse impacts would also occur on the landscape amenity of residents at properties to the east at Cilfynydd and Bodwenarth. Adverse landscape impacts would occur when quarry faces advance from the existing site into the extension site.

Some existing faces in this part of the site have weathered and vegetation has begun to encroach through natural regeneration. Quarrying activities and site restoration would be apparent from these locations, with impacts ranging from ***slight-moderate adverse*** dependent on the scale and prominence of quarrying activities in the view.

Once quarry faces reach their final position, the restoration proposals would commence where these areas are no longer required for access. Activity and disturbance within the site would result in short term ***slight adverse*** impacts on landscape amenity. This level of impact would steadily reduce during the restoration phase and establishment of vegetation towards a negligible impact after the restoration of the site. At this stage vegetation would have developed along upper benches and quarrying activity would have ceased. The quarry site would steadily become integrated into the landscape, resulting in a ***negligible*** impact.

The potential indirect impact of the proposed quarry extension on the public rights of way within the study area would include physical disruption and change to the character of the setting and its visual qualities, although it should be noted that there are no public rights of way within the application area.

A short section of public footpath closest to the site, connecting Cefn with the Darren Ddu Road, would experience temporary a major adverse impact, refer to **Assessment Photograph 2**. Construction of the screening landform would be a **large** scale element in the view, resulting in a ***major adverse*** impact. This impact would be temporary and last for the period where earthworks and movement of equipment to undertake construction of the landform are at their most visible.

Following the construction of the screening landform, the scale of impact would reduce to **medium**, as the landform is seeded and becomes a part of the landscape setting of the area, reducing the impact to ***moderate-slight adverse.*** In the longer term the seeding and natural regeneration woodland vegetation would screen the quarry void from view, and provide a visual link connecting with the woodland along the Darren Ddu Road. The restoration works would have a ***slight beneficial*** impact on the setting of this section of footpath.

A short section of the public footpath on the Darren Ddu Road, closest to the extension site, would experience a ***moderate adverse*** impact on its landscape setting, as the quarry extension would be a prominent feature within the setting of this section of footpath, as shown in **Appraisal Photograph 11**. The moderate adverse impact would only occur for the section of the path where views are not screened by vegetation along the route. Once the path passes to the southwest of the quarry extension and heads into the valley the impact would reduce to ***negligible***, as the quarry extension is screened by landform and vegetation.

Other public footpaths and bridleways within close proximity to the site would also experience a change in outlook, such as the view from the public footpath near Gelli-lwch in **Assessment Photograph 4** and the public footpath near Lan, in **Appraisal Photograph 12**, which would experience a moderate adverse impact and the views from the public footpaths shown in **Appraisal Photographs 8, 19, 20**, which would experience a slight adverse impact.

Overall the impact on the quarry extension on public rights of way would have a ***moderate-slight adverse*** impact on the landscape setting of the path dependent on the scale of the quarry extension and its dominance within the setting of the route.

Vehicle travellers would perceive the quarry extension to a lesser extent than pedestrians. Views of the quarry extension are possible from Penheol Ely Road (see **Appraisal Photograph 18**), Eglwysilan Road (**Assessment Photograph 6**), and Llantrisant Road (**Appraisal Photograph 21**) and from other minor roads within the site context. Views from roads are minimised by the existing intervening landform, vegetation and settlement. Users of roads would experience a ***slight adverse-negligible*** impact on their landscape setting, as the extension site would be viewed as a glimpsed view in the context the movement of other vehicles along the road and the existing quarry operations.

Special Landscape Area

Several viewpoints illustrate the impact of the proposed extension site upon the SLA. **Assessment Photograph 4** and **Appraisal Photograph 13 and 14** illustrate views towards the extension site from within the SLA to the west, and **Appraisal Photographs 11** illustrates views from the SLA to the immediate southwest.

In the views from the west, although the extension site would be a visible element from within the SLA, areas of visibility are limited by topography and vegetation, with views of the site limited to ridgelines of higher ground to the northwest of the extension site. Views of the development will often be seen in the context of the wider development of the Taf Valley and the prominent masts and tanks which are features of the SLA.

In the view from **Appraisal Photograph 11**, to the immediate southwest of the site, although there would be direct near views into the operational extension site, these would be only glimpsed views experienced by users of the Darren Ddu Road and would not have an adverse impact on the overall setting of the SLA.

The quarry extension would not be a dominating feature within the area to such an extent that it would alter the character and perception of the SLA.

The overall impact on the setting of the Special Landscape Area is assessed as ***slight adverse*** during operation, with the introduction of quarrying activities reducing to ***negligible*** following restoration as the proposed planting and quarry bench treatment assist with integrating the quarry into the surrounding landscape.

Designated landscapes

The impact on the setting of the Rhondda Landscape of Special Historic Interest will be ***negligible***, as the places from which the extension site is a perceptible element from within the special landscape area are small, and not publicly accessible.

The summary landscape assessment is shown in Table 6.6 below. Sensitivity of landscape receptors is shown in the first column, with red=high, yellow=medium, green=low.

Table 6-6 Significance of landscape effects

Landscape Receptor (sensitivity)	Elements	Magnitude of change	Significance (assessment of effects during operation)	Significance (assessment of effects following restoration)
Vegetation pattern	Hedgerows, hedgerow trees	Small	*Slight adverse*	*Negligible to slight beneficial*
Landscape features/ character	Pattern of valley landform and prominent landmark topography, field boundary walls, acid grassland, hedgerow vegetation	Medium	*Moderate adverse*	*Negligible*

Landscape Receptor (sensitivity)	Elements	Magnitude of change	Significance (assessment of effects during operation)	Significance (assessment of effects following restoration)
Landscape amenity	Public footpaths, byways, open access land	Small-Large	*Major adverse for a small section of footpath during the construction of the screen bund; during the operational phase impacts reduce to Slight adverse - Moderate adverse dependent on the scale and prominence of quarrying activities in relation to the setting of the path*	*Negligible to slight beneficial*
Landscape amenity	Roads	Small	*Slight adverse*	*Negligible*
Landscape amenity	Local residents, settlement	Small-Medium	*Slight-moderate adverse*	*Slight adverse during initial restoration activities, reducing to negligible*
Special Landscape Area	SLA3 Llwyncelyn Slopes	Small	*Slight adverse*	*Negligible*
Designations	Rhondda Landscape of Special Historic Interest	*None*	*Negligible*	*Negligible*

6.4.8 Effects on the Landscape: Conclusion

There would be a change in the character of the site associated with the introduction of the quarry extension, from that of grassland to an active quarry site.

The change to the landscape associated with the introduction of the quarry extension would be viewed in the context of the existing quarry development, urban development on the Taf Valley floor, roads and high voltage power lines within the area.

There would be a moderate to slight adverse impact on the setting of public footpaths within the study area, dependent on the dominance of the quarry extension in relation to the setting of the path. For a small section of footpath closest to the quarry extension the impact would be major adverse during construction of the screen bunds, but then reducing to moderate to slight adverse as vegetation on the bund establishes. The impact on roads within the study area would be slight adverse-negligible.

The settlements of Glyncoch, Coed-y-Cwm, Cefn, Cilfynydd and Bodwenarth were identified within the study area for the LVIA. .

Most properties closer to the site in Glyncoch have their views screened by landform and vegetation. Construction of the screening landform would have temporary short term slight-moderate adverse impact on some properties in Glyncoch and Cefn, however following its construction views of quarrying activities would be entirely screened from these properties.

Properties with direct views towards the site are more likely to experience moderate adverse impacts. Impacts on residential dwellings and settlement range from moderate adverse-negligible.

There would be no direct impacts on the physical historic landscape resource of the area. There would be no impact on the nearby Listed buildings, ancient monuments, Conservation Areas or Landscapes of Special Historic Interest.

The quarry extension would not be a dominating feature within the area to such an extent that it would alter the character and perception of the Llwyncelyn Slopes Special Landscape Area. The overall impact on the SLA is assessed as slight adverse during operation, with the introduction of quarrying activities, reducing to negligible following restoration.

There are no significant adverse impacts on LANDMAP aspects areas with evaluations of High or Outstanding.

6.5 Visual Assessment

This section deals with the effects on visual amenity, arising from changes in the views available to people in the surrounding area.

6.5.1 Assessment methodology

The assessment process is described generally in section 6.1 and the details of the methodology for assessing the significance of the likely effects of the proposed development are set out below.

Visual Sensitivity

The sensitivity of viewers, view locations, and views, is affected by factors such as whether few or many viewers are affected, and the importance of the site or proposed development in the overall view. The context of the viewpoint may contribute to the sensitivity, for example, people viewing from residential properties or from a valued landscape are likely to be more sensitive than people viewing from an industrial context. Particular views may have importance, as “classic” views depicted in art or reported in literature, or as part of the experience of a valued landscape. The following categories of visual sensitivity are used:

Table 6-7 Indicative criteria for assessing Visual Sensitivity

Category	Indicative criteria
High sensitivity	Viewers in residential or community properties Views experienced by many viewers Daily, prolonged or sustained views available over a long period, or where the view of the landscape is an important attractant Views from a nationally or internationally valued landscape or recreation facility
Medium sensitivity	Frequent open views available Viewers are pursuing activities such as sports or outdoor work, where the landscape is not the principal reason for being there or the focus of attention is not the view Views from a regionally valued landscape, or a regionally important recreation facility
Low sensitivity	A view of low importance, or where the view of the landscape is not the reason for visiting A view from a landscape of moderate value, or a locally important recreation facility Occasional open views or glimpsed views; passing views available to travellers in vehicles A view available to few viewers

6.5.2 Assessment criteria

The degree of the likely visual effects of the proposed development is determined by relating the sensitivity of the receptors to the changes in the landscape or view of the landscape to which they will be subjected. The scale of magnitude of the changes in visual amenity is graded as follows:

Table 6-8 Indicative criteria for assessing Magnitude of Visual Change

Magnitude of Change	Visual Change
Large	A great many viewers are affected Great change in the composition of the view or loss of the view A large proportion of a near view changed
Medium	Many viewers affected Noticeable change in the composition of view Distance moderates the degree of change in the view
Small	Few viewers affected Small or minor change in view Distance reduces the importance of the change in the view
Negligible	Barely perceptible change

The degree of effect, whether adverse or beneficial, is assessed by relating the sensitivity of the receptor and the magnitude of change, using the following indicative criteria:

Table 6-9 Indicative criteria for assessing Visual Effects

Visual effect	Indicative criteria
Great	Large or very large change or visual intrusion experienced by highly sensitive viewers or from highly sensitive public viewpoints The proposal would cause a great deterioration in the existing view, with little or no scope for mitigation Long term or permanent change in the

Visual effect	Indicative criteria
	view Large or very large improvement in the view, sufficient to upgrade overall visual amenity
Major	Large change or visual intrusion, especially for highly sensitive viewers or viewpoints The development would cause considerable deterioration in the existing view, with limited scope for mitigation Appreciable improvement in the existing view
Moderate	Medium change or some visual intrusion on settlements or numbers of properties and/or from moderately sensitive public viewpoints The development would be a noticeable change in the view Medium term change in the view Some scope for mitigation Noticeable reduction in visual intrusion, or improvement in the view
Slight	Small or localised visual intrusion in the existing view Good scope for mitigation The change in the view is of short duration Localised reduction in visual intrusion, or improvement in the view
Negligible	The change in the view is imperceptible or difficult to discern

In addition to these criteria, in some instances the effect may be discernible or greater, but offset by other considerations, for example, through the mitigation or landscape proposals for the development, and the resulting effect is neither beneficial nor adverse. In such cases, the effect is assessed as neutral.

6.6 Visual Baseline

Factors affecting visibility of the site

Zone of theoretic visibility

Zones of Theoretic Visibility (ZTV) have been generated by computer to identify the geographic extents within which views may be available of the proposed development.

Figure LVIA.04-1 shows show the predicted extent of the ZTV for the ground surface of the site. The computer generated Zone of Theoretical Visibility (ZTV) is based on a digital terrain model generated from the 50m grid interval Ordnance Survey OS Terrain 50® dataset. The ZTV is based on topographic data only; minor undulations in the terrain may not be reflected in the 50m grid interval of the dataset. The screening effects of surface features such as buildings are not taken into consideration during the preparation of the ZTV.

The screening effect of the woodland areas has been taken into consideration in **Figure LVIA.04-2**. These areas of woodland have been taken from the Ordnance Survey OS VectorMap® District ESRI® Shapefile and have been given a mean average height of 10m.

Figure LVIA.04-3 shows the predicted extent of visibility including the proposed screen bunds, while **Figure LVIA.04-3** includes both the proposed screen bunds and woodland features in the analysis. The theoretical visibility of the proposed development shown by the ZTV provides an indication of visibility but is not a true representation of actual visibility.

For the visual impact assessment, a ZTV study area of a 3 kilometre radius from the site was investigated and mapped; refer to **Figure LVIA.04**. Potentially sensitive visual receptors include people visiting areas covered by landscape designations, areas or sites of historic interest, public footpaths, bridleways and cycle routes, and visitor attractions.

During the field study the extent of the ZTV was confirmed and features such as vegetation, buildings or localised topographic variation, which define actual visibility, were identified. Representative viewpoints were selected for the visual impact assessment.

6.6.2 Viewpoint study

The visual appraisal drawing, **Figure LVIA.03**, illustrates the location of the proposed development and shows the Zone of Theoretical Visibility (ZTV) at a scale of 1:25,000. **Figure LVIA.03** also shows the locations of the assessment and appraisal photographs, which are reproduced on **Figures LVIA.08** and **LVIA.09**.

A total of twenty-one views were taken to illustrate the site and its appearance in publicly available views; refer to **Figures LVIA.08** and **LVIA.09**. From the viewpoint studies, a representative selection of six views is taken forward to the visual impact assessment (see **Figure LVIA.08**). The views available of the extension site can be split by the direction of view:

- Views from the north: Views from public footpaths, minor roads and to a lesser extent from the settlement of Coed y Cwm;
- Views from the west: from a higher elevation than the proposed extension site from public footpaths, cycle routes, minor roads and scattered farmsteads and dwellings; and
- Views from the east: Views from public footpaths, minor roads and to a lesser extent from the settlement of Cilfynydd and Bodwenarth.
- Views from the south: from the minor road above Graig.

Views from the North

The ZTV on **Figure LVIA.04** identifies potential views of the quarry extension site from the northern part of the settlement of Coed y Cwm and the higher ground beyond. Visual receptors within the area include residents of Coed y Cwm, minor roads; users of a number of public footpaths and roads in the area; visitors to the access land at Pen-y-Foel; and farmsteads in the area. Existing vegetation and buildings within settlements limit the number of available views towards the extension site. Views from the north from publicly accessible places in Cefn are screened by landform; views from within properties will be obscured by the proposed screening landform.

Assessment Photograph 1 is taken from the minor road the northwest of the settlement of Coed y Cwm. Settlement at Glyncoch is visible on the valley sides in the centre of the view. The existing Craig yr Hesg Quarry is located in the central part of the view just below the horizon. Higher ground at Cefn Eglwysilan forms the horizon in the left hand side of the view. The existing quarry plant site and the majority of the quarry faces are obscured by land to the north and intervening vegetation. The deciduous woodland at Coed Craig yr Hesg and Penygraigwen forms the horizon in the view. The ridge landform running through the proposed extension site is a prominent feature with the settlement of Glyncoch along its north facing side slopes. Views from public accessible places in Glyncoch were not identified during the appraisal due to the low elevation of the settlement in relation to the site. The proposed extension site is visible on the horizon beyond this settlement in the view.

Assessment Photograph 2 is taken from the public footpath to the north of the extension site boundary, accessible via Cefn Lane. A stone boundary wall to the north of the site is visible framing the left of the view, with vegetation along the Darren Ddu Road visible in the right of the view. The ground surface of the extension site is visible in the right of the view, with vegetation forming one of the field boundaries within the site forming the horizon in the view.

Appraisal Photograph 7 illustrates a view from the settlement at Coed y Cwm. The view looks out over landform descending towards the Taf valley in the left hand side of the view. The existing Craig yr Hesg Quarry is located beyond the horizon in the view, above the settlement at Glyncoch, visible in the centre of the view. Existing vegetation along the southern edge of the settlement of Glyncoch and landform obscure the quarry void. Vegetation along the northern part of the quarry site, particularly on land rising from Glyncoch Rugby Club, forms a continuous band of vegetation along the horizon. The dry stone field boundary walls of the extension site are identifiable elements on the horizon. These provide potential screening from this acute angle view. The ground surface of the site is not visible from this point.

Appraisal Photograph 8 is taken from the public footpath to the northwest of Coed y Cwm. Settlement at Glyncoch is visible on the valley sides in the left of the view. The existing Craig yr Hesg Quarry is obscured by vegetation near the horizon in the left of the view. The ridgeline forming the extension site is visible to the right of this vegetation.

Appraisal Photograph 9 is taken from the junction of the public footpath linking Cefn Lane with the Darren Ddu Road. The extension site is visible in the centre of the view, with the stone wall field boundary within the site visible and vegetation along the Darren Ddu road framing the right hand side of the view.

Appraisal Photograph 10 is taken from the Daren Ddu Road and was obtained by climbing up onto the bank adjacent to the footpath to gain a view into the site. The ground surface of the site fills the centre of the view and the stone walls within the site can be seen in the left of the view.

Appraisal Photograph 11 shows a view looking towards the northwest corner of the extension site from the Darren Ddu Road. The ground surface of the site is visible through vegetation in the centre of the view.

Views from the West

Views available from the west are generally from a higher elevation than the proposed extension site. Views available are from public footpaths, cycle routes, minor roads and scattered farmsteads and dwellings. Deciduous woodland at Coed Craig yr Hesg and along Darren Ddu Road screens the south western edge of the site from some areas.

Assessment Photograph 4 shows a view from the public footpath from the public footpath near Gelli-lwch farmstead. The active part of the quarry is obscured by landform. The elevated viewpoint looks down over the proposed extension site is visible in the centre of the view, partially screened by vegetation. Higher ground at Craig Leyshon Common is visible beyond the extension site in the view, with high voltage pylons and roads forming built features. Settlement within the Taf valley lies partially screened by vegetation in the left of the view.

Appraisal Photograph 12 shows a view from the public footpath at Lan. The proposed extension site is a prominent feature in the central part of the view. The topography of the ridgeline also contributes to the prominence of the site from this point as the site slopes towards the viewpoint. During quarrying the northeast face of the extension would be visible, although partly screened by the woodland along Darren Ddu Road.

Appraisal Photograph 13 shows a view from the farmstead on the minor road near Cyrnau to the northeast of the site boundary. The view looks southeast out over landform descending towards the Taf Valley. Landform beyond the valley rises towards Cefn Eglwysilan, with settlement at Trallwn visible on the valley floor. The proposed extension site is visible in the far right hand side of the view, partially screened by vegetation. The ground surface of the extension site is visible, with the active quarry site hidden by landform.

Appraisal Photograph 14 shows a view from the minor road near Pen-y-Wal. The proposed extension site is a prominent feature in the central part of the view. The topography of the ridgeline contributes to the prominence of the site in this view as the site slopes towards the viewpoint. The deciduous woodland at Coed Craig yr Hesg and along Darren Ddu Road screens the south western edge of the site.

Views from the East

The ZTV on **Figure LVIA.04** identifies views being theoretically available from within the Taf Valley, particularly along its eastern side slopes. Views from the valley floor and lower side slopes are those from the settlements of Cilfynydd and Bodwenarth. Intervening features partially obscure views from these locations, particularly buildings and vegetation. There are more open views from elevated grazing land to the east from Craig-Evan Leyshon Common and Cefn Eglwysilan. Near views from the east from publicly accessible places in Glyncoch are screened by landform and vegetation.

Assessment Photograph 3 shows a view southwest from the minor road at Craig Leyshon Common. The view looks down the Taf Valley towards Pontypridd and adjacent settlements. The settlements of Glyncoch and Coed y Cwm are visible in the middle distance extending to the right of the operational quarry. The extension site is visible on the higher ridgeline beyond.

Assessment Photograph 5 is taken from Ffordd Cartraeth, Cilfynydd. The view looks out over the rooftops of houses on Ffordd Cartraeth, with the existing quarry site visible in the left of the view. Settlement in Glyncoch is visible to the right of the quarry. The extension site is visible towards the ridgeline above the current active site.

Assessment Photograph 6 shows a view from Eglwysilan Road on the edge of the open access land at Cefn Eglwysilan. The elevated view looks out over the wider landscape of the Taf Valley towards Pontypridd. The quarry site is visible in the centre of the view, with the extension site on the ridge beyond. High voltage power lines for large scale built features in the view.

Appraisal Photograph 15 shows a view from the public footpath to the east of Pontshonnoriton Road. The view looks out over residential properties on Pontshonnoriton Road. The woodland at Coed Craig-yr-Hesg is visible in the centre of the view, screening views of the existing quarry site and extension site beyond.

Appraisal Photograph 16 shows a view from the public footpath to the east of Pontshonnoriton Road. The view looks out over residential properties towards the existing quarry site, with quarry plant visible in the centre of the view. The edge of the proposed extension site is screened beyond vegetation to the left of the existing quarry.

Appraisal Photograph 17 is taken from Ffordd Taliesen, Cilfynydd, located within the Taf Valley directly opposite the active quarry site. Intervening features help to reduce the prominence of Craig yr Hesg quarry in the view, which is surrounded by vegetation in the centre of the view. The existing quarry plant is visible in the right of the view. The ground surface of the proposed extension site is just visible beyond the active site, largely screened by vegetation.

Appraisal Photograph 18 shows a view from the valley side slopes to the east of Pontypridd, from Penheol Ely Road. Coed Craig yr Hesg and landform obscure the quarry void in these views. However, the relative elevation of these locations provides elevated views of the quarry plant site. Existing woodland adjacent to the site and scrub establishing within the quarry help to soften the appearance of the quarry. A relatively small proportion of the active part of the quarry is visible. The extension site is obscured beyond vegetation on the ridgeline of Coed Craig yr Hesg.

Appraisal Photograph 19 shows a view from the public footpath on Penheol Ely Road, leading to Bodwenarth. The expansive view looks out over the Taf valley towards higher ground at Twyn y glog and the existing quarry site, visible in the centre of the view. The proposed extension site is visible beyond the existing working site in the view, although the acute angle of the view ensures that it appears as a narrow band just above the back face of the quarry. The western extension of the quarry would reduce the apparent height of the back face of the existing quarry because the level of the land falls towards the west away from the viewpoint.

Appraisal Photograph 20 shows a view from the public byway within the open access land at Cefn Eglwysilan. The view looks over the Taf valley towards the active quarry, visible in the centre of the view with woodland at Coed Craig-yr-Hesg visible to the left and settlement at Glyncoch and

Coed y Cwm to the right. The proposed extension site is visible on higher ground beyond the active site.

Views from the South

The ZTV shows that views from the south are theoretically possible from the elevated slopes above Graig and Treforest. In reality views from these areas are limited by intervening vegetation which obscures potential views of the existing quarry and the extension site.

Appraisal Photograph 21 illustrates the view from Llantrisant Road, above Graig. The view looks north towards the quarry site, which is obscured by vegetation on Coed Craig-yr-hesg in the centre of the view. The extension site is visible to the right of the vegetation on Coed Crag-yr-Hesg, partially obscured by vegetation. The active quarry site is obscured by Coed Craig-yr-Hesg.

6.7 Visual receptors

The following is a résumé of the viewers and locations from where views may be available, with references to the representative viewpoints or other photographs.

Views from settlements and residential properties

Views from residential properties to the north of the site are represented by **Appraisal Photograph 7**. Properties in Coed y Cwm will have oblique views of the extension site form upper stores where intervening buildings and vegetation do not obscure views of the site. Other near views from properties to the north is screened by existing landform and vegetation and would be further screened from view of the operational extension site by the proposed screening landform.

Settlement to the west of the site is limited to single dwellings and farmsteads scattered across the wider rural landscape. There are views, some filtered by vegetation, of the extension site from Pen-y-wal, Gelli-lwch and other residential properties, as illustrated by **Assessment Photograph 4** and **Appraisal Photographs 13 and 14**.

Settlement on the eastern side of the Taf valley has views towards the existing quarry site and plant, though generally views of the extension site are obscured by landform and vegetation on Coed Craig-yr-Hesg, as illustrated by **Appraisal Photographs 16 and 18**. Some properties have more elevated and open views due to their location and orientation, see **Appraisal Photograph 17** and **Assessment Photograph 5**.

Views from residential properties in Glyncoch would be fully screened by the lower elevation of view, and by the screening landform.

Users of public rights of way

Views from public rights of way to the north of the site are represented by **Assessment Photograph 1** and **Appraisal Photograph 8**. The higher part of the extension site is visible along the horizon. The ridge landform running through the proposed extension site is a visible feature from these paths.

Views from public routes to the west are available from elevated land at a higher level than the extension site where surrounding vegetation does not obscure views, as illustrated by the view from the public footpath at Lan, in **Appraisal Photograph 12** and the public footpath near Gelli-lwch, in **Assessment Photograph 4.**

There are also near views into the extension site possible from the Darren Ddu Road see **Appraisal Photograph 11;** and from the public footpath connecting to Cefn, see **Appraisal Photograph 9**.

Views from public footpaths to the east into the extension site are theoretically available from the lower lying slopes of the Taf Valley, see **Appraisal Photograph 16**. However, in reality vegetation on Coed Craig-yr-Hesg obscures views from these areas towards the extension site. More elevated views look directly into the quarry site and the extension site is visible, as a narrow band just above the back face of the quarry, see **Appraisal Photographs 19 and 20**.

Road users

Views from roads are limited by surrounding topography and vegetation. Vehicle travellers are less able to perceive changes within the setting of the route they are travelling along and potential views of the site would be limited to glimpsed views as the vehicles pass the site. Views are available from a number of minor roads within the site context, as illustrated by **Assessment Photograph 1**, which shows a view from the minor road to the north of Coed y Cwm. **Assessment Photograph 3** shows a view from the minor road at Craig-Evan-Leyshon Common to the northeast, and to the east **Assessment Photograph 6** shows a view from the minor road at Cefn Eglwysilan Common and **Appraisal Photograph 18** shows a view from Penheol Ely Road. A view from Llantrisant Road to the south above Graig is shown in **Appraisal Photograph 21**.

Views from other landscape interests

Assessment Photograph 3, which shows a view from Craig-Evan-Leyshon Common to the northeast; while **Assessment Photograph 6 and Appraisal Photograph 20** show views from the Cefn Eglwysilan Common, similar but more elevated and distant views will be available from scheduled monuments on the common to the east. **Appraisal Photograph 11** shows a view from the ancient woodland on the Darren Ddu Road. Views from listed buildings within the area are obscured by surrounding vegetation and settlement. Views of the extension site from the Rhondda Area of Special Historic Interest are limited to a small area to the east of the historic landscape which is not publicly accessible. There are no views possible from the Registered Historic Garden of Ynysangharad Park due to surrounding vegetation.

Several viewpoints illustrate the view available from the Llwyncelyn Slopes Special Landscape Area. **Assessment Photograph 4** and **Appraisal Photograph 13 and 14** illustrate views towards the extension site from within the SLA to the west, and **Appraisal Photographs 11** illustrates views from the SLA to the immediate southwest.

6.7.2 Visual baseline summary

A summary of the visual baseline information to be taken into account as part of the detailed assessment of the effects on visual amenity is as follows:

- Views from the north are from public footpaths, minor roads and to a lesser extent from the settlement of Coed y Cwm;
- From the north the higher part of the extension site is visible along the horizon. The ridge landform running through the proposed extension site is a prominent feature when viewed from the settlement of Coed y Cwm. Stone wall field boundaries are distinctive and identifiable feature;
- There are no views possible from publicly accessible places in Glyncoch due to surrounding buildings and vegetation;
- Views from the east are from public footpaths, minor roads and to a lesser extent from the settlements of Cilfynydd and Bodwenarth, but the ground surface within the extension site is only visible from acute angle at more distant views from elevated locations;
- The proposed extension site is a prominent feature in the central part of the view from the west, views are available from higher ground than the proposed extension site, including from public footpaths, cycle routes, minor roads and scattered farmsteads and dwellings;
- Deciduous woodland at Coed Craig yr Hesg and along Darren Ddu Road screens the south western edge of the site from some areas; and
- Landform and deciduous woodland at Coed Craig yr Hesg obscures the extension site from views in the south and southeast.

6.7.3 Effects on Visual Amenity

Sensitivity

The sensitivity of views is affected by factors such as the distance to the viewer, the number of viewers affected and the importance of the site in the overall view. The context of the viewpoint may also contribute to its ability to accommodate change; for example a view from residential properties or from a valued landscape might be regarded as less able to accommodate change, than a view from an industrial context. **Table 6.5-1** provides examples of High, Medium and Low sensitivity, demonstrating how the contributing factors are interpreted.

The visual impact assessment is based on the selection of representative views to illustrate the views available at a range of distances and for different receptors. The views identified in **Table 6.10** below are defined as sensitive to the potential impacts of the proposed development. Sensitivity of visual receptors is shown in the first column, with red=high, yellow=medium, green=low.

Table 6-10 Assessment photographs

Assessment Photograph reference (sensitivity)	Location	Reasons for selection	Distance to site (km)
01	Existing view south from minor road west of Coed y Cwm	Views from the north Minor road	1.32
02	Existing view southeast from public footpath south of Cefn	Near views from the north Public footpath Nearby residences	0.04
03	View southwest from the minor road at Craig Leyshon Common	Views from the northeast Minor road Open access land	2.03
04	Existing view from public footpath near Gelli-lwch	Views from the west Public footpath Nearby residences View from Special Landscape Area	0.67
05	View west from Ffordd Cartraeth in Cilfynydd	Views from the east Residential properties	1.30
06	View west from Eglwysilan Road at the edge of Cefn Eglwysilan Common	Views from the east Minor road Open access land	2.50

6.7.4 Assessment

The visual appraisal has been informed by the Zone of Theoretical Visibility (ZTV) study as shown on **Figure LVIA.04**. It identified a number of locations from which the proposed development is theoretically visible. A selection of representative views to illustrate the views available at a range of distances and for different receptors are identified in **Table 6.10** and defined as sensitive to the potential impacts of the proposed development.

The seven representative views are described below and the effects of the development on them assessed:

Assessment Photograph 1

Existing view from minor road west of Coed y Cwm, 1.32km from site, 185m AOD

The receptors in this location or nearby who would experience the change in the view are users of the roads and footpaths in this area. The view is of **medium** sensitivity due to the nature of the receptors who would experience the view, including users of the minor road. Similar views would be experienced from nearby residential properties at Coed y Cwm and from roads and footpaths in the area.

Settlement at Glyncoch is visible on the valley sides in the centre of the view. The existing Craig yr Hesg Quarry is located in the central part of the view just below the horizon. Higher ground at Cefn Eglwysilan forms the horizon in the left hand side of the view. The existing quarry plant site and the majority of the quarry faces are obscured by land to the north and intervening vegetation. The deciduous woodland at Coed Craig yr Hesg and Penygraigwen forms the horizon in the view. The ridge landform running through the proposed extension site is a prominent feature with the settlement of Glyncoch along its north facing side slopes. Views from public accessible places in Glyncoch were not identified during the appraisal due to the low elevation of the settlement in relation to the site. The proposed extension site is visible on the horizon beyond this settlement in the view, see **Figure LVIA.08-1**.

View during quarrying

During quarrying, the extension of quarrying activity into the ridgeline would be a perceptible feature within the view. Movement of plant during the short term period associated with the construction of the screening landform would be visible prior to the first phase of development while the landform was being constructed. Following the construction of the screening landform, quarrying activities would be screened beyond the landform from this viewpoint.

View after restoration

The view following restoration would be of the retained bund and regenerating vegetation on the ridgeline. In the longer term the regeneration of woodland would form a continuous band of vegetation along the ridgeline.

Assessment

Prior to the first phase of quarrying, the construction of the screen bunds would create a **small** change in the view, with movement of equipment construction activities creating a ***slight adverse*** impact in the view. Following construction of the screen bund, quarrying activities would be screened. Once the bund is seeded and forms a continuous green band along the ridgeline, the impact would reduce to ***negligible***. Following restoration of the quarry, proposed planting along the bund would create the appearance of a continuous band of woodland along the ridgeline, creating a ***slight beneficial*** impact on the view.

Assessment Photograph 2

Existing view southeast from public footpath south of Cefn, 0.04km from site, 171m AOD

The receptors in this location or nearby who would experience the change in the view are users of the public footpath between Cefn and Daren-Ddu Road. The view is of **medium** sensitivity due to the nature of the receptors who would experience the view. The view is representative of views from the settlement at Cefn to the north and from the Darren Ddu Road to the southwest.

The extension site is visible in the centre of the view, with the stone wall field boundary within the site visible and vegetation along the Darren Ddu road framing the right hand side of the view, see **Figure LVIA.08-1**.

View during quarrying

Prior to the first phase of quarrying, the construction of the screen bunds would be visible as a large scale element in the view. Following the construction of the bunds, the view of quarrying activity during Phases 1-3 would be screened from this point.

View after restoration

The view following restoration of the quarry would look towards the area of proposed planting along the north-western edge of the quarry, proposed to link the existing woodland block to the south of the primary school with woodland along the Darren Ddu Road.

Assessment

Construction of the screening landform would be a **large** scale element in the view, resulting in a ***major adverse*** impact. This impact would be temporary and last for the period where earthworks and movement of equipment to undertake construction are at their most visible.

Following the construction of the screening landform, the scale of impact would reduce to **medium**, as the landform is seeded and becomes a part of the landscape setting of the area, reducing the impact to ***moderate-slight adverse,***.

In the longer term the establishment of woodland vegetation would screen the quarry void from view, and provide a visual link connecting with the woodland along the Darren Ddu Road. The restoration works would have a ***slight beneficial*** impact on the view from this viewpoint.

Assessment Photograph 3

View southwest from the minor road at Craig Leyshon Common, 2.03km from the site, 151m AOD

Receptors in this location or nearby who would experience the change in the view are users of Craig Evan Leyshon Common, walkers along the public the footpath at Nant Cae Dudwg, scattered properties to the north-east, and users of the minor road over the ridgeline towards Nelson.

Coed Craig yr Hesg is visible on the horizon in the middle distance, wrapping around the back wall of the quarry. The wooded ridgeline extends along the right hand side of the quarry towards the quarry plant site. Higher ground to the left of the settlement of Glyncoch obscures the plant site from view. The proposed extension site is visible on the ridgeline of ground beyond these properties in Glyncoch, see **Figure LVIA.08-2**.

There are many detractors in the view including two high voltage overhead powerlines in the near distance and a further two overhead powerlines crossing the ridgeline to the west of the site in the far distance. The sloping topography of the valley results in much of the near settlement being visible occupying a large proportion of the view. The view is of **medium** sensitivity due to the nature of receptors who would experience the view, including users of Craig Evan Leyshon Common.

View during quarrying

During the first phase of quarrying the soil stripping and construction of the screen bunds would be a visible element in the view, changing from a green field to operations within the extension area. Quarrying activity within the extension site would be partially screened from view following the construction of the screening landform. Quarrying activities within the existing site would be visible as they continue, with restoration and greening of the quarry slopes softening the appearance of the existing quarry faces and benches when restoration commences in this area.

View after restoration

The main short term effect of the restoration strategy in this view would be the application of bench treatment 4, soiling and planting, on the faces to the west of the plant site. This planting would visually narrow the break in the rock spur to the rear of the plant site. It would strengthen the band of woodland linking Coed Craig yr Hesg with the woodland along Ynysybwl Road. The extent of the visible quarry faces at the back wall of the quarry would also reduce.

In the long term, weathering of quarry faces and natural regeneration of benches within the quarry void would begin to soften the appearance of the quarry. This would combine with the planting referred to above to assist in the integration of the quarry into its landscape context in the view. Vegetation establishing on the screening landform would extend the view of the woodland along the ridgeline in the view.

Assessment

The existing quarry is a relatively intrusive element in the existing view. Other visually intrusive elements and the well wooded nature of the landscape result in a visual setting which is less sensitive to change. The visible part of the quarry occupies a relatively small part of the view. The extension of the quarry site would be a **small** change within the view resulting in an initial ***slight adverse*** impact while the screen bunds are constructed.

The scale of the quarrying activities would continue to be **small**, with a ***slight adverse*** visual impact, due to the proportion of the view the active quarry works will occupy.

The progressive restoration of the quarry faces and benches which would be visible in the view, and selective areas of quarry bench planting, would soften their appearance. Following restoration of the site the visual impact would be ***negligible*** and would reduce to ***slight beneficial*** once the proposed planting creates a visual link with Coed Craig yr Hesg along the ridgeline.

Assessment Photograph 4

Existing view from public footpath near Gelli-lwch 0.67km from the site, 232m AOD

The receptors in this location or nearby who would experience the change in the view are users of the public footpath and nearby residents at Gelli-lwch. The view is of **high** sensitivity due to the nature of the receptors who would experience the view, including residents in their own homes.

The elevated viewpoint looks down over the proposed extension site which is visible in the centre of the view, partially screened by vegetation. The proposed extension site is viewed against land along the eastern side of the River Taf valley in these views, which contrast in colour with the site, see **Figure LVIA.06-2**. Higher ground at Craig Leyshon Common is visible beyond the extension site in the view, with high voltage pylons and roads forming built features. The active part of the quarry site is obscured by landform in the view. Settlement within the Taf valley lies partially screened by vegetation in the left of the view.

View during quarrying

During the first phase of quarrying the soil stripping and construction of the screening landform would be a visible element in the view, changing from a green field to an active quarry site. Movement of vehicles and quarrying activities would be a visible element in the view.

During quarrying the northeast face of the extension would be visible, with the second and third phases of quarrying more visible than the first, but then screened as operations work down into the quarry void below the upper bench.

From similar views of the same direction the extension site will be partly screened from view as illustrated in **Appraisal Photographs 12, 13 and 14** by the woodland along Darren Ddu Road.

View after restoration

The progressive restoration of the quarry faces and benches would be visible in the view. The principal views would be of quarry bench treatment 2, with granular material and fines taken from the quarry waste stockpile to cover the bare rock. Over time, regenerating vegetation on these faces would soften their appearance.

Assessment

Extension of the quarry void would result in a **medium** scale change with the extension of quarrying activities into the view. The visual impact in this view would be ***slight adverse*** during initial phase of soils stripping, increasing to ***moderate adverse*** during the construction of the screening landform and during the active quarrying phases.

The progressive restoration of the quarry faces and benches would be visible in the view, and over time regenerating vegetation would soften their appearance. Following restoration of the site the visual impact would reduce to ***negligible***.

Assessment Photograph 5

View west from Ffordd Cartraeth in Cilfynydd, 1.30km from the site, 174m AOD

The receptors in this location or nearby who would experience the change in the view are residents and users of roads and footpaths in Cilfynydd.

The view looks out over the rooftops of houses on Ffordd Cartraeth, with the existing quarry site visible in the left of the view. The Taf Valley eastern side slope raises the settlement up from the valley floor, presenting similar views across the valley to many properties in Cilfynydd and Bodwenarth.

The foreground of the view is occupied by residential properties and land sloping down towards the valley floor and the A470, which can be clearly heard but is obscured by intervening landform. Craig yr Hesg quarry is located in the middle distance on steeply rising land at the opposite side of the valley. The ground surface of the extension site is visible beyond the existing quarry site in the view.

The existing quarry void is visible, largely screened by Coed Craig yr Hesg and houses in the view. The uppermost parts of the western faces are visible and, along with scattered trees and Coed Craig yr Hesg, form the horizon in the left hand side of the view. These faces contrast strongly in colour with adjacent features. Craig yr Hesg Quarry processing plant appears surrounded by woodland in this view, which softens its appearance, see **Figure LVIA.08-3**.

This view is of *high sensitivity* due to the prominence of the site in the view and the number of residential properties with primary and secondary views towards the site.

View during quarrying

During the initial phases of quarrying soil stripping and extension of the quarry void into the extension site will be visible features in the view, extending the visible portion of quarrying activity in the view.

Existing mature trees along the eastern boundary of the site would be retained, continuing to provide some screening of the active quarry faces. The woodland at Coed Craig-yr-Hesg also helps to obscure views.

View following restoration

The main short term effect of the restoration strategy in this view would be the application of bench treatment 4, soiling and planting, on the faces to the rear of the plant site. This planting would visually narrow the break in the rock spur and reduce the extent of quarry faces visible. It would strengthen the band of woodland linking Coed Craig yr Hesg with the woodland along Ynysybwl Road. Woodland planted on the screen bunds would also be visible, contributing to the strengthening of this band.

In the long term, weathering of quarry faces and natural regeneration of benches within the quarry void would begin to soften the appearance of those faces visible at the back wall of the quarry. This would combine with the planting referred to above to assist in the integration of the quarry into its landscape context in the view.

Assessment

The existing quarry is a visible element in the view due to its colour contrast with adjacent woodland. The development within the proposed extension site would result in an extension of this view.

Extension of the quarry void would result in a **small-medium** increase the proportion of the quarry visible in the view. The visual impact in this view would be ***slight-moderate adverse*** dependent on the angle of the viewer and the resulting scale of quarrying activities in the view.

The progressive restoration of the quarry faces and benches which would be visible in the view, and selective areas of quarry bench planting, would soften their appearance. Following restoration of the site the visual impact would reduce to ***negligible***.

Assessment Photograph 6

View west from Eglwysilan Road at the edge of Cefn Eglwysilan Common, 2.5km from the site, 327m AOD.

The receptors in this location or nearby who would experience the change in the view are users of the minor road and walkers on Cefn Eglwysilan Common.

The Taf Valley eastern side slope occupies the foreground of the view, descending towards the valley floor, which is largely concealed due to the convex profile of the intervening topography. Topographic pattern is the dominant feature of the view with a prominent ridge and valley pattern. Changes in vegetation pattern are also important. The open land in the context of the viewpoint is in contrast with the well vegetated and wooded area on the opposite side of the valley. Coed Craig yr Hesg and adjoining woodland dominate the central part of the view. The pattern of woodland is interrupted by settlement and by Craig yr Hesg Quarry, see **Figure LVIA.08-3**.

Despite the relative elevation of the viewpoint, the existing quarry floor within the void is obscured by the wooded ridge of Coed Craig yr Hesg. A proportion of the back wall of the quarry, on its north-western side is visible in the middle distance. The main haul road extends to the right from the void towards the primary crusher, which is partially obscured by woodland along Ynysybwl Road.

The existing Craig yr Hesg Quarry processing plant appears surrounded on three sides by woodland in this view, which softens its appearance. The spur of rock extending between the quarry void and plant site can be seen to the rear of the plant site, rising up towards the route of the main haul road. It is easily identified by its relative lack of vegetation compared to adjacent woodland. The proposed extension site is visible on higher ground beyond the existing operation site.

This view is considered of **medium** sensitivity due to the nature of the receptors who would experience the view including users of the minor road and walkers on Cefn Eglwysilan Common.

View during quarrying

During the initial phases of quarrying soil stripping and extension of the quarry void into the extension site would be visible features in the view, extending the visible portion of quarrying activity in the view.

View after restoration

The main short term effect of the restoration strategy in this view would be the application of bench treatment 4, soiling and planting, on the faces to the rear of the plant site. This planting would reduce the extent of quarry faces visible. It would strengthen the band of woodland linking Coed Craig yr Hesg with the woodland along Ynysybwl Road.

In the long term, weathering of quarry faces and natural regeneration of benches within the quarry void would begin to soften the appearance of those faces visible at the back (north-western) face of the quarry. This would combine with the planting referred to above to assist in the integration of the quarry into its landscape context in the view.

Assessment

The existing quarry is relatively well integrated into the view by mature woodland around the site boundary. Built development is the main intrusive element in the existing view. The visible part of the operational quarry currently occupies a relatively small part of the view.

Extension of the quarry void would create a **small** increase the proportion of the quarry visible in the view. The visual impact in this view would be ***slight adverse***.

The progressive restoration of the quarry faces and benches which would be visible in the view, and selective areas of quarry bench planting, would soften their appearance. Following restoration of the site the visual impact would be ***negligible***.

Table 6.11 provides a summary of the above assessment. Sensitivity of visual receptors is shown in the first column, with red=high, yellow=medium, green=low.

Table 6-11 Significance of visual effects

Photograph reference (sensitivity)	Viewpoint	Magnitude of change	Significance (assessment of effects during operation)	Significance (assessment of effects following restoration)
01	Existing view south from minor road west of Coed y Cwm	Small	*Slight adverse during construction of screen bund, reducing to negligible following establishment of grass seeding on bund.*	*Slight beneficial once vegetation has established, creating a continuous band of vegetation along the ridgeline.*

Photograph reference (sensitivity)	**Viewpoint**	**Magnitude of change**	**Significance (assessment of effects during operation)**	**Significance (assessment of effects following restoration)**
02	Existing view southeast from public footpath south of Cefn	Large during construction of screen bund, reducing to Medium	*Major adverse during construction of screen bund, reducing to moderate-slight adverse following establishment of grass seeding on bund.*	*Slight beneficial once vegetation has established, creating a continuous band of vegetation between the existing woodland block and the Darren Ddu Road.*
03	View southwest from the minor road at Craig Leyshon Common	Small	*Slight adverse during construction of screen bund, continuing to be slight adverse while active quarry works are a visible element in the view.*	*Negligible initially, improving to Slight beneficial once vegetation has established, creating a continuous band of vegetation along the ridgeline.*
04	Existing view from public footpath near Gelli-lwch	Medium	*Slight adverse during soil stripping, increasing to Moderate adverse during construction of the screen bunds and phases of active quarrying.*	*Negligible as over time regenerating vegetation on quarry faces softens their appearance.*
05	View west from Ffordd Cartraeth in Cilfynydd	*Small-Medium*	*Slight-moderate adverse dependent on the angle of the viewer and the resulting scale of quarrying activities in the view.*	*Negligible as over time regenerating vegetation on quarry faces softens their appearance.*
06	View west from Eglwysilan Road at the edge of Cefn Eglwysilan Common	*Small*	*Slight adverse due to an increased proportion of the quarry visible*	*Negligible as over time regenerating vegetation on quarry faces softens their appearance.*

6.8 Policy considerations

Restoration and aftercare measures have been incorporated into the scheme design in line with Policy CS10, and details of these measures are outlined in Chapter 4.0.

The proposed development of the extension site retains the local character of the landscape, with vegetation around the site boundary along the Daren Dddu Road and Coed Craig-yr-Hesg retained to assist in integrating the extension site into the wider landscape. The proposed extension of quarry workings would not alter the character and perception of the Llwyncelyn Special Landscape Area (AW8, NSA25);

The impact on the amenity of local residents ranges from moderate adverse to negligible. Construction of the screening landform would reduce the impact on residential properties to the immediate north and east of the site. (AW15). Proposed seeding and natural recolonistaion on the screening landform would have a long term slight beneficial impact on public footpaths in the area (AW7).

Planning policy requires that careful consideration should be given to the potential effects the development proposals may have on setting of historic assets. There are no adverse impacts identified upon listed buildings, scheduled monuments and Registered Parks and Gardens (AW7).

The extension site is identified as a Preferred Area of Known Mineral Resource (SSA25), as discussed in detail in Section 8.0 of the Planning Application Statement.

6.9 Summary and Conclusions

There would be a change in the character of the site associated with the introduction of the quarry extension, from that of grassland to an active quarry site.

The change to the landscape associated with the introduction of the quarry extension would be viewed in the context of the existing quarry development, urban development on the Taf Valley floor, roads and high voltage power lines within the area.

There would be a moderate to slight adverse visual impact on the setting of public footpaths within the study area, dependent on the dominance of the quarry extension in relation to the setting of the path. For a small section of footpath closest to the quarry extension the impact would be major adverse during construction of the screen bunds. The impact on roads within the study area will be slight adverse-negligible.

The settlements of Glyncoch, Coed-y-Cwm, Cefn, Cilfynydd and Bodwenarth, along with residential dwellings scattered through the wider rural landscape to the west of the site were identified within the study area for the LVIA.

Most properties closer to the site in Glyncoch have their views screened by landform and vegetation. Construction of the screening landform would have temporary short term slight adverse impact on some properties in Glyncoch, Coed y Cwm and Cefn, however following its construction views of quarrying activities would will be entirely screened from these properties.

Properties with direct views towards the site are more likely to experience moderate adverse impacts. Impacts on residential dwellings and settlement range from moderate adverse to negligible.

There would be no direct impacts on the physical historic landscape resource of the area. There would be no impact on the nearby Listed buildings, ancient monuments, Conservation Areas or Landscapes of Special Historic Interest.

There are no significant adverse impacts on LANDMAP aspects areas with evaluations of High or Outstanding.

The visual appraisal, informed by the Zone of Theoretical Visibility (ZTV) study identified a number of locations from which the proposed extension site is visible. Six viewpoints were identified as representative of the most sensitive views available. The visual impact is assessed as major to slight adverse during construction of the screening landform, reducing to slight to moderate adverse during quarrying operations.

The progressive restoration of the quarry faces and benches would be visible, and selective areas of quarry bench planting, would soften their appearance. Following restoration of the site the visual impact would be negligible to slight beneficial.

The extent of the proposed extension area has been defined to retain important features and minimise impact on nearby properties and settlements. The western extent is defined by the retention of vegetation and stone walling along Darren Ddu Road. The northern extent is defined by the dry stone walls and vegetation along the field boundaries. Also, there is a gentle gradient towards this northern boundary before the land become steeper to the north. The eastern extent of the proposed quarry extension has been defined by the screening landform. The establishment of the screening landform would have the greatest effect in reducing potential adverse impacts from this direction.

Major adverse impacts identified are from selected areas close to the site boundary and will be short term, temporary impacts, which will reduce following the construction and seeding of the screening landform and bund which act to reduce landscape and visual adverse impacts during the operational period.

The mitigation measures proposed would reduce the negative landscape and visual impacts associated with the extension of Craig yr Hesg quarry to an acceptable level.

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7.0 ECOLOGY

7.1 Introduction

This Chapter of the Environmental Statement (ES) has been prepared by SLR Consulting, and provides an Ecological Impact Assessment (EcIA) in respect of the proposed extension and subsequent restoration of Craig yr Hesg Quarry. The EcIA focuses on a proposed north-westerly extension to the existing quarry void.

The boundary of the extension and consolidation application site is shown on **Figure 1.1** and includes the currently permitted Craig yr Hesg Quarry, and an extension area comprising some 11.2 hectares (ha) of land to the west of the existing quarry, which comprises the proposed quarry extension area, land to accommodate screen bunds, and immediately adjoining land. Within this chapter reference is made, where appropriate to the ‘application site’ which relates to the full ‘application site’ (existing quarry and extension area), and to the ‘extension area’ alone.

The proposed quarry development is described in full in Chapter 3 of the ES, although in summary it will essentially comprise:

- establishment of proposed landform screening bunds to enclose the quarry extension area and accommodate overburden material from phase 1 of the extension area development;
- progressive development of existing quarry faces and benches in a north-westerly direction, to a depth of 100m AOD in accordance with existing quarry depth, as shown on the Phasing Plan **Figures 3.1 – 3.5**; and
- restoration of the application site in accordance with the established principles for the existing quarry. The proposed restoration and aftercare scheme is included as Chapter 4 of the ES. The ability to deliver biodiversity gains has been a key consideration in the development of the restoration and aftercare proposals.

The purpose of this EcIA is to provide decision-makers with information about the likely significant ecological effects associated with the proposed quarry development within the extension area, in particular the potential impacts on designated and undesignated habitats and protected or notable species.

It is the role of all ecologists involved in ecological assessment to:

- provide an objective and transparent assessment of the ecological effects of a proposed development or activity;
- facilitate objective and transparent determination of the consequences of the proposals in terms of national, regional and local policies relevant to nature conservation and biodiversity; and
- set out what steps will be taken to ensure that legal requirements relating to habitats and protected or controlled species are met.

In assessing the effects of any such proposal, it is necessary to define the spatial and temporal area of study and to focus the assessment upon those features or resources that are of ecological value in the context of that proposal. The scope of this assessment has been determined through the consideration of the possible direct and indirect impacts associated with the proposed extension and the ecological receptors that may be affected.

7.2 Methodology

The scope of this EcIA, i.e. the collection of baseline data, evaluation of ecological resources and description and assessment of the significance of impacts, follows guidelines set out by the Institute of Ecology and Environmental Management (IEEM 2006) (now the Chartered Institute of Ecology and Environmental Management) and references therein.

7.2.1 Approach to Assessment

The ES relates to the proposed north-westerly extension to the permitted extraction area at Craig yr Hesg Quarry.

The EcIA study focuses on the proposed extension area as shown on **Figure 7.1**, but refers to existing ecological information relating to the existing quarry where relevant.

Also relevant to this EcIA, are Chapter 4 of the ES, which sets out the restoration strategy, Chapter 9 of the ES, which considers potential hydro-geological impacts, and Chapter 12 of the ES, which considers air quality (dust) impacts.

7.2.2 Collation of Baseline Data – Consultation

A scoping opinion has been received from Rhonda Cynon Taf County Borough Council (RCTCBC), dated 26th November 2014. The scoping opinion was issued after completion of the initial (Phase 1) habitat survey, although was developed through discussion between SLR and RCT.

A discussion was also held between SLR and the RCTCBC Ecologist on the 5th August 2014. The discussion related specifically to the requirement for any additional protected species surveys, during which it was agreed that no specific surveys for protected species would be required. This was based on the habitat types to be affected and the nature of potential impacts.

The scoping opinion requested that existing grassland be subject to a Phase 2 vegetation survey, with particular reference to establishing whether the grassland communities MG5 or U4 occur within the proposed extension area, as these grassland communities are generally indicative of unimproved grassland habitats of higher conservation value.

7.2.3 Collation of Baseline Data – Background Data and Biological Records

To inform the EcIA study, the following organisations or on-line resources have provided data:

- South East Wales Biodiversity Records Centre (SEWBReC) has provided information relating to statutory designations and existing species records for a 2km search area;
- The Natural Resources Wales (NRW) website has provided information on statutory designated sites;
- The RCTCBC Ecologist has provided information relating to non-statutory ecological designations;
- Wales Biodiversity Partnership website has provided information on habitats and species of principle importance for conservation in Wales;
- RCTCBC website has provided information on species and habitats of local importance; and
- Forestry Commission Wales (FCW) website, which provided the 2011 Ancient Woodland Inventory (AWI).

A summary of background information received for the purposes of this EcIA is included within this Chapter and **Appendix 7.1**. Copies of site designations have been included within **Appendix 7.1,** although the full SEWBReC report is not included due to the contents including sensitive information on the location of protected species.

In addition, a range of ecological surveys were undertaken during 2009 to inform an Environment Act Initial Review application, which was submitted to RCT in 2010. A decision notice with an updated schedule of conditions was issued in April 2013 (ref 08/1380/10).

The 2009 study area encompassed the boundary of the current planning permission at Craig yr Hesg Quarry, and immediately adjoining land, where the 2009 survey area partly overlaps the boundary of this EcIA. The 2009 EcIA thus provides a valuable source of contextual information, and the 2009 survey results are accordingly reviewed in this EcIA, where appropriate to the current application.

7.2.4 Collation of Baseline Data – Habitats and Flora

Phase 1 Survey

To inform the EcIA study, a Phase 1 habitat survey of the extension area and immediate surrounding area has been undertaken following the standard methodology for Phase 1 habitat survey; this approach was developed by the Joint Nature Conservation Committee (JNCC) in the mid 1980's and has, as its core, the utilisation of a standardised series of colour, symbols and descriptive categories to record habitats, species and other physical features.

The methodology was developed in order to allow a quick, universal, means of mapping semi-natural and other habitats at up to a county scale. A Phase 1 survey therefore provides a consistent approach to habitat recording and evaluation, and a means of identifying features which may be of value for protected species through the use of target notes.

The Phase 1 survey was 'extended' to include an assessment of the potential for protected species to occur within or adjacent to the study area.

The Phase 1 survey was undertaken on the 9th May 2014. The Phase 1 habitat map is shown as **Figure 7.1** and is based upon the JNCC methodology.

Phase 2 Survey

Following consultation with RCTCBC during the preparation of the scoping opinion, a Phase 2 botanical survey was undertaken on the 10th September 2014 following the National Vegetation Classification (NVC) methodology. The quadrat locations are shown on **Figure 7/2.**

Vegetation communities (determined by recording species and their abundance) were sampled using 2x2m quadrats, in accordance with the guidance for sampling grassland.

The survey area was initially walked to identify potentially different stands of vegetation. At least five quadrats were then completed in each potential stand of homogenous vegetation/grassland community that had been identified.

The quadrat data from each vegetation stand was then assessed using both MAVIS and cross-referencing the data to the NVC British Plant Communities Volume 3 (grasslands) in order to determine which community of the NVC was most like that of those recorded.

7.2.5 Collation of Baseline Data – Protected and Notable Fauna

The Extended Phase 1 survey and consultation identified that the proposed extension area largely occurs within two fields enclosed by dry stone walls. The fields were found to contain a sward of predominantly semi-improved grassland, which was found to be relatively species poor across much of the study area and lack any vegetation structure.

The south-western field was found to contain localised areas where the sward showed increased floristic diversity, although remained heavily grazed and dominated by grasses, with more extensive areas of bracken also present with scattered scrub species.

As such, the potential for protected and notable fauna to occur, or be negatively impacted upon by the proposed extension, was considered to be low and no specific protected species surveys have been advised or undertaken to inform this EcIA. This approach was agreed during consultation with RCTCBC on the 5th August 2014.

The presence of birds and reptiles within the application site has been confirmed during habitat surveys, and it has been concluded for the purposes of this EcIA that these groups utilise the application site. Further details are provided in the Results section.

Ecological survey work undertaken at the site during 2009 has also been taken into account for contextual purposes.

7.2.6 Collation of Baseline Data – Constraints

No specific constraints have been identified that would prevent the EcIA from being completed.

It is considered that the level of detail gathered during this EcIA study has been sufficient to assess the ecological value of the application site, in order to advise an appropriate scheme of mitigation to ensure that the proposed extension can be undertaken without adversely affecting sensitive or important ecological receptors.

The ecological surveys undertaken to inform this EcIA have been undertaken following industry guidance and best practice. The surveys have been undertaken at appropriate times of the year to achieve the required objectives.

7.3 Approach to Evaluation

The baseline information obtained has been used to undertake an assessment of the value of ecological features within the extension area.

Ecological features are defined as:

- statutorily protected (Natura 2000 sites, National Nature Reserve, Sites of Special Scientific Interest and Local Nature Reserves) or locally designated (e.g. Sites of Importance for Nature Conservation/County Wildlife Sites) sites and features;
- sites and features of biodiversity value not designated in this way, e.g. areas listed on published inventories of priority biodiversity habitats (e.g. ancient woodland inventory, lowland grassland inventory), habitats of principle importance for conservation in Wales (Section 42 habitats) or areas of habitats subject to Local Biodiversity Action Plan targets; and
- species of biodiversity value or other significance, including those protected and controlled by law.

An evaluation of the above ecological features has been based upon the relevant CIEEM guidelines.

7.3.1 Impact Assessment

The assessment of ecological impacts follows the process described by the CIEEM guidance, which can be summarised as:

- determine the value of ecological features and resources affected through survey and/or research and assess impacts affecting important features and resources (quantifying the proportion affected and reversibility/recoverability of those resources);
- identify significant impacts in the absence of any mitigation;
- identify measures to avoid or reduce adverse impacts (and in particular likely significant impacts);
- demonstrate the likely success of mitigation measures;
- identify opportunities for enhancement; and
- produce a clear summary of the significant residual impacts of the proposal incorporating all mitigation and enhancement measures.

7.3.2 Evaluation Criteria

All species and populations of species, including those with statutory protection, are evaluated on the same basis. It should be noted that even when a species is protected under European and UK statute, the presence of a small population on a site within a region where this species is widespread is unlikely to be assessed at a value of greater than district-level importance. Equally, a particular feature on a site may attract large numbers of an unprotected species that has limited distribution and this may represent a feature of county or even regional importance.

The criteria used to determine the biodiversity value of a species or features that may support a species include the following general considerations:

- rarity at a geographical level (international, national or local);
- endemism and locally distinct varieties or sub-species;

- species on the edge of geographic range;
- size of populations in the local geographical context;
- species-rich assemblages of a larger taxonomic grouping, e.g. herpetofauna or wintering birds;
- plant communities, ecosystems or habitat mosaics/associations that provide habitat for any of the above species or assemblages; and
- populations of species considered as significant under locally published guidelines or Red Data Books (RDB).

Current guidelines (IEEM 2006) suggest that to ensure a consistency of approach, ecological features are valued in accordance with their geographical frame of reference as follows:

- International;
- UK;
- National (Wales);
- Region (South Wales);
- County/Borough (Rhondda Cynon Taf)
- District (Taff Valley)
- Parish/Local (Pontypridd) and
- Site Level Only (Craig-yr-Hesg Quarry).

Sites and features that are valued as being important within the immediate zone of influence (i.e. site level) may still have ecological value, for either flora or fauna, but this value is considered to be no greater than what is typical for those habitats or species in that locality and they do not have any special nature conservation interest. These categories have been applied to the features identified in baseline survey described previously.

Separate valuations are provided for designated sites, non-designated sites, features and species where appropriate.

These categories are then applied to the features identified in baseline surveys and desk-top studies. Some features can already be recognised as having ecological value and as such they may be designated as a statutory or non-statutory wildlife site, other features may require an evaluation based upon their previously un-assessed biodiversity value.

Impacts are assessed as significant if they affect the Favourable Conservation Status (FCS) of a receptor at a specified geographic scale. The conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. Conservation status of a habitat means the sum of influences acting upon it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species.

7.3.3 Impact Criteria

Table 7-1 below identifies the key considerations when characterising impacts on ecological receptors once the above values have been established. The table characterises the valued ecological receptors affected and identifies the range of potential impacts, the magnitude and significance of the effect

To fully evaluate the effects of a predicted impact upon those valued ecological receptors it is necessary to assess the magnitude of the impact upon that feature (identified in **Table 7-2**). The predicted impacts of the proposed development, following mitigation, i.e. the residual impacts are assessed using the following criteria which are based on published guidance.

Table 7-1 Key Considerations When Characterising Impacts

Descriptor	Definition[2]
Direction of impact	Positive or negative impact.
Probability of occurring	Broadly defined on 3 levels: Certain (> 95% of occurring), Probable (above 50% but below 95%) or Unlikely (above 5% but below 50%).
Complexity	Direct, Indirect or Cumulative.
Extent and Context	Area/number affected and % of total.
Magnitude	Describes the severity of effect in words.
Timing and Frequency	Seasonality and resilience to repeated impacts (e.g., noise).
Duration	Permanent or Temporary in ecological terms (e.g. within the lifetime of the species effected).
Reversibility	Whether or not the effect can be reversed in an appropriate ecological timescale.

[2] Definitions for these terms and further information relating the methods of assessment are given in Guidelines for Ecological Impact Assessment (IEEM, 2006).

Table 7-2 Criteria for Assessing the Magnitude of Impacts

Magnitude of Impact	Criteria
Major Negative	A change likely to cause a permanent adverse effect upon the integrity and/or conservation status of the ecological receptor.
Negative	A change adversely affects the valued ecological receptor but not to the extent that a permanent effect on integrity and/or conservation status occurs.
Neutral	No effect.
Positive	A change is likely to benefit the receptor in terms of its conservation status, but not so far as to achieve favourable conservation status.
Major Positive	A change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value.

7.3.4 Mitigation Hierarchy

Mitigation follows a three stage process:

i) Avoidance i.e. can the impact be removed through a change to the design or project timetable;

ii) Mitigation i.e. where impacts cannot be avoided, can they be reduced or removed through the implementation of mitigation measures.; and

iii) Compensation.

Where mitigation measures do not address all aspects of the predicted impact i.e. residual impacts would still occur, further measures may be required to provide compensation for unmitigated impacts.

Compensation and mitigation are often grouped together in an EcIA, as although there are technical differences, they often link together to form an overall mitigation strategy which combines element of mitigation and compensation to address the impacts identified.

Following the implementation of all mitigation and compensation measures, the potential exists for residual impacts to remain. The significance of residual impacts is then subject to a final assessment on three separate levels. These can be summarised as:

- consequences for biodiversity resources, including effects upon the individual ecological features in terms of individuals and populations, cumulative and in-combination effects;
- consequences in terms of national and local nature conservation planning policy: and
- legal requirements relating to protected species and designated sites.

7.4 Legal and Policy Considerations

A brief overview of planning policies that are potentially relevant to this EcIA is provided below.

7.4.1 National Policy

Chapter 5 of Planning Policy Wales (PPW) contains important policy statements in respect of biodiversity and, more specifically, the mechanisms for protecting and enhancing biodiversity through development controlled by the planning process. This includes a requirement for an assessment of ecologically designated sites and protected species to be undertaken for proposed developments.

The PPW guidance is supplemented by Technical Advice Notes (TAN), with TAN 5 relating to nature conservation and planning, which further explains the requirement to consider ecological impacts in development proposals.

7.4.2 Local Policy

The RCT Local Development Plan (LDP), adopted in March 2011, includes a number of policies that relate to biodiversity. These have been further explained in RCT's Supplementary Planning Guidance (SPG) relating to Nature Conservation. The policies relevant to this EcIA are:

Policy AW6 – Design and Placemaking sets out that: "Development Proposals will be supported where" amongst other considerations "The design protects and enhances the landscape and biodiversity";

Policy AW 8 – Protection and Enhancement of the Natural Environment sets out that:

"*Rhondda Cynon Taf's distinctive natural heritage will be preserved and enhanced by protecting it from inappropriate development. Development proposals will only be permitted where*:-

1. They would not cause harm to the features of a Site of Importance for Nature Conservation (SINC) or Regionally Important Geological Site (RIGS) or other locally designated sites, unless it can be demonstrated that:-

a) The proposal is directly necessary for the positive management of the site; or

b) The proposal would not unacceptably impact on the features of the site for which it has been designated; or

c) The development could not reasonably be located elsewhere and the benefits of the proposed development clearly outweigh the nature conservation value of the site.

2. There would be no unacceptable impact upon features of importance to landscape or nature conservation, including ecological networks, the quality of natural resources such as air, water and soil, and the natural drainage of surface water."

7.4.3 International Sites

The most important sites for biodiversity are those identified through international conventions and European Directives. Local planning authorities should identify these sites on proposals maps and may need to cross-refer to the statutory protection given to these sites in the explanatory texts in local development documents

7.4.4 National Sites

Many Sites of Special Scientific Interest (SSSI'S) are also designated as sites of international importance and will be protected accordingly. Those that are not, or those features of SSSI's not covered by an international designation, should be given a high degree of protection under the planning system.

7.4.5 Local and Regional Sites

Sites of regional and local biodiversity and geological interest, which include Regionally Important Geological Sites, Local Nature Reserves and Local Sites i.e Sites of Importance for Nature Conservation (SINC), have a fundamental role to play in meeting overall national biodiversity targets; contributing to the quality of life and the well-being of the community; and in supporting research and education.

Criteria-based policies should be established in local development documents against which proposals for any development on, or affecting, such sites will be judged. These policies should be distinguished from those applied to nationally important sites, which in RCT is transposed into Policy AW8.

7.4.6 Biodiversity within Developments

Development proposals provide many opportunities for building-in beneficial biodiversity or geological features as part of good design, and developers are encouraged to maximise such opportunities.

7.4.7 Species Protection

Many individual wildlife species receive statutory protection under a range of legislative provisions.

Local authorities should take steps to protect the habitats of these species from decline, through the inclusion of policies in local development plans. Planning authorities should ensure that these species are, where necessary, protected from the adverse effects of development by the use of appropriate planning conditions.

7.4.8 National Legislation

Local Authorities have a statutory obligation to conserve and enhance biodiversity under the Natural Environment and Rural Communities Act (NERC) 2006. This act extends the biodiversity duty set out in the Countryside and Rights of Way (CROW) Act to public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity:

"Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity" Section 40, NERC Act, 2006.

7.5 Ecological Baseline

7.5.1 Ecologically Designated Sites

A summary of the ecologically designated sites identified within the desk study search area is provided in Table 7-3 below.

Citations and site information received during the desk-top study have been provided within **Appendix 7.1.**

Table 7-3 Summary of Ecologically Designated Sites within the 2km Search Area

Site Name and proximity to Application Site Boundary	Reason for Importance
Craig-yr-Hesg Local Nature Reserve – adjacent to southern boundary of quarry.	Part of the SINC area (see below for habitat descriptions) has been designated as a LNR formalising public access and use of the woodland habitat.
Craig-yr-Hesg/Lan Wood SINC - partially within Phase 1 study area (TN 10), but outside the proposed development area, and present adjacent to Craig-yr-Hesg Quarry.	The SINC designation extends to 89.72ha and is predominantly ancient semi-natural woodland, with evidence of former quarry/coal workings and natural rock outcrops, with smaller areas of grassland and bracken habitats. The SINC has associated faunal interest, in particular woodland birds.
Lower Clydach Woodlands – c.0.6km north.	Semi-natural (and part ancient) woodland occurring along a steep sided valley of the Nant Clydach. The SINC also contains areas of dry grassland / bracken and species-rich marshy grassland.
Llys Nant and Craig Twyn-y-glog Woodlands – c.0.5km north-west.	A mosaic of habitats including an upland stream which is likely to have associated faunal interest for birds such as dipper and salmonid fishes. The SINC also contains areas of species-rich broadleaved woodland and conifer plantation.
Taff and Rhondda Rivers – c.1km south-east.	Recognised as a 'major biodiversity artery' the river catchment has high faunal interest, including otter, salmonid fishes, birds and a diverse range of associated riparian habitats including carr woodland, floodplain grassland and scrub/woodland.

7.5.2 Other Ecological Designations

Craig-yr-Hesg wood borders parts of the site, as shown in **Appendix 7.1,** 20.35ha of which is identified as restored ancient woodland on the FCW AWI.

A minor area (0.31ha) of the Phase 1 survey area (TN 10) is also identified on the FCW AWI as ancient semi-natural woodland, although this occurs beyond the application boundary. The Phase 1 survey found this area contained scattered mature trees, but the area was dominated by a bracken and tall herb vegetation.

7.5.3 Pre-existing Records of Protected and Notable Species

A background search for records of protected and notable species was undertaken as part of the study. The search area extended 2km as shown in **Appendix 7.1**.

A number of records of legally protected and ecologically notable species within the search area were returned during the desk study. Due to the high number of biological records returned, only a summary of the internationally and nationally protected and priority species records identified within the search area is provided in Table 7-4 below.

Table 7-4 Summary of Species Records within the 2km Search Area (records in bold relate to the Application Site).

Group	Species (Scientific name)
Mammals	Whiskered bat (*Myotis mystacinus*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), noctule bat (*Nyctalus noctula*), brown long-eared bat (*Plecotus auritus*), otter (*Lutra lutra*), badger (*Meles meles*), hedgehog (*Erinaceus europaeus*) and polecat (*Mustela putorius*).
Birds	Peregrine falcon (*Falco peregrines*), barn owl (*Tyto alba*), kestrel (*Falco tinnunculus*), northern goshawk (*Accipiter gentilis*), sky lark (*Alauda arvensis*), kingfisher (*Alcedo atthis*), tree pipit (*Anthus trivialis*), lesser redpoll (*Carduelis cabaret*), common linnet (*Carduelis cannabina*), black-headed gull (*Chroicocephalus ridibundus*), cuckoo (*Cuculus canorus*), lesser spotted woodpecker (*Dendrocopos minor*), yellowhammer (*Emberiza citronella*), reed bunting (*Emberiza schoeniclus*), hobby (*Falco subbuteo*), pied flycatcher (*Ficedula hypoleuca*), brambling (*Fringilla montifringilla*), little bittern (*Ixobrychus minutus*), Mediterranean gull (*Larus melanocephalus*), common crossbill (*Loxia curvirostra*), red kite (*Milvus milvus*), spotted flycatcher (*Muscicapa striataz*), osprey (*Pandion haliaetus*), house sparrow (*Passer domesticus*), grey partridge (*Perdix perdix*), wood warbler (*Phylloscopus sibilatrix*), marsh tit (*Poecile palustris*), hedge accentor (*Prunella modularis*), bullfinch (*Pyrrhula pyrrhula*), lapwing (*Vanellus vanellus*), fieldfare (*Turdus pilaris*), song thrush (*Turdus philomelos*), redwing (*Turdus iliacus*) and starling (*Sturnus vulgaris*).
Herpetofauna (amphibians and reptiles)	Slow worm (*Anguis fragilis*), common lizard (*Zootoca vivipara*), adder (*Vipera berus*), palmate newt (*Lissotriton helveticus*) and common frog (*Rana temporaria*).
Invertebrates	Small pearl-bordered fritillary (*Bolorai selene*), pearl-bordered fritillary (*Boloria euphrosyne*), brown-banded carder bee (*Bombus (Thoracobombus) humilis*), goat moth (*Cossus cossus*), marsh fritillary (*Euphydryas aurinia*), white-letter hairstreak (*Satyrium w-album*) and grayling (*Hipparchia semele*).
Fish	European eel (*Anguilla anguilla*), atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*).
Plants	Bluebell (*Hyacinthoides non-scripta*).

7.5.4 Habitat Baseline

An Extended Phase 1 habitat survey was undertaken on the 9th May 2014 by Mr Chris Mitchell, a Chartered Environmentalist (CEnv), a Full Member of the CIEEM (MCIEEM), and Associate Ecologist with SLR.

The results of the survey are shown on **Figure 7.1**, Phase 1 Habitat Map, which has been refined during a subsequent Phase 2 survey (see below). Full descriptions of habitats against the Target Note (TN) references shown on **Figure 7.1** are provided in Table 7-5 below.

The application site largely occurs within two fields enclosed by dry stone walls. The fields contain a sward of predominantly semi-improved grassland, which was found to be dominated by monocotyledons and relatively species poor in terms of herbaceous species.

The majority of the grassland area was found to be very closely grazed by horses at the time of both the Phase 1 and Phase 2 surveys, showing signs of more intensive agricultural improvement in places through the localised dominance of white clover (*Trifolium repens*). The south-western field was found to contain localised areas where the sward showed increased floristic diversity, although remained heavily grazed and dominated by grasses, with areas of bracken (*Pteridium aquilinum*) also present with scattered scrub species.

The field boundaries were marked by dry stone walls, which were generally intact, with bracken fringing the walls in places.

The wider surroundings comprise of the existing quarry void broadly to the south, semi-improved grassland and small woodland blocks to the north and east, with Craig-yr-Hesg/Lan Wood SINC to the west of the application site, with a small area within the boundary of the application site but not part of the extension area.

Table 7-5 Target Note Descriptions

Photograph	TN number and Description
	**1. Ruderal Mosaic** An area of disturbed ground with various soil storage mounds (from the previous quarry extension) that have been re-colonised by bramble (*Rubus fruticosus* agg.) with patches of soft rush (*Juncus effusus*), rosebay willowherb (*Chamerion angustifolium*) and broad-leaved dock (*Rumex obtusifolius*). Small remnants of grassland sward occur, with sweet vernal grass (*Anthoxanthum odoratum*), Yorkshire fog (*Holcus lanatus*), common bent (*Agrostis capillaris*) and occasional bird's foot trefoil (*Lotus corniculatus*), creeping buttercup (*Ranunculus repens*), ribwort plantain (*Plantago lanceolata*) and sheep's sorrel (*Rumex acetosella*). A defunct hedge marks the boundary, ranging from 4-6m in height and dominated by goat willow (*Salix caprea*) with silver birch (*Betula pendula*) also present.

Photograph	TN number and Description
	**2. Dry stone Wall Field Boundary** Mostly intact with some collapsed sections, the wall has a partial fringe of bracken and scattered scrub regeneration comprising bramble, holly (*Ilex aquifolium*), rowan (*Sorbus acuparia*) and hawthorn (*Crataegus monogyna*). Bluebell (*Hyacinthoides non-scripta*) was present at low frequencies along the base of the wall. Two semi mature Scot's pine (*Pinus sylvestris*) trees, in the region of 8-10m in height and with a Diameter at Breast Height of 0.5m, occur alongside the wall.
 May 2014	**3. Semi-improved grassland** The main component of the proposed extension area, a gently sloping field heavily grazed by horses at the time of survey, with sward height being less than 2cm across large swathes of the field. Grasses dominate the sward, with sweet vernal grass, common bent and crested dog's tail (*Cynosurus cristatus*) all being abundant species. Yorkshire fog, red fescue

Photograph	TN number and Description
 September 2014	(*Festuca rubra*) and smooth meadow grass (*Poa pratensis*) and perennial rye grass (*Lolium perenne*) occur on an occasional to frequent basis. Herbaceous species occur at low frequencies and include rough hawkbit (*Leontodon hispidus*), creeping buttercup, ribwort plantain, cat's ear (*Hypochaeris radicata*) and common field speedwell (*Veronica persica*). Common knapweed (*Centaurea nigra*) was found to occur at very low frequencies (less than 5 plants in total). White clover was found to be an abundant sward component over an approximate 20% of the field (broadly south-western area), indicating more intensive agricultural improvement is likely to have taken place here.

Photograph	TN number and Description
	**4. Dry stone Wall Field Boundary** The wall is largely intact although gaps occur towards the northern end (as shown in photo) and is approximately 1m in height. A fringe of bracken occurs along most of the wall, with occasional foxglove (*Digitalis purpurea*), sheep's sorrel, heath bedstraw (*Galium saxatile*) and the moss *Polytrichum formosum*.
 May 2014	**5. Semi-improved grassland** Also heavily grazed at the time of survey, with sward height typically less than 5cm and generally comparable to TN3 in open grass dominated areas. The main exception being that bracken forms dominant stands over approximately 50% of the field area which became more evident by the September survey. Where bracken does occur, the sward was found to contain occasional yellow rattle (*Rhinanthus minor*) and bird's foot trefoil, although the sward remains otherwise comparable to the wider field.

Photograph	TN number and Description
 September 2014	The localised presence of anthills in this area, and noticeable absence of clovers, indicates this area of the field is less likely to have been subject to significant levels of agricultural improvement. Towards the western edge of the field, sandstone bedrock outcrops occur, although limited in extent, and support a sparse cover of mosses (*Rhytidiadelphus squarrosus, Brachythecium rutablum* and *Polytrichum* sp.) and sheep's sorrel.
	**6. Quarry Boundary** The existing quarry rim is marked by a palisade fence, with a low bund and stone wall also running alongside. The bund is bare/disturbed ground and rock in places, but also vegetated with small patches of grassland and is subject to encroachment by bramble, silver birch and oak (*Quercus robur*).

Photograph	TN number and Description
	**7. Semi-Improved Grassland** The field was not directly accessible during the survey but appeared to support a grassland resource comparable to that of TN 5, although the field was unmanaged and had an increased sward height at the time of survey.
	**8. Woodland** The woodland was not directly accessible during the survey but the main species could be observed. The woodland appeared secondary in nature, potentially including a degree of plantation, with beech (*Fagus sylvatica*), ash (*Fraxinus excelsior*) and rowan (*Sorbus acuparia*) all forming the canopy layer. The shrub layer comprises hazel (*Corylus avellana*), holly and hawthorn (*Crataegus monogyna*) over patches of bramble and scattered bluebell.

Photograph	TN number and Description
	**9. Darren Ddu Road** The Road, which takes the form of a narrow lane which is not suitable for road traffic is bordered by mature hazel coppice and frequent oak, rowan and beech which continue along the edge of the grassland (TN 5), opening out to TN 10 (below). The lane edges support a woodland ground flora which includes bluebell, wood avens (*Geum urbanum*), enchanter's nightshade (*Circea intermedia*), common male fern (*Dryopteris felix-mas*), hard fern (*Blechnum spicant*), dog violet (*Viola riviniana*) and wild strawberry (*Fragaria vesca*). Mosses also form a prominent element of the ground flora, in particular along the edges of a defunct stone wall which marks the field boundary, with *Polytrichum formosum* and *Plagiothecium undulatum* being abundant species.

Photograph	TN number and Description
	**10. Bracken with Scattered Trees** The woodland shelter belt of Darren Ddu Lane opens out to an area of predominantly bracken with an understorey of bluebells, interspersed with lenses of acid grassland and scattered scrub/mature trees. This area is included within the Craig-yr-Hesg/Lan Wood SINC and is also identified as ancient semi-natural woodland on the FCW AWI.

Protected Flora

Bluebell, a plant species listed on Schedule 8 of the Wildlife and Countryside Act 1981 (as amended), was identified in the desk study and recorded within the study area (TN 2, 8, 9, & 10). This species receives protection in respect of collection for trade purposes rather than in relation to development activities.

Notable Flora

Detailed Phase 2 botanical surveys of the proposed extension area were undertaken during September 2014.

The survey covered the grassland habitats within the proposed extension area, with a total of 30 quadrats being completed. The locations of the quadrats are shown on **Figure 7.2,** with a copy of the quadrat data being provided as **Appendix 7.2.**

Completion of the computerised analysis found all six sample areas to most closely resemble the NVC community of MG6 *Lolium perenne – Cynosurus cristatus* grassland. Five of the sample areas most closely resembled the *Anthoxanthum odoratum* sub-community, with one area most closely resembling the typical sub-community.

Table 7-6 shows the detailed community analysis.

Table 7-6 Vegetation Community Analysis output from MAVIS

Quadrat Numbers	MAVIS Analysis (closeness of fit)
1 - 5	MG6b (59.15 %), MG6 (53.10 %), MG6a (50.63 %)
6 - 10	MG6b (55.36 %), MG6 (54.94 %), MG6a (54.34 %)
11 - 15	MG6b (57.14 %), MG6 (54.73 %), MG6a (54.05 %)
16 - 20	MG6b (59.14 %), MG6 (50.55 %), MG6a (49.79 %)
21 - 25	MG6b (49.12 %), MG6a (48.07 %), MG6 (46.82 %)
26 - 30	MG6a (60.99 %), MG6 (57.59 %), MG6b (57.46 %)

Following completion of the computerised analysis, manual reference to the NVC key confirmed the vegetation as most closely resembling MG6.

Although subtle differences in the vegetation are evident particularly in the south-western field i.e lower than expected abundance *Lolium perenne,* the localised dominance of bracken and more frequent herbaceous species, these are not significant enough factors to fundamentally change the community type as the main sward species were found to be relatively constant, in terms of frequency and abundance, across the survey area.

Invasive Flora

No invasive plant species as listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), were recorded. Japanese knotweed (*Fallopia japonica*) was previously recorded during the 2009 surveys, although beyond the current application site.

As site visits were completed during May and September i.e the optimum periods for botanical recording, it is considered likely that if any invasive species were present within the application site then they would have been evident.

7.5.5 Protected Species (Fauna) Baseline

Bats

The desk top study confirmed records of five species of bat, namely common pipistrelle, soprano pipistrelle, whiskered, noctule and brown long-eared. None of the records related to the extension area itself, or the immediate surroundings.

Potential Roost Sites

The 2009 surveys did not identify any roost sites and concluded that the presence of roosts within the existing active quarry (faces) was unlikely due to the high levels of ongoing mineral extraction at the site. This assessment remains valid as the existing quarry is highly operational.

The proposed extension area does not contain any potential roost sites i.e. mature trees, buildings or underground structures.

Scattered semi-mature trees occur beyond the application site although these would be retained during the proposed quarry development.

As such, no further surveys in respect of bat roosts have been undertaken, as no potential roost sites occur within the extension area.

Bat Foraging and Commuting

Activity surveys of the wider site undertaken in 2009 identified relatively low levels of foraging activity by soprano pipistrelle and common pipistrelle.

The extension area itself offers limited foraging opportunities for bats, due to the absence of floristically diverse/structured habitats that would have associated invertebrate interest and therefore provide significant foraging opportunities for bats. The elevated and exposed setting of the extension area also reduces the likelihood of sustained or regular bat foraging taking place.

The extension area does not contain any connected hedgerows that could provide secure movement corridors for bats.

The woodland edge habitats adjacent to the extension area are representative of more suitable foraging and commuting habitats for bats.

As such, no further surveys in respect of bat activity have been undertaken, an approach agreed during consultation with the RCTCBC Ecologist.

Badger

The desk top study returned a single record of badger within the search area. The 2009 ecological surveys did not identify any badger setts in the survey area employed at the time, although reference to a potential badger paw print/scratch marks and foraging marks along the south-western area of the quarry void was made.

No evidence of badgers, such as setts, footprints, pathways, snagged hairs or snuffle marks, was recorded during either of the 2014 site survey visits. The current presence of badgers is therefore discounted and no further surveys have been undertaken.

Reptiles

The desk top study identified the presence of slow worm, common lizard and adder within the search area.

The 2009 surveys of the wider site area identified the presence of these species, and identified that the presence of grass snake could not be fully discounted.

A juvenile common lizard was recorded during the Phase 1 survey, basking near to the edge of the existing quarry rim (close to TN 6).

The majority of the extension area represents unsuitable habitat for reptiles, due to the intensity of grazing which prevents the development of structured vegetation. The open nature of the sward also removes opportunities for reptiles to bask or find shelter.

The exception to this is the presence of localised areas where grazing is less intensive and scattered scrub/tall ruderal vegetation occurs i.e predominantly along the margins of the existing quarry void and field boundary walls.

The areas dominated by bracken were found to lack vegetation structure during the May site survey, although sward height had increased by the time of the September survey. Although these areas could also support reptiles, they remain isolated from any extensive areas of high suitability habitat which decreases the likelihood of high numbers of reptiles occurring.

Based on the nature of potential impacts, and minimal areas of reptile habitat that would be lost, it was agreed with the RCTCBC Ecologist that a formal survey for reptiles would not be necessary to inform an appropriate mitigation strategy for reptiles, given their presence has already been confirmed.

As such, no specific surveys for reptiles have been undertaken.

Amphibians

The desk top study identified the presence of palmate newt within the search area.

No specific surveys for amphibians were undertaken during the 2009 study, as no suitable breeding habitats were identified.

No aquatic habitats occur within the proposed extension area, and none were identified in the immediate surrounding area.

As such, no specific surveys for amphibians have been undertaken, as their presence within the proposed extension area is highly unlikely.

Birds

The desk top study identified a relatively high number of bird species within the search area, including species of high conservation importance such as peregrine falcon, goshawk, hobby and kingfisher, all of which are included in Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

The majority of bird records are correlated with woodland habitats and sites of known nature conservation value, including Craig-yr-Hesg/Lan Wood SINC.

A breeding bird survey of the wider site was undertaken in 2009, which recorded the presence of 28 species as confirmed or likely breeders. This included the presence of peregrine falcon, which was also recorded during the September 2014 survey, although the majority of interest was found to be associated with peripheral woodland and scrub habitats of the existing quarry.

Two meadow pipits (*Anthus pratensis*) were recorded during the September 2014 survey, both of which were recorded in the south-western field where bracken occurs.

Individual raven (*Corvus corax*), jackdaw (*C. monedula*) and green woodpecker (*Picus viridis*) were also recorded flying over the proposed extension area during the 2014 study.

Potential bird nesting habitats within the proposed extension area are limited to immature scattered scrub and any localised areas of increased sward height i.e. where bracken dominates, which offer limited opportunities for ground nesting species such as meadow pipit. Based on the relatively low level of bird activity recorded during the site visits, it is considered highly unlikely that significant assemblages of breeding birds would occur.

Invertebrates

The desk top search returned records of a number of butterflies and moths and a smaller number of other invertebrate species. This included species of high conservation priority, such as marsh fritillary, pearl-bordered fritillary and grayling butterflies.

The presence of grayling butterfly, and a range of other common and widespread species, was identified during the 2009 surveys of the wider site.

The Phase 1 survey found that the majority of the site provides limited opportunities for invertebrates, due largely to absence of structured vegetation or flowering plants. The extension area does not contain any habitats which are of recognised high invertebrate value, such as semi-natural woodland, species rich-grassland or standing water.

The margins of the existing quarry (i.e. TN 6) offer increased suitability for invertebrates due to the presence of a more varied vegetation structure combined with areas of bare rock with a range of aspects. This mosaic also meets the habitat requirements of grayling butterfly, which has previously been recorded at the site.

Due to the limited scale of any potential invertebrate habitat within the extension area, and nature of quarry development and restoration that is proposed, no specific surveys for invertebrates have been undertaken to inform the EcIA.

Other Fauna

Based on the geographical setting and nature of habitats present within the proposed extension area, the potential for any other faunal groups to occur has been discounted.

Ecological Processes and Trends

In the absence of the proposed quarry extension taking place, it can only be assumed that the currently agricultural management of the application site would continue.

It would be expected that the main, north-eastern, field would remain as an open sward of limited structural or floristical value.

The south-western field would be expected to show further development of bracken and scrub habitats, as although the fields are connected and could therefore be subject to identical grazing pressure, there is evidently less grazing/agricultural management currently taking place here.

Ultimately, any scrub vegetation could reach a climax community of woodland.

7.6 Nature Conservation Evaluation

7.6.1 Statutory Nature Conservation Sites

The application site itself is not subject to any statutory designations.

One statutory designated site occurs within the 2km search area. Craig-yr-Hesg Local Nature Reserve is approximately 0.25km to the south of the extension area.

7.6.2 Non-Statutory Nature Conservation Sites

The application site is not subject to any non-statutory designations, although a minor component of Craig yr Hesg / Lan Wood SINC occurs within the EcIA study area (TN 9 and 10).

A further three SINC's occur within the search area, namely Lower Clydach Woodland SINC, Llys Nant and Craig Twyn-y-glog SINC and Taff and Rhondda Rivers SINC.

These SINC's have been selected as sites of County-level ecological importance i.e. they are important within RCT, although unlikely to meet the criteria for selection as a site of national importance and receive a statutory designation.

7.6.3 Undesignated Features of Biodiversity Importance: Habitats and Flora

There is no ancient woodland within the extension area, although the majority of Craig yr Hesg / Lan Wood is identified as 'ancient semi-natural woodland' or 'ancient restored woodland' by the FCW AWI. This includes the area described by TN10, which although within the EcIA study area, occurs outside the proposed development area. The 2014 survey found this area to comprise a mosaic of bracken, acid grassland and scattered trees.

The majority of the extension area comprises of semi-improved grassland which has been found to most closely represent the NVC community of MG6 *Lolium perenne* - *Cynosurus cristatus* grassland, predominantly the *Anthoxanthum odoratum* sub-community. The presence of grassland communities of higher conservation value i.e MG5 or U4 have not been identified. The grassland community MG6 is representative of a more 'improved' grassland than MG5, typically as a result of unstructured (year round) grazing and additional inputs of chemical fertiliser being in place over a traditional hay meadow management regime.

Where bracken occurs in association with grassland, this mosaic forms part of a wider area of Ffridd which occurs along the upper slopes of the Craig-yr-Hesg ridgeline. The presence of (less than 10) anthills was also noted in this area, indicating that parts of the south-western field may have been subject to lower levels of improvement/mechanical disturbance, although the sward composition remains broadly comparable. Localised areas of tall ruderal vegetation and scattered scrub also occur, primarily along the edges of the quarry rim.

Collectively, the habitat resource is assessed as being of Parish (local) importance for the following reasons:

- There is a relatively low level of vegetation structure or floristic diversity, with the habitat supporting species that are common and widespread, especially in the South Wales valleys;
- The habitats present occur frequently in elevated situations throughout the valleys of South Wales i.e the habitats of the application site lack any significant distinctiveness; and
- The resource of grassland habitats of higher conservation value remains relatively abundant in South Wales.

7.6.4 Undesignated Features of Biodiversity Importance: Fauna

The following section provides an evaluation of the faunal groups that have been confirmed, or have the potential to occur, within the application site. Those groups discounted from having the potential to occur have been excluded from the remainder of this EcIA.

Bats

The extension area lacks potential bat roost sites, and as such, has no value to roosting bats.

The extension area has been assessed as having limited opportunities for bats to forage and commute, due to the nature of habitats present and general setting/elevated position and exposure that the application site has. The habitats adjacent to the extension area i.e. woodland, represent higher value foraging habitats and provide more sheltered commuting linkages for bats.

The extension area is unlikely to be of higher than site level value for bats, due to the absence of potential roost sites and higher suitability foraging and commuting habitats in the immediate surrounding area i.e Darren Ddu Road and Craig-yr-Hesg wood.

Badger

No evidence of badger has been recorded during the EcIA studies, although a very low level of evidence was recorded in the wider site area during the 2009 surveys.

The occasional presence of badgers, as part of foraging in a wider territory, is a possibility. However, based on the absence of any field signs within the extension area itself, it is considered unlikely at the current time. As such, the extension area is assessed as having no value to badgers.

Reptiles

The presence of reptiles has been confirmed within the extension area, as one common lizard was observed during the Phase 1 survey.

The 2009 surveys also recorded adder and slow worm in the wider site, with the potential for grass snake to occur also being a possibility.

The extent of habitats that are suitable for reptiles to use within the extension area is limited, as the majority of the extension area comprises of closely grazed grassland that lacks the features required by reptiles.

Based on the extent and connectivity of suitable reptile habitats within the extension area, it is likely that relatively low numbers of common lizard and slow worm are present. The occasional presence of individual adders cannot be fully discounted as they are known to occur in the wider site.

The commonly occurring reptiles species occur frequently in south Wales due to the relatively mild climate and extensive occurrence of suitable habitats. As such, together with the fact that the extension area represents a proportion of the wider habitat resource for reptiles at Craig-yr-Hesg quarry, the extension area is assessed as being of less than site level value for reptiles.

Birds

Opportunities for birds to nest within the extension area are limited, due to the relatively low occurrence of scrub and the predominantly open/closely grazed nature of the grassland which is of low suitability for ground-nesting species.

The presence of meadow pipit was recorded during the Phase 1 survey and it is likely that this species breeds within the extension area at low densities in the localised areas where grazing is less intensive as a result of bracken cover reducing sward palatability.

Green woodpecker was recorded and is likely to forage within the extension area as part of a wider territory, as would be expected for a range of common and widespread bird species.

As such, given that areas of higher quality habitat for birds occur in the wider Craig-yr-Hesg quarry, the extension area itself is assessed as being of less than site level value for birds.

Invertebrates

The majority of the extension area is of negligible value to invertebrates, due to the dominance of closely grazed grassland which has a very low frequency of flowering plants to provide a forage resource for invertebrates.

The habitats most likely to be used by invertebrates, including species of local importance such as grayling butterfly, are the edges of the existing quarry rim. Here, the absence of grazing allows flowering plants to complete their growing cycle (and flower), and the mosaic of developing scrub, grassland and open ground/bare rock in a range of aspects, provides a suitable resource for a range of invertebrate groups.

The extent of this habitat mosaic within the extension area represents a component of the wider resource of comparable habitats at Craig-yr-Hesg quarry. As such, the extension area is assessed as being of less than site level value for invertebrates.

Other Fauna

The extension area is not considered to have potential to support any further protected species or any critical assemblages of other species above densities found in comparable habitats that occur relatively frequently in the surrounding landscape.

7.6.5 Social, Community or Economic Value

Some areas of habitat/species may not be particularly rare or of high ecological value in their own right, but they may be of social or community value for a neighbourhood/community that has the use of such an area for recreational or educational use (nature trails for example). In addition to this some wild populations of animals may also be of economic value such as red grouse on heather moors that can be shot, or trout in rivers that are fished, or even significant populations of birds that may attract bird watchers to a region.

Such an assessment is, however, centred upon those populations and areas that are considered to be natural or semi-natural.

There is currently no formal public access to the extension area and no species of particular socio-economic value were recorded from within the extension area or considered likely to occur.

As such, the extension area is not assessed as having any particular social, community or economic value in terms of biodiversity.

7.7 Potential Impacts

To assess the effects of a proposed development it is essential that the impacts that could arise are identified and characterised. The range of impacts that require consideration in the ecological impact assessment are based upon knowledge of the proposed development, including operational and restoration stages, and knowledge of the receptors (features of ecological significance). This can only be undertaken with a thorough understanding of ecological processes and how flora and fauna react to the range of impacts that could occur.

Potential impacts are characterised in terms of their direction, permanence, certainty and reversibility. An assessment is also made of the likely significance of the impact prior to mitigation, and the significance of the residual impact, i.e. after all agreed mitigation is implemented. The degree of confidence in the likely success of mitigation, based upon published studies and the experience of the assessor, is also made in the following paragraphs and any uncertainties are clearly expressed.

Full details regarding the approach to quarrying operations in order to implement the proposed extension, in terms of mineral extraction and restoration activities, are provided in Chapters 3 and 4 respectively.

Mineral extraction at Craig yr Hesg Quarry is long standing,, with the quarry established at the end of the 19th Century. More recently, the principle of a north-westerly extension, to which this EcIA relates, has been included as a proposal within the adopted RCT LDP. This EcIA is required to identify the scope of potential ecological impacts associated with the proposed north-westerly extension, as potential impacts associated with the existing quarry operations have been assessed and accepted as part the site's recent Environment Act Initial Review of planning conditions (April 2013).

7.7.1 Ecological Receptors

Through the process of consultation, desk study and ecological survey, the following ecological receptors have been identified as having the potential to be affected by a north-westerly extension of Craig yr Hesg quarry and are in need of further consideration or comment in this EcIA:

- Direct Habitat Loss – predominantly species-poor MG6 grassland, with smaller areas of bracken, ruderal and scrub vegetation;
- Indirect Habitat Loss – impact to adjacent receptors i.e. Craig yr Hesg / Lan wood SINC;
- Bats;
- Breeding birds including peregrine falcon;
- Reptiles; and
- Invertebrates.

The following assessment of potential impacts only considers effects upon those features that have been identified as being of potential ecological significance.

7.7.2 Potential Impacts to Habitats

Impacts to habitats will potentially take place during the stripping of vegetation and overburden from the proposed extension area (direct impacts) and during the extraction of sandstone (indirect impacts).

The following potential impacts have been identified and are discussed in the following section:

- Habitat loss, fragmentation and isolation through land-take;
- Alterations to ground water;
- Alterations to surface water flow and quality;
- Pollution;
- Dust deposition; and
- Post construction (restoration) impacts.

Habitat Loss, Fragmentation and Isolation though Land-take

Habitat loss involves the direct destruction or physical take-up of vegetation. Habitat loss may also occur as a result of a change in land or water management, for instance the alteration of the 'local' water table by dewatering a quarry leading to a change in habitat type. The potential for such indirect impacts is considered further below, with this section focusing on direct impacts.

Habitat loss can result in the direct loss of individuals or populations of plant or animal species. It may also cause other populations to become demographically unstable or unsustainable, due to loss of prey species or habitat niches.

Fragmented and isolated habitats are likely to be more vulnerable to external factors that may have a negative effect upon them; e.g. disturbance, and may be less resilient to change, including climate and management change than connected habitats because colonising species may be unable to reach the habitat.

The proposed extension of the extraction area will result in the direct loss of approximately 7.9 ha of predominantly species-poor MG6 grassland, with smaller areas of bracken, scattered scrub and ruderal vegetation. This habitat resource has collectively been assessed as being of Parish (local) ecological importance. Although the habitats of the application site itself do not possess any particularly high conservation value in their own right, and have been excluded from the Craig yr Hesg SINC, they do form part of a wider mosaic of Ffridd associated with the upper slopes of Craig yr Hesg ridgeline.

Due to the nature of the proposed quarry extension i.e. a lateral extension to an existing extraction void, no habitat fragmentation or isolation would occur.

The proposed landscape measures, and ultimate site restoration, place an emphasis on re-establishing habitat linkages around peripheral areas of Craig yr Hesg to complement the wider Ffridd mosaic. As such, no habitat losses or fragmentation that could be considered ecologically significant is likely to occur.

Alternations to Groundwater and Surface Water Flow and Quality

Full details of the potential hydrological impacts of the proposed extension are provided as Chapter 9 of the ES in the form of a Hydrogeological Impact Assessment (HIA).

The proposed extension would result in a lateral extension of the existing void and would not be any deeper than the existing quarry void (100m AOD), noting that the 100m AOD level is above the regional groundwater table.

There are no surface water features within the proposed extension area that could be directly affected. The HIA identifies that Nant Tai'r-heol at Cefn and Darren-Ddu streams occur in the vicinity of the quarry, and these "*are the only potential surface water receptors that have been considered to be potential at risk of impact from the proposed quarry operations*". The HIA concludes that "*The risk of potential impact is considered to be low, and any minor impact is likely to already have occurred historically as the quarry base is already well below the elevation of these springs*". As such, the likelihood of any significant ecological impacts occurring is also assessed as low.

The HIA also considers the potential for the proposed extension to alter moisture contents in Craig yr Hesg LNR. The HIA reaches a similar conclusion and states that "*It is considered that any effects on this feature would already have taken affect and that extending the area of the quarry at 100 m AOD will have negligible further effect and hence negligible impact*".

As the LNR designated area occurs further from the application site than the area of SINC designation/identified as ancient woodland, this is considered a valid conclusion in respect of the woodland as a whole.

As such, the proposed extension is assessed as being unlikely to specifically result in any alterations to groundwater or surface water regimes that could cause direct or indirect effects to ecological receptors within the site or immediate surrounding area. This includes the presence of Craig yr Hesg / Lan Wood SINC and the ancient woodland it encompasses.

Pollution

During all phases, there is potential that stored materials, stationary plant and vehicles could lead to an increased risk of accidental pollution events, which could have an effect upon habitats and species within the site or immediate surroundings.

There is however a very small risk of accidental pollution, e.g. fuel spill leakage from machinery and plant, as the applicant (Hanson) undertakes regular checks of site machinery as part of standard operating procedures.

The environmental control measures, including silt lagoons and oil interceptors, associated with the existing operations are regulated by Natural Resources Wales via a consent issued in 2013 (Consent Number AF4029101). These measures would continue to be in use during the implementation of the proposed extension, thereby ensuring the quality of any water discharged to the River Taf meets the required standard. Further controls are in place via the Environment Act Review schedule of conditions (ref 08/1380/10, condition 35).

As such, the potential for significant ecological impacts as a result of pollution is assessed as being low, this includes off site impacts to receptors such as the River Taf SINC.

Dust

The proposed extension to Craig yr Hesg quarry would not introduce any additional processes which could generate dust, such as extraction, processing and transportation of aggregate from the site, compared to the current situation as mineral production levels are predicted to continue at comparable levels.

The site already implements dust suppression and control measures in accordance with the current planning permission (ref Environment Act Review schedule of conditions: 08/1380/10, condition 30).). As these controls would continue, no significant ecological impacts are predicted as no changes to baseline conditions would take place.

Noise

The proposed extension to Craig yr Hesg quarry would not introduce any additional processes which could generate noise, such as blasting, extraction, processing and transportation of aggregate, compared to the current situation as the same operational processes would be used.

As such, no significant ecological impacts are predicted as no changes to baseline conditions would take place.

7.7.3 Potential Impacts to Species

Bats

No bat roosts occur within the proposed extension area. The potential impacts to bats relate to the loss of foraging resource and disruption of commuting routes.

The proposed extension area does not contain any linear habitat features that could provide direct habitat linkages or secure commuting routes for bat species. Any bats currently commuting along the edge of the quarry void in preference to direct flight over the void could continue to do so, due to the nature of the proposed extension design which avoids habitat fragmentation and the positive habitat creation measures which are proposed will enhance the current situation for commuting bats.

The proposed extension development would not introduce any artificial lighting. As such, indirect impacts to foraging or commuting bats would be avoided.

In terms of potential bat foraging habitats, relatively small scale losses of low suitability foraging habitat would take place. In the context of the surrounding landscape and wider Craig yr Hesg woodland etc., the temporary reduction in the extent of foraging resource available to bats is not considered to be significant. More specifically, it is unlikely to affect the ability of any bat species to maintain population fitness, and overall favourable conservation status (FCS), given the longer term nature conservation based site restoration.

Reptiles

The proposed extension development would result in the direct loss of habitats where common lizard has been recorded, or where their presence is possible by virtue of comparable habitats, although such losses would be small in scale, estimated at less than 0.8 ha. The presence of individual/low numbers of slow worm and adder is also a possibility.

In the absence of mitigation, vegetation removal would have the potential to kill or injure reptiles present when removal takes place. The loss of habitats would also decrease foraging habitat, which could potentially affect the population size as a result of reduced prey sources.

A wider resource of known or potential reptile habitats would be retained around the peripheral areas of Craig yr Hesg quarry and adjacent habitat mosaics, ensuring the local assemblage of reptiles would be able to maintain itself at comparable levels.

This impact would be significant for any reptiles present when habitat removal takes place, but would be unlikely to be significant for the wider reptile assemblage associated with Craig yr Hesg, as the proposed extension would only affect minor areas of habitat and it is unlikely significant numbers of reptiles would be present at any given time.

Breeding Birds

The potential impacts to breeding birds are most likely to occur during vegetation removal. Such works can be timed to avoid the nesting season thus removing the potential for an impact in a given season to occur.

The proposed extension area would result in minor losses of potential habitat for breeding birds. However, substantial areas of comparable and higher value nesting habitats are present in the immediate surrounding area.

The displacement of any bird territories, in terms of breeding or foraging, from the proposed extension area is highly unlikely to be significant due to the small scale of habitat losses involved.

As such, no significant impacts to birds are predicted.

Invertebrates

The potential impacts to invertebrates are most likely to occur during vegetation removal resulting in the loss of habitat. The majority of the application site offers negligible value to invertebrates due to the absence of structural variation or floristic diversity the vegetation has.

The areas of highest potential for invertebrates are the habitat mosaics associated with the existing quarry rim, wider areas of which occur in the wider Craig yr Hesg quarry. They also form a key element of the proposed restoration, of the existing site and proposed extension, to ensure longer term continuity of habitats for invertebrates.

As such, no significant impacts to invertebrates are predicted.

7.8 Proposed Mitigation

The most important opportunities to deliver biodiversity gains will arise during site restoration works, although preliminary works would also take place with habitat creation taking place along the northern screening landform, natural regeneration of the proposed western bund and re-creation of dry stone wall boundaries to replicate and enhance the existing network of habitats bordering the extension area.

Restoration Strategy

The proposed restoration is described in detail in Chapter 4 of the ES. It has been designed to maximise ecological gains and to complement the surrounding Craig yr Hesg/Lan Wood SINC. The proposed restoration has also been designed to complement the permitted restoration scheme for the wider site and includes the following key elements:

- Natural woodland regeneration along the western screening bund to strengthen adjacent woodland habitat corridor associated with Craig y -Hesg wood and Darren Ddu Road;
- Woodland creation through tree seeding along the northern screening bund to increase habitat linkage and provide screening for landscape purposes;
- Bare rock/scree to create a scree slope in the western corner of the site;
- Natural regeneration of pioneer vegetation and grassland communities on quarry benches; and
- Exposed quarry faces.

Mitigation for Loss of Habitat – Creation of New Habitats

The majority of the extension area comprises of species-poor MG6 grassland. Smaller areas of increased sward height and floristic diversity do occur where stands of bracken indicate reduced levels of grazing occur. The extension area is currently subject to unstructured grazing as a management technique.

Whilst the extension area is not assessed as having any particularly high habitat value, further supported by the fact that with the exception of a small area at the southern extremity of the site (defined by target note 10), the extension area is excluded from the adjacent Craig yr Hesg / Llan Wood SINC. The area forms part of a wider area of Ffridd habitat associated with the Craig yr Hesg ridgeline. However, this small part of the extension area which lies within the SINC is excluded from the proposed operational area associated with quarrying and screen mounds and would be retained and incorporated into the wider site restoration plan as shown on plan CYH E/12.

The northern screening landform would be surfaced with soil stripped from phase 1 of the extension area, with the surface to be tree seeded with the species mix provided in Chapter 4, which has been developed to compliment the wider woodland resource. The objective is to establish an area of woodland which would link with, and strengthen existing woodland blocks that border the northern areas of the application site and create both a landscape and wildlife corridor.

The western screen mound, and average 35m wide corridor along the southern boundary would be allowed to naturally re-colonise with the objective of establishing a wider corridor of woodland and acid grassland along the eastern side of Darren Ddu Road.

As the proposed restoration is dedicated to the creation of habitats of nature conservation value, including grassland and scrub woodland, no further mitigation is deemed to be required.

Moreover, since the proposed restoration places an emphasis on natural regeneration, this would also ensure that species of local provenance would occur in the restored site.

No offsite/indirect habitat impacts have been predicted, although the proposed restoration would complement and contribute to the surrounding network of non-statutory designated habitats.

Mitigation for Impacts to Species

The potential for negative impacts to bats and invertebrates, that would require specific mitigation, has been scoped out based on the nature of the proposed quarry extension. The proposed restoration, including initial screening measures, would nonetheless provide gains for these groups which would represent a positive impact. As such, these groups are not considered below, but are considered in **Table 7-6** where positive impacts would occur.

This section considers only those groups where a specific mitigation requirement is needed to address a potential negative impact i.e reptile and birds.

Reptiles

The commonly occurring reptile species are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) in respect of part of sub-section 9(1) and all of sub-section 9(5) only. As such, it is an offence to intentionally kill, injure or trade these species.

The presence of common lizard has been confirmed within the extension area and the presence of individual/low numbers of slow worm and adder is also a possibility. To ensure that the development proposed within the extension area complies with the relevant legislation and conservation objectives for reptiles, a Reptile Mitigation Strategy (RMS) will be prepared in consultation with the LPA to set out a procedure for the clearance of known or potential reptile habitats.

The principles of the RMS will involve staged habitat manipulation within areas of known or suitable reptile habitat, to reduce suitability and attractiveness, prior to vegetation clearance taking place. This would displace reptiles into adjacent habitats which meet the requirements of reptiles. As those adjacent habitats would remain undisturbed during quarry development works, reptiles would eventurally be able to recolonise the site after restoration.

Habitat manipulation would be followed by sensitive removal of vegetation under the direction of an appropriately qualified ecologist. This would allow for the capture and relocation of any reptiles still present, in the unlikely event that any remain following implementation of the initial stage of habitat manipulation.

This is considered an appropriate and proportional approach due to the small scale, and localised occurrence, of known or potential reptile habitat to be removed, the wider resource of habitats to be retained and the longer term creation of suitable reptile habitats during site restoration.

Birds

The nests of wild birds, regardless of how common the species are, are protected under the Wildlife and Countryside Act 1981 (as amended) whilst they are occupied or being built.

The potential impacts to breeding birds are most likely to occur during vegetation removal. Such works can be timed to avoid the nesting season (the season is March to August) thus removing the potential for an impact in a given season to occur.

If this is not possible, a breeding bird survey to check for any active nests would need to be undertaken by an appropriate experienced ecologist.

It is recommended that a watching brief is maintained in respect of peregrine falcon, which has previously been recorded in the existing quarry, to ensure that site operations take into account its presence due the legal protection which it received through Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). As the proposed, and existing, restoration concepts include the retention of quarry faces, suitable nesting ledges for this species will remain in the long term.

7.9 Cumulative Effects and Impacts

No specific cumulative effects in need of further consideration or additional mitigation have been identified.

7.10 Residual Ecological Impacts

Table 7-6 provides a summary of the potential impacts on ecological receptors that have the potential to be affected by the proposed extension of Craig yr Hesg Quarry, and assesses the type, magnitude and duration of residual impacts following mitigation, where proposed and appropriate. Habitats are considered first, then species.

Table 7-6
Summary of Potential Impacts, Mitigation and Residual Impacts

Ecological Feature	Description of Potential Impact	Characterisation of Impact	Ecological Significance of Impact if unmitigated	Mitigation and Enhancement Proposals	Significance of Residual Impact following Mitigation and level of Confidence.
Habitat Loss – c.7.9 ha of MG6 Grassland including small areas of bracken, scattered scrub and ruderal vegetation.	Loss of 7.9ha to allow establishment of screening bunds and mineral extraction area.	• Negative. • Certain. • Direct. • 7.9ha or c. 40% of the approximate 19ha of connected grassland habitat present. • Permanent (although reversible through restoration).	Significant at Parish (Local) level.	Regeneration of acid grassland around screening bunds using topsoils/turves to be lost, wider long term establishment of further areas during site restoration.	Minor negative significance at a local level during operational period. High level of confidence.
Breeding birds **Protected under Wildlife and Countryside Act 1981 whilst nesting.**	Loss of nesting habitat.	• Negative. • Certain. • Direct. • Negligible proportion of wider habitat network. • Permanent (although reversible through restoration).	Insignificant.	Provision of alternative comparable habitats along screening bund and during restoration.	Not significant. High level of confidence.
Reptiles **Partial protection under Schedule 5 of the Wildlife and Countryside Act.**	Potential killing or injury during vegetation removal, reduced foraging area.	• Negative. • Certain. • Direct. • Loss of approximately 0.8ha, minor proportion of wider habitat network. • Permanent (although reversible through restoration).	Significant for any reptiles killed, unlikely to be significant for wider site reptile assemblage.	Implementation of Reptile Mitigation Strategy to prevent killing or injury, provision of alternative habitats during operational stages and final restoration.	Not significant. High level of confidence.

Habitat Creation and Species Enhancements during landscape and restoration works.	The following habitats will be present upon completion of all quarrying and restoration works resulting in 'no net loss' in terms of habitat area: • Exposed quarry faces, bare ground and rock/scree; • Naturally regenerated acid grassland; and • woodland and scrub. Further areas of these habitat types will also occur within the wider site as per the permitted restoration concept as shown on application plans ref CYH / E12 and E14.	• Positive.	n/a	Creation of northern screening landform with woodland planting would provide a habitat linkage between currently unconnected blocks of woodland in the peripheral areas of the site. This would also represent an enhancement for bats, invertebrates, breeding birds and reptiles. The western screen bund would be allowed to naturally regenerate, to include a mosaic of woodland, scrub and acrid grassland to compliment the wider Ffridd mosaic of the Craig yr Hesg ridgeline. Progressive restoration of the quarry void would also provide further areas of habitat for bats (foraging), birds, invertebrates and	Positive long term gains, significant at Parish (Local) level.

	reptiles.

7.11 Review of Policy Considerations

A number of planning policies of relevance to this EcIA have been identified. **Table 7-7** below provides a summary of such policies, together with consideration of whether the proposed development contravenes the policy or not.

Table 7-7
Summary of Policy Considerations

Planning Policy	Consideration
PPW TAN 5	TAN 5 provides a wider overview of planning considerations relating to nature conservation, which the policies contained within the RCT LDP encompass.
RCT Policy AW6	The location of the operation is determined by the underlying mineral deposits and so could not be located elsewhere. The design has sought to protect features of known ecological interest (i.e Craig-yr-Hesg/Lan Wood SINC) and the proposed restoration provides ecological and landscape integration with retained areas and maximises opportunities to enhance the biodiversity value of the restored site.
RCT Policy AW8	No direct impacts to Craig-yr-Hesg/Lan Wood SINC would occur. The potential for indirect impacts to occur is considered to be insignificant, based on the nature of quarrying activity that has already taken place at Craig-yr-Hesg and the hydrogeological regime that exists.

In summary, it is considered that the proposed extension of Craig-yr-Hesg quarry would be undertaken in a manner that complies with local and national planning policies.

7.12 Summary and Conclusions

SLR Consulting Limited was instructed by Hanson UK to undertake an EcIA to provide technical input into an Environmental Statement and planning application to extend Craig yr Hesg quarry.

An assessment of the significance of predicted ecological impacts that would result from the proposed extension of the site has been undertaken following current guidance.

The scope of this EcIA has been informed through consultation with stakeholders and a review of information available from SEWBReC.

An Extended Phase 1 habitat survey was undertaken in May 2014 by an experienced terrestrial ecologist, followed by a Phase 2 (NVC) survey during September 2014.

Impacts to the majority of protected species groups have been discounted on the basis of the nature of habitats present. As such, no specific species surveys were deemed to be required to enable completion of the EcIA, a conclusion discussed and agreed with RCTCBC during the scoping stages.

The presence of reptiles has been confirmed and the implementation of a RMS is proposed to avoid significant impacts to reptiles and comply with the relevant legislation.

Breeding birds are also likely to occur, although impacts can be avoided through timing of works or advance survey if this is not possible.

No significant adverse ecological impacts have been predicted and it is considered that the proposed nature conservation based restoration would provide a net gain for biodiversity in the long term.

Figure 7-1 Phase 1 Habitat Plan.

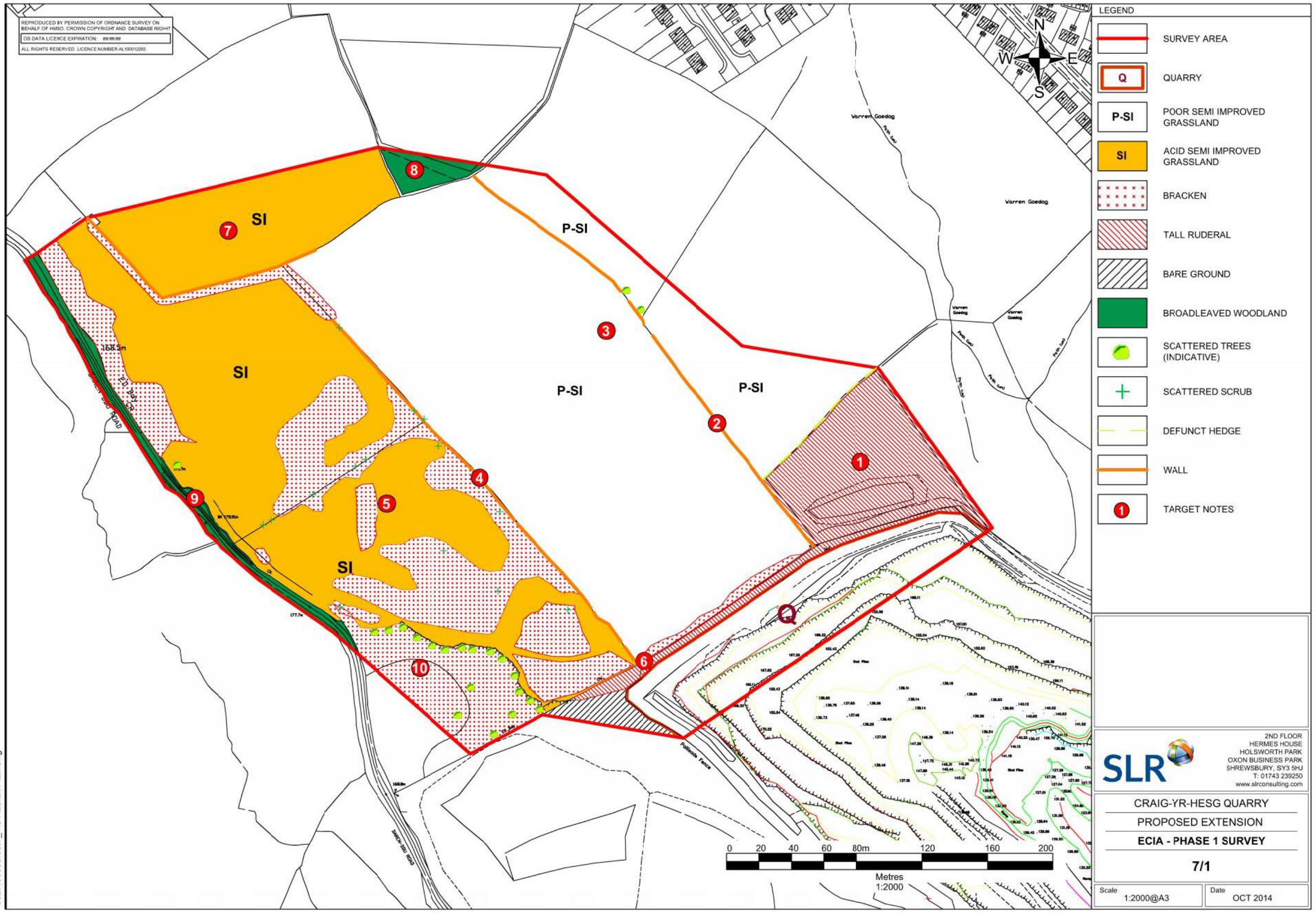
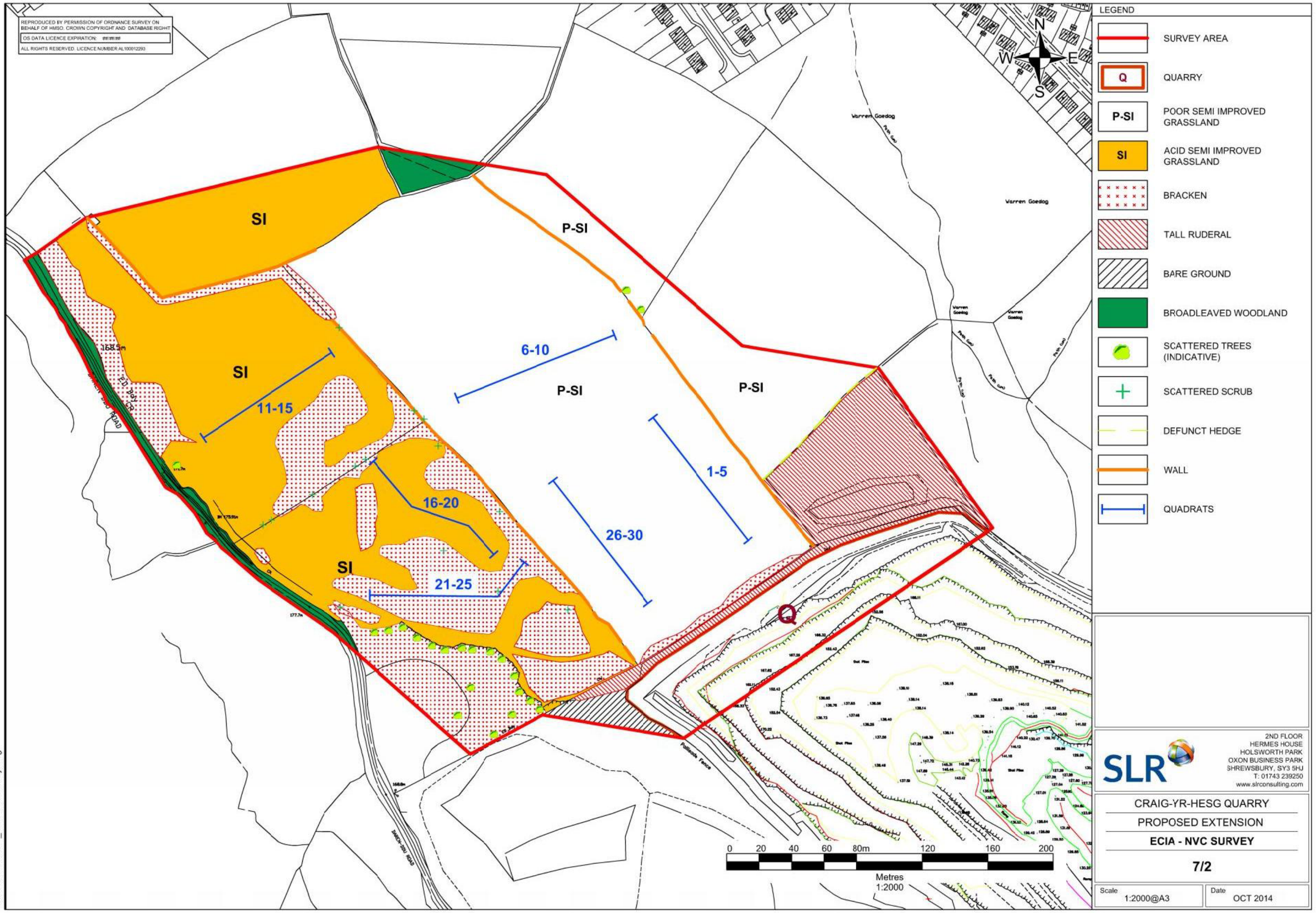


Figure 7-2 NVC Botanical Survey



8.0 AGRICULTURE AND SOIL RESOURCES

8.1 Introduction

An Agricultural Land Classification and Soil Survey has been undertaken by Richard Stock Bsc (Hons) MIAgrE, who has over 30 years experience of agricultural land classification gained in statutory, commercial and consultancy organisations. The survey area comprised some 9 hectares of land within the 11 hectare proposed extension area, and excluded peripheral land to the east and south west. The results of the study are set out in this Chapter of the ES.

The soil survey was undertaken on 25th April 2015 by sampling soil at twenty locations using a 1.2 metre dutch auger and spade. This was supplemented by examining detailed records from a trial pit survey which described 18 profile pits excavated to sandstone bedrock. Further information has been obtained from the Soil Survey of England and Wales, and information on detailed land classification has been obtained from the Land Use Planning Unit of Wales.

The site is located at the northwest end of the existing Craig yr Hesg quarry. It is centred on National Grid Reference ST072 919 at an altitude of approximately 193m AOD, (range 185m to 197.)

The soil survey details have been interpreted to grade the site in accordance with the Ministry of Agriculture, Fisheries and Food Agricultural Land Classification of England and Wales (Revised Guidelines and Criteria for Grading the Quality of Agricultural Land) published in 1988. The system considers criteria relating to the **climate, site and soil.**

8.2 Climate

Agro-climatic data for the site influences the agricultural land classification in respect of growing conditions for crops, and the soil reaction in terms of wetness and drought.

The meteorological office has published agro-climatic data for England and Wales on a five kilometre grid basis, which can be interpolated to produce data for specific grid points. Data for this site is presented in Table 8.1 below.

Table 8-1 Agro-climatic Data

Grid Reference	ST 072 919
Altitude - ALT	193 m
Average Annual Rainfall - AAR	1617 mm
Accumulated Temperature - Jan to June - ATO	1332
Moisture Deficit Wheat - MDMWHT	30
Moisture Deficit Potatoes - MDMPOTS	6
Duration of Field Capacity - FCD	308

The climatic criteria are considered first when classifying land as climate can be overriding irrespective of soil and site conditions. The main parameters used in the assessment of climatic limitation are Average Annual Rainfall (AAR), as a measure of overall wetness, and Accumulated Temperature (ATO, Jan to June), as a measure of the relative warmth of the area.

On the basis of Rainfall and Accumulated Temperature, there is a climatic limitation to grade 4.

8.3 The Site

The assessment of site factors is mainly concerned with the way the topography influences the use of agricultural machinery and hence the cropping potential of the site. It also takes account of flooding, complex changes in slope angle and rock outcrops. Most of the site comprises gently graded land with occasional steeper gradients, but none which would limit the agricultural land classification grade lower than the grade 4 climatic limitation. There are occasional rock outcrops on the south western flank which could limit this part of the site to grade 5, which is described as 'Land with severe limitations which restrict use to permanent pasture or rough grazing'.

At the time of the survey the site was in grass for grazing. Horses had been removed to facilitate the survey, but it is understood that the land has been used for horse grazing for many years. The land is severely poached in the northwest corner where there is a narrow finger of land giving access to the adjacent field.

On the basis of **site** characteristics the occasional rock outcrops would limit small parts of the south west flank to grade 5, but the remainder would not be graded lower than 4, determined by the climatic criteria.

8.4 The Soils

The soils are identified on the 1:250,000 soil map of Wales as the Withnell 1 Association.

This Association is described as '*well drained loamy soils over sandstone usually on steep slopes. Some fine loamy soils with slowly permeable subsoils and slight seasonal waterlogging. Bare rock locally*.'

This description broadly accords with the detailed survey, which described sandy clay loam topsoil overlying similar textured subsoil over bedrock sandstone. The topsoil and subsoil contained variable amounts of sandstone cobbles and slabs and bedrock was struck at depths of between 0.3m and 0.8m. At a number of locations where the soil profile was impenetrable by auger, small pits were hand dug to establish the depth to bedrock. The stone content of the underlying subsoil was variable across the site and in a number of pits the high stone masked the subsoil structure. A separate trial pit survey of the area using an excavator recorded similar depths to bedrock sandstone. It was noticeable that there are rock outcrops on the south western flank which restrict agricultural cropping.

A typical soil profile comprises dark brown sandy clay loam topsoil 0.15 to 0.3m deep overlying a variable depth of orange brown sandy clay loam subsoil containing sandstone cobbles and slabs. Occasionally there is a shallow depth (0.05 to 0.15m) of pale grey sandy loam (weathered sandstone) overlying bedrock.

8.5 Agricultural Land Classification

The site was graded by applying the survey details to the Ministry of Agriculture, Fisheries and Food Guidelines for Agricultural Land Classification (October 1988).

The current classification system was adopted in 1988 and was a refinement of the previous system. The Provisional ALC map for Wales at a scale of 1:250,000 was published in 1977. Consultation with the Land Use Planning Unit for Wales has confirmed that the site is shown as Provisional grade 4, but recommends that for detailed planning purposes an Agricultural Land Classification survey will be required to grade the land according to the current ALC System (MAFF 1988).

The agricultural land classification system provides a framework for classifying land according to the extent to which it's physical or chemical characteristics impose long-term limitations on agricultural use. The limitations can affect the range of crops that can be grown, the level of yield, the consistency of yield and the cost of obtaining it. The principal factors considered are **Climate, Site and Soil**. These factors, together with interactions between them, form the basis for classifying land into one of five grades. Grade 1 is land of excellent quality and grade 5 is very poor. Grade 3 is divided into sub-grades 3a and 3b since this grade covers about half of England and Wales. The grade or sub-grade is determined by the most limiting factor present.

On this site there is a **climatic** limitation to Grade 4.

The assessment of **Site** factors considers the way the topography affects agricultural machinery use and crop production. Most of this site comprises gently graded land and fundamentally offers no restrictions to agricultural use and cropping potential, with steeper side batters which would occasionally limit the land to grade 3b over short distances. Rock outcrops mainly occurring in the southwest part of the site outside the proposed extraction and operational area would limit the use of cultivation equipment, and thereby limit the land to permanent pasture in grade 5.

The main **Soil** properties, which may affect cropping potential, are texture, structure, depth, stoniness and chemical fertility. The land has been actively farmed for generations and there are no overriding limitations caused by the individual soil factors.

The remaining consideration for ALC grading on this site relates to **Interactive** limitations, principally wetness and drought.

Drought is not likely to be a limiting factor greater than the climatic limitation to grade 4 and in respect of wetness, while there is evidence of some slowly permeable subsoil, which would place it in wetness class IV at worst, the sandy clay loam topsoil would only limit it the grade 3b.

It is concluded that the majority of the site is Grade 4, with isolated areas of Grade 5 rock outcrops on the south west flank, which are too small to map.

The soil survey locations and ALC are shown on Plans C21/1 and C21/2 respectively, produced as **Appendix 8.1**.

8.6 Summary of Development

The development scheme is described in Chapters 3.0 and 4.0 of the ES, but those features of relevance to the consideration of soils resources are:

(i) The stripping of top soil and sub soil from the footprint of the screening landform and western soil bund;

(ii) The construction of the core of the screening landform using sandstone fines (dust) from the stockpiles within the existing quarry;

(iii) The stripping of the top soil, sub soil and overburden from phase 1 of the extension area, and the use of the overburden to complete the screening landform profiles.

(iv) The surfacing of the landform with sub soil and top soil from phase 1 and the screening landform footprint (some 7,986m3) and tree seeded in accordance with the details set out in Chapter 3.0;

(v) The placement of residual top soil in the western screen bund (800m3), with the residual top soil and sub soilfrom phase 1 and soil from the existing storage bund in the north eastern area of the existing quarry to be placed in a defined soil storage area within the existing quarry; and

(vi) The subsequent stripping of top soil and sub soil from phases 2 and 3, with the temporary stockpiling of soils from phase 2 on the phase 3 area, and the subsequent use of the soil resource for ongoing restoration works (ref ES Chapter 4.0).

8.7 Assessment of Effects

The Scoping Opinion issued by RCT recognises that it is unlikely that best and most versatile land will be affected by the extension development, but it confirms that:

(i) since agricultural land will be affected, account should be taken of the advise set out in paragraphs 32 and 33 of Minerals Planning Policy Wales;

(ii) the handling of soils during mineral operations should be undertaken in accordance with Annexes B and C of Minerals Technical Advice Note 1: Aggregates; and

(iii) if an agricultural after use is proposed, then consultation will be required as part of the determination process.

The ALC study has confirmed the assumption of the Scoping Opinion that the land quality at the site is grade 4 (and partly grade 5), and thus not best and most versatile quality. The requirement of MPPW para 32 is that best and most versatile land should only be used for mineral extraction if, inter alia, land of a lower quality is not available. These issues are thus addressed in the case of the Craig yr Hesg extension development which is confined to land of a lower grade (grade 4 and 5).

Para 33 continues by noting that irrespective of Agricultural Land Classification, other agricultural factors such as farm structure, soil conservation and drainage may be matters to be taken into account in appraising the development, particularly where agriculture is to be the after use of the site.

In this case, agriculture is not proposed as a main after use, albeit low key grazing may be feasible on the restored base of the quarry. There would be no affects on farm structure since the land represents an isolated land holding which is let for grazing by horses. There would be no adverse effects on drainage, with surface water drainage catered for within the quarry void as part of the restoration scheme.

The key issue is thus the sustainable use of the soil resources present at the site, as discussed in section 8.8 below.

8.8 Mitigation Measures

The main negative agricultural impact of the proposals is the loss of agricultural land, albeit a maximum of grade 4 quality, and the nature of the quarry development and resulting restoration profiles means that it is not possible to restore any substantive areas to future productive agricultural use. The scheme has however been designed to ensure the sustainable use of all the indigenous soils for the amenity/ nature conservation based restoration land uses which are proposed.

As part of the preliminary works, the soils from phase1 would be used to provide a soil profile of 0.4m of top soil and 0.6m of sub soil / overburden on the final contours of the screening landform, and the area would then be tree seeded in accordance with the details set out in section 3.0 of the ES. Residual soil would be placed on a permanent soil bund along the western boundary of the quarry.

All other soils, including those stripped from phases 2 and 3, and existing soil resources within stockpiles in the existing quarry would be used for restoration of the quarry benches and profiled final floor of the quarry, in accordance with the restoration treatments set out in chapter 4.0 of the ES.

Soils would be stripped, handled, stored and replaced (on the screening landform) based upon the principles set out in Annex C, sections C2, C3 and C4 of MTAN1, with attention paid to the timing of stripping to avoid problems of compaction and smearing during wet conditions, using excavators and dump trucks which are acknowledged as being optimal for reducing the risk of soil compaction (ref MTAN 1 C2). The sub soils and top soils would be placed on the screening landform in sequence, to the proposed soil profile depths using dump trucks and an excavator / dozer.

In addition to the advice set out in MATAN1 re soil handling, attention would also be paid to the well established advice on soil handling using hydraulic excavators, articulated dump trucks and low ground pressure bulldozers set out on MAFF (2000), Good Practice Guide For Handling Soils (version 04/00), FRCA Cambridge, notably sheets 1, 2, 4, and 19 as follows:-

- Sheet 1 Soil stripping with excavators and dump trucks.
- Sheet 2 Building soil storage mounds with excavators and dump trucks.
- Sheet 4 Soil replacement with excavators and dump trucks.

- Sheet 14 Building soil storage mounds with bulldozers and dump trucks.

8.9 Residual Effects

The residual effect is that some 9 hectares of land associated with the quarry extension and screening landform / screen bund would be lost to agricultural use. However, this relatively small area does not contain land of best and most versatile quality, and there would be no material effects on farm holdings. The soil resources would be used sustainably as part of the screening and restoration proposals.

Overall, the effects on agriculture and soil resources are considered to be minor / negligible

8.10 Conclusions

The extension area and land to be occupied by the northern screening landform and western soil bund comprises land of grade 4 and grade 5 qualities, with a relatively thin soil profile of sandy clay loam topsoil 0.15 to 0.3m deep overlying a variable depth of orange brown sandy clay loam subsoil containing sandstone cobbles and slabs.

The nature of the quarry development and resulting restoration profiles means that it is not possible to restore any substantive areas to future productive agricultural use. The scheme has, however, been designed to ensure the sustainable use of all the indigenous soils for the amenity / nature conservation based restoration and after uses which are proposed.

9.0 HYDROLOGY AND HYDROGEOLOGY

9.1 Introduction

This chapter has been prepared by ESI Ltd, and describes the hydrological and hydrogeological setting of the Craig yr Hesg quarry. A conceptual model for the site has been established using a significant amount of data from various sources (described within the chapter). This model was used to establish what impact (if any) the quarry development may have on hydrological and hydrogeological receptors within the vicinity of the site. Within the chapter, unless otherwise confirmed, the 'site' refers to the existing Craig yr Hesg Quarry and the proposed extension area.

Figures and references are presented at the end of the chapter.

9.2 Scope

The scope of the work undertaken as part of the study is as follows:

- Review of the baseline hydrology and hydrogeology of the area within which the site is situated;
- Identification of relevant receptors and any potential impacts of the development or restoration upon these;
- Preparation of a hydrogeological impact assessment for the continued development of the site.

9.2.1 Background

Craig yr Hesg Quarry is located approximately 1.5 km to the north of Pontypridd, South Wales, immediately south of Glyncoch at NGR 307800 191780 (**Figure 9.1**). The most recent planning permission for Craig-yr-Hesg Quarry was granted in August 1993 (ref 56/86/0827). A Section 106 agreement completed at the time relinquished the right to excavate through the edge of the ridgeline to the south and west which forms an important landscape feature situated within the historical permission boundary. The agreement also made provision for the planning conditions to apply to all other historical permissions within the quarry area. The conditions restrict the maximum permitted depth of quarrying to 100 m AOD, which is above the regional water table (as discussed below).

The mining site at Craig yr Hesg was the subject of an Environment Act review of conditions via a 'ROMP' application submitted in 2010. The Review application was accompanied by an EIA / ES, which included a Hydrogeological Assessment prepared by ESI in 2009 (ESI, 2009).

The environmental effects of quarrying within the existing permitted area of Craig yr Hesg Quarry were assessed as part of the 2010 ES, and ROMP review application which was determined by RCT Council in April 2013. The resulting schedule of updated planning conditions include controls to minimise the risk of ground and surface water pollution (ref conditions 35 – 37) and which, consistent with the 1993 planning permission, limits quarrying to a depth of 100m AOD (ref condition 38).

The assessment presented in this chapter updates the 2009 HIA taking into account the proposed extension area which extends beyond the current planning permission boundary as shown on **Figure 9.1**.

9.2.2 Study Area

The study area location is shown on **Figure 9.1.** The quarry lies behind the wooded, steep sided hillside of Craig-yr-Hesg, which forms an imposing backdrop to the nearby town of Pontypridd.

The land within the extension area is used predominantly for agricultural purposes, with hillside woodland present around the most southerly tip of the quarry and along the eastern boundary towards the office complex.

The River Taf is the dominant drainage feature in the area and is located about 350 m to the east of the quarry and flows from north to south. Surface water features are described in further detail in 9.4.3.

The maximum height of Coed Craig yr Hesg hill is approximately 200 m AOD. The deepest part of the quarry is currently at approximately 107 m AOD which is 7 m above the permitted depth of quarrying.

To the east and south, the topography falls towards the River Taf to an elevation of about 60 m AOD. To the west and north of the site, the ground falls towards the Nant Clydach and Nant Tai'r-heol to an elevation of about 90 m AOD.

9.2.3 Consultation

NRW and RCT Council have been consulted to obtain data for the site and wider study area. RCT has also provided a formal 'scoping opinion' on the issues to be addressed as part of the EIA, including hydrology and hydrogeology. The requirements have been incorporated into the HIA as set out in this chapter, and confirmed within Table 1.1 in chapter 1.0 of the ES.

9.3 Proposed Development

9.3.1 Quarry Development

Current Development

The total area of the existing quarry (excavated and processing areas) within the defined application area is approximately 20 ha. The current quarry layout is shown on plan ref CYH/E3. This shows the quarry processing plant in the eastern area of the site, comprising a crushing and screening plant, offices and replacement asphalt plant which is currently under construction. The main quarry area lies to the west, with a series of quarry faces and benches which are being developed in a general north-westerly direction within the limits of the existing planning permissions. Additional planned reserves lie within land between the processing plant and main quarry void. This area currently contains stockpiles of processed fine aggregate (dust) but, following the relocation of those stocks, the area will be partially quarried as part of the approved development scheme.

The current water management system at Craig yr Hesg quarry can be divided into two distinct parts:

- The drainage system for the northern side of the quarry comprising main haul road and processing plant area / office complex area ;
- The water management system associated with the main excavation anddust stockpile area.

Processing / office complex

Surface water from this area is dealt with via an existing system of settlement lagoons and an off site discharge regulated by NRW by a consent issued in 2013 (Consent Number AF4029101).

Main excavation and waste tip

Seepage from perched groundwater and rainfall / runoff into the main excavation makes its way to the quarry floor, via drainage channels and flows along haul roads. Runoff from the adjacent dust stockpile area is collected in a drainage channel at the base of the tip and gravity fed to the base of the quarry at approximately 107 m AOD. The water collected at the lower floor level freely seeps into the Pennant Sandstone and migrates downwards to the underlying regional water table.

Proposed Development

The proposed development will be a continuation of the existing programme of working the quarry benches and faces in a north-westerly direction to the limit of the current excavation footprint and then beyond into the extension area. The base level of the quarry will not extend below a floor level of 100 m AOD, although the extent of the void area at this level will be significantly enlarged.

The proposed development is described in further detail in the SLR (2014).

Inflows to the Excavation

As discussed in Section 9.4.3 below, effective rainfall and recharge rates for the site are estimated to be 1000 mm/a and 450 mm/a respectively.

The catchment of the current quarry area at Craig yr Hesg Quarry is estimated to be approximately 0.20 km^2 although the catchment of the main excavation is only 0.15 km^2. Therefore, the average daily volume of rainfall received by the quarry (excluding the processing area and conservatively including 100% of effective rainfall) and collected at the quarry base may be expected to be approximately 410 m^3/d. With the proposed extension area of 0.05 km^2 included this would increase to approximately 573 m^3/d. Peak run-off volume for the 1 in 100 year 6 hour storm is much higher than this and has been estimated to be 15,834 m^3 for the combined quarry area and extension with an increase of 30% in rainfall to allow for climate change. The equivalent run-off rate has been estimated as 733 l/s.

Prior to the sinking of the lowest level to around 100 m AOD, pumping and removal of collected incident rainfall from the main pit to the processing area surface water management system was only occasionally required during very wet periods. However, since reaching 107 m AOD incident rainfall / surface water drainage has been accommodated by natural drainage and infiltration from the lower quarry base level to the Pennant Measures. Records of pumped volumes are not available; however, assuming that the pumped volumes were much lower than the volumes calculated above would suggest that previously much of the collected surface water was lost to the Pennant Measures via the base and sides of the quarry sump. Very rough estimates (pers. comms: Roger Griffiths: Principal Geologist, Hanson UK, 25th July 2014) suggest that, up to around 60 Ml of water could collect in the base of the quarry (filling it to a depth of 10-12 m). A 6” pump would then run 24/7 for around 4 days to empty this volume to the processing area surface water management system.

Since the most recent sinking of the lowest level there has been no need to pump from the main pit as water drains freely through the quarry base at this location.

Given the indicative volumes of surface water that are calculated to be entering the quarry and, prior to the development of the soakage area around 5 years ago, based upon the minimal pumping that was typically required, it is considered that this indicates that the contribution to inflow to the quarry from perched groundwater is minimal, and this further suggests that the groundwater table is likely to exist at some depth below the base of Craig yr Hesg Quarry (ref section 9.4.4 below).

Evidence to date suggests that groundwater flow into the quarry is, and will continue to be, minimal, and related to perched water tables within the Pennant Measures.

It is considered that a significant increase in the volume of groundwater inflow into the quarry would not be observed as a result of the proposed extension, due to the evident low permeability of the Pennant Measures strata and the lack of groundwater ingress observed to date.

Discharge Quantities

Hanson currently holds one consent for the discharge of water from the quarry and processing areas (**Appendix 9.1**). This permit was issued in October 2013 as part of a permit variation to consolidate the two discharge consents previously held and to include a storm overflow. A maximum discharge volume of 36 l/s of treated quarry drainage alone is specified for the discharge point under consent AF4029101. However, there is no discharge limit to the combination of treated quarry drainage and storm overflow. It is t considered unlikely that a significant increase in the amount of discharge off site will be required given that water collected within the main pit is not discharged to surface water, and no expansion of the processing area footprint is proposed.

9.3.2 Quarry Decommissioning

The proposed final extent of the quarry under the current planning permission is shown in Figure SR05 in (WYG, 2009). The extension area beyond the current planning permission boundary is shown on **Figure 9.1.** The faces and benches would be worked back to their final limits within the extension area, creating a wider floor at the 100 m AOD level. The stockpile of dust / fine aggregate is still shown on Figure SR05, reflecting some uncertainty regarding the volume of dust which can be marketed. However, the intention is that at least a proportion of the dust will be retained for use in profiling the base of the quarry, to provide a gradient to assist final surface water drainage.

Following the cessation of operations, management of surface water run off within the quarry would cease. It is anticipated that the quarry void will not flood but that inflow will continue to freely seep into the Pennant Sandstone and migrate to the underlying regional water table.

9.4 Baseline Conditions

9.4.1 Previous Studies

The principal study with respect to the potential hydrological and hydrogeological impacts of the site is the ESI Hydrogeological Assessment (ESI, 2009). This reviewed the potential impacts with respect to the current planning permissions. The assessment presented in this ES is an updated version of this study taking into account the proposed extension area.

9.4.2 Geology

Structure

The region is characterised by much folding and faulting. The principal orientation of faulting is in a north-west to south-east direction. The Daren-Ddu and West Ynysybwl Faults are shown on **Figure 9.2,** the latter of which runs through the Site. These faults downthrow to the west by an unknown amount.

Regional Geology

Craig-yr-Hesg quarry is located in the south of the South Wales Coalfield, close to the axis of the syncline that forms the predominant geological structure of the region.

The regional solid geology comprises predominantly Upper Carboniferous rocks. The stratigraphic sequence in the study area is summarised in **Table 9.1** and the regional geology is shown on Figure 9-2 taken from the 1:50,000 scale geological maps of the area (British Geological Survey, 1969 and 1975). The site works the Carboniferous Pennant Measures.

Superficial geology

According to British Geological Survey (1969 and 1975), glacial deposits cover much of the bedrock in the region. The superficial deposits vary from stiff, unsorted glacial till, to well-washed and stratified sand and gravel. Typically the glacial till occurs on the middle and lower valley sides with sand and gravel deposits on the base of the principal valleys such as that of the River Taf to the east and Nant Clydach to the north.

Alluvium is present in the immediate vicinity of surface water courses and discontinuous peat deposits are present on valley sides and tops.

Solid Geology

As described in **Table 9.1,** the Pennant Measures are massive fluviatile sandstone strata, with an increasing proportion of shale, mudstone and coal moving up the sequence.

The Upper Pennant Measures typically comprise bluish grey, weathered, brown, thick massive or cross-bedded fine to coarse grained (locally pebbly) sandstones. In South Wales, and in the vicinity of the site, the sandstones tend to dominate in the lower part of the sequence and argillaceous beds and coal seams become more common higher up. The Upper Pennant Measures are thinner and less massive than the Lower Pennant Measures.

Table 9-1 Summary of Stratigraphic Sequence

Stratigraphy	Formation		Lithology
Pleistocene and Recent	-		Glacial sand and gravel Fluvio-glacial sand and gravel Glacial drift (undifferentiated, ranging from stiff glacial till to stratified sand and gravel) Alluvium Peat
Carboniferous	Upper Coal Measures (Pennant Measures)	Upper Pennant Measures	Fluviatile lithic sandstones with argillaceous horizons and coal seams (becoming more common higher up in succession). Fluvial channel facies consisting of conglomerates and medium to coarse grained sandstones also present.
		Lower Pennant Measures	Massive fluviatile lithic sandstones with subordinate argillaceous horizons and a few thick coals. Sandstones are typically bluish grey, weathered brown, thick massive or cross-bedded, fine to coarse-grained, and locally pebbly sandstones.
	Middle Coal Measures		Argillaceous in nature, with thick extensive coals, residual soil horizons and ironstone bands sandstones predominating.
	Lower Coal Measures		Predominantly argillaceous in nature, with thick sandstones of limited lateral extent
	Millstone Grit		Shales with some sandstones
	Carboniferous Limestone	Main Limestone	(Upper) Undolomitised and some patchily dolomitised limestones (Lower) Dolomite or dolomitic limestones and limestones
		Lower Limestone Shales	(Upper) mainly mudstone with some thin limestones (Lower) mainly limestone with some mudstone

In the area of Craig-yr-Hesg the Hughes Beds (180–270 m thick), Brithdir Beds (110-270 m thick) and the Rhondda Beds (160-335 m thick) of the Upper Pennant Measures are present and consist predominantly of conglomerates, medium to coarse grained sandstone and local finer grained units of fluvial origin. These rarely comprise complete cyclothems and the arrangement of the constituent elements shows much lateral variation (British Geological Survey, 1983).

The principal coal seams present are the Brithdir Rider and Daren-Ddu Seams, which are shown on Figure 9.2. The coal seams outcrop at surface in the hill and valley sides and hence these seams were the first coals in the region to be exploited from shallow bell pits and adits. The extensive disturbance and subsidence caused by mining has resulted in hydraulic continuity between water bearing horizons and mine workings. In addition, large portions of the aquifer have historically been dewatered with consequent lowering of groundwater levels (British Geological Survey, 1983).

Local Geology

Information on the local geology is available from 2 boreholes (CYH02 and CYH04) drilled within the proposed extension area. A third borehole was also installed within the quarry site boundary, CYH01/12, but no log is available. Their locations are shown in **Figure 9.3** while logs for CYH02 and CYH04 are provided in **Appendix 9.2**.

The geology is generally described as "very strong grey lithic arenite" which is comparable to the Pennant Sandstone "lithic sandstones" reported in Table 9.1. A number of thin mudstone bands ranging from 0.4 to 4.8 m in thickness were encountered as summarised in **Table 9.2.**

A further borehole was drilled at the base of the quarry in August 2009 to approximately 44 m bgl (63 m AOD). No borehole log was provided but it was reported that from 81 m AOD the cuttings were coloured due to the intersection of shale horizons. A coal seam was intercepted from 63 to 61.5 m AOD. It was reported that no voids were encountered.

Table 9-2 Borehole data summary

Borehole	Ground Elevation (mAOD)	Base Elevation (mAOD)	Total Depth (m)	No. Mudstone bands encountered
CYH02	189.65	89.6	100	Six bands between 0.4 and 1.5 m thick
CYH04	186.32	86.32	100	Four bands between 0.7 and 4.8 m thick
CYH01/12	100.60	-	-	

9.4.3 Hydrology

Surface Water Features

A site visit was carried out by ESI on 12 August 2009 during which key water features in the vicinity of the quarry were observed. All major surface water features within a 1 km radius of the quarry and smaller features within 750 m were observed. A second visit to update the first was undertaken on 30th June 2014.

Major surface water features are shown in **Figure 9.3**. Surface water feature observation points are described and summarised in **Table 9.3** with their locations shown in Figure 9-3. Weather conditions immediately prior to the first water features survey were damp, with rainfall occurring during the preceding day. Weather conditions immediately prior to and during the second visit were dry.

The River Taf forms the major surface water drainage feature in the vicinity of Craig yr Hesg Quarry, flowing from north to south approximately 350 m to the east. The stage of the River Taf ranges from 80 m AOD in the vicinity of Abercynon to 49 m AOD in Pontypridd. The Afon Cynon joins the River Taf at Abercynon, approximately 3 km north (upstream) of Craig-yr-Hesg Quarry. Downstream of the site, the River Taf continues to flow south, joined by the River Rhondda approximately 1.6 km south of the site, through the suburbs and inner city of Cardiff, to discharge to Cardiff Bay.

The Nant Clydach flows from west to east approximately 850 m to the north of the Craig yr Hesg Quarry, at an elevation of between 80-90 mAOD. The Nant Clydach joins the River Taf 850 m north of Craig-yr-Hesg Quarry, east of Coed-y-Cwm. The river is largely sourced from compensation release from Clydach reservoir located 6.6 km north-west of the quarry, and is augmented by numerous spring fed springs originating on both eastern and western valley slopes upstream of the confluence with the River Taf.

Numerous smaller features were identified during the water features survey, and are described below:

- The Nant Tai’r-heol originates from springs present on the western side of the Daren-Ddu Road 450 m to the west of Craig-yr-Hesg Quarry at an elevation of approximately 220 m AOD. The stream flows from its source, north-east toward the Daren Ddu Road, which it then follows. The Nant Tai’r-heol is augmented by spring flow emerging on the eastern side of the Daren-Ddu Road, south of Cefn (ST 0689 9208 and Point 1 in **Table 9.3**) and referred to here as the Cefn Springs, at an elevation of approximately 165 m AOD. No flow was observed in the Nant Tai’r-heol upstream of the Cefn Springs during the site visits, and discharge from these springs formed the first trace of flow in the stream during the first site visit. Only standing water was observed in the area of the spring on the second visit, with the first sign of flow in the stream being approximately 270 m downstream of the spring equivalent to an elevation of approximately 155 m AOD. The Nant Tai’r-heol is joined by two streams issuing from the valley slopes to the west of Daren Ddu Road to the south-west and west of Cefn. The stream continues to flow north through a small group of properties at Tai’r-heol where the channel is modified for aesthetic purposes to discharge to the Nant Clydach 200 m east of Ynysybwl.
- On the first visit springs were observed feeding a stream at the southern end of the Darren Ddu Road, 300 m south-west of Craig yr Hesg Quarry, at an elevation of approximately 150 m AOD (ST 0724 9151 and Point 10 in **Table 9.3)**. These are referred to here as the Darren Ddu springs. The springs emerge less than 20 m to the west of the Darren Ddu Road and the subsequent stream (referred to here as the Darren Ddu stream) flows east, although it ‘sinks’ prior the reaching the road. A series of re-emergences and sinks then occurs prior to a final re-emergence approximately 50 m south of the sink point, from which the steams flows south-east down the Darren Ddu Road. During the survey, there was evidence of flow along the length of the channel on the Darren Ddu Road upstream of the spring.
- Two small streams confluence immediately west of the Darren Ddu Road at ST 0732 9141 and Point 13 in Table 9.3, and form a single channel which flows south parallel to the stream above (referred to here as the Darren Ddu stream west). During the second site visit flow in this stream (which appears to be at a slightly higher elevation to the Daren Ddu stream) was observed to originate from a spring in the side of the hill on the other side of the valley to the quarry at an elevation of approximately 135 m AOD. Flow in this stream appeared to be greater than in the Darren Ddu stream. Several small issues join this stream along its route, which confluences with the stream flowing down the Darren Ddu Road at ST 0741 9130 (Point 15 in Table 9-3). The combined stream becomes engineered as it flows under the railway and into the residential area before discharging to the River Taf 500 m south of Craig yr Hesg Quarry.
- A pool and wetland area is present 20 m to the east of the southern end of the Darren Ddu Road, 300 m south of Craig yr Hesg quarry, at an elevation of approximately 85 m AOD. The wetland is believed to be fed by an unmapped spring that drains to a stream which flows south to discharge to the River Taf.
- A stream flows between the railway and the River Taf approximately 200 m to the east of Craig yr Hesg Quarry. The stream originates at ST 0821 9200 (Point 5 in **Table 9.3)** and flows north for 1.2 km prior to discharging to the River Taf east of Glyncoch. A similar stream joins this channel from the east, originating immediately adjacent to the Taf. The sources of the streams could not be accessed during the survey and their origin is not clear, although it is likely to be spring flow on the valley floor at the base of the steep slopes associated with the southern and western edge of the quarry.

The Cefn Springs originate at the intersection of the outcrop of the Pennant Measures and low permeability glacial till which extends up the valley of the Nant Tai'r-heol (**Figure 9.3).).** The mechanism generating spring flow is the intersection of groundwater near the surface of the southern slopes of Craig-yr-Hesg with the glacial till resulting in a discharge at the surface.

Table 9-3 Water features survey points

Map ID	Location Description	NGR	X	Y	Electrical conductivity (µS/cm)
1	Cefn Springs	ST 06887 92082	306887	192082	61.3
2	First point of active flow in Tai'r-heol	ST 06839 92094	306839	192094	59.3
3	Pool area adjacent to Daren-Ddu Road	ST 06769 92136	306769	192136	62.1
4	Nant Tai'r-heol at point of stream crossing footpath cross roads	ST 06750 92157	306750	192157	64.7
5	Stream at slope base flowing north parallel to Taf	ST 08209 91998	308209	191998	619
6	Property of Tai'r-heol	ST 06518 92625	306518	192625	116.2
7	Dry stream crossing track	ST 06588 92051	306588	192051	-
8	Dry stream channel	ST 06418 92161	306418	192161	-
9	Channel with small flow	ST 06706 92117	306706	192117	65.5
10	Daren-Ddu spring. Stream rapidly sinks back to ground	ST 07242 91512	307242	191512	189
11	Sudden flow on Daren Ddu stream, re-emergence of above spring	No GPS signal*	307275	191475	188.3
12	Re-emergence of flow on Darren Ddu stream	No GPS signal*	307288	191450	187.4
13	Confluence of 2 streams west of Darren Ddu stream	ST 07324 91409	307324	191409	176.6
14	Tributary to Darren Ddu stream west	ST 07349 91351	307349	191351	372
15	Unification of Darren Ddu stream and Darren Ddu stream west	ST 07405 91301	307405	191301	195.7
16	Darren Ddu stream at last major accessible point before engineered	ST 07471 91139	307471	191139	195.7
17	Nant Clydach at Coed-y-Cwm	ST 07744 92622	307744	192622	189.9
18	Wetland and stream at base of Craig yr Hesg	ST 07571 91157	307571	191157	112.5
19	River Taf immediately downstream of Craig yr Hesg discharge	ST 07764 91037	307764	191037	-

*Grid reference estimated from surrounding points

The Darren Ddu Springs are located immediately adjacent to the Darren Ddu Fault, at the intersection of the fault and the Darren Ddu Coal Seam (Figure 9-2). A correlation between observations from the field survey and the geological map suggest that these are fed from groundwater in the Pennant Measures intersecting the fault from the west. Similarly the wetland areas, likely derived from spring flow to the south-east of Craig yr Hesg may be related to the intersection of the Darren Ddu Fault and the Brithdir Rider coal seam draining the Pennant Measures on the south western slopes of Craig yr Hesg. However the absence of geological logs and hydrogeological data for the area creates some uncertainty over the mechanism driving spring flow.

Stream Flows

Stream flow statistics are available for four permanent gauging locations on three rivers within 5 km of Craig yr Hesg Quarry provided by CEH [3] Summary gauge details and flow statistics are presented in **Table 9.4** below. The locations of the flow gauges are presented on **Figure 9.4.**

Table 9-4 Summary flow statistics for permanent gauge locations

Gauge	River	NGR	Catchment Area (km²)	Flow Statistics (Ml/day)		
				Mean	Q_{95}	Q_{10}
Pontypridd	River Taf	ST 079 897	454.8	1785	317	4130
Trehafod	River Rhondda	ST 054 909	100.5	506	66	1185
Fiddlers Elbow	River Taf	ST 089 951	194.5	595	116	1391
Abercynon	Afon Cynon	ST 079 956	106	375	48	907

The Environment Agency has provided daily mean flow data for the River Taf at Pontypridd for the period January 2000 to May 2014. This is coincident with the gauge presented in **Table 9.4.** Summary flow statistics at this gauge for this period are presented in **Table 9.5.**

[3] Data taken from http://www.nwl.ac.uk/ih/nrfa/station_summaries associated with the CEH national gauging station register.

Table 9-5 Summary flow statistics of daily mean flow data (Environment Agency)

Gauge	River	Data Period	Flow statistics (Ml/day)		
			Mean	Q_{95}	Q_{10}
Pontypridd	Taf	Jan 2000-May 2014	1967	343	4752

The hydrograph and flow duration curve for this gauge are presented on **Figure 9.6.** The hydrograph shows that stream flow response in the vicinity of the Site is flashy. The base-flow index for the River Taf at this gauge is just 0.45 (Centre for Ecology and Hydrology [CEH], 2014). This implies that there is relatively little groundwater base-flow contribution upstream of this point to the river with the majority of flow being derived from surface runoff and interflow within the shallow soils.

Surface Water Levels

The Environment Agency (Wales) has provided information pertaining to one surface water level monitoring location on the River Taf, at Pontypridd. Details are presented in **Table 9.6** below and the location is shown on **Figure 9.4.**

Table 9-6 Summary of surface water level monitoring

Gauge	River	Data Period	Stage statistics (m AOD)			Range (m)
			Min	Mean	Max	
Pontypridd	Taf	Aug 2008-May 2014	48.77	49.16	51.82	3.05

River level fluctuations correlate with flow patterns shown in Table 9-4

Flooding

The Welsh Government's Technical Advice Note 15 Development Advice Maps show that the existing quarry and proposed extension area are located entirely within Flood Zone A (considered to be at low risk of fluvial and / or coastal / tidal flooding).

Rainfall

Rainfall data have been provided by the Environment Agency (Wales) and NRW (as it has now become) for a single rainfall gauge at Nant-yr-Ysfa. Summary rainfall gauge details are provided in **Table 9.7.**

Table 9-7 Rainfall data provided by EA (Wales)

Gauge	X	Y	Distance from site (km)	Data available
Nant-yr-Ysaf	303426	196377	6.3 (NW)	Long term monthly total rainfall (Jan 1977 to May 2014). Daily rainfall (Jan 2000 to May 2014).

Monthly rainfall statistics for Nant-yr-Ysaf for the period January 1977 to May 2014 are presented in **Table 9.8.**

Table 9-8 Summary rainfall statistics for Nant-yr-Ysfa rainfall gauge

Month	Monthly rainfall statistics (mm/month)		
	Min	Max	Mean
January	40.40	737.30	254
February	2.60	466.20	180
March	4.40	495.70	160
April	15.80	236.00	118
May	3.60	266.20	116
June	20.43	367.00	115
July	14.00	337.20	125
August	14.71	432.13	141
September	26.20	376.80	155
October	0.00	573.80	240
November	89.63	463.80	229
December	6.63	491.05	249
		Total (mm/yr)	2080
		Total (m/day)	0.006

Long term average (LTA) rainfall for the period is high at 2080 mm/a, although annual rainfall varies between 1358 mm/a (2003) to 2796 mm/a (2000). The rainfall gauge is located in the vicinity of Clydach Reservoir in the elevated region north-west of the site and thus rainfall at the gauge may be higher than experienced in the vicinity of Craig yr Hesg Quarry.

Given the topography of the site, there is likely to be a large component of surface water runoff surrounding the site, particularly on the steep southern and western slopes.

BGS (1983) states that, although significant amounts of superficial deposits are present in places, up to 250 mm/a of rainfall is thought to infiltrate to the Upper Coal Measures water table, with the majority of this contributing to baseflow of the major rivers.

Run-off

Run-off calculations have been undertaken as part of a recent surface water and drainage assessment (included in **Appendix 9.3**). The rates and volumes for the 1 in 100 year 6 hour storm event (the event which is typically used for planning assessment) are summarised in the table below. This includes an allowance for climate change in accordance with planning guidance (DCLG 2012a/b).

Table 9-9 Run-off estimates (1 in 100 year 6 hour storm)

Scenario		Run-off			
		Processing area	Main pit	Extension area	Main Pit + Extension area
Current Quarry	Peak flow (l/s)	124	415	136	551
	Volume (m^3)	2,681	8,975	2938	11,913
Current quarry and extension area and climate change*	Peak flow (l/s)	161	540	193	733
	Volume (m^3)	3,485	11,667	4,167	15,834

* 30% increase in rainfall due to climate change.

Effective Rainfall and Recharge

Effective rainfall may be estimated using the CEH flow statistics for the gauging stations at Pontypridd, Trehafod and Fiddlers Elbow as discussed in Section 9.4.5. The site is located within 5 km of the gauges and positioned to give an indication of effective rainfall in the area of Pontypridd (**Figure 9.4)).** The effective rainfall estimated from the CEH gauge flow statistics in the vicinity of Craig yr Hesg are presented in **Table 9.9.**

Table 9-10 Estimated effective rainfall

Gauge	River	Catchment Area (km^2)	Mean flow (m^3/s)	1961-90 LTA rainfall (mm/a)	Estimated effective rainfall (mm/a)
Pontypridd	River Taf	454.8	20.67	1830	1434
Trehafod	River Rhondda	100.5	5.86	2184	1840
Fiddlers Elbow	River Taf	194.5	6.88	1715	1116

The estimates of effective rainfall presented in **Table 9.10** are higher than expected and are likely to be reflective of the contribution of rainfall in the upland valleys to the north and north-west further upstream, where rainfall is high and steep slopes lead to increased runoff coefficients.

The BGS hydrogeological map for South Wales (1983) suggests that the average annual rainfall in the vicinity of the site is approximately 1600 mm/a. This is less than the LTA rainfall for the catchments upstream of the flow gauges for which the effective rainfall was estimated and Nant-y-Ysaf. The difference between LTA rainfall and the estimated effective rainfall for the three catchment varies between 344-599 mm/a, with an inverse relationship existing between the difference and LTA rainfall. The rainfall provided by the BGS (1983) suggests an LTA in the vicinity of Craig yr Hesg comparable to the Fiddlers Elbow catchment. As the Fiddlers Elbow LTA rainfall catchment is approximately 100 mm/a higher than the BGS estimate for the Pontypridd area, effective rainfall in the vicinity of Craig yr Hesg is likely in the region of 1000 mm/a.

It is anticipated that a relatively high run-off rate will typically occur over the area due to the relatively steep topography and therefore the typical recharge rate is likely to be much less than the effective rainfall. Allowing for a 55% run-off factor, recharge in the order of 450 mm/a may be expected in the vicinity of the site. This is high in comparison to the estimate of 250 mm/a made by the BGS (BGS, 1983), and it may be that superficial deposit cover further inhibits recharge. It is noted that in the calculation above using river gauging data only this provides an approximate indication of the recharge rate as the calculation of effective rainfall assumes that there is no net anthropogenic influence on the flow at the two gauging stations.

Surface Water Quality

No surface water quality data was available in the vicinity of the site.

Discharge Consents

There are 20 discharge consents (to surface water) within 2 km of Craig yr Hesg Quarry (**Error! Reference source not found.**), details of which have been provided by the Environment Agency/NRW and are presented in **Appendix 9.4** and summarised in **Table 9.12.**

One of the discharge consents is associated with quarrying operations at Craig yr Hesg. Further details of this discharge including the consent limit is given in **Table 9.11.** The full discharge consent is given in **Appendix 9.1.**

Table 9-11 Details of discharge consents associated with Craig-yr-Hesg Quarry

Consent Number	Type	Consent limits			
		Volume (Ml/day)	pH	Suspended Solids (mg/l)	Oil and grease (mg/l)
AF4029101	Site drainage	3.1	5 to 9	200	No significant trace present

Table 9.12 summarises the recorded water quality at the discharge point. **Figure 9.7** plots suspended solids concentrations.

The recorded values have not exceeded the consent limits for pH and suspended solids. No data was provided for oil and grease.

Table 9-12 Details of discharge consents within 2 km of the quarry

Map ID	Consent Number	Name	X	Y	Receiving Water	Type
D1	AN0156801	Pwllgwaun Road	306750	190290	River Rhondda	Sewerage Network - Sewers- water company
D2	AN0080101	Mill Street	307040	190100	River Rhondda	Sewerage Network - Sewers - water company
D3	AN0330401	Taf Street	307305	190065	River Taf	Sewerage Network - Sewers- water company
D4	AG0004501	Cilfynydd STW	308231	192861	River Taf	Sewage Disposal Works - water company
D5	AN0241501	Lower Mill Street	307126	190024	River Rhondda	Sewerage Network - Sewers- water company
D6	AN0080401	Pontypridd – West Street	307500	190400	River Taf	Sewerage Network - Sewers- water company
D7	***AF4029101***	Craig-yr-Hesg Quarry*	***307800***	***191250***	***River Taf***	***Extraction of Stone, Gravel, etc.***
D8	NPSWQD004364	Park Place high level overflow	308857	192662	Nant Cae-dudwei	Sewerage Network - Sewers- water company
D9	AN0249701	SPS at rear of Taf Street	307330	190150	River Taf	Sewerage Network - Pumping Station - water company
D10	AN0238301	Sion Street	307463	190532	River Taf	Sewerage Network - Pumping Station - water company
D11	AG0004601	Cilfynydd STW	308231	192861	River Taf	Sewage Disposal Works - water company
D12	AN0099601	Flushing Station	306590	192870	Nant Clydach	Sewerage Network - Sewers- water company
D13	AN0033701	Cynon Valley STW	308149	192997	River Taf	Sewage Disposal Works - water company
D14	AN0332501	Egan Waste	307935	191195	River Taf	Other Vehicles
D15	AF4001901	Cynon Valley STW	308149	192997	River Taf	Sewage Disposal Works - water company
D16	AN0337101	Crossbrook Street	307305	190331	River Taf	Sewerage Network – Sewers - water company
D17	AN0057802	Grovers Field	307720	192630	Nant Clydach	Sewerage Network - Pumping Station - water company
D18	AN0079801	Pwllgwaun Shepherd St	306590	190360	River Rhondda	Sewerage Network - Sewers- water company
D19	AE2017703	Ynysangharad High Relief	307265	189971	River Taf	Sewerage Network - Sewers- water company
D20	AN0156701	Park Place	308780	192650	Nant Cae-dudwei	Sewerage Network - Sewers- water company

Table 9-13 Summary of water quality at discharge points

Discharge point	AF4029101
pH (PH units)	
No. of samples (Nov 2012 – Feb 2014)	20
Maximum	9.0
Minimum	7.6
Average	8.1
No. above consent limit	0
Suspended solids (mg/l)	
No. of samples (Nov 2012 – Feb 2014)	20
Maximum	192.4
Minimum	0.4
Average	65.8
No. above consent limit	0

9.4.4 Hydrogeology

Aquifer Characteristics

The Pennant (Upper Coal) Measures are designated by the Environment Agency as a Secondary A aquifer and as a “minor” aquifer by Jones, et al., 2000. They are characterised by massive fluviatile, lithic sandstones (the Pennant Sandstones) and subordinate argillaceous horizons and a few thick coal seams.

The Pennant Measures typically comprise bluish grey, weathered, brown, thick massive or cross-bedded fine to coarse grained (locally pebbly) sandstones. In South Wales, and in the vicinity of the site, the sandstones tend to dominate in the lower part of the sequence and argillaceous beds and coal seams become more common higher up.

The Hughes Beds, that are present in the vicinity of the quarry, consist predominantly of conglomerates, medium to coarse grained sandstone and local finer grained units, of fluvial origin.

The Coal Measures sandstones are very well cemented and extremely hard and dense, and as such they exhibit very little primary porosity or inter-granular permeability. The permeability of these units is determined by the distribution and size of fractures present in the sandstones. Fracture apertures are largest at outcrop and shallow depths ranging up to several centimetres in diameter (Holliday, 1986).

Under natural conditions the unit constitutes a complex, multi-layered aquifer system, with individual fractured sandstone horizons acting as independent aquifers isolated by intervening low permeability argillaceous beds. In areas in which mining has taken place, hydraulic continuity (as a result of shafts, adits and related subsidence) commonly exists between individual aquifer layers (Jones, et al., 2000).

Permeability within the sandstones tends to decrease with depth as a result of increasing thickness of overburden and reduction in size of fracture aperture. This was reflected in deeper mines typically being drier than shallow mines (Jones, et al., 2000). Additionally, the Pennant Measures have historically shown greater permeabilities due to mining subsidence which has produced irregular zones of tensional and compressional strains resulting in increased fracturing (Holliday, 1986).

Aquifer Properties

Little regional data are available with regard to hydraulic properties of the Pennant Measures. Jones, et al (2000), quote horizontal hydraulic conductivities of about 4.2×10^{-4} m/d (4.9×10^{-9} m/s), and vertical hydraulic conductivities ranging from 4.0×10^{-4} to 5.5×10^{-2} m/d (4.6×10^{-9} to 6.4×10^{-7} m/s), with total porosities ranging from 11.3% to 13.6%. Samples taken from depth (~900 m bgl) gave hydraulic conductivities of 0.12 to 1.3×10^{-5} m/d (1.4×10^{-6} to 1.5×10^{-10} m/s) and total porosities of 1.7 to 4.8%. These are generally very low hydraulic conductivity values and would tend to suggest low groundwater flows.

The hydraulic conductivity of the Pennant Measures in the vicinity of Craig yr Hesg Quarry will be dependant primarily of the degree of fracturing and fissuring of the strata. During the site visit on 12 August 2009, the strata were observed to be massive and blocky, with two prevailing sub-vertical fracture sets, one striking approximately north-south and the other, perpendicular to this, in an east-west direction. Clear sub-horizontal bedding planes were also observed, dipping to the north-east. These features were seen across the entire height of the exposed quarry walls.

BGS (1983) states that the total porosity of the Upper Coal Measures (Pennant Measures) is typically low (2%), and further reduced where folding and faulting have resulted in secondary cementation. The hydraulic conductivity of the sandstones is noted as resulting from joints and fissures.

Transmissivities of the Coal Measures range from 0.1 to 25 m^2/day, although the higher end of this range is thought to reflect large amounts of storage in disused mine workings.

Groundwater Levels

Groundwater levels in the Pennant Measures are monitored on a two-monthly basis in two monitoring boreholes (CYH02 and CYH04) installed to the northwest of the excavation area during September 2006 and one borehole (CYH01/12) installed within the quarry processing area to the east of the main pit in May 2011. The locations of these boreholes are shown in **Figure 9.3** and associated groundwater hydrographs are presented in **Figure 9.8.** Summary groundwater level data is shown in **Table 9.15.** Piezometers were constructed to 100 m depth as follows: basal 20 m slotted pipe with remaining upper section of 80 m being plain pipe, backfilled with 6 mm chippings for the whole depth with no bentonite seals. The effective response zone of the borehole is therefore the entire 100 m section. This would mean that these piezometers are integrating water levels over the ranges shown in **Table 9.14** below. No information on water strikes encountered during drilling was available.

Table 9-14 Piezometer response zones

Borehole	Datum (mAOD)	Slotted section (m AOD)	Response zone (m AOD)
CYH01/12	100.60	0.60 to 20.60	0.60 to 100.60
CHY02	189.65	89.65 to 109.65	89.65 to 189.65
CYH04	186.32	86.32 to 106.32	86.32 to 186.32

Table 9-15 Summary of available site groundwater level data

Borehole	Datum (mAOD)	Water level (mAOD)			Range (m)
		Min	Mean	Max	
CYH01/12	100.60	82.67	92.27	97.53	14.86
CHY02	189.65	106.65	143.89	159.95	52.94
CYH04	186.32	142.45	159.80	169.78	27.33

Water levels recorded in CYH01/12 support the conclusion that the elevation of the regional water table is lower than the permitted base of the excavation (100 m AOD) with maximum water levels of 97.53 m AOD being observed.

Site observations of the face quarry face between the upper quarry floor level (115 m AOD) and the quarry base (107 m AOD) show that a fault is present (**Appendix 9.3**). Water appears to infiltrate the base of the quarry floor along the trace of this fault. A shaley Coal Measures stratum was observed in the face and is thought to be the cause of previous perching of groundwater in the former sump created earlier in the quarry's development.

Groundwater levels in CYH02 and CYH04 are clearly higher than those in CYH01/12 and are considered to be water levels perched on mudstone bands rather than the regional groundwater table. These perched horizons are known to occur throughout the Pennant Measures in the vicinity of Craig yr Hesg from exploratory borehole logs. The position of mudstone bands in boreholes CYH02 and CYH04 are shown in **Figure 9.8.** The groundwater levels recorded in CYH02 are likely to be highly influenced by and representative of perched groundwater on a mudstone band at 104 m AOD. Four mudstone bands are present between 114 and 91 m AOD at CYH04 with the groundwater level consistently above the highest recorded band.

A steep hydraulic gradient exits between CYH02 and CYH04; typically between 10-20 m over a lateral distance of 125 m (equivalent to a gradient of between 0.08-0.16). This gradient is also in the opposite direction to the surface water drainage direction and the direction of dip of the beds (both of which are approximately northerly). This provides further indication that the recorded levels represent systems perched on low permeability layers within the Pennant Measures rather than the regional water table. Furthermore, the quarry is located on a steep sided hill and it unlikely that the regional water table would be encountered at such a level near the hill crest.

Perched groundwater is likely to be the source of the springs feeding the minor water courses, notably the Nant Tai'r-heol and the Daren-Ddu streams. This can be inferred given the elevation of the springs as discussed in 9.4.3, and the repeated sinking and emergence behaviour and ephemeral nature observed during the site visit.

The Environment Agency does not monitor any observation boreholes to obtain groundwater levels within 3 km of Craig yr Hesg Quarry to enable identification of the level of the regional water table in the vicinity of the quarry. However, if the main rivers are assumed to be in hydraulic continuity with the regional groundwater table then their levels (**Table 9.6)** would suggest groundwater levels significantly lower than the current quarry base.

Groundwater Quality

No groundwater quality data are available for either the Pennant Measures or superficial deposits in the vicinity of Craig yr Hesg Quarry.

9.4.5 Conceptual Model

Schematic conceptual cross sections across the site are shown in **Figure 9.10** (north-east to south-west) and **Figure 9.11** (north-west to south-east).

Bedrock beneath the site consists of massive, fluviatile, lithic sandstones with argillaceous horizons and coal seams. These strata comprise the Pennant Measures and dip to the north-east at between 5 and 10 degrees.

As discussed in Section 9.4.3 the LTA rainfall is expected to be around 1600 mm/a and the effective rainfall around 1000 mm/a. An approximated runoff factor of 30%, as a consequence of the steep nature of the topography around Craig yr Hesg, yields an estimate of recharge to the Pennant Measures of 700 mm/a. This may be locally reduced by the presence of glacial till on valley slopes which would further increase the runoff fraction.

The River Taf to the east and Nant Clydach to the north form the major drainage features in the vicinity of the site. The Nant Clydach is present at elevations between 80-90 m AOD in the vicinity of the quarry, with the River Taf reducing from 80 m AOD to 49 m AOD. Flows in the Taf at Pontypridd are flashy with the runoff dominated stream response reflective of the catchment topography and high effective rainfall in the upland areas.

Several minor streams were identified during the water features survey in the direct vicinity of the quarry. These originate from spring flows on the mid slope areas. Stream flows are ephemeral, with lengths of dry channel, sinking and re-emergence behaviour identified in the upper reaches.

Perched groundwater recorded at CYH02, immediately north-west of the quarry, is between 15-25 m below the elevation of the springs at Cefn (165-167 m AOD). This indicates that these springs are likely fed from an upper perched groundwater system on the north-western slopes of Craig yr Hesg which is independent of that adjacent to the quarry. However, perched groundwater levels at CYH04 are comparable with the spring elevation and potentially form part of the same perched system feeding the Cefn springs. However a very shallow hydraulic gradient would be required for this to be the case. Spring flows are then generated by the intersection of a perched system with low permeability glacial till protruding up the valley of the Nant Tai'r-heol. These springs are also significantly higher than the base of the quarry, below which the regional groundwater table is present and therefore are considered independent of this system.

Spring flows on the western and southern slopes are likely to be associated with the presence of faults and juxtaposition of coal seams. Near-surface, perched groundwater in the Pennant Measures intersecting these features is the source of the spring flow. However field observations and a review of the geological map indicate the Daren-Ddu springs are on the other side of the valley, to the west of the Fault, and opposite Craig-yr-Hesg.

The Pennant Measures themselves are designated a Secondary A aquifer by the Environment Agency, and are not of regional importance for water supply. The Pennant Measures have small primary porosity and permeability and the ability to transmit groundwater is dependent on the density and nature of fissures.

Water levels recorded at CYH01/12 are considered to be representative of the regional groundwater levels, supporting previous suggestions that they are below the current and proposed maximum base level of the quarry (100 m AOD). Groundwater levels monitored in the area immediately north-west of the quarry (boreholes CYH02 and CYH04) are considered perched on low permeability mudstone bands. Similarly, seepages noted at various elevations on the quarry faces within the main void are small and considered to represent perched water. During the second site visit the magnitude of groundwater inflow into the quarry was so small that it was hard to identify any areas of active flow and the base of the quarry was dry. This suggests that flow within perched layers is unlikely to be great.

Even if it were the case that the base of the site is in fact located at or below the permanent water table, and as such dewatering of the aquifer would need to take place, then the steep hydraulic gradients between the quarry floor and the nearby boreholes would indicate that the permeability of the Pennant Sandstone in the vicinity of the site is extremely low, (i.e. the secondary permeability provided by the fractures and fissures within the bed rock is not significant, beyond the quarry blast zone). The radius of influence of any dewatering would therefore be limited as would be suggested by the higher water levels recorded in the monitoring boreholes immediately north-west of the site (typically 140-160 m AOD).

9.4.6 Uncertainties

The key uncertainties are those associated with the location and extent of perched groundwater levels within the Pennant Sandstone and the size of the catchment areas for the springs in the area.

9.5 Methodology: Approach to Impact Assessment

9.5.1 Introduction

On the basis of the conceptual model developed for the area, an approach to the impact assessment has been adopted which incorporates a qualitative assessment of groundwater flows within the recommended risk assessment framework.

The standard approach recommended for environmental risk assessment is set out in "Guidelines for Environmental Risk Assessment and Management", DEFRA, 2011. This recommends a source-pathway-receptor methodology. In the context of the impact assessment for Craig-yr-Hesg Quarry these elements may be defined as:

Source: Dewatering associated with further working and expansion of the footprint of Craig-yr-Hesg Quarry.

Pathways: The groundwater flow pathways or hydrogeological linkages identified in the conceptual model.

Receptors: Key water features.

The risk assessment process can be sub-divided into a number of steps as described below.

Step 1: Identification of Receptors. The identification of a risk requires the presence of all three elements in the source-pathway-receptor chain. The source is by definition the quarry at which changes to runoff and infiltration are occurring. The first task in the risk assessment process is therefore to identify any relevant receptors. Potential impact receptors include all water features identified during the water features survey (section 9.4.3) and the private water supplies (Table 9.17). The complete list of all potential receptors is included in the next section below.

Step 2: Identification of Pathways. Having established all potential impact sources and receptors, it is then necessary to identify pathways between the quarry (the source) and each water feature (the potential receptors) (i.e. determine all source-pathway-receptor linkages). In simple terms, the assessment process must establish whether the groundwater level effects of Craig-yr-Hesg Quarry activity could potentially affect any of the identified water features. This has been achieved by considering each potential source-pathway-receptor chain in the context of the conceptual model. Hence, where there is believed to be no significant groundwater pathway between the quarry and a given receptor, this receptor can be removed from the hydrogeological impact assessment process (note: where a pathway linkage is unclear, for example due to uncertainty in the conceptual model, the pathway is assumed to exist). In effect, this risk assessment approach serves to filter the list of potential receptors. In addition to underground pathways, overland pathways are also considered where the runoff has been redirected from its original path towards one of the quarry discharge locations.

Step 3: Quantification of Effects. The presence of a hydrological / hydrogeological pathway between the quarry and a receptor does not on its own indicate that an effect will occur at the receptor. The next step in the impact assessment process must therefore be to address whether or not there is likely to be an effect at each potentially vulnerable receptor resulting from the quarry development (and restoration) works.

Step 4: Assessment of Significance. The demonstration and quantification of a potential effect does not in itself represent a significant potential impact as this requires an assessment of the significance of the effect. This is conducted individually for each receptor.

There are two aspects to the assessment of significance:

1. it is necessary to compare the size of the potential effect with a relevant criterion. If the size of effect is smaller than the criterion then the effect does not represent a significant impact. In some cases it may be more appropriate to determine this on a qualitative basis.

2. if the size of effect is potentially greater than the relevant criterion, it is necessary to assess the significance that the potential impact represents. The significance of an impact is dependent on the magnitude of the effect and the importance of the receptor.

1. Relevant Criteria

In this case, given the nature of the receptors it has been determined that a qualitative judgement regarding the magnitude of effect is appropriate.

2. Importance of Receptors

The second factor in the consideration of degree of impact is the importance of the receptor. Receptors have been assigned to one of three status categories – low, medium or high. The methodology for assigning to a particular category is based on the following general criteria although it is subjective to a large degree:

- Low Status – Unlikely to be of significant ecological or societal value (e.g. small ephemeral pond); surface water and groundwater abstractions that supply or impact on an individual or small number of people (e.g. farm or home supply);

- Medium Status – Of local ecological or societal value or supporting medium or high status ecological features (e.g. springs); surface water or groundwater abstractions that supply or impact on a local community (e.g. local water supply or water supply to a local amenity);

- High Status – Nationally and internationally designated ecological sites (e.g. SACs) or features supporting these (e.g. springs); surface or groundwater abstractions that feed into public water supply. Degree of impact is determined by applying the degree of effect with the receptor status according to the matrix in **Table 9.16** below:

Table 9-16 Hydrogeological Impact Assessment Matrix

		Receptor Value		
		Low	Medium	High
Degree of effect	Negligible	Negligible	Negligible	Negligible
	Low	Minor	Minor	Moderate
	Medium	Minor	Moderate	Major
	High	Moderate	Major	Major

Whilst the table above provides impact magnitude, impacts are further defined in terms of whether they are adverse (i.e. negative) or beneficial (i.e. positive).

Only adverse impacts that are Moderate or higher (highlighted with red text in the table above) are considered to be potentially significant and in need of mitigation.

9.5.2 Potential Receptors

Potential receptors to impacts upon the hydrogeological / hydrological regime in the vicinity of the Site as a consequence of quarrying activities progressing into the extension area are discussed in the following sections. The potential receptors are screened on the basis of their susceptibility to any changes in the hydrogeological / hydrological regime (i.e. the pathway), and those deemed susceptible are carried forward to the remaining impact assessment stages.

9.5.3 Surface Water Flows

The surface water features in the vicinity of the site that may be considered potential receptors with regard to the proposed working are;

- the River Taf to the east of the Craig yr Hesg,
- the Nant Clydach to the north of the Craig yr Hesg,
- the spring feeding the Nant Tai'r-heol adjacent to the Darren Ddu Road at Cefn on the northern slope of Craig yr Hesg,
- springs feeding the Darren Ddu stream to the west of Craig yr Hesg and
- springs feeding the wetland area and pools to the south-east of Craig yr Hesg.

A pathway to each of these receptors exists via groundwater within the Pennant Sandstone or through site discharges to surface water. Passive dewatering and the redirection of surface water to surface water discharge points or infiltration through the base of the pit will result in a redistribution of flows. The proposed quarry development therefore has the potential to alter surface water flows.

Both the Nant Clydach to the north and the River Taf to the east are approximately 10-20 m and 30-50 m below the elevation of the current and proposed base of the quarry respectively. These surface water courses have large catchments, of which the quarry forms a very small proportion. These rivers are therefore not carried forward to the impact assessment as potential receptors with respect to impacts upon surface water flows.

The minor spring flows feeding the Nant Tai'r-heol at Cefn and Darren Ddu Stream are carried forward to assess the potential impacts of the proposed development.

9.5.4 Groundwater and Surface Water Quality

Development of the quarry has the potential to impact on the quality of groundwater and surface water via the water quality of discharges from the site.

The Pennant (Upper Coal) Measures are designated as a Secondary A aquifer and the groundwater quality is a potential receptor

Craig yr Hesg Quarry holds one discharge consent to discharge to the River Taf which is therefore a potential receptor with respect to surface water quality.

9.5.5 Abstractions

Rhondda Cynon Taf County Borough Council has provided information for 8 private water supply abstractions within 3 km of Craig yr Hesg Quarry. Locations of these abstractions are presented on **Figure 9.9** and details are provided in **Table 9.17** below.

Table 9-17 Private water supply abstraction details

Map ID	Source	No. premises using source	Town	X	Y
ABS1	Spring	6	Porth	304885	191802
ABS2	Multiple (mixed)	2	Graigwen	305500	191913
ABS3	Spring	1	Ynyswbwl	307348	193485
ABS4	Borehole	1	Cilfynydd	309551	193196
ABS6	Spring	1	Rhydyfelin	309334	189825
ABS7	Spring	1	Rhydyfelin	309355	189832
ABS8	Spring	1	Pontypridd	309259	189578
ABS9	Spring	1	Ynysybwl	305654	193621
ABS2	Spring	6	Porth	304885	191802

According to the Environment Agency there is one licensed surface water abstraction and no licensed groundwater abstractions within 3 km of Craig yr Hesg Quarry (ESI, 2014). The licensed surface water abstraction has four abstraction points, details are presented in **Table 9.18.**

Table 9-18 Environment Agency Abstraction Licence Details

Map ID	Source	Purpose	Annual Quantity (m^3/a)	Daily Quantity (m^3/d)	X	Y
ABS10-1	Surface Water	Agriculture	3,090,528	8,467.2	304885	191802
ABS10-2			283,824	777.6	305500	191913
ABS10-3			583,416	1,598.4	305654	193621
ABS10-4			583,416	1,598.4	304885	191802

The majority of abstractions are located greater than 2 km from the site and can be ruled out from being at risk of impact from Site activities due to their distance from the site and their location well outside the surface water catchment of the site.

There are no abstractions within 1.5 km of the site. It is not considered likely that any of these locations are at risk of impact from quarrying at the site to 100 m AOD.

9.5.6 Designated Sites

There is only one designated conservation site in the vicinity of Craig yr Hesg Quarry. Nant Gelliwion Woodland SSSI is located 3 km to the south west of Craig yr Hesg in the valley of Nant Gelliwion covering an area of 11.6 ha. The Nant Gelliwion flows northward to join the River Rhondda in Pontypridd prior to the confluence with the River Taf (**Figure 9-3)**. Given the distance from the site, location of the source of the Nant Gelliwion, and location to the south of the River Rhondda, the SSSI is not considered susceptible to impacts of quarrying activities at Craig yr Hesg. Therefore the site is not carried forward as a receptor to the impact assessment stage.

Craig yr Hesg Local Nature Reserve is located immediately south-west of the quarry in the vicinity of the Daren-Ddu Road. The nature reserve is primarily comprised of woodland, with some bog/marsh land. It is carried forward to assess the potential impacts of the proposed development.

There are no source protection zones (SPZ) in the vicinity of Craig yr Hesg.

9.5.7 Summary of Potential Receptors and Receptor Value

The following features are considered to be potentially at risk of impacts from the quarry development during the ROMP period and the proposed extension and are brought forward to the assessment stage in the following sections:

- Minor spring flows feeding the Nant Tai'r-heol at Cefn and Daren-Ddu Stream. These features are considered to be of medium value.
- Groundwater quality in the Pennant (Upper Coal) Measures minor aquifer. This is considered to be of medium value.
- Surface water quality in the River Taf. This is considered to be of high value.
- Moisture contents in the Craig-yr-Hesg local nature reserve located immediately south-west of the quarry comprising woodland with some bog/marsh land. This feature is considered to be of medium value.

9.6 Impacts of Quarry Development

9.6.1 Surface water flows

Low effects upon Cefn Springs and Darren Ddu springs cannot be discounted by quarrying to date given that the base of the quarry extends to 107 m AOD, which is some 50 to 120 m below the elevations of the springs described above, with the available hydrogeological data. However, any effects are likely to be limited given that perched groundwater levels in excess of 160 m AOD are recorded in the boreholes between the quarry and the Cefn springs. This suggests that the degree of effect of the quarry development to date on the perched horizons within the Pennant Sandstone is limited.

No flow was observed in the Nant Tai'r-heol upstream of the Cefn Springs during the site visit. This is likely to be indicative of natural conditions during the summer. The dry section of this stream originates at elevations of over 200 m AOD on the adjacent hill to the west of Craig yr Hesg, across the Darren Ddu Fault. Therefore, it is considered that the stream is likely to be fed by a separate perched groundwater system to that below the Craig yr Hesg hillside in its upper reaches and as such the effect of quarrying would be negligible.

It is considered, therefore, that the impact on these receptors at present is minor (i.e. not significant) and that increasing the area of the quarry base at 100 m AOD will have no further impact upon these surface waters and no further action is therefore warranted.

9.6.2 Groundwater and Surface Water Quality

The development and operation of excavations which require the collection and discharge of site water have inherent potential to affect groundwater and surface water quality. Such potential effects include:

- Suspended sediment contamination of surface water
- Hydrocarbon contamination of groundwater and surface water from fuel oil and solvents used in the operation and maintenance of site vehicles and machinery
- Inflow of naturally poor quality Coal Measures perched groundwater to the quarry and its subsequent discharge to ground. The risk of this inflow in the proposed extension is very small given the elevation of the workings above the known coal seams within the quarry and presence of an unsaturated zone beneath the quarry floor.

Suspended Solids

Sediment suspended in site runoff is a common contaminant produced from the extractive industry. Suspended solids are a particular hazard to aquatic fauna by clogging fish gills, destroying spawning sites and restricting plant growth. Increased entrained sediment in streams also increases the erosive capacity and can also exacerbate flooding.

Quality and rate of discharge from the site is controlled by the on-site attenuation and settlement system and regulated by the existing discharge consent to the River Taf (Consent Number AF4029101). To date, due diligence has ensured that the quality of surface water leaving the site has not been of concern; this is not expected to change as a result of the extension development given that the water which is discharged originates from the processing plant area and not the quarry workings.

Hydrocarbon contamination

Leakage of fuel oil and / or solvents from plant machinery, vehicles or storage tanks could locally lead to surface water contamination through interception by runoff and subsequent discharge to surface watercourses, and groundwater contamination through infiltration and migration to the local water table. Groundwater contamination may pose a risk to water resources where groundwater abstractions are present and also surface waters, if they derive baseflow from the aquifer underlying the contaminated area.

The current and future extraction of the Pennant Measures is characterised by the use of automated machinery and processing within custom built structures. Fuel is stored in appropriately constructed and maintained tanks within bunded areas. Oil interception screens are employed where possible in order to reduce hydrocarbon contamination in site runoff water prior to discharge. Site machinery and vehicles are appropriately maintained within in site workshops to prevent or quickly identify and repair leaks. The good practice as to the management of hydrocarbons will continue in all operational areas.

With the mitigation incorporated in the existing and proposed operation (as described above) the degree of effect on surface water and groundwater quality is negligible and hence the impact is also considered negligible.

9.6.3 Designated Sites

Craig yr Hesg Local Nature Reserve (LNR) is the only designated site considered potentially at risk from the proposed development. During the site walkover a wetland and spring was observed immediately to the south of the boundary of the LNR but outside the LNR (Point 18 in **Table 9.3** and **Figure 9.3**) at between 80 to 90 m AOD.

A level of 107 m AOD has already been reached in the southern end of the quarry. It is considered that any effects on this feature would already have taken affect and that extending the area of the quarry at 100 m AOD to the north would have negligible further effect and hence negligible impact on the Local Nature Reserve.

9.6.4 Flooding

The existing quarry and proposed extension area are located entirely within Flood Zone A (considered to be at low risk of fluvial and / or coastal / tidal flooding). As such there is no requirement to carry out a Flood Consequence Assessment. The risk of flooding in the area is also considered to be minimal due to the quarry’s location at between 100 and 195 m AOD on the inter-fluve between the Nant Clydach, River Taf and River Rhondda.

Run-off into the main excavation will be allowed to continue soaking into the base of the quarry and does not represent a flood risk outside the site. The performance of the current soakage area would suggest that this could accommodate most flows (see **Appendix 9.3**); however where flows are too high the quarry floor would be allowed to flood temporarily. This water would be removed subsequently through ongoing soakage to ground.

Any discharge of water from the quarry will be controlled by the discharge consent for which there is no volume limit, confirming the very low perceived risk of flooding in the vicinity of the site.

9.7 Impacts of Quarry Decommissioning

There are not anticipated to be any post-restoration impacts on any of the receptors mentioned above.

Restoration proposals provide for the baseof the quarry to be graded to a gentle fall to the east, with surface water allowed to infiltrate into the ground. There will be no increased risk of flooding. There will be no requirement for an overflow to any surface water body.

9.8 Mitigation Measures

Given that there are not expected to be any significant impacts to the receptors defined, mitigation measures are not required. Due diligence will be maintained throughout the proposed development to ensure this remains the case. This includes the continued employment of settlement lagoons to ensure suspended solid loads remain below the consented limit and receiving water courses are not adversely affected by the quarry discharge. The proposed quarry extension does not impact on the existing situation for the quarry discharge.

Whilst significant impacts are not anticipated, it is acknowledged that there is uncertainty regarding the catchment and source of water to the Cefn springs. Typically, when the groundwater supplying springs adjacent to quarry developments are removed / disrupted causing a significant change in the flow, augmentation of the flow can be made using water from the on-site water management system. This is not considered necessary in this circumstance given the relatively low impact of the proposed extension.

9.9 Residual Effects

With no mitigation measures proposed additional to those already incorporated in the current site operation and regulation, the residual effects are as described in Sections 9.6 and 9.7 i.e. not more than minor and therefore not significant.

9.10 Summary of Effects

The following impacts have been identified in **Table 9.17:**

Table 9-19 Summary of Effects

Receptor	Value of receptor	Quarry Development			Quarry Decommissioning		
		Description of effect	Level of effect	Impact	Description of effect	Level of effect	Impact
Spring flows feeding the Nant Tai'r-heol at Cefn and Daren-Ddu Stream	Medium	Reduction in flow	Low	Minor	None	n/a	n/a
Groundwater quality in the Pennant (Upper Coal) Measures minor aquifer	Medium	Reduction in groundwater quality	Negligible	Negligible	None	n/a	n/a
Surface water quality in the River Taf.	High	Reduction in surface water quality	Negligible	Negligible	None	n/a	n/a
Moisture contents in the wet area south of the Craig-yr-Hesg Local Nature Reserve	Medium	Reduction in moisture content	Negligible	Negligible	None	n/a	n/a

9.11 Recommendations

There are currently two piezometers installed within the Pennant Measures in the extension area. Whilst these are not considered to reflect the elevation of the regional water table, it is recommended that groundwater level monitoring of these perched horizons continues to be undertaken on a monthly basis such that any changes to the current conditions that occur during quarrying of the proposed extension area may be observed.

Whilst not an environmental consideration, the soakage capacity of the main excavation needs to be maintained to ensure efficient operation of the quarry. A number of specific recommendations have been made in the surface water and drainage assessment (**Appendix 9.3)** to help achieve this. One of the key recommendations is to ensure that the existing soakage area is retained and that the continued efficiency of the soakaway is encouraged by installing a drainage blanket (which has already been done).

9.12 Conclusions

This chapter presents an assessment of the potential impacts of the continued operation at Craig yr Hesg Quarry and proposed north-west extension to the quarry.

The relevant data on the geology, hydrogeology and hydrology of the site have been collected and reviewed in order to develop a conceptual understanding of the local flow systems.

The main permeable formations of interest to this assessment are the sandstones within the Upper Pennant Measures that form the bedrock and the reserve of economic interest.

Regional groundwater levels are considered to be below the current and proposed minimum base level of the quarry (100 m AOD) given the locality of the quarry on top of Craig yr Hesg hill and evidence from groundwater level monitoring via on site piezometers.

Spring flows on the western and southern slopes are likely to be associated with the presence of perched groundwater flowing within faults and juxtaposing of coal seams.

No active dewatering of the bedrock is currently required or is anticipated to be needed for the working of the quarry within the current site and proposed extension area.

Minor spring flows feeding the Nant Tai'r-heol at Cefn and Darren Ddu streams in the vicinity of the quarry are the only potential surface water receptors that have been considered to be potential at risk of impact from the proposed quarry operations. The risk of potential impact is considered to be low, and any minor impact is likely to already have occurred historically as the quarry base is already well below the elevation of these springs.

Potential impacts on surface water and groundwater quality will be adequately mitigated by standard quarrying good practice measures and the existing discharge consent.

Following the cessation of operations at Craig yr Hesg Quarry, it is proposed to cease management of surface water and groundwater within the quarry.

The volume of data collected for the Site (including groundwater level, flow, and quality) represents a highly robust basis for this assessment.

In summary, following a full impact assessment it is considered that there are will be no significant impact to hydrological/hydrogeological receptors from the proposed development at Craig yr Hesg.

9.13 References

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Department for Communities and Local Government, 2012b. Technical Guidance to the National Planning Policy Framework (NPPF)

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ESI, 2014. Craig-yr-Hesg Quarry: Hydrogeological Assessment.

Holliday, D.W. 1986. Devonian and Carboniferous basins. Geothermal energy – the potential in the United Kingdom. 84-110. Downing, R.A. & Gray, D.A. (editors).

British Geological Survey, 1983. Hydrogeological map of South Wales, including hydrometric area 58 and parts of 54, 55, 56, 57, 59, 60 and 61. Hydrogeology Research Group.

Centre for Ecology & Hydrology [CEH], 2014. 57005 – Taff at Pontypridd daily flow data. Accessed from http://www.ceh.ac.uk/data/nrfa/data/meanflow.html?57005 on 27/05/2014.

Jones, H. K, Morris, B. L., Cheney, C. S., Brewerton, L. J., Merrin, P. D., Lewis, M. A., MacDonald, A. M., Coleby, L.M., Talbot, J.C., McKenzie, A. A., Bird, M. J., Cunningham, J. and Robinson, V. K. 2000. The physical properties of minor aquifers in England and Wales. British Geological Survey Technical Report WD/00/4. Environment Agency R&D Publication 68.

SLR, 2014. Brief for EIA Consultancy Services.

Figure 9-1 Site location

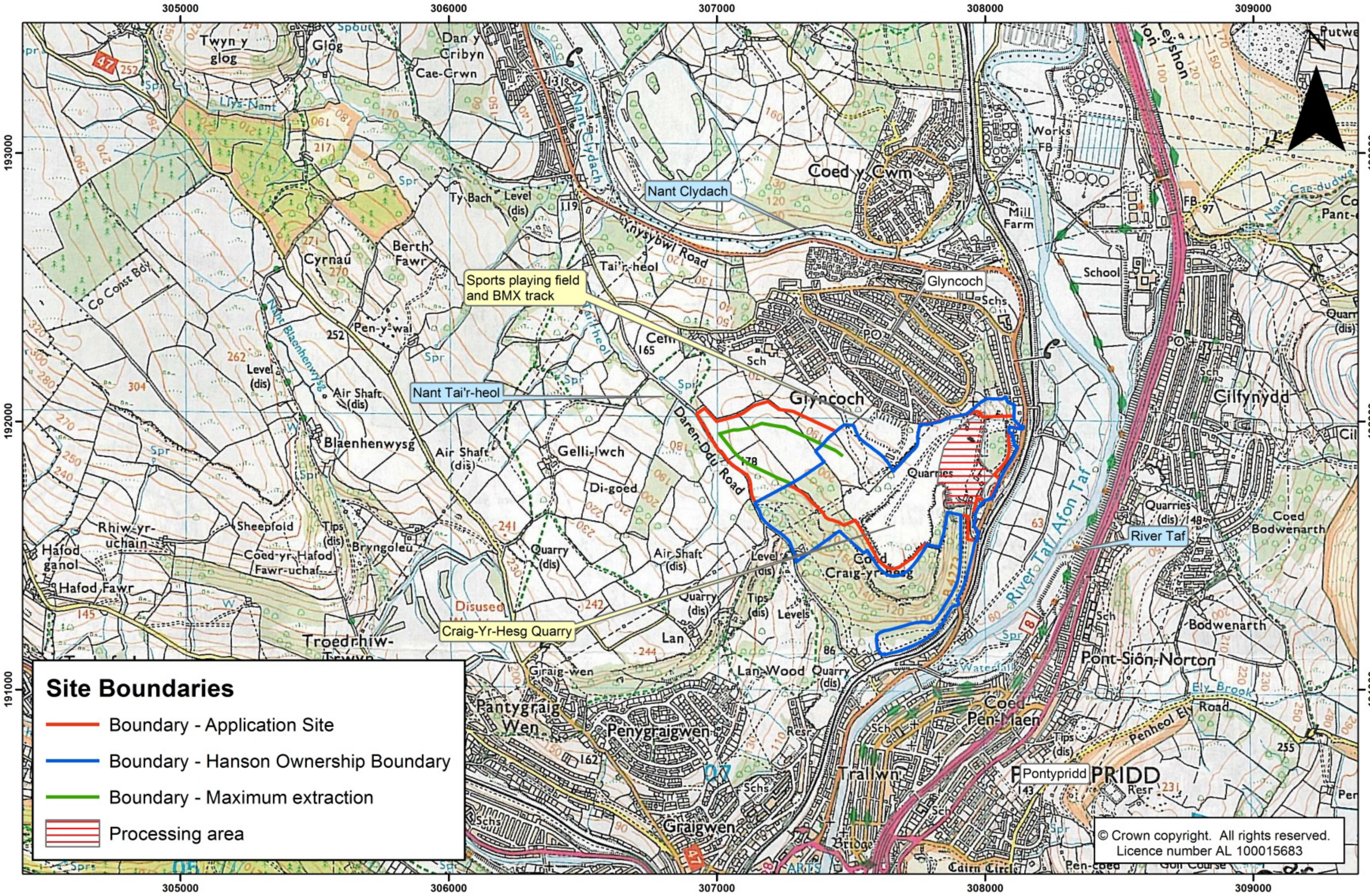


Figure 9-2 Regional Geological Setting

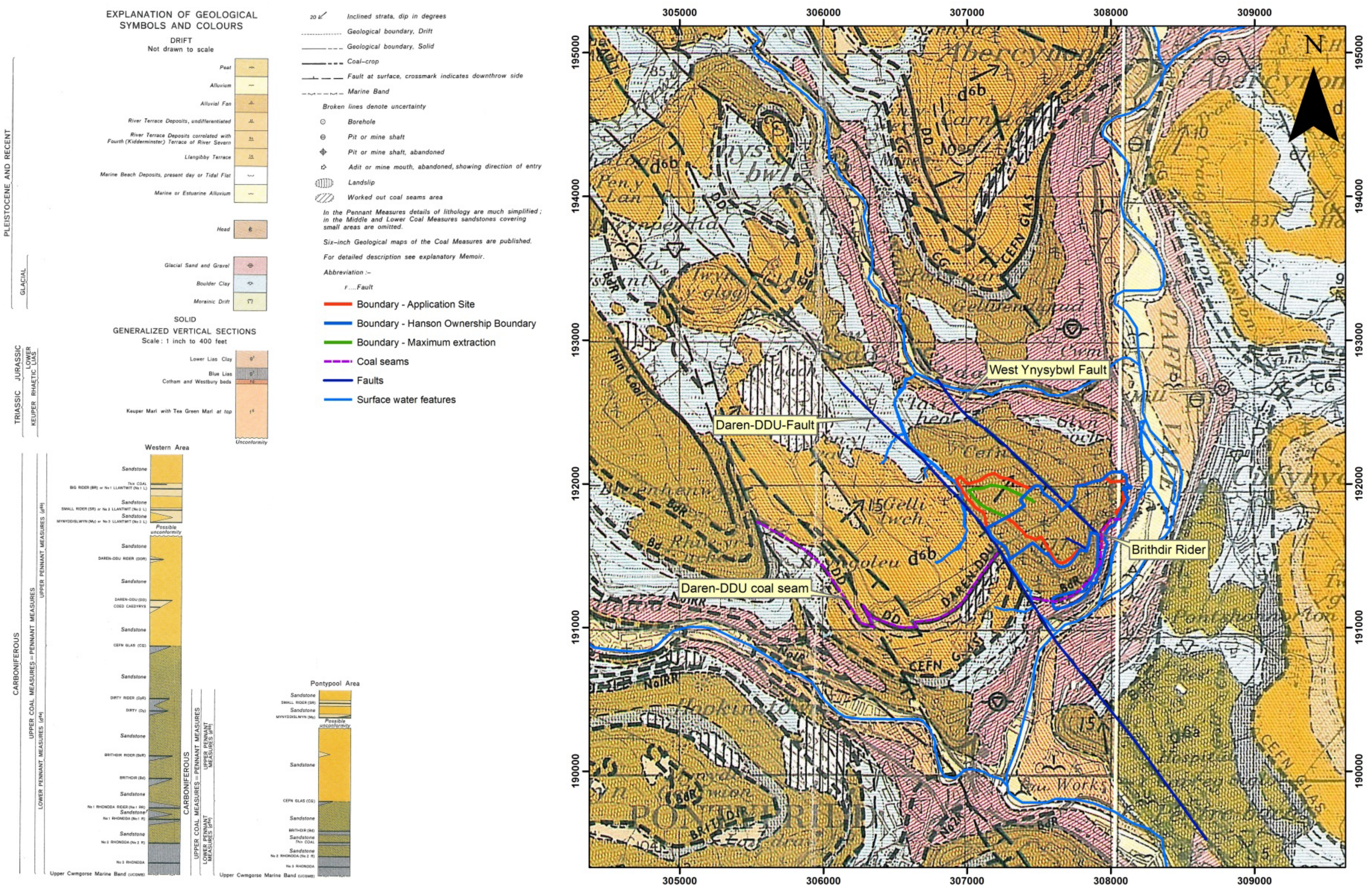


Figure 9-3 Locations of Boreholes and Hydrological Features

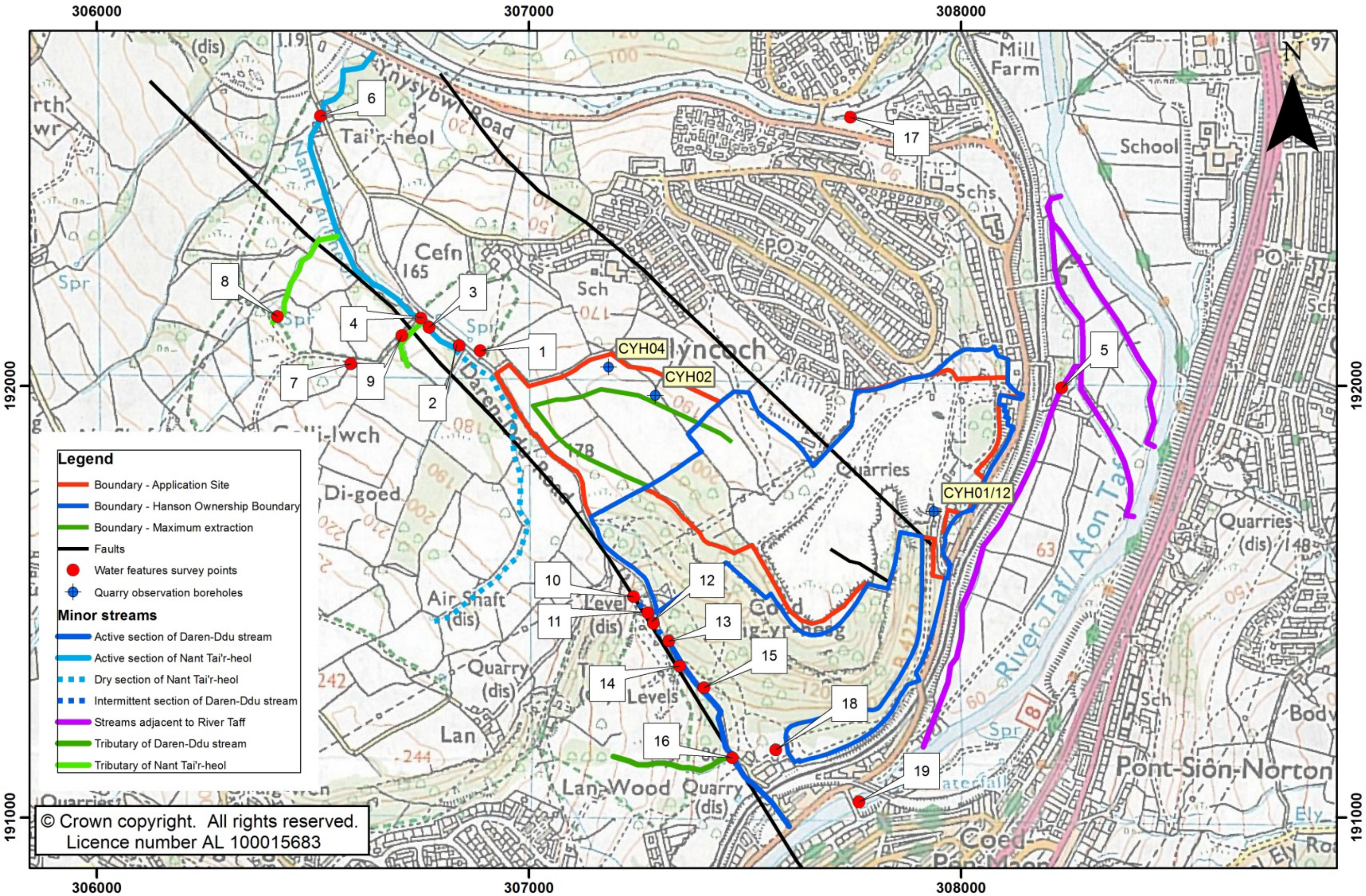


Figure 9-4 Surface Water Features and EA Data Locations

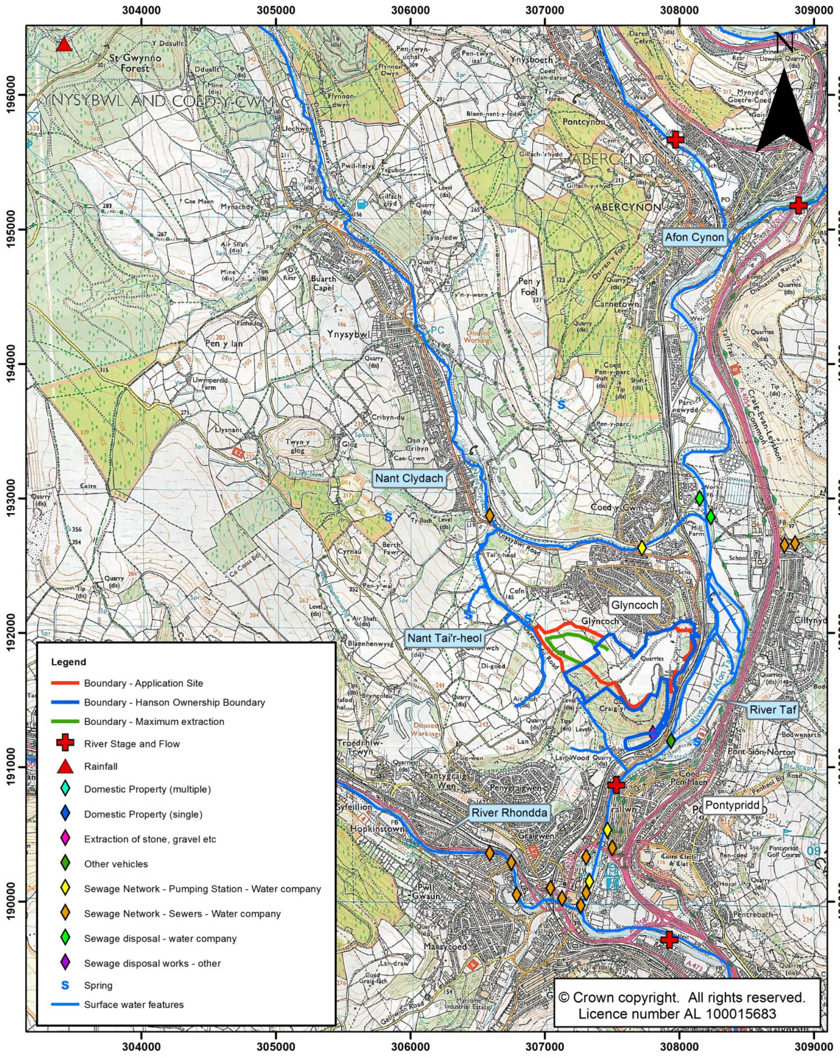


Figure 9-5 Daily mean flow for the River Taf at Pontypridd

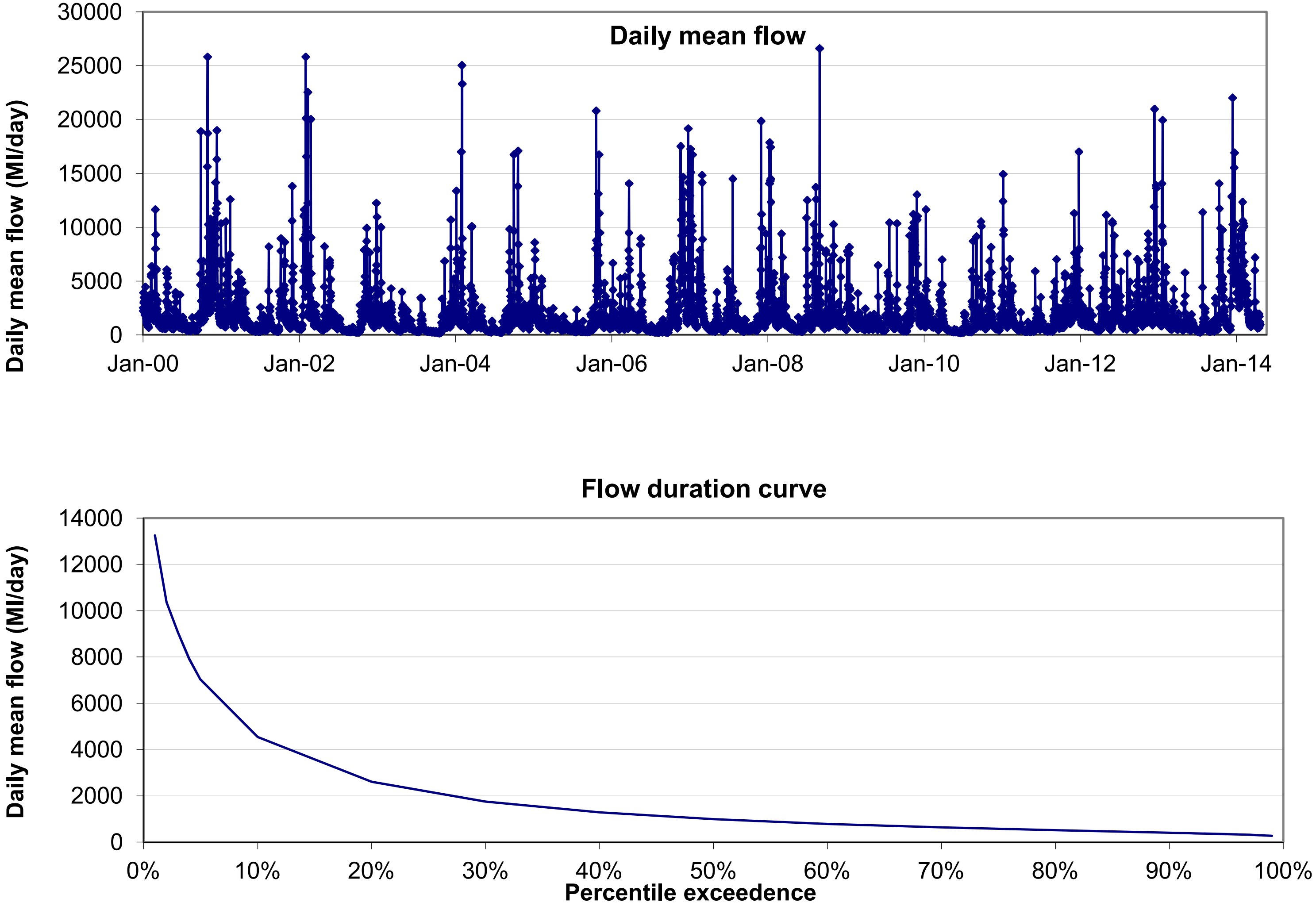


Figure 9-6 Location of Local Discharge Consents

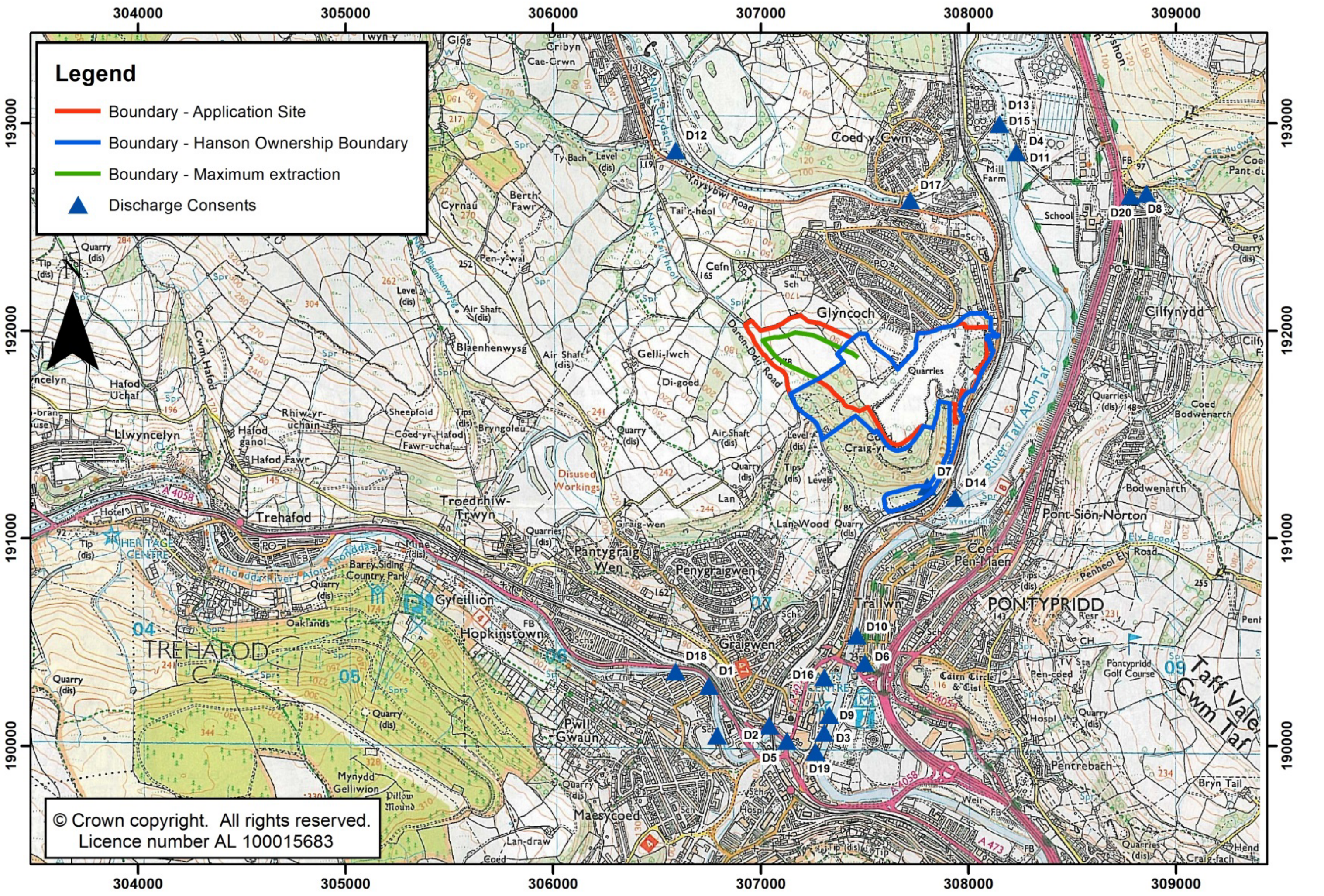


Figure 9-7 Water Quality Data at the Quarry Discharge Point

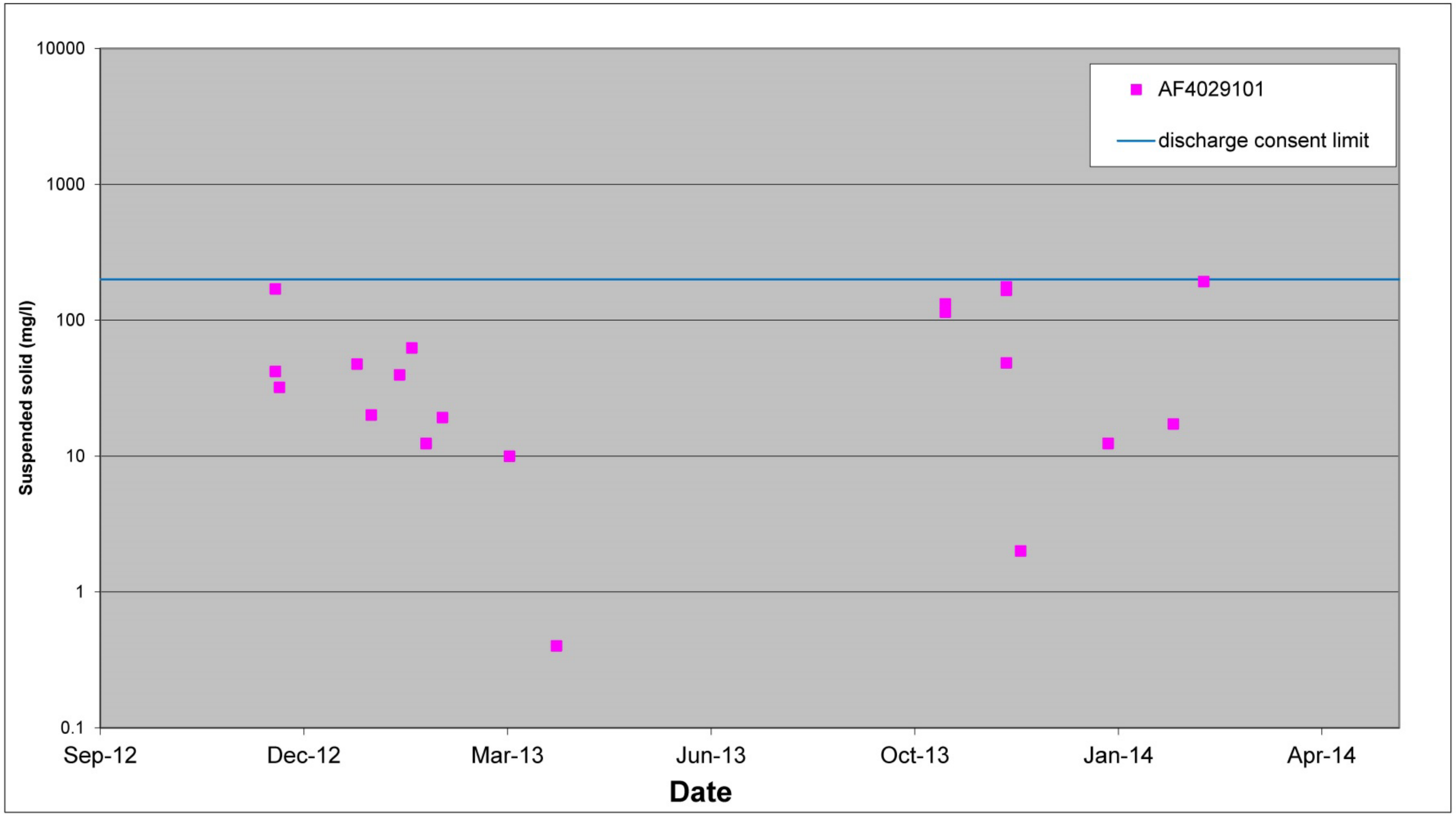


Figure 9-8 Groundwater Level Hydrographs

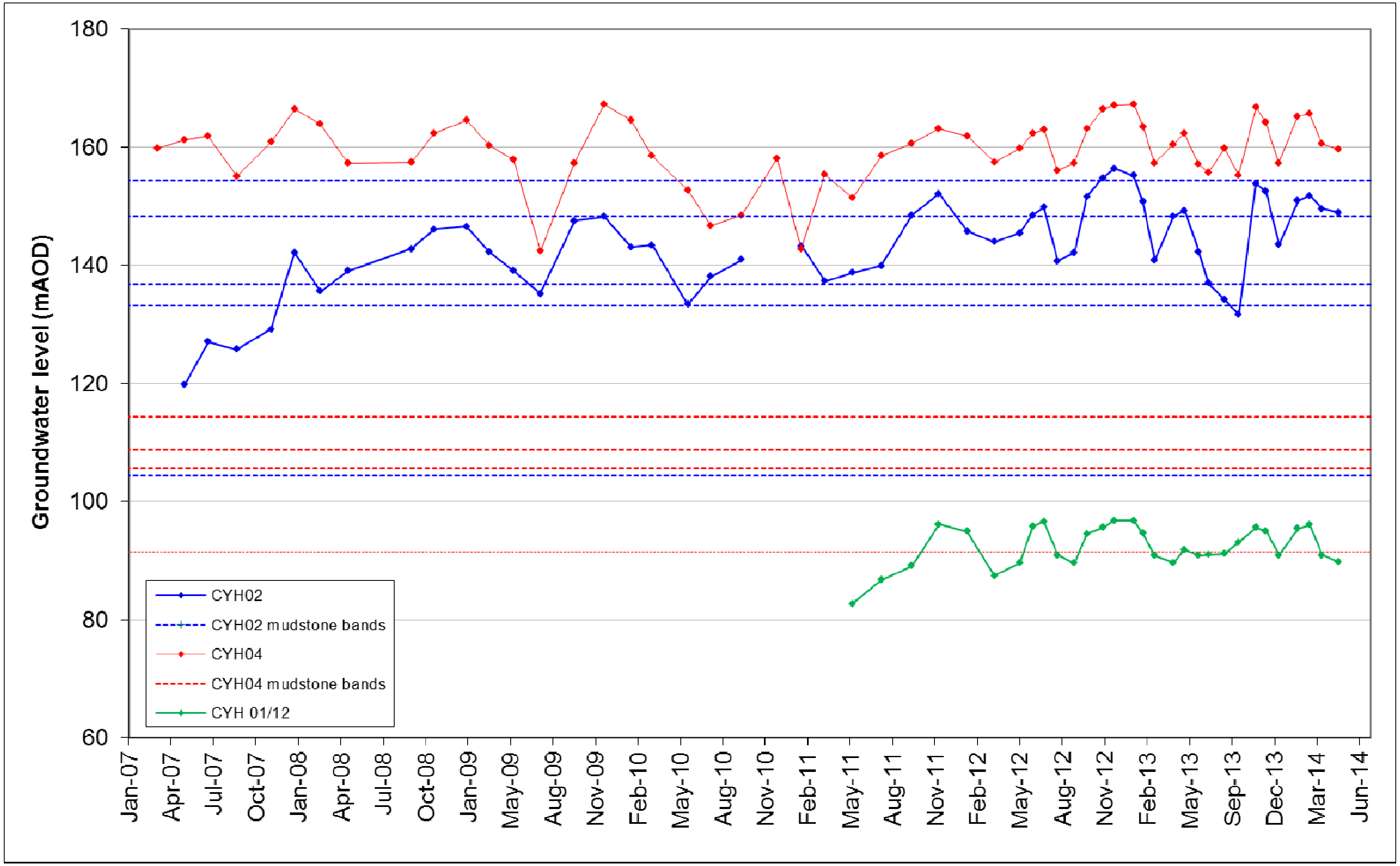


Figure 9-9 Private Water Supplies

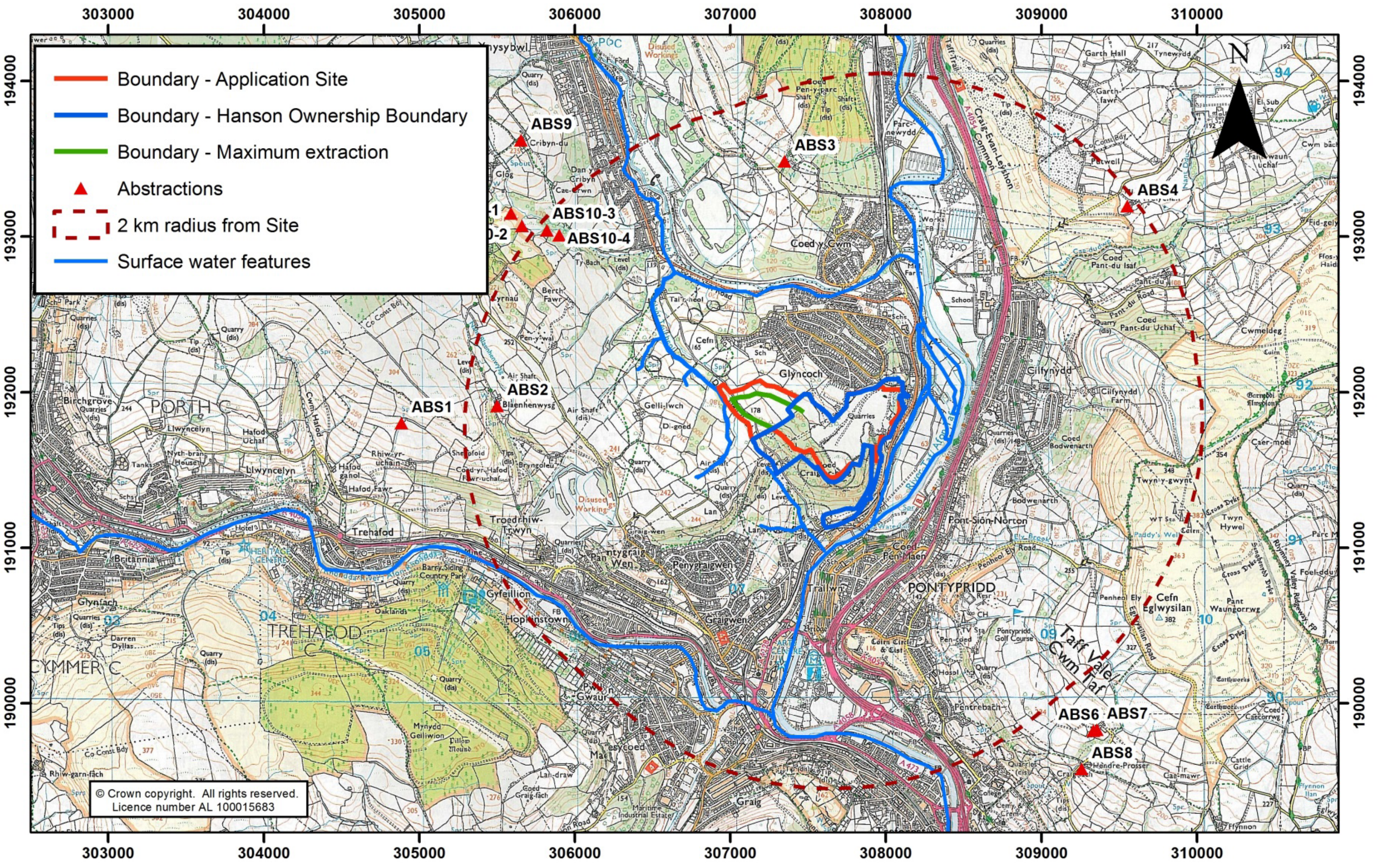


Figure 9-10 Cross Section NE SW

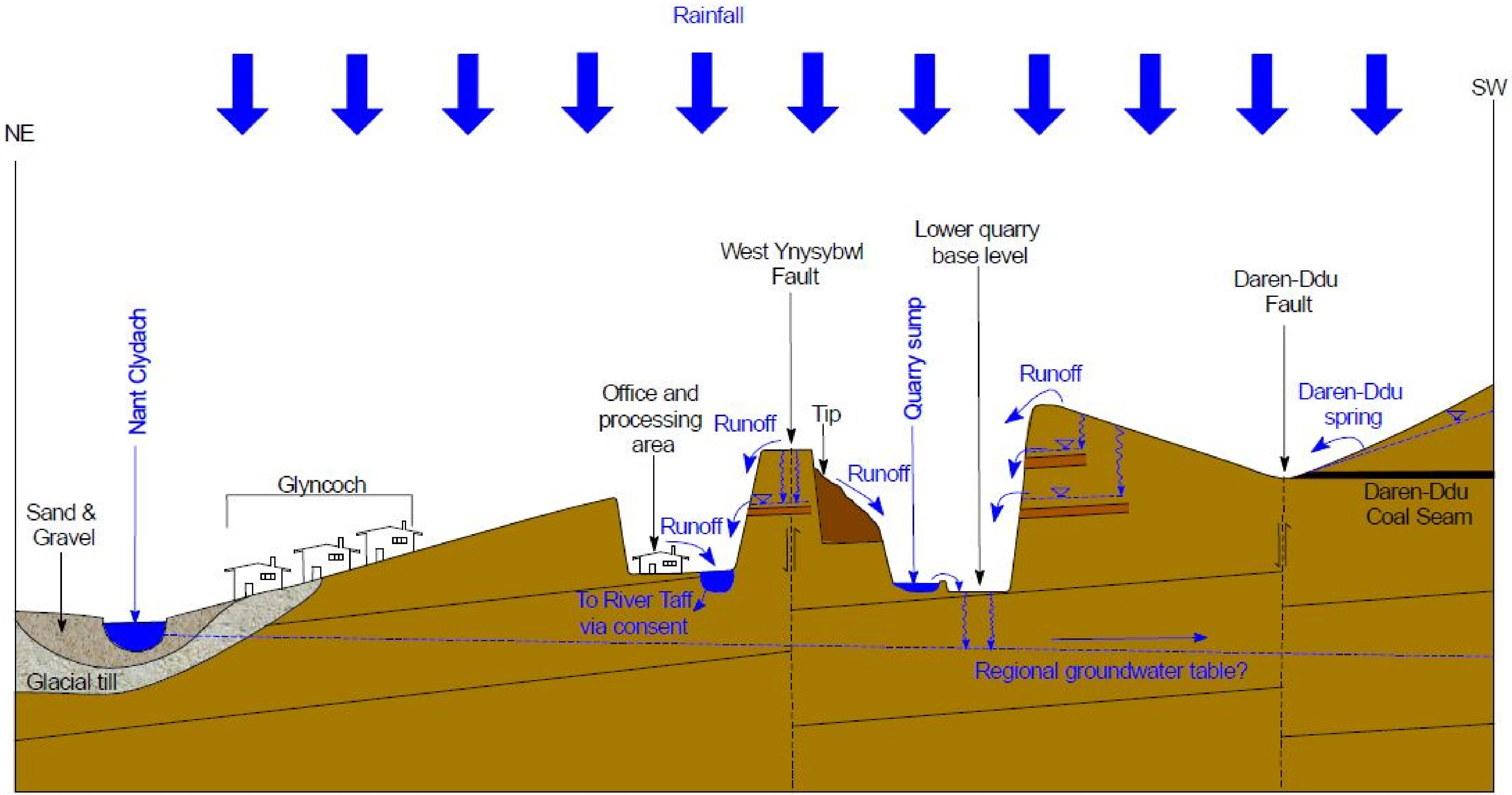
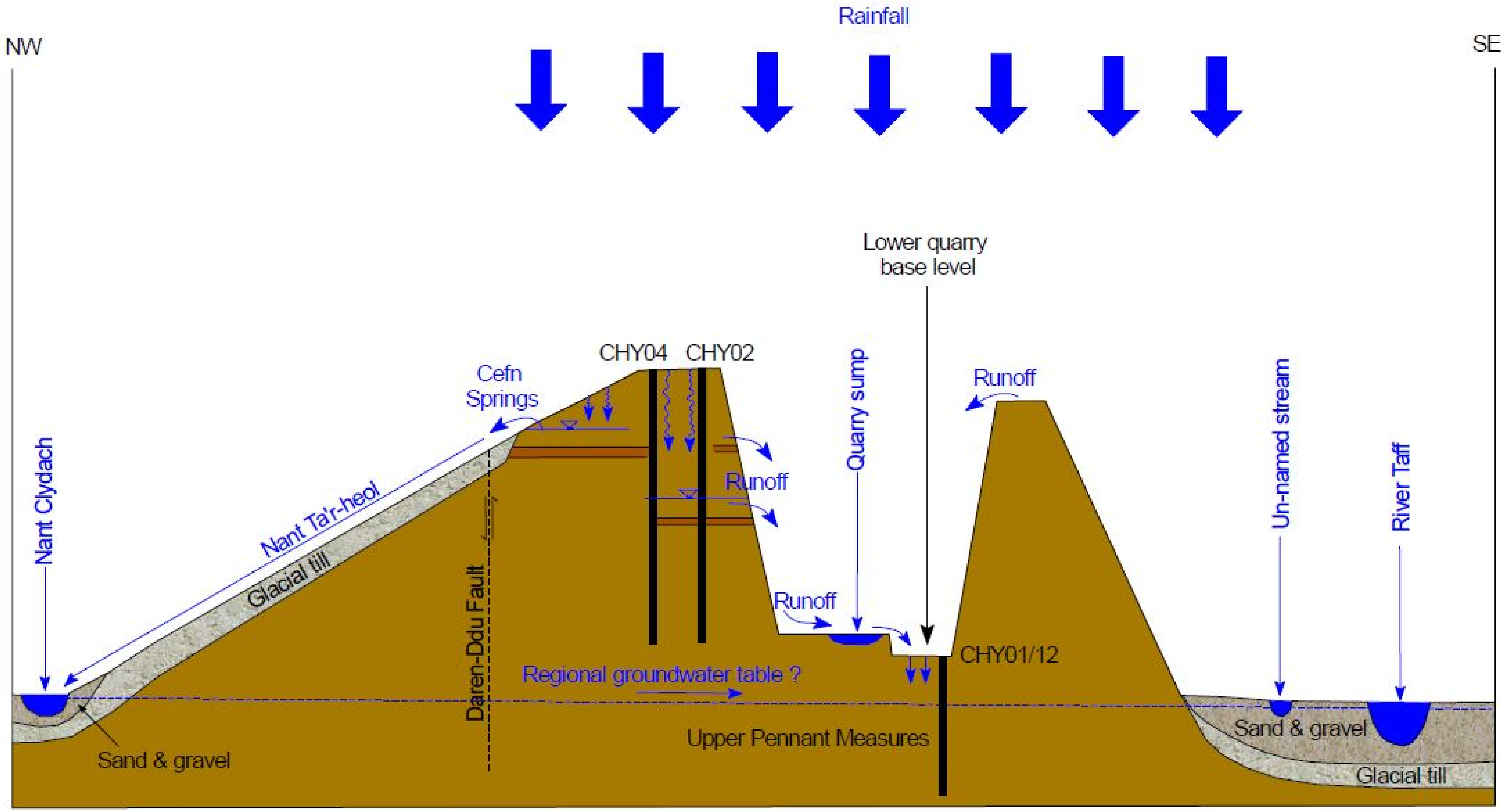


Figure 9-11 Cross Section NW SE



10.0 NOISE

10.1 Introduction

This chapter has been produced by the Walker Beak Mason Partnership (WBM), and sets out the results of an assessment of the effects of noise which would arise from the proposed extension development and associated operations within the existing quarry.

Noise has been identified as a key issue given the relative proximity of the proposed extension area to noise sensitive properties. The consideration of noise is a significant factor influencing the design of the screening landform, with particular reference to the height of the bund and the barrier attenuation it can provide, notably in relation to operations (shot hole drilling) which will take place on the top level of the quarry on its inner side.

WBM was approached by Hanson in March 2014 to provide preliminary advice on noise in connection with the proposed extension area. WBM has had previous involvement with Craig yr Hesg Quarry, including examination of a noise impact assessment prepared as part of the 2010 Environment Act Review EIA / ES, and subsequent routine site noise monitoring undertaken in 2013. In May 2014 WBM was instructed to provide professional advice on noise in connection with input to an EIA for the proposed quarry extension.

The noise assessment follows a conventional approach of establishing current background noise levels, via noise monitoring at representative properties in the vicinity of the extension area; determining the sound power levels of plant to be utilised; calculating site noise levels; and comparing the site noise levels with conventional criteria set out in MTAN1.

Whilst the application will be for an extension to the quarry, it is also a consolidation application and therefore it is appropriate to comment on the noise contribution from the processing plant and related operations at the quarry which will form part of the overall noise climate.

The noise study undertaken as part of the 2010 EIA and ES submitted in support of the Environment Act ROMP Review, and the resulting updated planning conditions form a context to the study, together with more recent noise monitoring which has been undertaken by WBM as indicated above.

The results of the assessment are set out in this chapter along with detailed appendices that provide noise survey results and more information on site noise calculations undertaken for the extension area.

10.2 Assessment Methodology

10.2.1 TAN 11

The primary planning guidance on noise is contained in Planning Guidance (Wales) Technical Advice Note (Wales) 11 Noise dated October 1997, abbreviated to TAN 11. TAN 11 provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development. TAN 11 introduces the concept of noise exposure categories for proposed residential development near transport related noise sources and advises on the use of conditions to minimise the impact of noise.

TAN 11 does not refer specifically to noise from surface mineral workings. However, following extensive consultation and research, the Department of the Environment and The Welsh Office prepared guidelines on noise from mineral workings for Mineral Planning Authorities and Minerals Operators. The advice was contained in Minerals Planning Guidance Note 11 (MPG 11) dated April 1993.

10.2.2 MPG 11

The government prepared guidelines on noise from mineral workings contained in Minerals Planning Guidance Note 11 "*The Control of Noise at Surface Mineral Workings*" dated April 1993. This guidance has since been superseded in part by a Minerals Technical Advice Note in Wales as described below in section 10.2.3.

The aim of Minerals Planning Guidance Note 11 (MPG 11) as set out in paragraph 1 is "*to provide advice on how the planning system can be used to keep noise emissions from surface mineral workings within environmentally acceptable limits without imposing unreasonable burdens on minerals operators*."

It is stated in paragraph 3 "*The Government recognises that noise from mineral working can have a significant impact on the environment and the quality of life of communities. The Government is concerned to ensure that noise levels are kept to the minimum practicable level consistent with good environmental practice and the efficient and economic working of sites*."

10.2.3 MTAN1

Minerals Technical Advice Note (MTAN) (Wales) 1: Aggregates issued by the Welsh Assembly Government in March 2004 includes paragraphs 85 to 88 headed "*Noise*" on pages 34 and 35. MTAN 1 supersedes paragraphs 31 to 42 of MPG 11:1993, but the advice and noise limits closely follow the advice contained in MPG 11: 1993 (since replaced in England), with daytime working hours defined as 0700-1900 and night-time hours as 1900-0700. Paragraphs 85 to 88 from pages 34 and 35 of MTAN 1 are reproduced in **Appendix 10-1** for examination.

10.2.4 Local Authority: Current Planning Conditions

Following an Environment Act 1995 Review of Planning Conditions, new conditions have been applied to Craig-Yr-Hesg Quarry by decision notice ref: 08/1380/10, dated 24.04.2013. Condition numbers 18 to 22 relate to noise limits and noise monitoring and the wording of those conditions is reproduced below.

Condition 18 states "*Between the hours of 07:00 and 19:00 the free field Equivalent Continuous Noise Level LAeq,T due to operations within the site shall not exceed the relevant noise limit specified in Table 1 below at each selected noise sensitive property. Measurements taken to verify compliance shall have regard to the effects of extraneous noise and shall be corrected for any such effects.*"

Table 1

Receptor	*No 36 Conway Close*	*No 3 Pen y Bryn*	*Flat above shop Garth Avenue*	*No 1 Rogart Terrace*
Criteria	*49 dB LAeq,1hr*	*47 dB LAeq,1hr*	*54 dB LAeq,1hr*	*55 dB LAeq,1hr*

Condition 19 states "*Between the hours of 19:00 and 07:00 the free field Equivalent Continuous Noise Level $L_{Aeq,T}$ due to operations in the site shall not exceed 42 dB $L_{Aeq,1hr}$ at each selected noise sensitive property specified in Table 1 above*."

Condition 20 states "*Noise levels attributable to operations of a temporary nature on the periphery of the site such as the formation, removal or alteration of spoil tips, screening and storage embankments, measured at any noise sensitive property specified in Table 1 above , shall not exceed a level of 67dB LAeq,1hr (free field) These noise limits shall only apply for a maximum of 8 weeks in any calendar year*."

Condition 21 states "*Noise monitoring shall be undertaken at the properties listed in Table 1 or other representative properties biannually for the first 2 years from the date of the decision notice, then annually for the following three years. Thereafter, the frequency of monitoring shall be agreed with the LPA. The results of monitoring shall be submitted to the LPA, together with confirmation of action taken to remedy any breach of the limits set out in Table 1*."

Condition 22 states "*Within three months of the date of this permission a noise management scheme for the site shall be submitted to and approved in writing by the LPA, which shall, if practicable, include the provision of measures to reduce noise levels from site operations including the provision of any perimeter bunds/barriers, and specify the locations and methodology for monitoring carried out as required by condition 21 above. All site operations and noise monitoring shall be carried out in accordance with the approved scheme, unless otherwise approved in writing by the LPA*".

10.2.5 BB93 Acoustic Design of Schools

Building Bulletin 93 "Acoustic Design of Schools" in Section 2 gives *"recommendations and guidance concerning noise control, starting with the choice of a site and the control of external noise. Local government planning policy will be influenced by the recommendations on maximum external noise levels in playing fields and other external areas used by the school."*

In section 2.3 Noise Survey it is stated "*If the noise measurement survey shows that the ambient external noise levels on the site are below 45 dB $L_{Aeq,\ 30\ min}$, and prediction work shows that they will remain below 45 dB $L_{Aeq,\ 30\ min}$ in the future, no special measures are likely to be necessary to protect the buildings or playing fields from external noise.*"

BB93 Table 3.2 "*Guideline noise levels for external teaching areas*"

External noise level dB LAeq,30min	Comment
45	If noise levels on the site are below 45 dB $L_{Aeq,30min}$, and will remain so in the future, no special measures are likely to be necessary to protect the playing fields from external noise.
50	Ideally, noise levels on unoccupied playing fields used for teaching sport should not exceed 50 dB $L_{Aeq,30min}$. If this is not possible at all locations, there should be at least one area at which noise levels are below 50 dB $L_{Aeq,30min}$ so that some outdoor teaching is possible.
55	Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$.
60	60 dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external premises used for formal and informal outdoor teaching and recreational areas.

10.3 Site Description

Craig yr Hesg quarry is situated on the western side of the Taff Valley, some 1km north of the built up area of Pontypridd. The village of Glyncoch lies beyond the northern boundary of the quarry. Locally, the quarry is bounded to the north by the Glyncoch rugby ground and clubhouse; to the northwest by open agricultural land; to the west and southwest by the prominent wooded ridgeline of Coed Craig yr Hesg, which overlooks the town of Pontypridd; and to the east by a narrow corridor of woodland between the site and the B4273 Ynysybwl Road. The A470 dual carriageway is situated east of the B4273 and east of the River Taff.

10.4 Measurement Methodology

10.4.1 Measurement of Existing Noise Levels

Routine Noise Monitoring has been undertaken by WBM on Saturday 06 April 2013, Friday 22 November 2013, Saturday 23 November 2013, on three days in July 2014 and on Friday 5th December 2014 at four locations "*Existing Site Noise Monitoring Locations under ROMP Planning Conditions*" referred to in table 10-1 below as locations A-D. A total of forty eight 15-minute measurements and a 1 hour measurement have been taken.

Baseline Noise Surveys have been completed by WBM on Thursday 10 July 2014, Friday 11 July 2014 and Tuesday 15 July 2014 at three locations "*Additional Noise Monitoring Locations for Quarry Extension Survey*", referred to in table 10-1 below as locations 1-3. A total of fifteen 15-minute attended measurements have been taken.

Sound level meters were installed for unattended measurements between about 12:00 on 10 July 2014 and 14:00 on 15 July 2014, with consecutive hourly data obtained over that period, at two locations in gardens at dwellings on Conway Close and Cefn Lane.

The attended sample measurements were undertaken within the currently permitted hours of quarrying operations namely 07:00 and 19:00 Monday to Friday and 07:00 to 16:00 on Saturday.

The installed meters were in place for weekdays and over a weekend in the rear garden of a dwelling on Conway Close and in the side garden of a house south of Cefn Lane.

The noise survey measurement locations in July 2014 are shown in Table 10-1. Positions A, B, C and D are the "*Existing Site Noise Monitoring Locations under ROMP Planning Conditions*". Positions 1, 2 and 3 are the "*Additional Noise Monitoring Locations for Quarry Extension Survey*".

Table 10-1 Noise Survey Measurement Locations July 2014

Position	Measurement Location
A Conway Close	By pavement and low wall south of No.23 Conway Close (and close to no 36 Conway Close)
B Pen y Bryn	By break in fence at edge of road, west of No. 5 Pen-y-Bryn (and close to no 3 Pen y Bryn)
C Garth Avenue	Edge of grass bank above shop, end of roadway east of No. 113 Garth Avenue
D Rogart Terrace	On path by site access road, west of No. 1 Rogart Terrace, about 5 metres to HGV movements on site access road
1 Cefn Lane	In field south of Cefn Lane on public footpath to west of road heading to new housing
2. Daren Ddu Road	Side of track to north of dwellings
3 Cefn Primary School	Field at rear of No. 26 Conway Close, near to boundary with school field
Install – Conway Close	Rear garden of No. 26 Conway Close
Install – Cefn Heulog	Side garden of Cefn Heulog, south of Cefn Lane

Note: The noise monitoring locations A, B, C and D are as set out in the Noise Monitoring Scheme dated October 2013, which has been approved by Rhonnda Cynon Taf Borough Council in their letter dated 27 November 2014. The monitoring positions were selected to be as close as practicable to the locations listed in the planning permission conditions, without the need to enter private property. For example, the Site Noise Monitoring Location A Conway Close is by the pavement and low wall south of No. 23 Conway Close rather than by the high retaining wall of the cul-de-sac adjacent to the garden No. 36 Conway Close or in the garden itself of No. 36 Conway Close.

All but one of the attended sample measurements were of 15 minutes duration, rather than a 1 hour measuring period that is used in MTAN 1 for site noise limits. WBM normally take 15-minute samples for background noise measurements as it allows samples to be taken at more locations and at different times of the day. As background noise level is fairly constant at most locations over the course of an hour, it is expected that there would not be significant variation in a measured background noise level between a 15-minute sample and a 1-hour sample. By way of illustration, a 15-minute sample and a 1-hour sample were taken at Position C Garth Avenue on Thursday 10 July 2014 (see **Appendix 10-5**) and the background noise level was 46 dB $L_{A90, T}$ for both measurements.

10.4.2 Existing Noise Levels

The existing measured noise levels and associated comments from the attended sample measurements are tabulated in **Appendix 10-5**. The hourly data from the two installed meters is tabulated in **Appendix 10-5**. The range of measured noise levels are presented in Table 10-2 for the existing hours for quarrying operations, namely 07:00 to 19:00 Monday to Friday and 07:00 to 16:00 on Saturday.

Background noise levels were potentially affected by quarry activity at two locations, namely C Garth Avenue near to the primary crusher tipping point and D Rogart Terrace by the site access road. At other locations existing quarry activity was either not audible or just audible during lulls in local road traffic. For the measurement locations nearest to the proposed quarry extension area it is considered that background noise levels were not affected by the existing quarry operations.

The measurements in July 2014 were made in largely dry and relatively calm conditions with winds forecast or observed during the attended sample measurements to be from the North, North West or West. These wind directions would tend to minimise road traffic noise from the A470 dual carriageway road, thereby leading to lower background noise levels than if there were an easterly wind component from the A470 to the site.

10.5 Evaluation and Analysis of Noise Data

The range of background noise levels, dB $L_{A90,\,T}$ and range of equivalent continuous noise levels, dB $L_{Aeq,\,T}$ for the daytime periods stated above are shown in Table 10-2.

For Positions A, B, C and D the values are taken from routine monitoring on Saturday 06 April 2013, Friday 22 November 2013, Saturday 23 November 2013, Thursday 10 July 2014 and Friday 05 December 2014 with additional data gathered on Friday 11 July 2014 and Tuesday 15 July 2014. For the other locations the values are taken from the attended sample surveys and installs in July 2014.

Table 10-2 Range of Measured Noise Levels

Position	dB $L_{A90,\,T}$	dB $L_{Aeq,\,T}$
A Conway Close	34-49	41-51
B Pen y Bryn	30-43	35-46
C Garth Avenue	45-53	49-57
D Rogart Terrace	49-54	55-67
1 Cefn Lane footpath	28-35	32-41
2. Daren Ddu Road	40-46	42-47
3 Rear of Conway Close	32-37	37-44
Install – Conway Close	29-37	36-60*
Install – Cefn Heulog	28-42	35-50

Note* Part of the Friday daytime period at the install at Conway Close appears to have been affected by noisy activity close to the install meter.

As stated at 10.4.2 the background noise levels, dB $L_{A90,\,T}$ were potentially affected by quarry activity at C Garth Avenue near to the primary crusher tipping point and D Rogart Terrace by the site access road.

10.6 Consideration of Site Noise Limits

MTAN1 paragraph 88 relates noise limits to background noise levels, dB $L_{A90,\,T}$ for daytime working (see **Appendix 10-1**). Paragraph 88 of MTAN 1 "*Noise Limits*" states "*noise limits should relate to the background noise levels…where background noise is less than 45 dB(A), noise limits should be defined as background noise levels plus 10 dB(A)*".

To assist with consideration of daytime working site noise limits for the existing quarry and proposed extension at Craig yr Hesg Quarry, the table below sets out average daytime background noise levels for the proposed noise monitoring locations.

Also included for examination are values set at 10 dB(A) above the average daytime background noise levels and the ROMP conditions noise limits for four of the proposed monitoring locations.

Table 10-3 Average Background Noise Levels + 10 dB(A)

Position	dB $L_{A90,\,T}$	$L_{A90,\,T}$ + 10 dB (A)	ROMP Limit
No 36 Conway Close	36**	46	49
No 3 Pen y Bryn	37**	47	47
No 113 Garth Avenue	48*	N/A	54
No 1 Rogart Terrace	50*	N/A	55
Cefn Heulog	31	41	N/A
Cefn Primary School	N/A	N/A	N/A

Note* Background noise levels were potentially affected by quarry activity at these locations.

Note** The average background noise levels for No. 36 Conway Close and No. 3 Pen y Bryn are taken from the installed meters on Monday 20 June 2009 that were selected for the Noise Chapter associated with the Environmental Statement for the Environment Act Periodic Review of Planning Conditions, rather than for the locations where measurements were made in July 2014. Based on the measurements in July 2014 it is considered that the average background noise levels presented in Table 10-3 for these two locations are appropriate and representative.

The noise measurements in July 2014 at locations north-west of No. 36 Conway Close were generally lower than the noise measurements made on 02 June 2009 in the garden of No. 36 Conway Close. The noise measurements by pavement and low wall south of No. 23 Conway Close, east of No. 36 Conway Close for the site noise monitoring under the ROMP conditions were generally higher than the noise measurements made on 20 June 2009 in the garden of No. 36 Conway Close.

It is recommended that consideration be given to a lower site noise limit for No. 36 Conway Close and revised measurement location, by agreement with the mineral planning authority. Should the mineral planning authority agree, the revised measurement location would be on land owned by the authority at the rear garden boundary (west) of No. 36 Conway Close.

It is recommended that the ROMP conditions noise limits for Positions B, C and D, at the measurement locations listed in Table 10-1, remain in place.

For Cefn Heulog, one of nearest dwellings on Cefn Lane to the proposed extension area, where average daytime background noise levels are below 35 dB $L_{A90,\,T}$ a site noise limit based on average dB $L_{A90,\,T}$ + 10 dB(A) would be 41 dB $L_{Aeq,\,1\ hour,\,free\ field}$. A daytime site noise of 41 dB $L_{Aeq,\,1\ hour,\,free\ field}$ would be below the MTAN1 night-time noise limit of 42 dB $L_{Aeq,\,1\ hour,\,free\ field}$. The imposition of site noise limits lower than 45 dB $L_{Aeq,\,1\ hour,\,free\ field}$ at the dwellings on Cefn Lane closest to the extension area, would impose unreasonable restrictions on the mineral operator.

Although MTAN 1 does not set a lower daytime limit, the overarching planning document TAN 11 provides advice on how the planning system can be used to minimise the adverse impact of noise without placing "*unreasonable restrictions*" on development or adding unduly to the costs and administration burdens of business (ref TAN 11 paragraph 3).

The site noise limit of 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ proposed for Cefn Primary School corresponds to the lowest value in the BB93 Table 3.2 "*Guideline noise levels for external teaching areas*".

Suggested Site Noise Limits are shown in Table 10-4.

Table 10-4 Suggested Site Noise Limits

Position	Suggested Site Noise Measurement Location	Suggested Noise Limit
No 36 Conway Close	Authority Land to West	46
No 3 Pen y Bryn	Existing location *	47
No 113 Garth Avenue	Existing location *	54
No 1 Rogart Terrace	Exsiting location *	55
Cefn Heulog	Public Footpath to South	45
Cefn Primary School	By Agreement with School	45

Note: The suggested site noise limits are in terms of dB $L_{Aeq,\ 1\ hour,\ free\ field}$.

Note* The Suggested Site Noise Measurement Location for these Positions are the "*Existing Site Noise Monitoring Locations under ROMP Planning Conditions*".

10.7 Calculated Site Noise levels

The noise levels likely to arise at selected properties depend on the sound power levels (noise output) of the plant chosen to work on site as much as on the distance to the properties and the effects of intervening ground and buildings. Proper allowance can be made for these variables, such as barrier attenuation attributable to intervening landforms and any proposed barriers, to calculate site noise levels.

The Equivalent Continuous Noise Level, $L_{Aeq,\ T}$, is the preferred unit for assessing environmental noise sources. It is the value of a continuous level that would have equivalent energy to the continuously varying noise over the specified period "T". This unit is recommended internationally for the description of environmental noise and is in general use. It is the chosen unit of BS 5228-1: 2009 "*Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*", BS 7445 "Description and measurement of environmental noise" and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors Part 2: General method of calculation*".

The main sources of plant noise associated with the proposed extension area are a drilling rig, loading equipment at the extraction face, secondary breakage at the face and dump trucks to take the material to the primary crusher. The sound power levels for the plant items at this site are based on measurements of the rock drill in use at the site on 19 May 2014 along with examination of the WBM plant noise database for plant items proposed for use in the extension area

The calculations for the calculated site noise levels presented in this report are based on the methods contained in BS5228-1: 2009 + A1:2014 "*Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*".

Further details of the calculation methods are set out in **Appendix 10-6**. Summary site noise calculation sheets for the selected dwellings are included in **Appendix 10-7**, showing the sound power levels, attenuation factors and calculated levels for each of the noise sources.

For the purposes of the calculations, the receiver height has been set as 1.5 metres for the receiver locations for daytime operations at the site.

The nearest noise sensitive properties to the proposed extension area for which site noise calculations have been made are those selected for the attended baseline noise monitoring locations i.e. dwellings nearest to the proposed extension area as well as for Cefn Primary School.

The calculated site noise levels for daytime operations at the site are set out in Table 10.5 for subsequent consideration in the noise assessment. The calculated site noise levels include the barrier attenuation attributable to the proposed screening landform / bunding around the proposed quarry extension area. Since the existing ground rises, set back tests for the rock drill have been undertaken as a check.

Table 10-5 Calculated Site Noise Levels

Position	Calculated Site Noise Level (Extension Area)	Suggested Noise Limit
No 36 Conway Close	45	46
No 3 Pen y Bryn	47	47
Cefn Heulog	44	45
Cefn Primary School	43	45

Note: The calculated site noise levels are in terms of dB $L_{Aeq,\ 1\ hour,\ free\ field}$.

For all of the receiver locations, the calculated site noise level complies with the suggested noise limit.

10.8 Mitigation Measures

Noise has been identified as a key issue given the relative proximity of the proposed extension area to noise sensitive properties. The consideration of noise has been a significant factor influencing the design of the screening landform, with particular reference to the height of the bund and the barrier attenuation it can provide, notably in relation to operations (shot hole drilling) which will take place on the top level of the quarry on its inner side.

The other main mitigation measure for noise is the selection and use of a rock drill with a Sound Power Level not exceeding 116 dB L_{WA}, for work on the uppermost rock head. For the Craig yr Hesg Quarry ROMP a Sound Power Level of 116 dB L_{WA} was presented in the noise chapter of the ES in 2010. From measurements obtained of the rock drill in use at the site on 19 May 2014, from examination of the WBM plant noise database and noise data supplied by manufacturers, it is considered that a Sound Power Level of 116 dB L_{WA} is achievable and a realistic value for the calculations.

Quarry benches are to be maintained at a minimum height of 7 m, in other words plant and equipment at the extraction face will be at least 7 m below the rock drill on the uppermost rock head. The maximum bench height will be 15 m, which means that plant and equipment at the working face would be 15 m below the rock drill on the uppermost rock head at times.

10.9 Residual Effects

For Cefn Heulog the calculated site noise level of 44 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ is more than 10 dB(A) above the average background noise level, which was 31 dB $L_{A90,\ T}$ from the install at Cefn Heulog. However, the calculated noise level is below the suggested site noise limit of 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$.

For Cefn Heulog, a site noise limit set at 10 dB(A) above the average daytime background noise level would be 41 dB $L_{Aeq,\ 1\ hour,\ free\ field}$. This would lead to a daytime noise limit at or below the night-time noise limit of 42 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ as set out in condition 19 of the current permission ref: 08/1380/10. If such an approach were to be followed, then this is considered to be inappropriate and unrealistic in establishing daytime noise limits. Thus, for receiver locations nearest to the proposed extension area where average background noise levels are below 35 dB $L_{A90,\ T}$ the suggested site noise limit is 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$.

In the above circumstances it is considered that the imposition of site noise limits lower than 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ at the dwellings would be unnecessary and unrealistic, and would impose unreasonable burdens on the mineral operator and unrealistic restrictions on development.

The greatest contribution to the calculated site noise levels is from the use of the rock drill on the uppermost rock head and this noise source has therefore been the focus of the noise mitigation measures, namely the design of the screening landform and selection of a rock drill. As a further mitigation measure it would be possible to restrict the time of drilling to say 10.00 to 16.00 for work on the uppermost rock head.

It is unlikely that a drill rig and other mobile plant would be operating in close proximity, since if a face were being prepared for blasting it is likely that loading would be taking place from an earlier blast some distance away and possibly in a completely different part of the quarry. For example it should be possible to keep face loading operations say 2 or 3 bench heights below the rock drill when positioned on the uppermost rock head.

10.10 Temporary Operations

As part of the preliminary operations, prior to the commencement of quarrying within ‘phase 1’ of the extension area, the formation of the screening landform will generate noise, and noise levels associated with the construction operations have been calculated and are presented in Table 10-6.

In MTAN1 paragraph 88 Noise Limit it is stated “*During temporary and short-term operations higher levels may be reasonable but should not exceed 67 dB(A) for periods of up to 8 weeks in a year at specified noise sensitive properties.*” It is suggested that the temporary operation noise limit should apply to the formation of the screening landform.

Table 10-6 – Calculated Site Noise Levels

Position	Calculated Site Noise Level One Team	Calculated Site Noise Level Two Teams	Suggested Temporary Operation Noise Limit
No 36 Conway Close	61	64	67
No 3 Pen y Bryn	57	60	67
Cefn Heulog	57	60	67
Cefn Primary School	58	61	67

It can be seen that even with two teams of equipment associated with the construction operations that the calculated site noise level at all positions complies with the suggested noise limit for temporary operations. It has been confirmed by the applicants that the operations associated with the formation of the screening landform can be completed in periods of up to 8 weeks in a year.

Subsequent temporary operations would comprise the stripping of soils and overburden from extraction phases 2 and 3. These temporary works would benefit from the noise attenuation provided by the screening landform, and the noise levels would readily comply with the temporary limit of 67 dB $L_{Aeq,\ 1\ hour,\ free\ field}$.

10.11 Recommendations

It is recommended that the ROMP conditions noise limits for Positions B, C and D, at the measurement locations listed in Table 10-1, remain in place.

It is recommended that consideration be given to a lower site noise limit for No 36 Conway Close and revised measurement location, by agreement with the mineral planning authority. Should the mineral planning authority agree, the revised measurement location would be on land owned by the authority at the rear garden boundary (west) of No 36 Conway Close.

For other locations, nearest to the proposed extension area, where average background noise levels are below 35 dB $L_{A90,\ T}$ the suggested site noise limit is 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$. The imposition of site noise limits lower than 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ at the dwellings closest to the extension area, would impose unreasonable burdens on the mineral operator.

For Cefn Primary School a site noise limit for routine quarrying operations of 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ is recommended which corresponds to the lowest value in the BB93 Table 3.2 "*Guideline noise levels for external teaching areas*".

Given that the greatest contribution to the calculated site noise levels is from the use of the rock drill on the uppermost rock head it would be possible, as a further mitigation measure, to restrict the time of drilling to say 10.00 to 16.00 for work on the uppermost rock head.

It is recommended that the formation of the screening landform be classified as "*temporary and short-term operations*" subject to a noise limit of 67 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ "*for periods of up to 8 weeks in a year at specified noise sensitive properties"*.

This would lead to an intense but short term period of activity for the construction of the screening landform leading to the long term benefit in terms of noise attenuation that the landform will provide to all subsequent quarrying activity.

Should the planning authority deem it necessary, the applicant could be required to prepare a method statement for these works that demonstrates how the screening landform could be constructed in the timescale indicated in MTAN1. This requirement could appropriately be imposed as a planning condition.

The other main mitigation measure for noise is the selection and use of a rock drill with a Sound Power Level not exceeding 116 dB L_{WA}, for work on the uppermost rock head. For the Craig yr Hesg Quarry ROMP a Sound Power Level of 116 dB L_{WA} was presented in the noise chapter of the ES in 2010. From measurements obtained of the rock drill in use at the site on 19 May 2014, from examination of the WBM plant noise database and noise data supplied by manufacturers, it is considered that a Sound Power Level of 116 dB L_{WA} is achievable and a realistic value for the calculations.

Quarry benches are to be maintained at a minimum height of 7 m, in other words plant and equipment at the extraction face will be at least 7 m below the rock drill on the uppermost rock head. The maximum bench height will be 15 m, which means that plant and equipment at the working face would be 15 m below the rock drill on the uppermost rock head at times.

It is recommended that the existing site noise monitoring scheme be amended, to include additional locations that are representative of the nearest noise sensitive properties to the proposed extension area, so that noise monitoring would be undertaken in the event of work in that area.

10.12 Summary and Conclusions

Noise has been identified as a key issue given the relative proximity of the proposed extension area to noise sensitive properties. The consideration of noise has been a significant factor influencing the design of the screening landform, with particular reference to the height of the bund and the barrier attenuation it can provide, notably in relation to operations (shot hole drilling) which will take place on the top level of the quarry on its inner side.

The Walker Beak Mason Partnership (WBM) was approached by Hanson in March 2014 to provide preliminary advice on noise in connection with the proposed extension area. WBM has had previous involvement with Craig yr Hesg Quarry, including examination of a noise impact assessment prepared as part of the 2010 Environment Act Review EIA / ES, and subsequent routine site noise monitoring undertaken in 2013. In May 2014 WBM was instructed to provide professional advice on noise in connection with input to an EIA for the proposed quarry extension.

The noise assessment follows a conventional approach of establishing current background noise levels, via noise monitoring at representative properties in the vicinity of the extension area; determining the sound power levels of plant to be utilised; calculating site noise levels; and comparing the site noise levels with conventional criteria set out in MTAN1.

The calculated site noise levels for the extraction operations, with the barrier attenuation afforded by the screening landform, for daytime operations are around 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ at the nearest dwellings and the school. For some locations to the north of the extension area where background noise levels are extremely low, the calculated site noise levels for the extraction operations are slightly more than 10 dB(A) above the average daytime background noise levels.

The calculated site noise levels for the construction of the screening landform are around 60 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ at the nearest dwellings depending on the amount of equipment that is used for that operation. For all receiver locations, the calculated site noise levels are below the noise limit in MTAN1 for temporary operations.

It is recommended that the existing site noise monitoring scheme be amended, to include additional monitoring locations at Cefn Heulog and Cefn Primary School that are representative of the nearest noise sensitive properties to the north of the proposed extension area, so that noise monitoring would be undertaken in the event of work in that area.

11.0 BLAST VIBRATION

11.1 Introduction

This chapter of the ES has been prepared by Amec Foster Wheeler, and considers the effects of ground and airborne vibration which will result from blasting operations within the extension area as a continuation of current blasting practice in the existing Craig yr Hesg Quarry. It reviews published guidance and standards for blast induced vibration, and the existing planning controls and limits on vibration set for the existing quarry, and assesses the ability of the extension development to comply with such limits by reference to ground vibration predictions made at representative properties in the vicinity of the extension area.

The study makes recommendations for blast vibration limits which could appropriately be imposed, and which reflect up to date guidance and standards and the ground vibration limits imposed on the schedule of conditions regaulting operations at the existing quarry, and highlights conventional 'good practice' methodologies designed to minimise the effects of blast vibration.

The purpose of quarry blasting is to fracture the rock and pile it up on the quarry floor to enable it to be loaded for transport to the processing plant. It is important to understand that for any given blast it is very much in the operator's interest to always reduce vibration, both ground and airborne, to the minimum possible. This is because a well-designed, and carefully executed blast with the optimum weight of correctly placed explosive will result in maximum benefit to the operator with minimum effect on neighbours.

11.2 Effects of Blasting

When an explosive detonates within a borehole, stress waves are generated causing much localised distortion and cracking within the immediate strata. However outside this immediate vicinity, permanent deformation does not occur. Instead, the ground exhibits elastic properties whereby the rock particles are returned to their original position following the passage of the stress waves. Such vibration is always generated following blasts, but will radiate away from the blasting site and reduces as distance increases.

With experience and knowledge of the factors which influence ground vibration, such as blast type and design, site geology and receiving structure, the magnitude and significance of the stress waves can be predicted at any location. Accordingly this knowledge has been related to the situation at Craig yr Hesg Quarry and will be used as the basis of this vibration assessment.

11.3 Blast Vibration Terminology

11.3.1 Ground Vibration

Vibration can be generated within the ground by a dynamic source of sufficient energy. It will be composed of various wave types of differing characteristics and significance collectively known as seismic waves. These seismic waves will spread radially from the vibration source decaying rapidly as distance increases.

There are four interrelated parameters that may be used in order to define ground vibration magnitude at any location. These are:

- *Displacement:* the distance that a particle moves before returning to its original position, measured in millimetres (mm);
- *Velocity:* the rate at which particle displacement changes, measured in millimetres per second (mms^{-1});
- *Acceleration:* the rate at which the particle velocity changes, measured in millimetres per second squared (mms^{-2}) or in terms of the acceleration due to the earth's gravity (g);
- *Frequency:* the number of oscillations per second that a particle undergoes measured in Hertz (Hz).

Much investigation has been undertaken, both practical and theoretical, into the damage potential of blast induced ground vibration. Among the most eminent of such research authorities are the United States Bureau of Mines (USBM), Langefors and Kihlström, and Edwards and Northwood. All have concluded that the vibration parameter best suited as a damage index is particle velocity.

Studies by the USBM have clearly shown the importance of adopting a monitoring approach that also includes frequency. Thus, the parameters most commonly used in assessing the significance of an impulsive vibration are those of particle velocity and frequency which are related for sinusoidal motion as follows:

$$PV = 2 \pi f a$$

where PV = particle velocity

π = pi

f = frequency

a = amplitude

It is the maximum value of particle velocity in a vibration event, termed the ***"peak particle velocity (PPV)"***, that is of most significance and this will usually be measured in three independent, mutually perpendicular directions at any one location in order to ensure that the true peak value is captured. These directions are longitudinal (or radial), vertical and transverse.

The PPV of any one plane measurement is the accepted standard worldwide and as recommended by the British Standards Institution and the International Standards Institute, amongst others. It is also the basis for all the recognised investigations into satisfactory vibration levels with respect to damage of structures and human perception.

BS 7385-2:1993 states that there is little probability of fatigue damage occurring in residential building structures due to blasting. The increase of the component stress levels due to imposed vibration is relatively nominal and the number of cycles applied at a repeated high level of vibration is relatively low. Non-structural components (such as plaster) should incur dynamic stresses, which are typically well below, i.e. only 5% of, component yield and ultimate strengths.

All research and previous work undertaken has indicated that any vibration induced damage will occur immediately, if the damage threshold has been exceeded and that there is no evidence of long-term effects.

11.3.2 Airborne Vibration

Whenever an explosive is detonated transient airborne pressure waves are generated. As these waves pass a given position, the pressure of the air rises very rapidly to a value above the atmospheric or ambient pressure. It then falls more slowly to a value below atmospheric pressure before returning to the ambient value after a series of oscillations. The maximum pressure above atmospheric is known as the ***"peak air overpressure"***.

These pressure waves comprise energy over a wide frequency range. Energy above 20 Hz is perceptible to the human ear as sound, whilst that below 20 Hz is inaudible, although it can be sensed in the form of concussion. The sound and concussion together is known as ***"air overpressure"*** which is measured in terms of decibels (dB) or pounds per square inch (psi) over the required frequency range.

The decibel scale expresses the logarithm of the ratio of a level (greater or less) relative to a given base value. In acoustics, this reference value is taken as 20 x 10^{-6} Pascals, which is accepted as the threshold of human hearing.

Air overpressure (AOP) is therefore defined as:

$$\text{AOP, dB} = 20 \text{ Log } \frac{(\text{Measured pressure})}{(\text{Reference pressure})}$$

Since both high and low frequencies are of importance no frequency weighting network is applied, unlike in the case of noise measurement when an A - weighted filter is employed.

All frequency components, both audible and inaudible, can cause a structure to vibrate in a way that can be confused with the effects of ground vibrations. The lower, inaudible, frequencies are much less attenuated by distance, buildings and natural barriers. Consequently, air overpressure effects at these frequencies can be significant over greater distances, and more readily excite a response within structures.

Should there be perceptible effects they are commonly due to the air overpressure inducing vibrations of a higher, audible frequency within a property and it is these secondary rattles of windows or crockery that can give rise to comment.

In a blast, airborne pressure waves are produced from five main sources:

i) Rock displacement from the face;

ii) Ground induced airborne vibration;

iii) Release of gases through natural fissures;

iv) Release of gases through stemming;

v) Insufficiently confined explosive charges.

Meteorological factors over which an operator has no control can influence the intensity of air overpressure levels at any given location. Thus, wind speed and direction, temperature and humidity at various altitudes can have an effect upon air overpressure.

11.4 Methodology

Consideration has been given to the number and types of properties that should be used as the basis of the blast vibration assessment and a shortlist of six locations have been selected, and are described below:

- Cefn Primary School to the north of the proposed extension development;
- Properties adjacent Cefn Lee Farm to the north of the proposed extension development;
- Properties in Conway Close to the north of the proposed extension development;
- Properties at the southern end of Pen y Bryn in Glyncoch to the north east of the proposed extension development;
- Properties in Rogart Terrace on the B4273 (Ynysybwl Road) to the south east of the proposed extension development, and;
- Properties at the southern end of Darren Ddu Road to the south east of the proposed extension development.

In addition, it is recommended that major services be included as receptors, although as industrial and infrastructure features these have a different level of sensitivity to vibration than residential receptors. Residential receptors are set a blast vibration criterion to avoid disturbance to amenity (nuisance) whereas infrastructure receptors are set a criterion to avoid potential damage. The water main to the south west and the one running through the site (to be diverted) would be examples of such infrastructure.

11.4.1 Vibration Criteria

Ground Vibration

Potential significant effects can arise from blasting operations in terms of ground vibration and in rare circumstances these effects can result in damage to property. International and UK Government sponsored research has led to industry agreement in respect of the levels of vibration that are likely to lead to structural damage and this in turn has led to advice in respect of the setting of vibration limits to avoid disturbance to amenity that can be enforced by Mineral Planning Authorities It should be noted that the setting of an amenity based vibration criterion at residential receptors will by its very nature guard against any possibility of cosmetic damage occurring due to the lower levels involved. The research has also resulted in three definitions of damage that could theoretically occur at residential-type structures. These are summarised as follows:

- *'Cosmetic damage'* is the first threshold of damage and this is defined as the formation or development of existing cracks in plaster, drywall surfaces or mortar joints;
- *'Minor damage'* is defined as the formation of larger cracks or the loosening/falling of plaster etc; and
- *'Major or Structural damage'* would occur when the key structural elements of a building are damaged.

Detailed research from the United States undertaken in the late 1970s determined that vibration levels would need to exceed PPV levels of 50 mms^{-1} to produce cosmetic damage to residential type structures. However, in relatively unusual circumstances (low seismic wave frequencies) cosmetic damage could occur at lower levels and typically limits based on 12.7 mms^{-1} have been set to deal with such situations. However, this level is generally seen as quite conservative and UK based research has not identified any evidence of where cosmetic damage has occurred below these levels.

With respect to this assessment and residential properties, it is considered that exceedance of a maximum PPV of 10 mms^{-1} at any of the residential properties located in the vicinity of Craig yr Hesg Quarry would normally be considered to represent significant vibration effects in terms of protection against disturbance to amenity. This is based on the latest UK Government guidance (e.g. in MTAN 1) and the extant planning consent conditions relating to blasting which were issued in April 2013.

Water main

A literature search has been undertaken and has found little or no information regarding blasting criteria for water mains of any description. Most of the research has centred on high pressure gas transmission lines (for obvious reasons). In the past, it has been assumed that any criteria determined for high pressure gas transmission lines would also be suitable for water mains and enquiries have indicates that this is a generally held premise.

Possible damage mechanisms for pipelines and other infrastructure include:

- Elastic ground vibrations – normal ground deformation from blasting which returns to its original position and which is usually measured using the PPV parameter in mms^{-1};
- Permanent ground deformations – where the blast causes permanent ground heave and displacements and therefore can potentially cause more damage that way;
- Flyrock – shouldn't usually occur in a well-designed blast and would not cause damage to buried services, and;
- Air overpressure – again would not normally cause damage to buried services.

McKown, A F (1991) *"Close in Construction Blast-Impacts and Mitigation Measures"* describes research undertaken by Barenberg (exact reference unknown) which looked at damage to pipelines after the 1971 San Fernando earthquake. At displacements of 1.2" (30mm) 12" diameter or larger water distribution mains made of steel or cast iron experienced no significant damage (less than one break per kilometre). At a 2" displacement there were approximately four breaks per kilometre and at 3" (75mm) displacement there were about ten breaks per kilometre. McKown states that *"in order to get 1 inch of ground deformation from elastic ground vibrations, even at a low blast induced frequency of 10 Hz, the peak particle velocity would have to be over 6in/sec"*. A PPV of 6in/sec equates to approximately 150mms^{-1}.

McKown also indicates that there is a wealth of experience documented in the library maintained by the International Society of Explosives Engineers (ISEE) regarding the effects of blasting on buried pipelines and utilities. For example, Siskind et al (1995) in USBM Report RI 9523 (*"Surface Mine Blasting near Pressurised Transmission Pipelines"*) reported on the effects of US surface mine blasting on pressurised steel and PVC pipelines and concluded that *"it is recommended that 5 in/sec (125mm/s)* measured at the surface *is a safe-level criterion for large surface mine blasts for Grade B or better steel pipelines. The same criterion is recommended for the SDR 26 or better PVC pipe"*. This study also found that PPVs about 3 feet (about 1m) below the surface were approximately 40% less than those measured at the surface. These results were described as "surprising", however they were considered to be entirely in line with other studies including USBM RI 8969 which examined the effects of vibration monitoring on basement walls and floor. The two main reasons for this reduction between surface vibration levels and those measured on the pipeline itself are:

- Vibration attenuation properties of the material in which the pipeline is laid in the trench, and;
- A reduction in the magnitude of the Rayleigh (or surface waves) with increases in depth.

Aimone-Martin C and Clah E (2003) *"Response of High Pressure Natural gas Pipeline to Coal Mine Blasts"* ISEE 2003G, Volume 2 – describe similar results from monitoring of blast vibrations above 30" diameter, high pressure (845 psi) gas pipelines that experienced surface levels of up to 6 in/sec (150mm/sec) at 17 Hz. Again they concluded that all blasting near the pipeline was well below the limits that could cause damage to the pipeline.

McKown concludes his review section by stating that *"These and numerous other references firmly support the conclusion that peak particle velocities of up to 5in/sec (125mm/sec) should not cause damage to pressurised pipelines"*.

However, in the UK a much more conservative approach is applied to high pressure gas transmission pipelines and blast vibration. For example, Transco have published a specification for *"Safe working in the vicinity of Transco high pressure gas pipelines and associated installations – requirements for third parties (Rev 08/07)"* published in August 2007. Under blasting, Transco recommend that where PPVs are predicted to be greater than 50mms^{-1} monitoring of the vibration is required.

In addition, based on information contained in the International Institution of Gas Engineers publication IGE/SR/18 Edition 2 a recommended limit of 75 mms^{-1} is deemed suitable for such apparatus. Indeed, in a document entitled *"Safe working in the vicinity of Northern Gas Networks high pressure gas pipelines and associated installations"* published in November 2003 by Northern Gas Networks, under the heading "Blasting" the document states that:

"No blasting is allowed within 250 metres of a pipeline without an assessment of the vibration levels at the pipeline. The peak particle velocity at the pipeline must be limited to a maximum level of 75 mm/sec. Where the peak particle velocity is predicted to exceed 50 mm/sec, the ground vibration must be monitored by the contractor and the results available to the Northern Gas Networks responsible person at their request. Where ground conditions are of submerged granular deposits of silt or sand, an assessment of the effect of vibration on settlement and liquefaction at the pipeline shall be made".

In the UK a blasting criterion of between 50 – 75 mms^{-1} is considered suitable for buried high pressure gas transmission pipelines and therefore based on the USA and UK advice a suitable criterion of 75 mms^{-1} measured on the pipeline has been deemed suitable for the water main at Craig yr Hesg Quarry.

Air Over-pressure

Comprehensive investigations into the nature and effects of air overpressure with particular reference to its damage potential have also been undertaken by the USBM, which has reviewed the relevant other published data on this subject. The research has concluded that the weakest parts of most structures that are exposed to air overpressure are windows. In particular, poorly mounted, and hence pre-stressed windows, might crack at ~150 dB (0.1 p.s.i.) with most cracking at 170 dB (1.0 p.s.i.). Structural damage can be expected at 180 dB (3.0 p.s.i.).

With respect to determining what constitutes significant effects in terms of air overpressure, specific levels have not been identified in the relevant UK Government guidance (eg NPPG). This is mainly to do with the influence of weather conditions (very variable in the UK) on air overpressure, but also due to very high levels that would need to occur to cause structural damage.

In addition, British Standard (BS) 6472-2:2008, indicates in section 5.3 that the prediction of air overpressure is *"almost impossible"* and goes on to state that *"control of air overpressure should always be by its minimisation at source through appropriate blast design"*.

Minerals Technical Advice Note 1: Aggregates (MTAN1), published by the Welsh Assembly Government in March 2004, also discusses air overpressure in Paragraph 81 which concludes that, due to the unpredictability of air pressure due to prevailing weather conditions, *"planning conditions to control air overpressure are unlikely to be enforceable"*. In addition, paragraph 83 states that planning conditions relating to the control of blasting should only, amongst others, relate to those aspects of environmental management that are under the control of the operator. Obviously the vagaries of the British weather is not under the control of the mineral operator.

Perception levels

Another factor to take account of in the assessment is human perception to vibration levels and this is because generally people will become aware of vibration at levels of around 1.5 mms^{-1} and occasionally at levels as low as 0.5 mms^{-1}. Depending on the individual person, vibration perception can therefore lead to the generation of complaints, even at very safe levels of vibration. Operators may therefore take this factor into account when designing blasts to minimise the risk of complaints, but such an approach does not need to be reinforced by the setting of lower vibration limits by MPAs. This is generally recognised by the use of typical planning conditions like those which appear in MTAN1, which advocate the setting of limits based on a peak particle velocity (PPV) of 6 mms^{-1} for 95% of all blasts measured over any 6 month period, with no individual blast allowed to exceed a maximum level of 10 mms^{-1}.

With respect to this assessment and residential properties, it is considered that based upon adherence to a PPV limit of 6 mms^{-1} for 95% of all blasts (with a maximum level of 10 mms^{-1}) at any of the residential properties located in the vicinity of Craig yr Hesg Quarry, then this would normally be considered to represent a situation where potentially significant amenity effects would not occur. This is based on the latest Welsh Government guidance (MTAN1) and the extant planning consent conditions relating to blasting which were issued in April 2013 (see Section 11.6 below).

11.4.2 Prediction and Control of Vibration Levels

Ground Vibration

The accepted method of predicting peak particle velocity for any given situation is to use a scaling approach utilising separation distances and instantaneous charge weights. This method allows the derivation of the site-specific relationship between ground vibration level and separation distance from a blast.

A scaled distance value for any location may be calculated as follows:

Scaled distance, SD = $DW^{-½}$ in $mkg^{-½}$

Where: D = Separation Distance (Blast to Receiver) in metres

W = Maximum Instantaneous Charge in kg i.e. maximum weight of explosives per delay in kg

For each measurement location the maximum peak particle velocity from either the longitudinal, vertical or transverse axis is plotted against its respective scaled distance value using logarithmic scales.

An empirical relationship derived by the USBM relates ground vibration level to scaled distance as follows:

$$PV = a\,(SD)^b$$

where PV = Maximum Peak Particle Velocity in mms^{-1}

SD = Scaled Distance in $mkg^{-½}$

a, b = Dimensionless Site Factors

The dimensionless site factors (a and b) allow for the influence of local geology upon vibration attenuation as well as geometrical spreading. The values of a and b are derived for a specific site from least squares regression analysis of the logarithmic plot of peak particle velocity against scaled distance which results in the mathematical best fit straight line where:

a is the peak particle velocity intercept at unity scaled distance

and b is the slope of the regression line.

In almost all cases, a certain amount of data scatter will be evident, and as such statistical confidence levels are also calculated and plotted.

The statistical method adopted in assessing the vibration data is that used by Lucole and Dowding. The data are presented in the form of a graph showing the attenuation of ground vibration with scaled distance and results from log - normal modelling of the velocity distribution at any given scaled distance. The best fit or mean (50%) line as well as the upper 95% confidence level are usually plotted. However it should be noted that there will also be a corresponding lower 95% confidence line.

The process for calculating the best fit line is the least squares analysis method. The upper 95% confidence level is found by multiplying the mean line value by 1.645 times 10 raised to the power of the standard deviation of the data above the mean line. A log-normal distribution of vibration data will mean that the peak particle velocity at any scaled distance tends to group at lower values.

From the logarithmic plot of peak particle velocity against scaled distance, for any required vibration level it is possible to relate the maximum instantaneous charge and separation distance as follows:

$$\text{Maximum Instantaneous Charge (MIC)} = (D/SD)^2$$

Where D = Separation Distance (Blast to Receiver) in metres

SD = Scaled Distance in $mkg^{-½}$ corresponding to the vibration level required.

The scaled distance approach assumes that blast design remains similar between those shots used to determine the scaling relationship between vibration level and separation distance and those for which prediction is required. For prediction purposes, the scaling relationship will be most accurate when calculations are derived from similar charge weight and distance values.

The main factors in blast design that can affect the scaling relationship are the maximum instantaneous charge weight, blast ratio, free face reflection, delay interval, initiation direction and blast geometry associated with burden, spacing and stemming.

Although the instantaneous explosive charge weight has perhaps the greatest effect upon vibration level, it cannot be considered alone, and is connected to virtually all aspects of blast design through the parameter blast ratio.

The blast ratio is a measure of the amount of work expected per unit of explosive, measured for example in tonnes of rock per kilogram of explosive detonated (tonnes/kg), and results from virtually all aspects of a blast design i.e. hole diameter, depth, burden, spacing, loading density and initiation technique.

The scaled distance approach is also strictly valid only for the specific geology in the direction monitored. This is evident when considering the main mechanisms which contribute to ground motion dissipation:

i) Damping of ground vibrations, causing lower ground vibration frequencies with increasing distance;

ii) Discontinuities causing reflection, refraction and diffraction;

iii) Internal friction causing frequency dependent attenuation, which is greater for coarser grained rocks;

iv) Geometrical spreading.

In practice similar rates of vibration attenuation may occur in different directions, however, where necessary these factors should be routinely checked by monitoring, especially on sites where geology is known to alter.

Air Over-pressure

Because of the climatic variability in the UK, the fact that air overpressure levels can be adequately controlled at source using best practice blasting techniques, and that Government guidance determined that an air overpressure limit cannot be defined; it was considered inappropriate to carry out predictions nor define any criteria in this respect.

11.5 Blast Induced Vibration Measurements

It is envisaged that future blasting operations on the quarry will continue to be very similar to those currently undertaken. Bench heights are envisaged to be typically about 12 - 15 m high, but the top face is anticipated to be split with bench heights of circa 7m. Burdens are normally 3.0 - 3.5 m and spacings are normally 3.0 - 3.5 m. The holes are normally 110 mm diameter hole with 3 m of stemming on top of the explosive column the "average" maximum instantaneous charge weight for a 15m deep hole would be in the region of 120 kg (assuming a maximum charging density for ANFO of approximately 10kg/m), although the design of any blast will take into account any specific circumstances to ensure that relevant vibration criteria are not exceeded. The maximum historic MICs of 136 kg for a mixture of packaged (in wet parts of holes) and ANFO type (dry part of holes) explosives has been used for the purposes of this assessment. The initiation is via an electronic ("Hotshot") system.

An electric initiation system uses fixed delays between holes and rows.,. The fixed delay system is designed with a pyrotechnic fuse train which causes the actual fixed delay timing, normally in multiples of 25 ms^{-1} plus the base charge that initiates the main explosive column. Electronic detonator systems have been designed to eliminate the pyrotechnic fuse train that is a component of electric detonators, thus improving timing accuracy and safety. Electronic detonator systems have several advantages over electric systems, namely more precise timing, reduced vibrations, a reduced sensitivity to stray electrical currents and radio frequencies, and a great reduction in misfires through more precise circuit testing. The delay in an electronic detonator system is down to an integrated circuit and capacitor system. The exact delay is "programmed" by a blast controller unique to the particular system being used. The controller sends a signal to each detonator and the firing sequence is accurately assigned. The blast controller also checks the system for integrity to ensure that all detonators are connected correctly and a complete circuit is made.

Using electronic detonators, as designed and recommended by the manufacturer, requires specialized devices to identify, program and arm the blasting circuit. The detonators, connecting wires and accompanying items such as taggers, loggers, circuit testers and blast controllers are typically referred to as electronic blasting systems or electronic initiation systems.

Levels of vibration from three production blasts (Blast No. E372, E373 and E383) were measured on the 22nd and 29th of July and the 14th October 2014, respectively. The blasts were monitored using combinations of Mini-seis digital seismographs, manufactured by White Industrial Seismology

Inc and V901 seismographs manufactured by Vibrock Limited, which were located at varying distances from the blast panels within and out with the quarry void.

The following set-up parameters were used on the seismographs during the vibration measurements:-

- Trigger level: 0.3 - 0.5 mms^{-1}
- Record Length: 2.5 - 4.0 seconds
- Measurement Type: Impulse

Table 11.1 shows details of the blasts monitored and **Table 11.2** the results of the vibration monitoring. The 'separation distance' in Table 11.2 relates to distances from the blasts to the seismographs.

Table 11-1 Blast Details at Craig yr Hesg Quarry

Blast Ref No. E372 22 July 2014	
Time:	12:47 hours
No of Holes:	14
Diameter:	110 mm
Depth:	9.6 – 14.9 metres
Average Burden:	3.5 metres
Average Spacing:	3.2 metres
Explosive Charge Weight per Hole:	41.0 to 75.0 kg
Maximum Instantaneous Explosive Charge Weight:	75.0 kg
Total Explosive Charge Weight:	1030.0 kg
Explosive Type:	Exem 100 (350kg), Exem 55 (100kg) and Ammoblast (550kg)
Initiation:	Hotshot (delays between holes 18ms^{-1}; between rows 72 ms^{-1} and offset right 9 ms^{-1})
Blast Ref No. E373 29 July 2014	
Time:	13:15 hours
No of Holes:	27
Diameter:	110 mm
Depth:	12.8 – 15.2 metres
Average Burden:	3.5 metres
Average Spacing:	3.5 metres
Explosive Charge Weight per Hole:	81.0 to 94.0 kg
Maximum Instantaneous Explosive Charge Weight:	94.0 kg
Total Explosive Charge Weight:	2505.0 kg
Explosive Type:	Exem 100 (675kg), Exem 55 (75kg) and Ammoblast (1700kg)
Initiation:	Hotshot (delays between holes 18ms^{-1}; between rows 81 ms^{-1} and offset right 9 ms^{-1})
Blast Ref No. 383 14 October 2014	
Time:	14:40 hours
No of Holes:	23
Diameter:	110 mm
Depth:	13.0 – 14.0 metres

Average Burden:	3.0 metres
Average Spacing:	3.0 metres
Explosive Charge Weight per Hole:	50.0 to 75.0 kg
Maximum Instantaneous Explosive Charge Weight:	85.0 kg
Total Explosive Charge Weight:	1030.0 kg
Explosive Type:	Exem 100 (550kg) and Exem 55 (1075kg)
Initiation:	Hotshot (delays between holes 18ms^{-1}; between rows 99 ms^{-1} and offset right 9 ms^{-1})

Table 11-2 Results Obtained from Craig yr Hesg Quarry Blasting

Monitoring Location	Separation Distance (Blast to Monitor in m)	Measurement Axis	Peak Particle Velocity (mms-1)	Air Overpressure (dB)
Blast Number E372 @ 12:47 hours 22nd July 2014				
Site Location 1	31	Trans	52.8	128
		Vert	35.6	
		Trans	33.5	
Site Location 2	61	Trans	16.3	142
		Vert	10.7	
		Trans	22.9	
Site Location 3	100	Trans	17.5	140
		Vert	9.40	
		Trans	10.4	
Site Location 4	132	Trans	12.2	138
		Vert	3.56	
		Trans	11.2	
Site Location 5	180	Trans	2.92	127
		Vert	2.64	
		Trans	4.32	
Site Location 6	212	Trans	1.88	N/A
		Vert	1.55	
		Trans	1.78	
Site Location 7	233	Trans	1.33	113
		Vert	1.20	
		Trans	1.45	
Site Location 8	273	Trans	1.23	114
		Vert	1.25	
		Trans	1.78	
Site Location 9	362	Trans	1.78	104
		Vert	1.03	
		Trans	1.33	
Blast Number E373 @ 13:15 hours 29th July 2014				
Site Location 1	59	Trans	22.1	133
		Vert	19.6	
		Trans	10.4	
Site Location 2	79	Trans	9.65	142
		Vert	8.64	
		Trans	7.24	
Site Location 3	130	Trans	6.54	142
		Vert	4.38	
		Trans	4.89	

Monitoring Location	Separation Distance (Blast to Monitor in m)	Measurement Axis	Peak Particle Velocity (mms-1)	Air Overpressure (dB)
Site Location 4	189	Trans	4.70	138
		Vert	3.78	
		Trans	0.13	
Site Location 5	240	Trans	4.06	137
		Vert	3.46	
		Trans	3.33	
Site Location 6	288	Trans	2.13	132
		Vert	1.43	
		Trans	2.13	
Site Location 7	350	Trans	0.90	109
		Vert	1.33	
		Trans	1.18	
Site Location 8	390	Trans	0.95	N/A
		Vert	1.40	
		Trans	1.25	
Blast Number E383 @ 14:40 hours 14th October 2014				
Site Location 1	125	Trans	13.2	104
		Vert	9.13	
		Trans	17.2	
Site Location 2	133	Trans	11.3	N/A
		Vert	6.28	
		Trans	8.95	
Site Location 3	223	Trans	2.80	104
		Vert	2.15	
		Trans	3.53	

Monitoring Location	Separation Distance (Blast to Monitor in m)	Measurement Axis	Peak Particle Velocity (mms-1)	Air Overpressure (dB)
Site Location 4	253	Trans	1.55	N/A
		Vert	1.88	
		Trans	3.33	
Site Location 5	316	Trans	2.20	103
		Vert	1.38	
		Trans	2.50	
Site Location 6	338	Trans	1.18	N/A
		Vert	1.50	
		Trans	1.83	
Site Location 7	441	Trans	0.85	N/A
		Vert	0.725	
		Trans	1.00	
Site Location 8	488	Trans	0.58	107
		Vert	0.63	
		Trans	0.65	

It should be noted that seismographs were strung out across the West Ynysybwl Fault for blast numbers E372 and E373. From the results obtained it would appear that there is no significant reduction or increase observed in the results across the fault. Thus based on the results obtained it would appear that the Ynysybwl Fault does not adversely influence the propagation of vibration across it.

The data obtained from the above production blasts was used to generate a regression curve plot for blasting at Craig yr Hesg Quarry using the so-called "Hotshots" system (**Figure 11.1**). In addition, data from production blasting at the quarry as supplied by Hanson and attached as **Appendix**

11.1 was reviewed. The use of the USBM formula to predict vibration levels calls for the maximum peak particle velocity (PPV) to be plotted against scaled distance (SD) in a logarithmic manner. The upper 95% confidence level has been taken as a basis for the interpretation given in **Table 11.3** for a vibration criterion for residential properties of a maximum of 6 mms^{-1} peak particle velocity as recommended by MTAN1. In addition, Table 11.5 lists the MICs for a vibration criterion of 75 mms^{-1} peak particle velocity at a 99.9% confidence level in relation to the water mains.

However, it should be noted that the derivation of the 95% confidence limits are normally used to show the worst case situation, i.e. the upper 95% confidence limit line which includes all the points above the average regression line (the 50% confidence limit). However, due to the statistical nature of the 95% confidence limits these will also include a number of points below the regression line, as indicated by a lower 95% confidence limit line. The latter is never shown on regression line graphs because the worst case situation is usually presented. Thus, when predicting PPVs from blasting to a 95% confidence limit, results can obviously occur anywhere between the upper and lower 95% confidence limit lines. Predictions using the upper 95% confidence limit are used to always produce a robust assessment however in practice it is often the case that MICs above those produced by the regression line can be utilised without exceeding the relevant criteria .

Table 11-3 Maximum Instantaneous Explosive Charge Weights Related to Distance, based on Vibration Limit of 6 mms-1 at 95% Confidence Level (SD = 23.754 mkg-½)

Blast/Receiver Separation Distance (m)	Allowable Maximum Instantaneous Charge Weight (kg)
150	40.0
175	54.0
200	71.0
225	90.0
250	111.0
275	135.0
300	159.5*
325	187.0*
350	217.0*
375	249.0*
400	284.0*

* In practice Hotshot MICs have not exceeded 136 kg

Table 11-4 MICS that can be used at Residential Receptors in order to meet a criterion of 6mms-1 at 95% confidence

Sensitive Receptor/ Working Phase	Distance (m)	Scaled Distance $kgm^{-0.5}$	MIC* (kg)
Location 1: Cefn Cae			
Phase 1	370	31.73	136.0
Phase 2	270	23.15	129.0
Phase 3	250	21.44	111.0
Location 2: Cefn Primary School			
Phase 1	270	23.15	129.0
Phase 2	250	21.44	111.0
Phase 3	285	24.44	136.0
Location 3: Conway Close			
Phase 1	180	15.43	57.5

Sensitive Receptor/ Working Phase	Distance (m)	Scaled Distance $kgm^{-0.5}$	MIC* (kg)
Phase 2	175	15.01	54.5
Phase 3	240	20.58	102.0
Location 4: Pen y Bryn			
Phase 1	210	18.01	78.0
Phase 2	340	29.15	136.0
Phase 3	510	43.73	136.0
Location 5: Rogart Terrace			
Phase 1	550	47.16	136.0
Phase 2	835	71.60	136.0
Phase 3	850	72.89	136.0
Location 6: Darren Park			
Phase 1	630	54.02	136.0
Phase 2	685	58.74	136.0
Phase 3	825	70.74	136.0

* Maximum MIC is assumed to be the historic 136 kg

Table 11.5 outlines the allowable instantaneous explosive charge at differing separation distances for residential receptors. The predicted MICs that can be utilised whilst still complying with $6mms^{-1}$ at the upper 95% confidence line at each of the residential receptors is given in Table 11.4. The latter indicates that when blasting is undertaken at a closest approach distance to Conway Close of 175m, the MIC will need to be reduced to 54kg in order to meet the criterion of $6mms^{-1}$ at 95% confidence limit. The charge weights employed are required to be reduced and this would be achieved via the adoption of the various reduction techniques that have been outlined in Section 11.8 below. As the separation distances increase blast designs utilising the recent historic maximum instantaneous charge weights of 136 kg will be able to be used whilst complying with the recommended vibration criterion of 6 mms^{-1} at 95% confidence.

The measurements undertaken on site as part of this study measured a maximum PPV of $4.32mms^{-1}$ at a distance of 180m from a blast incorporating an MIC of 75kg. However, using the regression line at 95% confidence an MIC of about 57-58kg is required at a distance of 180m in order to meet the $6mms^{-1}$ criterion at 95% confidence. This illustrates the “worst case” nature of predictions based purely on the commonly used 95% confidence limit methodology. However, practical experience of blasting on the quarry indicates that blasting at a distance of 175m from the closest property can be undertaken whilst meeting the MTAN (para 83) vibration criterion, thus also satisfying the requirements of paragraph 71 of MTAN1 regarding the recommended minimum separation distance of 200m (or “buffer zones”) to mineral extraction “unless there are clear and justifiable reasons for reducing the distance (see Section 11.7 below).

Table 11-5 Maximum Instantaneous Explosive Charge Weights Related to Distance, based on Vibration Limit of 75 mms-1 at 99.9% Confidence Level (SD = 8.52 mkg-½)

Blast/Receiver Separation Distance (m)	Allowable Maximum Instantaneous Charge Weight (kg)
10	2.0
15	5.0
20	9.0
25	14.0

30	20.0
35	27.5
40	36.0
45	45.0
50	56.0
55	68.0
60	81.0
65	95.0
70	110.0
75	126.0
80	144.0*

* In practice Hotshot MICs have not exceeded 136 kg

For the water main, a blast design utilising the highest recent maximum charge weights of 136 kg could be undertaken at separation distances that exceed ~78m, from the water main, whilst complying with the recommended vibration criterion of 75 mms^{-1} at 99.9% confidence. If the lowest historic MIC of about 45kg were used, Table 11.4 above indicates that a separation distance of 45m would be required in order to meet the 75mms^{-1} criterion at 99.99% confidence limit. However, again practical measurements on site indicate that using a MIC of 94kg, a PPV of 52.8mms^{-1} was measured 31m from the closest hole in the blast panel. In addition, two blasts monitored at distances of 59m and 61m from blasts utilising MICs of 75 and 94kg (respectively) resulted in measured PPVs of only 22.1mms^{-1} and 22.9mms^{-1}, respectively. This again illustrates the "worst case" nature of the common statistically based blasting assessment methodology.

Review of Historic Blasting Data

Hanson have provided a summary of about 28 months' worth of blast vibration monitoring undertaken at Craig yr Hesg Quarry from 13th January 2012 through to the 3rd April 2014 (**Appendix 11.1**).

In 2012, a total of 30 No. blasting events were recorded in the summary. The blasting was undertaken with either nonel (electric) or "Hotshot" (electronic) detonating systems. The results indicate that of the 30 No. blasts fired in 2012, 18 No. (or 60%) generated complaints and of these 14 No. were generated by electric detonating systems and only 4 No. by the electronic system. Examination of the data for 2012 in **Appendix 11.1** also indicates that the electronic detonation system consistently produces lower PPVs than the equivalent blast using electric detonators. For example, Blast E293 using the electric detonating system was undertaken using an MIC of 105kg and monitored at a distance of 255m which measured a PPV of 7.7mms^{-1}. Several blasts (E299, E301/302 and E305) were undertaken at similar distances of 255m using the electronic 'hotshot' detonation system using MICs of 115kg which produced much lower PPVs of between 2.2 – 3.2mms^{-1}. This indicates that the electronic detonation system does indeed reduce vibration levels due partly to the fact that the delays between holes and rows can be more precisely set.

In 2013, a total of 31 No. blasting events were recorded. Of these, a total of 8 No. were the subject of complaint and all of these were fired using the nonel (electric) detonating system. Of the remaining blasts, 19 No. were fired using the electronic detonating system none of which were the subject of complaint. Of the "Hotshot" electronic blasts undertaken at distances of about 245 – 300m from the monitoring locations, PPVs of 1.8 – 4.28mms^{-1} were recorded from blasting incorporating MICs in the range 65 – 100kg. At distances of 300 – 370m PPVs of <0.5 (described as "instrument did not trigger") – 3.73mms^{-1} were recorded from blasts incorporating MICs of 72-85kg.

Up until April 2014 (the period for which the summary data is available), 11 No. blasts were fired all using electronic detonation systems (which is now the normal method of initiation on Craig yr Hesg Quarry). No complaints were received for any of these blasts. Blasts undertaken at a distance of 280m from the measurement location indicate that PPVs were in the region of <0.5 – 1.1mms^{-1} using MICs of 90kg. At distances of 290m the PPVs measured 1.08 – 2.4mms^{-1} from blasts utilising MICs of 75-82kg. When these blasts are run through the regression software for distance and MIC, in all cases and as would be expected the regression line predicts higher levels at 95% confidence limit (3.7 – 4.25mms^{-1}). Even at 50% confidence limit most predicted levels are higher than the actual measured results at between 2.06 – 2.37mms^{-1}.

The above illustrates that, whilst the regression analysis methodology is that most commonly used to undertake blasting assessments, it can over predict PPVs based on the 95% confidence limit when compared to actual on site measurements. In practice lower PPVs can be achieved based on the experience of the shot firer on the particular quarry.

It is understood that one blast in 2014, that does not appear in the summary in **Appendix 11.1** was the cause for complaint. Blast E380 was fired at 10:30hrs on 30th September and incorporated an MIC of 75kg in 16 holes. Monitoring undertaken at an approximate distance of 385m, near the complainants property, indicated that the PPV was 1.25mms^{-1} and the AOP was 104 dB all well within the extant planning conditions.

Since all blasts will be designed to meet the MTAN 1 criterion of 6.0 mms^{-1} (at 95% confidence level) and the water main criterion of 75mms^{-1} (at 99.99% confidence level), it is considered that the effects from blasting will not be significant.

11.6 Current Planning Conditions

In 2010 an Environment Act Review was submitted, accompanied by an EIA / ES. The application was determined by RCT Council in April 2014 when a schedule of updated planning conditions was issued, of which, Conditions 23 – 27 pertain to blasting and state:

Condition 23

Blasting shall be undertaken in such a manner to ensure that ground vibration, measured as a maximum of three mutually perpendicular directions taken at the ground surface, does not exceed a peak particle velocity (PPV) of 6mms^{-1} per second in 95% of all blasts measured over any continuous six month period, and no single blast shall exceed a PPV of 10mms^{-1} per second. The measurement is to be taken at or near the foundations of any vibration sensitive building in the vicinity of the quarry existing at the date of this consent.

Reason*: To limit ground vibration from blasting operations so as to protect the amenities of local residents and the structure of buildings in accordance with Policies CS10 and AW10 of the Rhonda Cynon Taf Local Development Plan.*

Condition 24

Blasting shall be designed in such a manner that air overpressure resulting from any blast does not exceed 120 dB at any residential property.

Reason*: To limit air overpressure from blasting operations so as to protect the amenities of local residents and the structure of buildings in accordance with Policies CS10 and AW10 of the Rhonda Cynon Taf Local Development Plan.*

Condition 25

Each individual blast shall be monitored in accordance with a Blast Monitoring Scheme to be submitted to the Local Planning Authority within 3 months of the date of this consent. That scheme shall include provision for the recording of details which shall include the location of the monitoring station (to be provided at a minimum of one of the properties listed at Para 10.3.1 of the Environmental Statement, or such other location previously agreed in writing with the Local Planning Authority); the position of the blast holes; weather conditions; the specification of the blast in terms of MIC, PPV data and total charge weight, and provision for the results to be made available immediately to the Local Planning Authority on request. All monitoring shall be undertaken in accordance with the terms of the approved scheme for the duration of the mining operations at the site.

Reason*: To ensure adequate monitoring of blasting operations in the interests of the amenities of local residents in accordance with Policies CS10 and AW10 of the Rhonda Cynon Taf Local Development Plan.*

Condition 26

Blasting times shall be clearly advertised at the Quarry and a warning, audible at the site boundary, shall be sounded prior to any blasting operations taking place, and shall be sounded again immediately after blasting has finished.

***Reason**: To give reasonable warning of blasting operations in the interests of public safety and the amenities of local residents in accordance with Policies CS10 and AW10 of the Rhonda Cynon Taf Local Development Plan.*

Condition 27

There shall be no secondary breakage of stone by the use of explosives.

***Reason**: To limit blasting operations so as to protect the amenities of local residents in accordance with Policies CS10 and AW10 of the Rhonda Cynon Taf Local Development Plan.*

11.7 Planning Policy and Advice

Minerals guidance is included within the Unity Authority Rhonda Cynon Taf County Borough Council's Local Development Plan 2006-2021. This document states in Policy CS 10 Minerals that *"The Council will seek to protect resources and to contribute to the local, regional and national demand for a continuous supply of minerals, without compromising environmental and social issues, by"*; (among others)*:*

- *Defining safeguarding areas for mineral resources, including coal, high quality hard rock, limestone and sand and gravel, taking into account the range, quality and extent of resources and environmental, planning and transportation considerations; and*
- *Ensuring that impacts upon residential areas and sensitive land uses from mineral operations and the transportation of minerals are limited to an acceptable proven safe limit.*

Minerals Technical Advice Note 1: Aggregates (MTAN1), published by the Welsh Assembly Government in March 2004, sets out detailed advice on the mechanisms for delivering the policy for aggregates extraction. Section C of this document describes one of the five key principles in the Minerals Planning Policy Wales document published by the National Assembly for Wales in December 2000. This section describes the methodologies to be employed to reduce the environmental impact of aggregates production and covers such topics as buffer zones, dust, blasting, noise and visual impact.

In terms of "buffer zones" for hard rock quarries paragraph 71 includes a recommended minimum separation distance of 200m from the extraction area to the nearest sensitive receptor, *"unless there are clear and justifiable reasons for reducing the distance"*. At Craig yr Hesg, the 200m buffer around the proposed quarry extension is met at all receptors apart from the nearest 5 dewllings in Conway Close.

In terms of blasting, MTAN 1 also gives advice on suitable planning conditions to control the environmental impact of blasting operations on quarries. Paragraph 83 states *"Planning conditions relating to the control of blasting should only: relate to those aspects of environmental management that are under the control of the operator; should be directly relevant to environmental issues; and, should not be in conflict with existing health and safety legislation. Consequently planning conditions should provide for:*

- *Acceptable days for blasting operations: unless there are exceptional circumstances such as a safety emergency, blasting should take place at regular times within the working week that is Mondays to Fridays. Blasting on Saturday mornings should be a matter for negotiation between the operator and the MPA taking into account the views of any nearby residents. No blasting should take place at any other time, that is, Saturday afternoons, Sundays or Bank or National Holidays;*
- *Acceptable times of blasting operations: blasting should only take place between the hours of 10:00 am and 16:00 pm, except when there is an emergency in the interests of safety;*

- *Maximum level of ground vibration at sensitive locations: ground vibration as a result of blasting operations should not exceed a peak particle velocity of 6mms^{-1} ppv in 95% of all blasts measured over any six month period, and no individual blast should exceed a peak particle velocity of 10 mms^{-1} ppv;*
- *Approval of a scheme by which air overpressure is managed and mitigated through careful design of blasting operations;*
- *Approval of a scheme of vibration monitoring so that compliance within set limits can be adequately demonstrated by the operator at any time."*

It should be noted that the above recommendation from MTAN1 regarding blast vibration criteria is reflected in the extant planning Condition 23 set out in the ROMP schedule of updated planning conditions, April 2013.

11.8 Mitigation Measures

There is no additional mitigation required since blasting operations will be designed to meet the MTAN1 criteria at all times and in addition blasting will be designed to comply with the proposed water main criterion referred to above. However, the Operator's Good Practice Guide outlined in the DETR report The Environmental Effects of Production Blasting from Surface Mineral Workings is already, and would continue to be, adopted to ensure that the potential for ground-borne and airborne vibration would be minimised at Craig yr Hesg Quarry. This would include:

1. Making accurate surveys & recording of blast area as per the Quarries (Explosives) Regulations 1988.
2. Ensuring correct blast design including correct relationship between burden, spacing and hole diameter.
3. Ensuring accurate drilling, keeping subdrill to the minimum required.
4. Making accurate surveys & recording of blast holes as per the Quarries (Explosives) Regulations 1988. If necessary, blast design would be revised in light of survey data.
5. Maximising use of free faces including by careful planning of delay sequences.
6. Optimising maximum instantaneous charge weight by:
   - Reducing number of holes;
   - Reducing instantaneous charge by decking charges (if necessary);
   - Reducing bench height or hole depth;
   - Reducing borehole diameter.
7. Optimising blast ratio in any changes to design.
8. Where practicable ensuring direction of detonation away from sensitive areas.
9. Wherever possible use of unconfined charges would be avoided particularly where fissures or broken ground or weaken of rock from previous blasting is known to be present.
10. Wherever possible the use of surface lines of detonating cord would be avoided. All surface detonators and explosives would be adequately covered with suitable material.
11. Stemming material would be of sufficient quality and quantity to confine adequately all explosives upon detonation. A coarse stemming material such as angular chippings should be considered. Drill fines would not be used.
12. Bottom initiation would be considered in preference to top initiation.

13. Misfire procedures would have due regard to under-burdened charges.

14. If air overpressure is found to be a potential problem consideration would be given to reducing blast panel area.

15. Blasting would be undertaken at regular times.

16. Ground and airborne vibration levels would be monitored regularly so that information may be employed into any necessary modifications of future blast designs.

11.9 Residual Effects

The impact of the blasting operations at Craig yr Hesg Quarry have been assessed to be “not significant” as long as blasting is undertaken to comply with the extant planning consent condition which stipulates a criterion of 6mms^{-1} for 95% of blasts in any six month period with no blast exceeding 10mms^{-1} when measured at a sensitive receptor The measures indicated in Section 11.8 above, whilst strictly not mitigation measures, can be considered as good blasting practice which when implemented are designed to achieve even better compliance with the blasting criteria.

11.10 Recommendations

Based on the above assessment the following recommendations are made:

- A planning condition similar to the extant Condition 23 should be attached to any approval of this planning application:
  - *Blasting shall be undertaken in such a manner to ensure that ground vibration, measured as a maximum of three mutually perpendicular directions taken at the ground surface, does not exceed a peak particle velocity (PPV) of 6mms^{-1} per second in 95% of all blasts measured over any continuous six month period, and no single blast shall exceed a PPV of 10mms^{-1} per second. The measurement is to be taken at or near the foundations of any vibration sensitive building in the vicinity of the quarry existing at the date of this consent.*

- As blasting progresses towards either of the water mains, levels of vibration should be monitored above the pipeline to provide data which can be used to inform future blast design. The regression line within this chapter can be used along with actual data measured on site to assist in designing realistic and practical designs in close proximity to the pipeline. It is recognised and has been demonstrated above, that predictions using the regression analysis, as a result of the statistical nature of the methodology, tend to over predict PPVs which can also result in overly restrictive reductions in MICs.

- It is recommended that the regression analysis be used as an initial basis for blast design which can then be supplemented and augmented by the results from practical experience on site.

- A best practice scheme for the minimisation of air over pressure would be prepared and adopted.

- All blasts will continue to be monitored at nearby sensitive properties and once blasting encroaches to within 80m of the water main, additional monitoring on top this pipeline should be commenced to provide practical data to aid future blast designs. NOTE –this would require the use of TWO vibrographs for monitoring – at pipeline and houses]

- All blasting will continue to be undertaken to comply with the Operator’s Good Practice Guide outlined in Section 11.8 above, to ensure that the potential for ground-borne and airborne vibration will be minimised at Craig yr Hesg Quarry.

11.11 Summary

An assessment of the future blasting activities in the proposed extension to Craig yr Hesg Quarry has been undertaken using a combination of the common regression line methodology and the historic results from approximately 28 months' worth of actual onsite monitoring.

A results of a literature search regarding blast vibration affecting both residential and pipeline receptors has been undertaken from which suitable blast vibration criteria have been derived.

As part of the assessment, measurements have been undertaken of vibration levels from three production blasts at the quarry. Using this data, a regression line for the quarry has been derived using "best fit" analysis techniques. Using this regression line a table of maximum instantaneous charge weights and separation distances has been produced for residential property and the water mains. Some context to these tables has also been added by examination of the historic blasting results. It has been demonstrated that the regression line methodology tends, by its very nature, to over predict magnitudes of PPV and therefore suggest overly restrictive reductions in MICs.

It has been demonstrated that blasting could be undertaken to within 175m of the closest property to the quarry whilst complying with the relevant criteria. Therefore the requirements of paragraph 71 of MTAN1 regarding "buffer zones" are also capable of being met.

The impact of the blasting operations at Craig yr Hesg Quarry have been assessed to be "not significant" as long as blasting is undertaken to comply with the extant planning consent and the recommended limits on blast vibration contained in para 83 of MTAN 1.

11.12 Conclusions

Vibration criteria for restricting vibration levels from blasting operations at Craig yr Hesg Quarry have been recommended in order to minimise impacts on nearby residents. Accordingly, a criterion of 6 mms^{-1} for 95% of events in any six month period, with an overall maximum of 10mms^{-1} has been suggested for residential locations. This criterion is in line with the recommended planning conditions pertaining to blasting operations contained within MTAN 1. With respect to the water main pipelines a criterion of 75mms^{-1} at 99.99% confidence limit has been suggested.

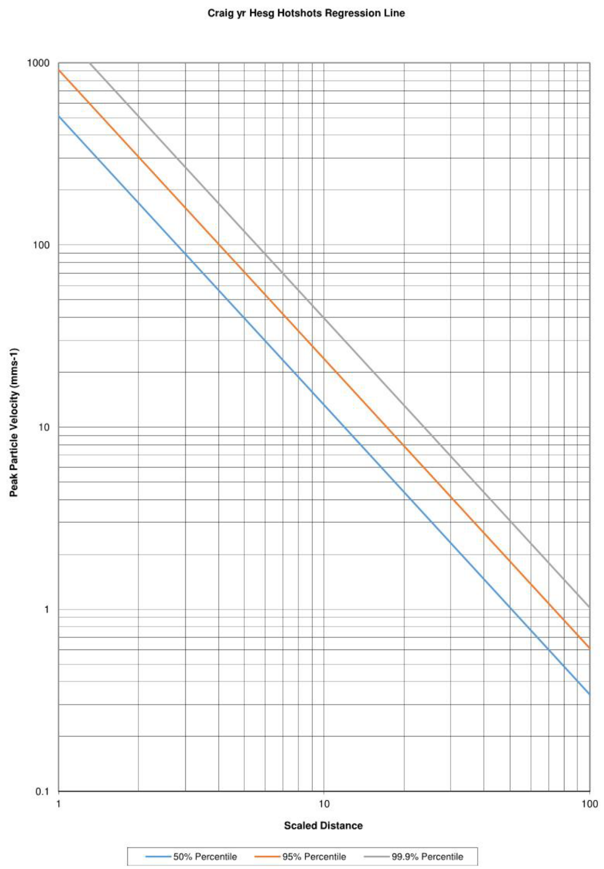
With respect to blasting where the proximity of residential locations is the governing factor, all vibration will be restricted to a low order of magnitude and would be entirely safe with respect to the possibility of even the most cosmetic of plaster cracks. All vibration will conform to MTAN1 and the proposed planning condition of 6mms^{-1} at 95% confidence over a six month period, with an overall maximum of 10mms^{-1}. With such low ground vibration levels accompanying air overpressure would also be of a very low and hence acceptable level, although possibly perceptible on occasions at the closest of properties. There are likely to be some occasions, particularly during working of the north eastern extremities of the extraction area, where there will be a need to exercise particular care in minimising vibration levels. This would involve using charge reduction techniques to ensure that a peak particle velocity limit of 6 mms^{-1} at a 95% confidence is not exceeded at any property. Similar considerations would also apply for blasting adjacent to the water mains.

Table 11.6 sets out the mitigation measures and proposals for compliance monitoring that can be incorporated into a scheme to mitigate the effects of blast vibration. It also includes details of who will be responsible for the implementation of the measures, and the suggested mechanism of compliance to ensure that the proposals will be carried out as envisaged.

Table 11-6 Implementation of Incorporated Mitigation and Monitoring Proposals

Mitigation Measure/ Monitoring Proposal	Actioned by	Compliance Mechanism
Normal Operations		
Blasts would be designed to ensure that vibration levels comply with agreed criteria for residential properties and major services.	Site management	By planning condition and a Blasting Management Plan (BMP)
A best practice scheme would be prepared and adopted to minimise air overpressure.	Site management	By planning condition and with agreement of MPA
All blasts would be monitored using suitable instrumentation and the results would be used to update regression analysis.	Site management	By planning condition

Figure 11-1 Craig yr Hesg Hotshots Regression Line



BLAST VIBRATION 11

12.0 AIR QUALITY

12.1 Introduction

This chapter has been prepared by the Smith Grant Partnership (SGP), and details the dust and air quality assessment carried out as part of the EIA undertaken in connection with the proposed westwards extension of the quarry and the continuation of operations within the existing quarry.

SGP are familiar with circumstances at Craig yr Hesg Quarry, and were responsible for the Air Quality assessment undertaken as part of the EIA and ES submitted to accompany the Environment Act ROMP Review application in 2010.

The current air quality study builds upon the previous study, with particular reference to the effects arising from operations within the proposed extension area. However, the study recognises that the extraction of reserves from the extension area will rely upon the use of existing haul roads within the existing quarry and the use of the existing fixed processing plant and related infrastructure. This is reflected in the 'consolidation' nature of the planning application, and the air quality study has been undertaken accordingly in referring where relevant to both the extension area development and operations within the existing quarry.

SGP have been continually involved in monitoring and related air quality issues at Craig yr Hesg since 2009, and, pursuant to updated planning conditions imposed as part of the ROMP Review. SGP have been involved in arranging an additional formal 12 month study of fine particulate PM 10 levels in the vicinity of the quarry primary crusher, and where appropriate data from that monitoring exercise has been utilised as part of this current air quality study.

Dust is a term used to describe particulate matter that can be dispersed through the air as a result of mechanical disturbance and wind movements; it is defined in BS6069 (part 2): 1987 as particulate matter in the size range 1 – 75 µm, which includes materials that can be described in soil classification terms as fine sand, silt and clay. Craig Yr Hesg is a quarry extracting Pennant Sandstone, and it is expected that dust sources at the quarry will be predominantly silica minerals, with a proportion of clays arising from shale bands.

Mineral dust that is coarser than 10 µm may constitute a nuisance due to soiling but does not pose any human health risk. Fine particulates of 10 µm diameter or less, referred to as PM_{10}, can be inhaled, and depending on concentrations and the nature of the particles, they can be associated with health impacts.

The site has been subject to an ongoing process of air quality assessment and review with respect to PM_{10}, with PM_{10} monitoring carried out by Hanson since December 2009. A Dust Management Plan was previously agreed with Rhondda Cynon Taf Council (RCT), and the requirements have been revised and updated as part of updated planning conditions imposed via the ROMP Review schedule of conditions issued in April 2013 (ref 08/1380/10). The conditions also impose a requirement to undertake a 12 month PM10 monitoring study, which formally commenced in November 2013. The results form part of the baseline for this current air quality study.

In addition, an assessment of air quality impacts from the re-establishment of an asphalt plant at the quarry has been recently carried out, and Environmental Permit conditions for the plant operation have been agreed between RCT and Hanson (Permit reference PPC/09-3.5-HQPEL/0104D dated 10th April 2014).

12.2 Scope

The local planning authority is Rhondda Cynon Taff Council (RCT). A scoping report has been prepared and submitted to RCT as part of a request for a formal scoping opinion on the issues which should be addressed as part of the EIA (and of relevance to this chapter, the scope of the air quality study). A formal Scoping Opinion was issued by RCT on 26th November 2014. As part of their input into the Scoping Opinion, the Public Health and Protection Division of the Council advised that the Air Quality Assessment should describe any changes to ambient levels of local airborne particulates, in particular PM_{10}, and should consider whether the proposals could influence future compliance with relevant Air Quality Objectives. RCT noted that there was no existing information regarding nuisance dust deposition outside and to the north and west of the site, and endorsed the proposal to collect data on existing short-term dust deposition in potential “worst case” locations.

SGP has based its assessment upon a review of the new extension proposals and potential for dust impacts on local sensitive receptors and the identification of appropriate mitigation measures, together with an updated assessment of the continued operations at Craig Yr Hesg Quarry. The latter has been the subject of recent appraisal via the ROMP air quality assessment and mitigation measures for the existing site operations have been recently determined by means of ROMP Conditions 29, 30, 31, 32 and 33. The assessment describes the current baseline air quality in relation to particulate matter and dust and considers the potential sources of dust emission associated with operations undertaken on site.

Other potential air emissions associated with the quarry extension relate to the exhaust emissions from mobile plant operating within the extension area, including earthmoving equipment used during site preparation and bund construction / final restoration, and for mineral loading and haulage to the processing plant. The emissions typically include PM_{10}s and oxides of nitrogen, however the low intensity of use means that the source are not considered to be significant. Likewise, exhaust emissions from HGVs entering and leaving the site are unlikely to be significant and have not been assessed. Emissions from the asphalt plant could include particulates and volatile organic compounds and have been previously assessed by SGP prior to the revision of an Environmental Permit for the plant; a summary of the findings of the assessment are presented as part of this chapter.

Recent off-site monitoring of airborne fine particulates (PM_{10}) has been, and continues to be, carried out by RCT. Results for the period up to 31st October 2014 have been reviewed in this report. In consultation with RCT, Hanson has previously produced a PM_{10} Emissions Action Plan for the quarry, and this document is also reviewed as part of this chapter.

RCT in its Local Development Plan (adopted March 2011) notes that Craig yr Hesg Quarry should be safeguarded from development that would adversely affect its operations by a 200m buffer zone (ref policy AW14). This may be taken to include the maximum range over which dust nuisance arising from sandstone extraction might ordinarily be experienced at surrounding developments. This conforms to guidance issued by the Welsh Assembly Government as Minerals Technical Advice Note (Wales) 1: Aggregates, March 2004 (MTAN 1), for a separation between proposed new hard rock quarry extraction and processing areas and settlements to avoid conflicts. It is noted in MTAN 1 that the 200m buffer zone should be regarded as a minimum unless there are clear and justifiable reasons for reducing the distance, for example because there is very little potential for impact due to other means of control.

RCT has stated that there exists a significant risk of breaching the short term Air Quality Objective for fine particulates in the settlement of Glyncoch located to the north of the existing Craig Yr Hesg Quarry processing plant, and that there is potential for the quarrying activities to significantly contribute to this risk (RCT Part IV, Environment Act 1995 Local Air Quality Management Detailed Assessment of Fine Particulate Matter, April 2014). This potential is thus assessed as part of this air quality study

Whilst the extension proposals would not affect the existing minerals processing operations at the Quarry, they will extend the operating life of the Quarry, and therefore extend the duration of any potential emissions arising from the existing or currently permitted operations (i.e. the crushing and screening plant and a re-established asphalt plant). Consequently, the existing processing operations are also considered within this assessment.

12.3 Legislation, Guidance and Industry Good Practice

12.3.1 Air Quality Objectives

Air Quality Objectives (AQOs) for specified pollutants deemed to pose a risk to human health or other receptors are set out by DEFRA and the devolved administrations in the "Air Quality Strategy for England, Wales, Scotland and Northern Ireland", 2007. AQOs are policy objectives based on EU Limit Values intended to present zero or minimal risk to health. The AQOs for particulates refer to PM_{10} concentrations in air under two statistical regimes calculated as a long term average (annual) and short term average (24 hours) which is permitted to be exceeded on up to 35 occasions per year.

There is no separate AQO in place for the finer fractions of particulate matter that can penetrate into lungs, and UK policy and legislation relating to $PM_{2.5}$ acknowledges the fact that there are no clear concentrations of particulate matter below which health effects do not occur. However, the approach adopted is to reduce the overall exposure of the population to $PM_{2.5}$ rather than aiming at reducing concentrations at 'hot-spots'. The expectation is that the objectives and limit values for PM_{10} which drive policies to reduce concentrations in hot-spots, will in general also help to bring down $PM_{2.5}$ in these locations.

Part IV of the Environment Act 1995 requires local authorities in the UK to review air quality in their area and designate Air Quality Management Areas (AQMAs) if improvements are necessary. Where an air quality management area is designated, local authorities are also required to work towards the Strategy's objectives prescribed in regulations for that purpose. An air quality action plan describing the pollution reduction measures must then be put in place. These plans contribute to the achievement of air quality limit values at local level.

The AQS objectives for PM_{10} and $PM_{2.5}$ are detailed in Table 12.1 below.

Table 12-1 Air Quality Objectives

Pollutant	Objective	Date	Comment
PM_{10}	40 µg/m^3, annual mean	2004	
	50 µg/m^3, 24 hour mean, not to be exceeded > 35 times per annum	2004	
$PM_{2.5}$	25 µg/m^3, annual mean	2020	Under negotiation
	15% reduction, urban background	2010 - 2020	target, UK urban areas

Notes: The Objectives apply to locations where members of the public are regularly present, as follows:

Annual mean: all locations where members of the public might be regularly exposed; including facades of residential properties, schools, hospitals, care homes etc.

24-hour mean: all locations where the annual mean objectives apply together with hotels and gardens of residential properties

12.3.2 Guidance

MTAN 1 provides guidance on the means to reduce the air quality impacts of aggregates production; these entail the use of buffer zones, as described above, and planning conditions or Environmental Permit conditions to control activities that could cause dust emissions. The essence of the guidance is the control of emissions through good site management, and the requirements to specify and implement mitigation measures to control dust. Industry good practice guidance is provided by

"The Environmental Effects of Dust from Surface Mineral Workings", DoE / Ove Arup & Partners, 1995.

Although not specifically adopted in Wales, the guidance in "Communities and Local Government, Planning Practice Guidance: Minerals; 2014" issued by DCLG for minerals and related operations gives a useful framework for dust assessment.

Other relevant guidance relating to air quality assessment is also provided by The Mayor of London ("The control of dust and emissions from construction and demolition. Supplementary Planning Guidance", 2014) Parts of this guidance may be applied to quarrying activities where these present similar risks of impacts to construction and demolition, and the relevant guidance is referred to concerning mitigation measures.

The Institution of Air Quality Management (IAQM) provides guidance referred to below regarding dust assessment for construction sites which is relevant to certain activities such as the construction of screening bunds.

12.3.3 Environmental Permit

An Environment Permit (ref: PPC/09-3.5-HQPEL/0104D dated 10th April 2014) issued by RCT under the Environmental Permitting (England and Wales) Regulations 2007, is held by Hanson to operate the minerals processing and asphalt plant and related activities at the site. The aim of the permitting system is to prevent, and where that is not practicable reduce, emissions to air, water and land by potentially polluting activities.

Premises that are operated under a Permit are required to operate in such a way that a) all the appropriate preventative measures are taken against pollution, in particular through the application of the best practicable means; and b) no significant pollution is caused.

12.3.4 Local Planning Policy

RCT in its adopted Local Development Plan 2006-2021 noted that Craig Yr Hesg Quarry should be safeguarded from development that would adversely affect its operations by a 200m buffer zone. This may be taken to include the range over which dust nuisance might ordinarily be experienced at surrounding developments.

12.3.5 Dust Deposition

Control of soiling and nuisance impacts is achieved through Part III of the Environmental Protection Act 1990 (EPA 1990) which contains the main legislation on Statutory Nuisance and allows local authorities and individuals to take action to prevent statutory nuisance. Nuisance is defined under the EPA 1990 as 'any dust, steam, smell or other eluvia arising on industrial or trade or business premises and being prejudicial to health or nuisance'.

Public concerns in relation to dust include the rate of deposition and/or the level of dustiness. Nuisance may be alleged when the dust coverage on surfaces is visible in contrast with other cleaner areas, especially if it occurs regularly. Severe nuisance is likely to be alleged when dust is perceptible without reference to a clean surface. There are no UK statutory or recommended levels of dust deposition which constitute an acknowledged nuisance. The possible onset of nuisance from a particular source is said to occur when dust deposition becomes noticeable, typically at a level which is 2 - 3 times background levels. For a rural area with a background deposition averaging 10-50 $mg/m^2/d$, nuisance might be experienced where deposition rates regularly exceed 150 $mg/m^2/d$, with 200 $mg/m^2/d$ often being quoted as a threshold for nuisance.

The onset of potential nuisance due to soiling is generally considered to occur when the daily effective area coverage exceeds 0.5% at a sensitive property. The effective area coverage (EAC) is a measure of the degree of soiling visible to the eye, and will depend on the quantity of dust and its colour which will determine visibility on a surface.

Controls of soiling and nuisance impacts are typically achieved through conditions within planning permissions and / or Environmental Permits requiring the implementation of a dust management plan to prevent amenity impacts.

12.3.6 Environmental Management System (EMS)

Hanson has implemented an accredited EMS across all of the company's UK sites, and which is implemented at Craig Yr Hesg Quarry. The control of dust and air quality impacts forms an integral part of the EMS.

A PM_{10} Emissions Action Plan has previously been agreed with RCT and is implemented by Hanson at the site (**Appendix 12.1**).

12.4 Assessment Methods

12.4.1 General Approach

In undertaking this air quality assessment SGP carried out the following activities:

- site visits on several occasions over 2012-14, to view the current and planned operations;
- walkover of surrounding area to view the extension site setting;
- review monitoring data, site weather station data, complaints history, permit conditions, inspection records, etc;
- review available RCT local air quality management data and reports, including RCT Progress Report, October 2014, and RCT Detailed Assessment of Fine Particulate Matter, April 2014 (released to the public in July 2014, and incorporating a study of PM_{10}s at Glyncoch over the period July 2011 to August 2012 by the University of West of England);
- commission dust deposition monitoring at strategic locations within and outside the quarry;
- assessment - dust;
- assessment - fine particulates;
- assessment - site mobile and fixed plant emissions;
- recommendations for mitigation;
- assessment - residual effects;
- non-technical summary.

12.4.2 Identification of Receptors

The assessment has predicted air quality impacts upon a range of representative receptors. In identifying potential receptors to be considered in the assessment reference has been made to Environment Agency[4] and DEFRA[5] guidance. Potential receptors have been considered on the following basis:

Table 12-2 Receptor Selection Principles

Human Receptors	
Houses / groups of houses Schools, hospitals, shops, factories Public rights of way, recreational areas Allotments	identified based on distance from site boundaries, operational areas and haulage distances, sensitivity and likely duration of exposure
Conservation Sites	
SPAs, SACs and RAMSAR sites SSSIs, National Nature Reserves, Local Nature reserves, SINCs, local wildlife and ancient woodland	within 1 km of site boundaries

Nuisance Dust

The impact of fugitive dust at a receptor will depend on the inherent sensitivity of the receptor and the perception of the acceptability of the effects of dust. Receptors may vary in their sensitivity to nuisance dust as follows:

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4 Environment Agency Horizontal Guidance – H1 Environmental Risk Assessment

5 Local Air Quality Management Technical Guidance LAQM.TG[09]: DEFRA (February 2009)

Table 12-3 Sensitivity of receptors to nuisance dust

	sensitivity	
high	**medium**	**low**
hospitals and clinics	schools	farms
retirement homes	residential areas	light and heavy industry
hi-tech industries	food retailers	outdoor storage
painting and furnishing	glasshouses and nurseries	
food processing	horticultural land	
painting and furnishing	offices	

Large dust particles, which make up the greatest proportion of dust emitted from mineral workings (>30 μm) will largely deposit within 100m of the source. Intermediate sized particles (10-30 μm) may travel up to 200-500m. Adverse impacts due to fugitive dust from surface mineral sites are therefore uncommon at distances greater than 250m from the source and resident's concerns are most likely to be experienced within 100m of the dust source. To provide a conservative assessment the dust assessment considers potential receptors within 250m with respect to nuisance dust of the application site.

PM_{10}

Fine particulate matter can travel further from sources than typical nuisance dusts, and potential human receptors within 500m are considered in this regard, although potential site emissions would be expected to merge with the background PM_{10} levels inside this distance due to dispersion.

12.4.3 Evaluation of significance

A range of approaches and methods are described in the guidance for determining whether the air quality effects of a development are significant. The significance evaluation methodologies for nuisance dust and road traffic emissions are derived from relevant DEFRA, EPUK and IAQM guidance.

Nuisance Dust

For fugitive dust emissions the assessment for each representative receptor takes into account the likely activities and duration, distance over which impacts may occur, degree of screening afforded at the time, and long-term frequency of wind directions.

The probability that dust, and windblown dust, will be carried towards receptors is based upon the frequency of winds, as indicated in Table 12.4:

Average wind directions and speeds are assumed from Meteorological Office Cardiff (St Athan) 5 year average data supplemented by site weather station records. It is noted that both St Athan and the nearby Cardiff Airport (Rhoose) data are strongly influenced by their proximity to Cardiff Bay, with westerly winds predominating. Site weather data show a more pronounced southwest- northeast axis of wind directions which is likely to be influenced by the weather station setting in a complex topography influenced by the local valley systems and adjacent quarry. However, there is insufficient long-term wind data for the site to be able to reasonably substitute this for Met Office records.

Table 12-4 Estimate of Probability of Dust Impact

Frequency of winds blowing towards receptor	Probability of impact
<5%	negligible
5-10%	low
10-20%	medium
>20%	high

The same probabilities of wind directions are used for wind-blown dust under conditions of >10 knots windspeed as these are considered most likely to raise dust from quarry surfaces and stockpiles. In practice, the probability of winds carrying dust may be reduced particularly outside the summer months, when rainfall can be typically expected to suppress fugitive dust emissions over more than one third of the time.

The magnitude of potential impacts is estimated by reference to the level of screening by vegetation, bunds etc., together with judgements of the emission strength and distance to the receptor; screening effects are estimated as follows:

Table 12-5 Indicative Estimate of Magnitude of Nuisance Dust Impact

	source - receptor distance			
Screening	0-100m	100-200m	200-500m	>500m
no screening	large	medium	small	small
partial screening	medium	small	small	imperceptible
full screening	small	small	imperceptible	imperceptible

The risk of dust impacts at each receptor is assessed taking into account the probability of impact and magnitude of impact, as detailed below:

Table 12-6 Risk of Dust Impacts Matrix

probability of impact	impact magnitude - change in concentration (adverse)			
	large	medium	small	imperceptible
high	substantial	moderate	slight	negligible
medium	moderate	moderate	slight	negligible
low	slight	slight	negligible	negligible
negligible	slight	negligible	negligible	negligible

Note: risk matrix derived from guidance provided by EPUK and IAQM

The essence of the guidance is that the risk of dust impacts occurring is used to determine the site-specific mitigation measures required to mitigate those impacts. In accordance with IAQM recommendations the significance is assigned after considering the operations with mitigation.

The overall assessment of significance takes into account a number of aspects, including the number of properties / people affected, potential duration of the impact, and the nature of the source.

Fine Particulate Emissions (PM_{10})

The magnitude and significance of the potential effects of PM_{10} emissions from traffic or general quarry activities upon air quality are assessed through reference to guidance issued by the IAQM and EPUK. The guidance provides an approach for defining the magnitude of changes and describing the air quality impacts at specific receptors

The magnitude of an impact at a receptor is described as follows, based on the change in concentration of a pollutant brought about by the scheme as a percentage of the assessment criterion.

Table 12-7 Definition of Impact Magnitude

magnitude of impact	description
large	increase / decrease in predicted concentration > 10% of the assessment criterion
medium	increase / decrease in predicted concentration 5 – 10% of the assessment criterion
small	increase / decrease in predicted concentration 1 – 5% of the assessment criterion
imperceptible	increase / decrease in predicted concentration <1% of the assessment criterion

Note: the use of 1% criterion for an 'imperceptible' change is consistent with the screening method described by the EA in their H1 Risk Assessment Guidance

The probability of impact is assessed on comparison of the resulting predicted concentration in comparison to the concentration with or without the scheme as follows:

The predicted impact at each relevant receptor is assessed taking into account the probability of impact and the magnitude of impact as detailed above in the preceding Table 12.6.

Once the impact has been described at each specific receptor the overall significance of the air quality impacts is assessed. This takes into account a number of aspects, including but not limited to, the number of properties / people affected; whether or not an exceedance of an objective or limit value is predicted; the extent to which an objective or limit value is exceeded and the degree of uncertainty.

Table 12-8 Air Quality Impact Descriptors for Predicted Increase in Annual Mean Concentrations at a Receptor

absolute concentration in relation to objective / limit value	change in concentration		
increase with scheme	small	medium	large
above objective / limit value *with* scheme	slight adverse	moderate adverse	substantial averse
90-100% of objective / limit value *with* scheme	slight adverse	moderate adverse	moderate adverse
75-90% of objective / limit value *with*	negligible	slight	slight

absolute concentration in relation to objective / limit value	change in concentration		
	small	medium	large
scheme		adverse	adverse
≤ 75% of objective / limit value *with* scheme	negligible	negligible	slight adverse

Note: an imperceptible change is described as negligible.

12.5 Baseline Conditions

12.5.1 Site and Surroundings

The quarry and processing operations are located in a partly rural setting and are largely bounded by woodland known as Coed Craig Yr Hesg, overlooking the Taff Vale. The valley sides to the southeast and southwest remain heavily wooded and include a local nature reserve and Site of Interest for Nature Conservation. More fragmented woodland and scattered trees are present across the northern flank of the quarry and process area. With the exception of the northern end of the main haul road and loading hopper to the Primary Crusher, the quarry and processes are effectively screened by this woodland from the nearest residential and commercial properties.

Land to the north is occupied by the Glyncoch housing estate, including two schools. This covers the northern slopes descending from Craig Yr Hesg into the valley of the Nant Clydach. The nearest properties within the Glyncoch Estate to the site include a Spar supermarket and old peoples flats, at approximately 50m from the Primary Crusher loading hopper.

The estate extends to the west, and a more open aspect of fields with hedgerows and scattered trees separates the existing western limit of the quarry from housing at Pen-Y-Bryn, Pearson Crescent, Conway Close, and Cefn Primary School, over 250m to the north.

The proposed extension will follow the existing high ground to the northwest of the existing void, to within a minimum of 240m from housing off Cefn Lane, adjacent to Cefn Lee Farm to the north and northwest. Scattered trees and gappy hedgerows are present between these houses and the proposed extension.

A woodland copse lies between the proposed extension and Cefn Primary School buildings which lie a minimum of 240m north of the edge of the extraction area. The school grounds approach to about 165m from the proposed extraction but are well screened by the wood. The closest residential properties to the proposed extraction area are 5 dwellings, nos. 28 – 36 Conway Close which lie within 200m to the north.

No other settlements or individual dwellings lie within 200m of the proposed new extraction area. Housing alongside Pearson Crescent and Pen-y-Bryn, Glyncoch are screened by open woodland and scrub, from the existing quarry and proposed extension, as is the Glyncoch Rugby Football Club. Daren Ddu Road passes within 30m of the southwestern side of the proposed extraction area; the road is closed to vehicles but is used as a footpath.

A screening landform rising between 4 and 6m above existing ground levels is proposed around the edges of the extension, and will be grassed and tree seeded.

The process plant yard lies above Ynysybwl Road which has scattered residential and some commercial development alongside. The nearest dwellings include Rogart Terrace, adjacent to the site entrance, and a garage and houses adjacent to the former lorry exit, whch is soon to become redundant.

12.5.2 Existing Air Quality

Existing air quality (baseline) data have been obtained via published sources, RCT records and Hanson monitoring data for the site itself. In accordance with the Assessment scoping opinion, the data relate to airborne fine particulates, with other potential air pollutants being considered unlikely to significantly change as a consequence of the proposed extension.

Air Quality Background Maps

Predicted background air quality data were obtained from the Defra LAQM website for the 1km x 1km grid squares in which the application site and existing quarry are located.

The predicted data is based on 2011 ambient monitoring and meteorological data and incorporate revised information on the age and distribution of vehicles and emission factors. Predicted data is provided by Defra for each year from 2012 to 2030.

The mapped LAQM background data for 2014 for the grid squares covered by the quarry and access roads are summarised in Table 12.9.

The interpolated values indicate that in 2014, the concentrations are all predicted to be well below the respective long term mean air quality objectives for particulates. The values below are typical of a rural setting, however these do not reflect the actual “background” monitoring carried out by UWE on behalf of RCT in 2011/12 on the northwestern side of Glyncoch which found an average PM_{10} concentration of 20.95 μg/m^3, discussed further below.

Table 12-9 2014 Background concentrations

Location	Grid square	Concentrations	
		PM_{10}	PM2.5
South (quarry and process area)	307500 191500	13.95	9.30
North (quarry and extension)	307500 192500	13.56	9.25
Mean		13.76	9.28
% AQS objective		34.4	37.1

Local Authority Monitoring data

As part of the LAQM review and assessment process, RCT has published air quality data for NO_2 and PM_{10} for monitoring points located within the Glyncoch Estate, summarised as follows:

Table 12-10 RCT local monitoring data – annual

Location	Pollutant	Year	Annual Mean pollutant concentration (μg/m^3)	% AQS objective	90th percentile of 24hr means
Greenfield Avenue (near	NO_2	2008	11.59	29.0	
		2009	13.08	32.7	

Location	Pollutant	Year	Annual Mean pollutant concentration (µg/m^3)	% AQS objective	90th percentile of 24hr means
Cefn Primary School)		2010	13.02	35.6	
		2011	12.04	30.1	
		2012	10.13	25.3	
Garth Avenue (ref RCT CBC/63/PM10 - NGR 307831, 192072)	PM_{10}	2009	28.62	71.6	51.5
		2010	25.52	63.8	48.9
		2011	28.22	70.6	52.3
		2012	32.10	80.3	69.2
		2013	29.01	72.5	52.9
Garth Avenue (ref RCT CBC/109/PM10 - NGR 307927, 192096)	PM_{10}	2009	22.34	55.9	39.9
		2010	29.15	72.9	54.6
		2011	40.16	100.4	70.0
		2012	27.80	69.5	40.1

Location	Pollutant	Year	Annual Mean pollutant concentration (µg/m^3)	% AQS objective	90th percentile of 24hr means
		2013	31.68	79.2	61.9

Note: concentrations are µg/m^3

The local authority monitoring within Glyncoch reveals an NO_2 level (determined through roadside diffusion monitoring) which correlates well with the background prediction and is substantially below the NAQS objective.

The PM_{10} data obtained from monitoring points alongside Garth Avenue approach, and in 2011 exceed, the annual mean objective. Because data capture rates are less than 90%, the risk of exceeding the short term objective allowing 35 days exceeding 50 µg/m^3 is estimated using the 90th percentile of the daily means; this calculation indicates routine exceedences of the short term objective.

The RCT station 63 and 109 data are considered to be indicative and differences between the stations, which are located about 75m apart, highlight the influence of very local and intermittent sources, and/or the inherent variability of the non-gravimetric measurement technology. For comparison, the UWE gravimetric monitoring at Garth Avenue in the period 2011/12 recorded a mean PM_{10} concentration of 27.2 µg/m^3 and 90th percentile of 46.9 µg/m^3 (SGP calculation from UWE data).

Local Authority Assessment and Review

A review of RCTs reports produced under their obligation to review air quality in their area has been carried out, including the most recent 2014 detailed assessment and progress reports. RCT describes Craig Yr Hesg Quarry as a strategically important gritstone quarry with onsite quarrying, crushing and processing activities.

Improvements to dust abatement measures at the quarry, above and beyond those required by the Environmental Permit, are acknowledged to have been implemented since 2009.

RCT reported that the probability that an unknown area of Glyncoch is in exceedence of the 24 hour mean AQO for PM_{10} is significant and that indicative monitoring was no longer sufficient. Consequently RCT commissioned the University of West of England (UWE) to undertake a 13 month detailed assessment of PM_{10} at 2 locations (Garth Avenue and Pineview) in Glyncoch using appropriate EU compliant methodology. The Garth Avenue site was located alongside the existing RCT Osiris Monitor (station 63) and is approximately 98m to the northwest of the Primary Crusher feed hopper. The Garth Avenue monitoring point is located within the housing area near to the Glyncoch bus route and amenities and therefore provides useful data for assessing potential human exposure, but is somewhat compromised by its location within 5m of houses and alongside a parking area. The Pineview site was located on the northwestern fringe of Glyncoch, at least 650m from the quarry. The UWE monitoring took place over a period when extensive roof repairs were being undertaken to many properties alongside Garth Avenue.

The detailed assessment by UWE has been published but unfortunately utilised an inappropriate method for sample analysis, with a data capture rate of substantially less than the target 90%, and hence the results are of limited usefulness. There was little correlation evident between the paired results for each site, with PM_{10} concentrations at Pineview exceeding those at Garth Avenue on 109 out of 285 days where comparable results are available. However, the peak results were generally higher at Garth Avenue, including a maximum daily concentration of 107.8 µg/m^3 recorded on the 27th December 2011 during the Christmas shutdown of the quarry.

The overall average concentrations have been calculated by us using the raw UWE data as 20.95 µg/m^3 for Pineview, and 27.2 µg/m^3 for Garth Avenue, indicating an average difference of 6.25 µg/m^3 between the sites presumably due to local sources around Garth Avenue that potentially include the quarry.

Quarrying operations as defined are to take place up to 7pm on weekdays and to 4pm on Saturdays, with no working on Sundays. When the difference in concentrations at Garth Avenue between the weekday and weekend PM_{10} concentrations is analysed, the results show an insignificant reduction of 0.07 µg/m^3 between Saturday and the Monday to Friday averages, and an average reduction of 4.51 µg/m^3 on Sunday compared to weekdays; this indicates the <u>maximum</u> average potential contribution to ambient PM_{10} at Garth Avenue due to quarrying operations including haulage and crushing. Of course, other potential local sources including building work and traffic would also be expected to provide reduced contributions to ambient PM_{10} levels on Sundays.

The UWE results showed that the annual mean objective of 40 µg/m^3 was achieved at both sites, at 52% (Pineview) and 68% (Garth Avenue) of the Objective.

With respect to the daily mean and permitted number of days exceeding 50 µg/m^3, there were 2 days at Pineview and 22 days at Garth Avenue (SGP calculations from the raw UWE data). Due to the low data capture, DEFRA LQM.TG(09) advises the use of the 90th percentile of the daily means to estimate the likelihood of exceeding the objective. In this case, the 90th percentile of the Garth Avenue data is 46.9 µg/m^3 achieving the short term AQO of 50 µg/m^3. However UWE has tentatively suggested applying a correction factor to the results to include volatile particles that could have been lost as a result of using the inappropriate analytical method. Application of the suggested correction factor would raise the 90th percentile over the objective, leading UWE and RCT to suggest that there was a risk of breaching the 24 hour mean AQO for PM_{10} at Garth Avenue.

In its most recent 2014 progress review, RCT analysed monitoring data for stations 63 and 109 located alongside Garth Avenue, Glyncoch covering the period 2008 to 2013. It was suggested that overall PM_{10} levels showed variations between years but no significant overall trend. It was suggested that the most recent 2013 data suggested the presence of several distinct sources of PM_{10} in proximity to the monitoring location. The most significant of these was said to be to the south and southeast of monitoring location 63, however the validity of the wind direction data used in the monitoring is questionable.

RCT acknowledge that the weather station data are unratified, and SGP examination of the data raises certain concerns, as follows. The weather station location is on the north side of a row of semi-detached houses in the lee of winds from the south, at about eaves height. The effects may be seen by comparing regional and site wind direction averages, which show prevailing winds from the west (Cardiff) and southwest (site). The RCT weather station records presented in the 2014 Progress Report show a spread of wind directions from northwest to southeast in seasonal wind roses (their Table 3.2.1 (15)) but in Table 3.2.1 (16) the wind rose for the whole of 2013 shows a predominantly northerly direction that is incompatible with the seasonal distribution. The report text refers to the anomalous northerly wind records over the year, and it is possible that there has been confusion between the recording of wind direction and heading (180^{o} different). It is also noted that the wind roses record a total 34.8% of calm conditions over 2013 which seems abnormally high; typical UK conditions of no wind are 5-10% of the year, and it is likely that missing results have been interpreted as zero wind speeds. These questions over the wind direction and speed data used in the RCT 2014 Progress Report to generate pollution roses undermine the conclusions drawn by RCT from the Station 63 and 109 historical data.

Current Local Authority Monitoring

RCT has recently installed a gravimetric PM_{10} monitor that is EU compliant and provides hourly PM_{10} readings available to the public at http://www.welshairquality.co.uk/. This has been operating since 16th July 2014, and although the results are as yet unratified, they are referred to here due to the insights provided. Some concentration results have been recorded as small negative values; these have been assumed to be zero for the purpose of calculating statistics. Data up to 12th November 2014 have been reviewed, with summary results in Table 12.11:

Table 12-11 RCT Garth Av. Gravimetric Equivalent PM10 Data, 2014

Monitoring Period	16/07/2014 to 12/11/2014
Days of monitoring	119 (99.8% data capture)
Average PM_{10}	21.31 µg/m^3
Maximum PM_{10}	114.17 (10th September 2014)
90th percentile PM_{10}	39.92 µg/m^3
Days exceeding 50 µg/m^3	6 (extrapolates to 18.4 over year)

The monitoring data indicate satisfactory air quality with respect to PM_{10} at Garth Avenue over the period, although occasional elevated concentrations have been recorded.

Graphs of the hourly and daily mean PM_{10} concentrations at Garth Avenue are presented in Figures 12.1 and 12.2 respectively , covering the period 16/7/2014 to 4/10/2014 when Craig Yr Hesg Quarry weather station data are available. Using the 'Openair' software tool, the hourly results have been analysed with respect to daily, hourly and monthly distributions, as shown on Figure 12.3.

Figure 12.3 indicates weekday peaks of PM_{10} concentrations, commencing at around 7.00am and tailing off at around 8.00pm, with a Wednesday maximum, and Sunday minimum. Results were relatively low in July and August, rising substantially in September and early October. Recent results since 05/10/14 to 12/11/14 have averaged 19.4 µg/m^3.

The Quarry weather station wind rose for the period 16th July to 4th October 2014 is shown in Figure 12-4.

The wind rose shows predominantly northerly winds over the period, with a secondary direction and the strongest winds blowing mainly from the south southwest. Winds from the southeast that would blow from the Primary Crusher towards the Garth Avenue monitor occurred over less than 5% of the time.

A pollution rose showing the contribution that each wind direction makes to the overall mean value of PM_{10} at the Garth Avenue monitor over the period 16th July to 4th October 2014 is shown in Figure 12.5. This shows that the largest contributions of PM_{10} arrive from the south south westerly and south easterly directions. The main quarry void and fines storage area lie over 400m distant in the former direction, and are considered to be unlikely long term sources of PM_{10}. The Primary Crusher and Baghouse Filter Stack lie to the southeast of the monitor, and could therefore be contributory sources during the relatively infrequent episodes of winds blowing from this direction, but which can carry high PM_{10} concentrations.

Figure 12-1 RCT Garth Avenue Hourly PM10 Gravimetric Monitoring (unratified results), 16th July to 4th October 2014

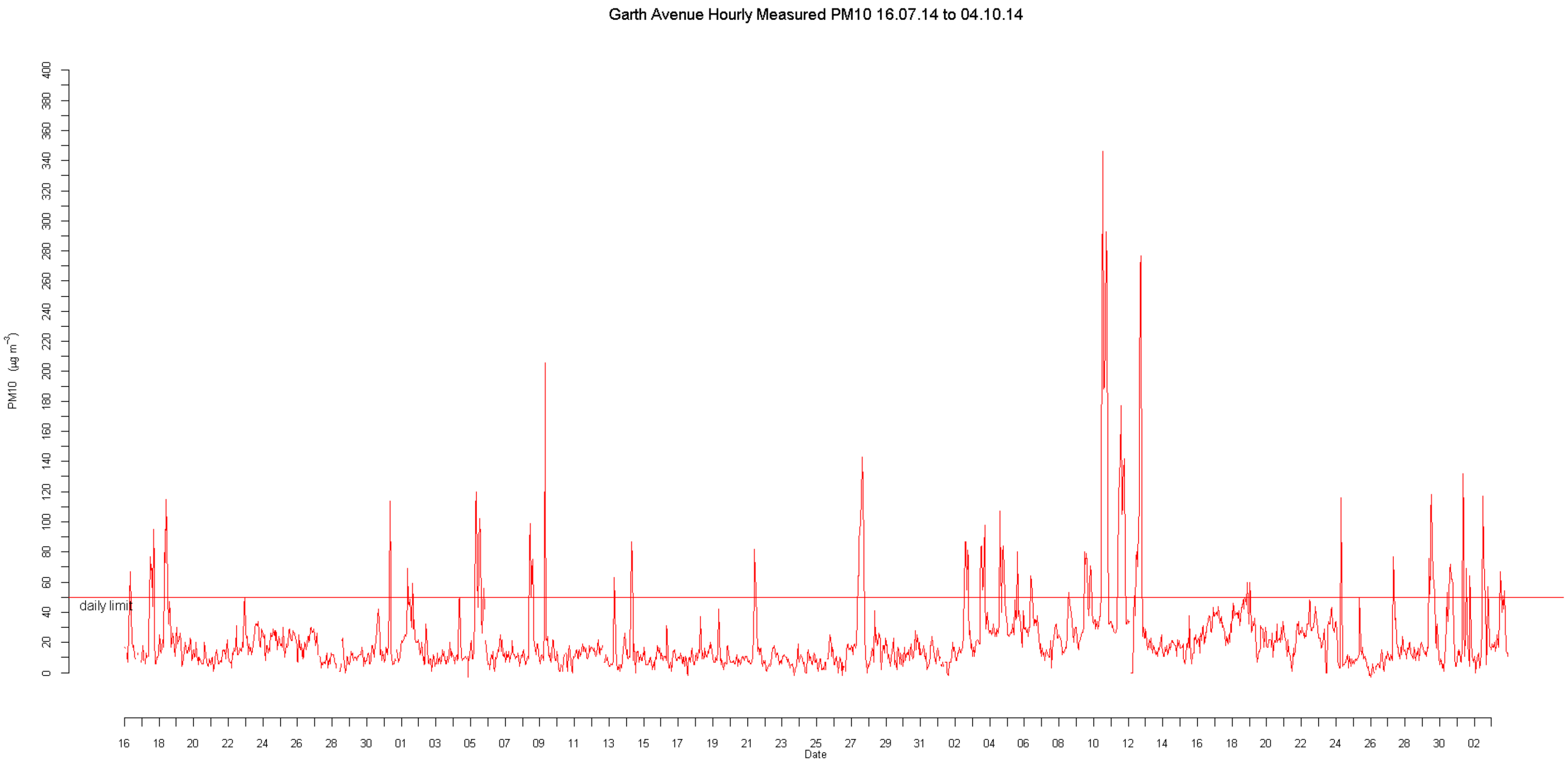


Figure 12-2 RCT Garth Avenue Daily Mean PM10 Gravimetric Monitoring (unratified results), 16th July to 4th October 2014

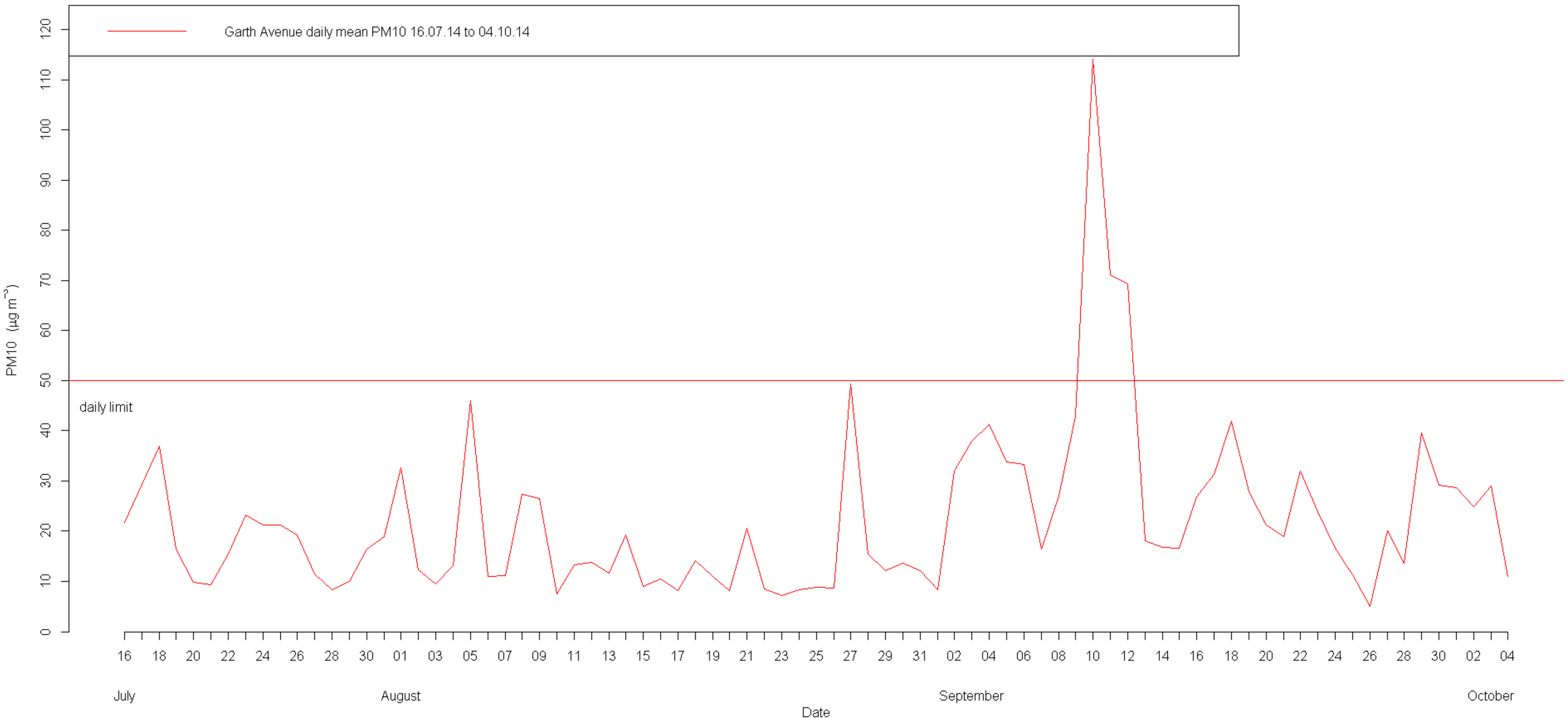


Figure 12-3 RCT Garth Avenue Hourly PM10 Gravimetric Monitoring (unratified results), 16th July to 4th October 2014; Data Analysis

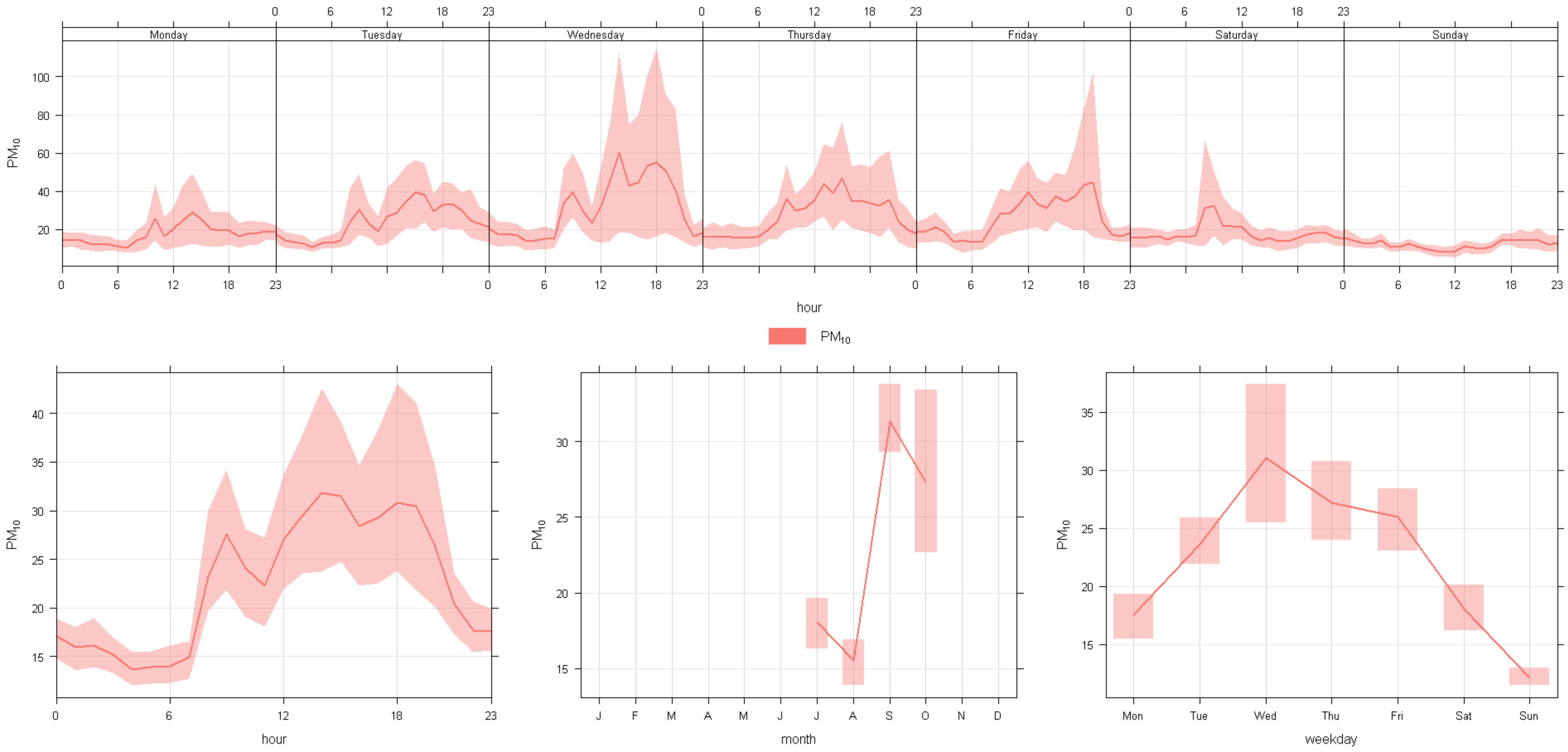


Figure 12-4 Site Weather Station Wind Directions and Speeds 16th July to 4th October 2014

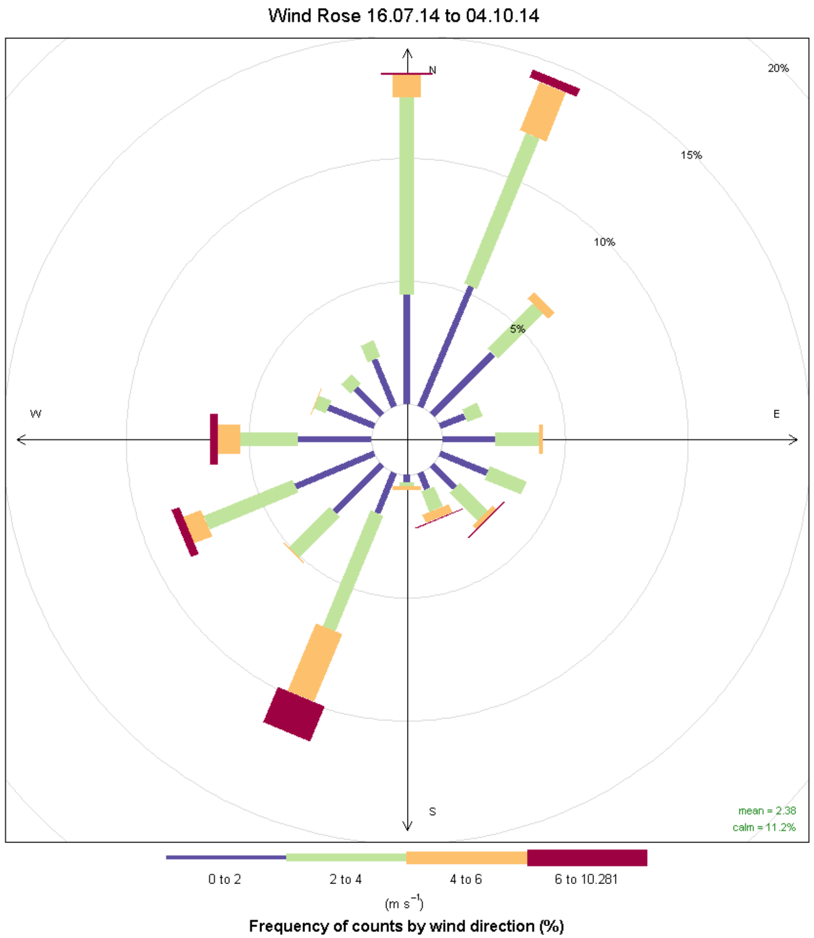
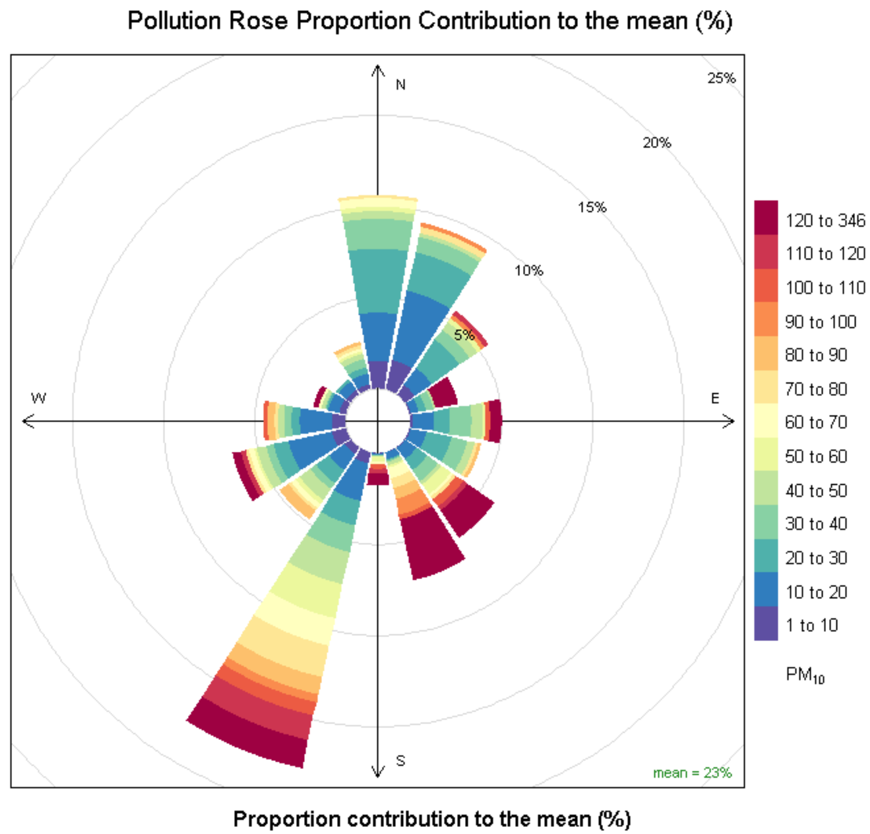


Figure 12-5 Pollution Rose for Percentage Contributions to the Mean PM10 Concentration at Garth Avenue, 16th July to 4th October 2014



note: PM_{10} concentration scale in μg/m^3

A sequence of 3 days on the 10th, 11th and 12th September 2014 (Wednesday to Friday) was associated with elevated PM_{10} concentrations exceeding the 50 µg/m^3 daily mean. The PM_{10} peaks developed from late morning/midday on each day, and tailed off at around 8 - 9pm (see Figure 12-7).

A close association appears between wind direction and the peaks, which arrived approximately 3-4 hours after the onset of southerly winds on each day. Wind speeds at the time were over 2 m/s, and the plume from a local source, say within the quarry at up to 400m distance would have travelled to the monitor in at most 800 seconds (13 minutes), making a continuous quarry source appear unlikely. The timelag may suggest a more remote source, potentially up to the coast 26km away. There are no automatic particulate monitoring stations located to the south or southwest of Craig Yr Hesg therefore no supporting data is readily available concerning PM_{10} concentrations upwind in this sector.

Figure 12-6 shows pollution roses produced using concentration frequency data separated into four arbitrary wind speed classes (0 - 0.894, 0.894 - 2.23, 2.23 - 2.68 and >2.68 m/s). The pollution roses further demonstrate the significance of wind speeds >2.68 m/s for a source to the southwest. The source to the southeast is recorded relatively infrequently due to the low frequency of winds from this direction, but also includes some high concentrations which are relatively insensitive to wind speed. This suggests a local industrial source with limited dispersion, that is likely to be the quarry processing plant. Further relatively minor sources are indicated to the northeast and east associated with wind speeds of 0.894 - 2.23 m/s, probably arising from Glyncoch or beyond.

Figure 12-6 Pollution Roses Indicating Frequency of PM10 Concentrations for Wind Directions and Speeds at Garth Avenue, 16th July to 4th October 2014

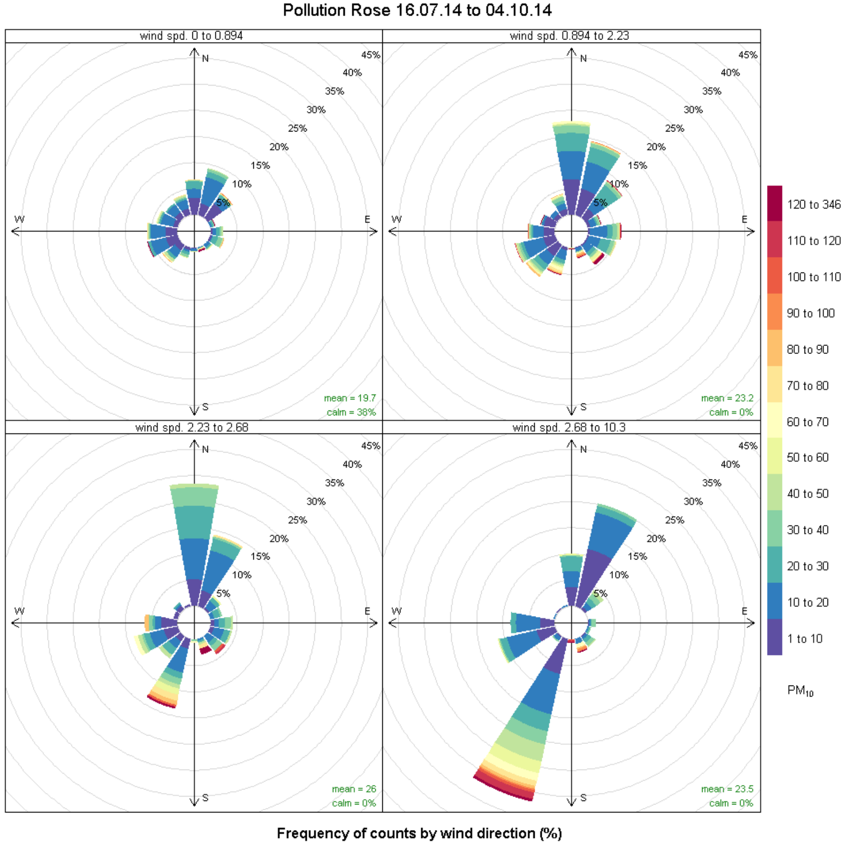
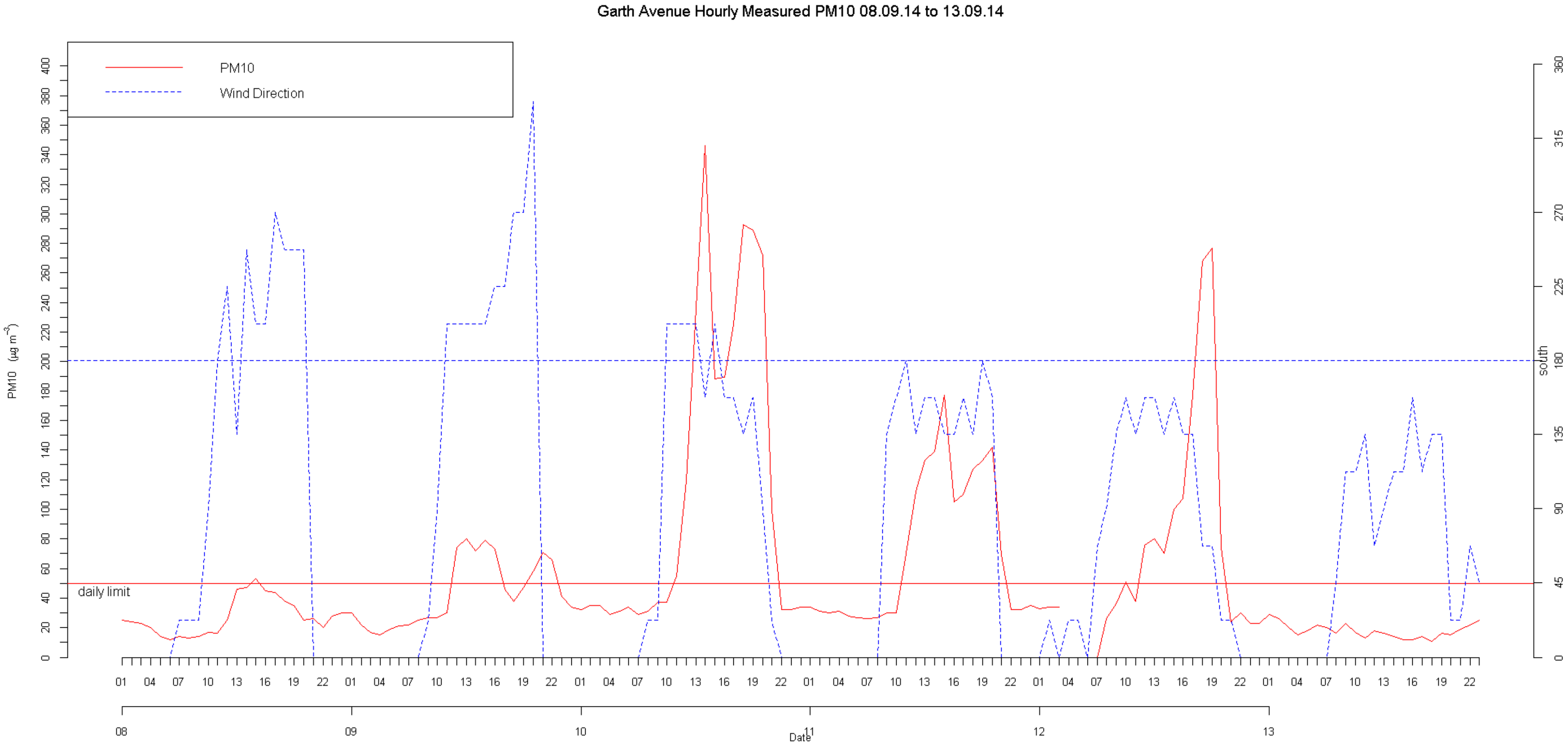


Figure 12-7 Wind Direction and Hourly PM10 concentrations at Garth Avenue, 8th to 14th September 2014



Site Monitoring Data

Hanson has operated a Dustscan PM_{10} monitor located between the Primary Crusher and quarry northern boundary with Glyncoch since December 2009 (at national grid reference 307915, 192015); monitoring records for the period 2009 to March 2012 have been reviewed as part of the ROMP EIA. The monitor collects PM10 continuously over a period of several days, with filter cartridges generally being changed weekly. The monitoring does not therefore meet EU equivalence requirements for daily PM_{10} monitoring, but provides useful long term indicative data at a strategic position between potential high risk sources associated with the quarry processing plant and the nearest residential population in Glyncoch.

Dustscan results collected in the more recent period March 2012 to November 2013 achieved a data capture rate of 44.5%, with an improved rate of 83.1% achieved since then through the replacement and improvement of equipment. Results are summarised in Table 12.12. Because monitoring periods are not necessarily constant, the mean results have been calculated as time weighted averages (results for each monitoring round are multiplied by the minutes of monitoring, summed together and the divided by the total minutes of monitoring in all rounds).

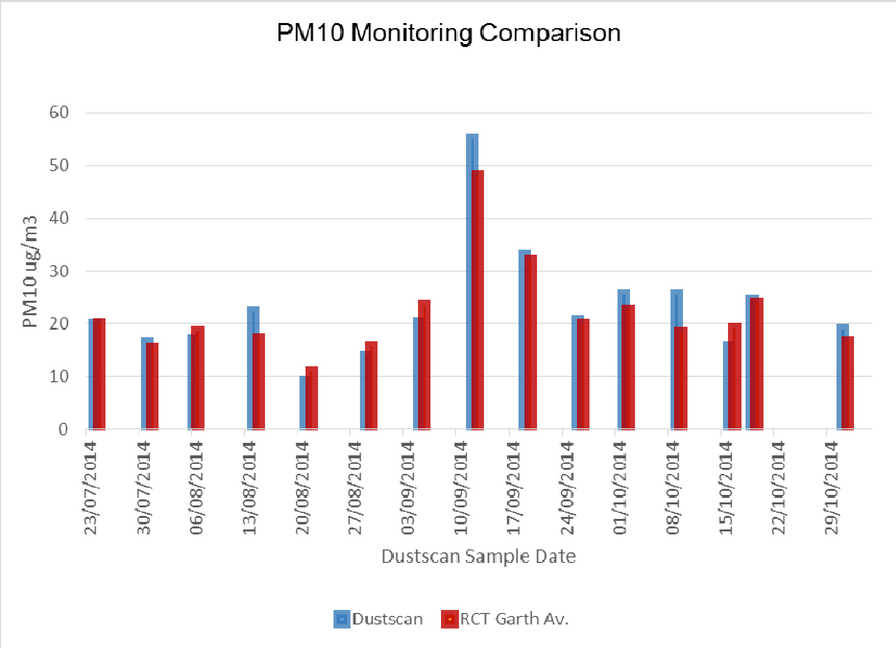
The number of potential daily exceedences cannot be accurately determined from the Dustscan data due to the smoothing effects of the multiple day monitoring periods. If it is conservatively assumed that in any period with >50 µg/m^3 each day is also over the threshold, then a total of 8 days exceeded the threshold in the 50 weeks up to 31st October 2014. There could also have been some daily exceedences in the multi-day monitoring where the average value was below 50 µg/m^3. Examining the number of days when average values were over 35 µg/m^3 shows another 12 days of monitoring in this category, where some days of exceedance may have been likely. Overall, the total of 20 days of possible exceedence remains well below the 35 days permitted under the Objective.

Table 12-12 Quarry Dustscan PM10 Data Summary

Period	Data
14 March 2012 to 14 November 2013	total days - 610 monitored days - 271 data capture rate - 44.5% **PM_{10} time-weighted average 19.73 µg/m^3** results >50 µg/m3 occurred in 2 periods: 23/03/12 - 30/03/12 (7 days) - 60.5 µg/m^3 28/05/12 - 30/05/12 (3 days) - 83.4 µg/m^3
15th November 2013 to 31st October 2014	total days - 350 (~50 weeks) monitored days - 286 days data capture - 81.7% or 83.1% if 6 day Christmas shutdown at quarry is excluded from total days **PM_{10} time-weighted average 20.11 µg/m^3** results >50 µg/m^3 occurred in 2 periods: 12/03/14 - 13/3/14 (1 day) - 60.61 µg/m^3 05/09/14 - 12/09/14 (7 days) - 55.0 µg/m^3

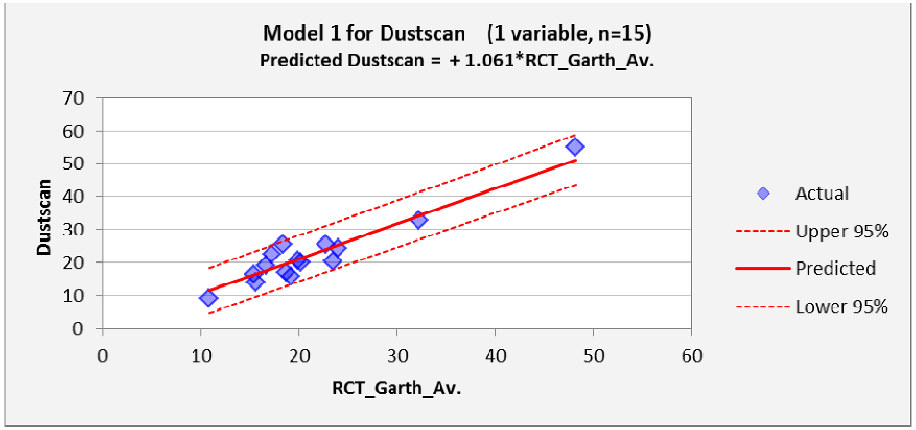
The quarry Dustscan PM_{10} results have been compared against the RCT Garth Avenue hourly data for the equivalent monitoring periods, rounded to the nearest start and finish hours. Records available for the period 24th July to 31st October 2014 have been analysed. A graph of the paired results is provided in Figure 12.8.

Figure 12-8 Comparison of Quarry Dustscan and RCT Garth Avenue PM10 Monitoring



Correlation analysis shows a strong statistical linear relationship between the two monitoring stations (r value 0.96). The averages over the period are 21.5 and 22.5 µg/m^3 for the RCT and Dustscan stations respectively, and on average Dustscan results were ~5% higher than the RCT Garth Avenue results, either suggesting increased PM_{10} levels near to the a potential source at the Primary Crusher, or simply differences in the monitor performance. However, the results overall suggest that confidence can be placed in the Dustscan monitoring data when compared to an EU equivalent PM_{10} monitor.

Figure 12-9 Statistical Analysis of Garth Avenue and Quarry PM10 Monitoring



In conclusion, the monitoring carried out by Hanson over a period of years at the quarry has demonstrated that the Air Quality Objective PM_{10} annual mean value of 40 µg/m^3 has been consistently met, with the last 50 weeks of monitoring averaging 20.11 µg/m^3 (50.3% of the objective). The permitted maximum of 35 days exceeding the 24 hour mean of 50 µg/m^3 appears unlikely to have been exceeded. It should be noted that the Objectives do not apply within the quarry as this is not an area of public exposure. If there is a risk of exceedance of the daily mean objective in Glyncoch then PM_{10} concentrations must be higher within the Estate than at the northern side of the quarry.

Dust Deposition Monitoring

Nuisance dust deposition has been undertaken using 4 frisbee type gauges located at the stations described in Table 12.13. Monitoring was carried out by Environmental Scientifics Group Ltd. and included 360° sticky strips to provide semi-quantitative information on soiling rates, referred to as % Effective Area Coverage (EAC) per day, and the principal source directions of dust. Monitoring was undertaken at approximately monthly intervals over the period October to December 2014, although station 3 was stolen after the initial monitoring round.

Table 12-13 Dust Deposition Monitoring Stations

Station	Grid Reference	Insoluble Matter ($mg/m^2/d$)	Effective Area Coverage (%)
1 - Primary Crusher	307908, 192001	298	0.4% maximum, from west
2 - Quarry NW side	307446, 191858	26	0.2% maximum from south and southwest
3 - Quarry W side	307359, 191689	14	0.1% maximum from south and southwest
4 - 26 Conway Close	307271, 192162	11	0.1% maximum from south and southwest

The monitoring provides baseline information at sites located near to the Primary Crusher and haul road, and Dustscan PM_{10} monitor (1), and on the northern and western sides of the existing quarry void (2 and 3). The final monitoring point is located within the rear garden to No. 26 Conway Close, at about 180m from the closest approach of the proposed extraction area (4).

The results covering the period are summarised in Table 12.14, and the test reports are presented in **Appendix 12.2.**

Figure 12-10: Dust Deposition Monitoring Locations

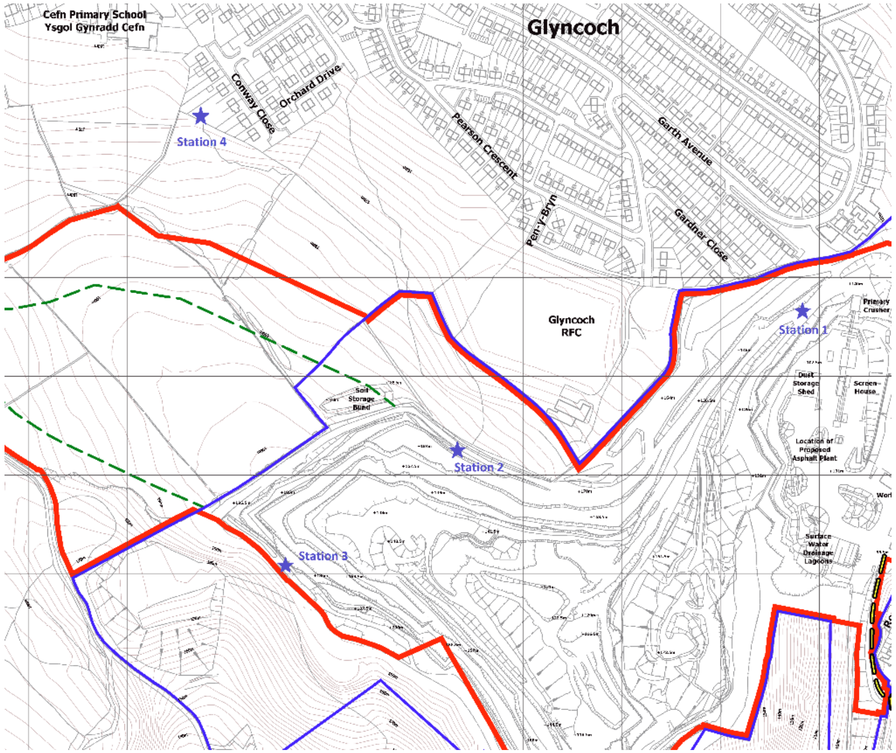


Table 12.14: Dust Deposition Monitoring Results (October-December 2014)

	Total Deposition (mg/m^2/d) and maximum EAC/d			
Station	1	2	3	4
3/10-31/10/14 (28 days)	298 0.4% from W	89 0.2% from S, SW	14 0.1% from S, SW, W	11 0.1% from S, SW
31/10-26/11/14 (26 days)	311 0.5% from S, SW, W	15 0.4% from S	lost	21 0.2% from E, SE, S, SW
26/11-22/12/14 (26 days)	144 0.2% from S, SW, W, NW	21 0.2% from SW, W, NW	lost	8 0.1% from SE, S, SW, W

The results indicate elevated dust deposition at station 1 alongside the primary crusher haul road, with the main impacts arising from the south through to northwest directions. The high level of deposition here may be attributable in part to mud splash from truck movements along the haul road, as the monitoring took place over a wet period, this section of haul road has fixed dust suppression sprays operating, and there is little or no visible dust on the adjacent vegetation. Alternatively, given the autumn period of monitoring and proximity of woodland to the station, it is possible that some organic matter could have contributed to the overall mass of material collected in the gauge. The measurements of elevated dust deposition do not reflect conditions outside the site boundary due to the intervening tree belt.

Station 2, located on the north side of the quarry, recorded slightly elevated dust over the first period, but with low, typically rural background levels thereafter. The low deposition rate at station 2 gives a preliminary indication that dust emissions from the established quarry void are low and are unlikely to cause a nuisance outside the site.

Stations 3 and 4 showed no evidence of significant dust deposition from quarry or other sources.

Local Wind Speed and Direction Data

Windroses have been obtained for the Meteorological Office weather station at St Athan, 24km to the southwest of the site over a five year period (2006-2011). These consistently show a strong prevailing wind direction from the west, as shown on the windrose for 2011 presented in Figure 12.10. St Athan and the nearby weather station at Rhoose (Cardiff Airport) are both located close to the coast of the Bristol Channel, and show similar wind patterns.

During the assessment of the proposed asphalt plant at the site, the site weather station records were compared with the St Athan data for the same period, and indicated an average -15.9^{o} shift in wind direction between St Athan and the site, shifting the wind directions anticlockwise. This is likely to be due to the local topography. For comparison, the windrose from the site weather station, located adjacent to the Primary Crusher, for 2013 is provided in Figure 12.11. Also, older wind data for the Cardiff centre for the period 1996-2005 have been reviewed, and these show a more pronounced southwest-northeast wind orientation compared to St Athan and Rhoose.

As the site weather station consistently shows significantly different wind directions to the available Met. Office data it has been concluded that the site wind data should be used in the assessment of potential dust impacts on local receptors. This is regarded as a conservative measure since the most vulnerable receptors are typically located to the north of the quarry and prevailing winds from the southwest as opposed to west are more likely to blow across areas of the quarry and proposed extension towards them.

Figure 12-10 Windrose for St Athan Meteorological Station, 2011

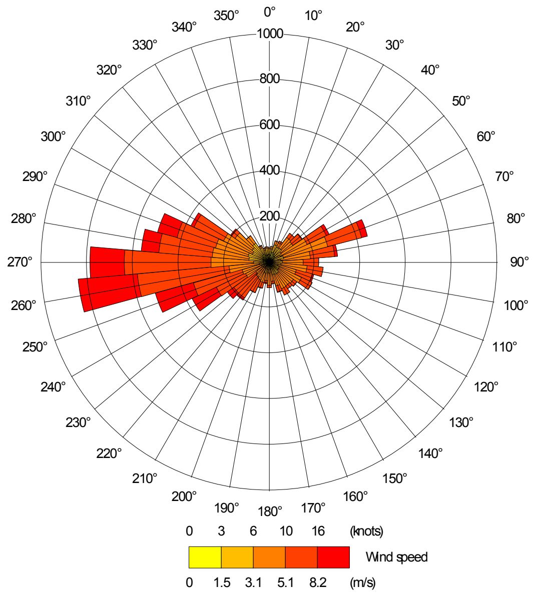
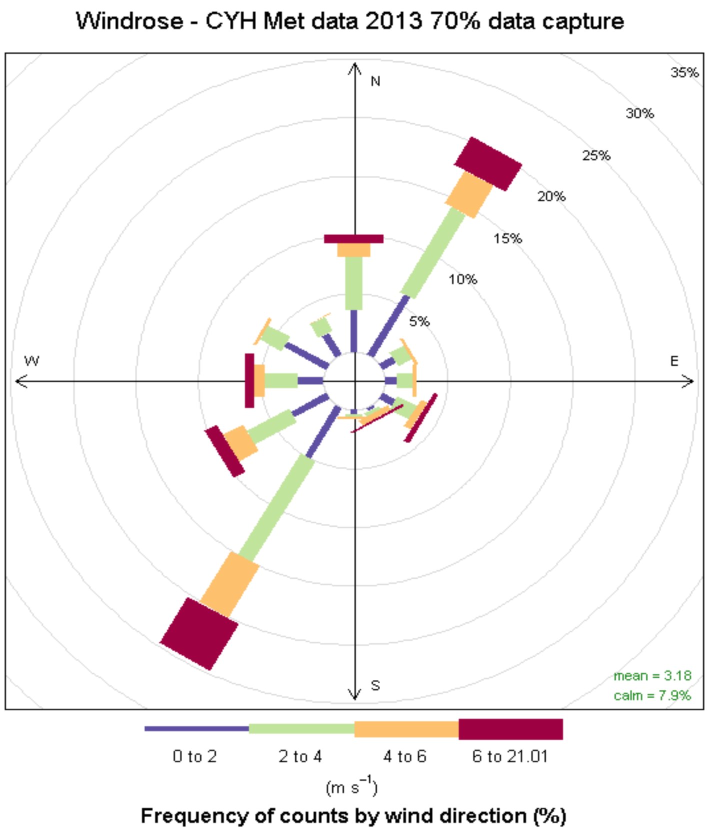


Figure 12-11 Windrose for Site Weather Station, 2013



12.5.3 Rainfall Data
Published rainfall averages for Pontypridd for the period 2000-2012 give an average total annual rainfall of 583mm and 122 days per annum with rain (1 day in every 3).

12.6 Dust Sensitive Receptors

12.6.1 Human Receptors

Potentially sensitive properties and landuses that are representative of the local community within about 300m of the proposed quarry extension at Craig yr Hesg are noted in the following table.

Table 12-14 Receptors nearest to Proposed Quarry Extension

Receptor	Distance, direction to source	Closest potential source	Screening
1. Cefn Cae / Cefnlee Farm	>265m, SE-S	Phases 2 & 3	partial -hedges and trees
2. No. 46 Greenfield Avenue	>265m, SE-S	Phases 2 & 3	partial - hedges and trees
3. Cefn Primary School	>255m, SE-SW	Phases 1 - 3	effective - woodland
4. No. 36 Conway Close	>175m, SSE-SW	Phases 1 & 2	none
5. No. 6 Pen Y Bryn	>220m, SSW-WSW	Phase 1	effective - woodland
6. Glyncoch Rugby Football Club	>160m, WSW-WNW	Phase 1	effective - woodland

Representative receptors nearest to the existing quarry, processing plant and access road are detailed below; receptors over 300m distant are considered unlikely to be affected by the existing or proposed continuation of quarry operations:

Table 12-15 Receptors nearest to Existing Processing Plant

Receptor	Distance, direction to source	Closest potential source	Screening
7. Rogart Terrace, Ynysbwl Road	100m, W-NW	stockpiles and yard	effective - woodland
8. Craig Yr Hesg house, Ynysybwl Road	170m, SW	process plant	effective - woodland
9. No 10 Glyncoch Terrace, Cefn Lane	170m, SW	1^{o} crusher feed hopper	effective - woodland
10. Garth Avenue, Old Peoples Flats, units 5-12	50m, SSE-S	haul road and 1^{o} crusher feed hopper	none

Receptor	Distance, direction to source	Closest potential source	Screening
11. Craig yr Hesg Primary School	300m, S-SSW	haul road and 1° crusher feed hopper	effective - Glyncoch Estate
12. Spar Supermarket, Garth Avenue	50m, SSE-S	haul road and 1° crusher feed hopper	none
13. No 113, Garth Avenue	45m, E- S	haul road	partial
14. No 24, Gardner Close	60m, E-SE	haul road	effective - woodland
15. No 28, Coed-y-Lan Road	120m E-S	haul road	effective - woodland
16. Club house, Rugby Football Ground	90m, E-WSW	quarry void and haul road	effective - woodland

The identified receptors are shown on Figure 12.13 and have been selected as being representative of the other potentially sensitive locations in the vicinity of the quarry and associated workings.

12.6.2 Ecological Receptors

Sandstone quarry mineral dust emissions are inert and chemically unreactive and pose little risk to the natural flora and fauna surrounding the site. High deposition rates may cause soiling of leaf surfaces and a reduction in photosynthesis, however inspection of vegetation surrounding the existing operations has revealed no evidence of significant soiling.

There are no statutorily designated ecological sites within the Study Area. The nearest designated site is Nant Gelliwion Woodland SSSI which is located 3 km to the southwest of the site and outside any possible influence of the site.

Local areas of conservation interest are likewise not expected to be affected by air emissions.

12.7 Assessment of Effects and Significance

12.7.1 Sources of Dust

The principal potential sources of airborne dust associated with the proposed quarrying and existing processing operations at Craig Yr Hesg include:

- soils stripping, storage and restoration, including screening bund construction and removal,
- drilling and blasting,
- loading and tipping,
- site haulage,
- crushing and screening,
- aggregates stocking,
- asphalt plant,
- road transport, and
- wind blow across bare ground and stockpiles.

12.7.2 Excavation

The drilling rigs are modern self-propelled units and are equipped with cyclones and filtration systems to minimise dust emissions. The blasting operations are designed to minimise excessive breakage, fly rock, noise and vibration and this will also reduce dust emissions. Any emissions from blasting will be short-lived and tend to be largely retained within the quarry void. Procedures are in place to condition sensitive areas with water from a bowser rain gun prior to blasting. Drilling and blasting is unlikely to result in significant dust emissions. Loading of the blasted rock results in localised dust emissions but these are retained within the quarry void.

12.7.3 Bund Construction

The surface soils around the quarry are generally free-draining, however the areas and volumes of soil for stripping, storage and restoration operations are so limited as to be unlikely to give rise to significant airborne dust emissions. Construction of the screening bund is expected to require approximately 57,000m^3 of material that will include stripped topsoil and subsoil and overburden, and quarry waste currently stored within the quarry void.

The bund construction will utilise dump trucks and bulldozers and is expected to take up to 8 weeks. The stepwise approach given by IAQM in "Guidance on the assessment of dust from demolition and construction" (2014) has been followed in assessing the potential dust impact from bund construction (and removal). The potential dust emission magnitude is defined as **Medium** scale (<100,000 tonnes material movement; <10 items of heavy earthmoving equipment operating at any one time; earthworks utilise a mix of soil types predominantly of gravel, sand and silt fractions with little clay).

The sensitivity of receptors in the area, which includes residential properties and Cefn Primary School, is defined as **High**.

No receptors lie within 100m of the bund and the sensitivity of the area to dust soiling is therefore **Low**. With respect to PM_{10}, annual mean background levels are expected to be <24 μg/m^3 based on RCT/UWE Pineview data and LAQM mapping. As the distance to the source is >100m the sensitivity of the area to Human Health Impacts is therefore **Low**.

Ecological sensitivity of the area is regarded as **Low** (no specific conservation designations or dust-sensitive species).

The combination of Medium scale operations with Low sensitivity of the area results in an assessment of **Low Risk** of dust impacts from dust soiling and for human health.

In the Low Risk situation, IAQM advises that certain mitigation measures should be applied. These are set out in Section 12.8.8.

12.7.4 Processing Plant

The Primary Crusher feed hopper is located at the northern end of the processing plant in an elevated position. The feed hopper is regarded as the most sensitive potential source for fugitive dust leaving the site. Arrangements for minimising dust emissions from this area include the use of flexible curtains over the entrance to provide containment, and use of mist spray systems to settle dust. The haul road and dump truck turning area are fitted with fixed water sprays to prevent dust raising from the road surface. No visible dust has been observed on any SGP inspections over the last 2 years.

The crushing and screening of hard rock such as sandstone can result in significant dust emissions. Consequently the crushing and screening processes at Craig Yr Hesg are fully enclosed within clad structures to provide generally effective containment of any emissions. The use of water sprays at the screens and at transfer points reduces the amount of airborne dust and the air extraction and filtration system at the secondary crusher house further reduces any impacts. However, height of release of exhaust air from the dust arrestment plant could result in a plume level with the top of the quarry, potentially resulting in increased levels of particulates at the downwind site boundaries. Screening by trees is likely to minimise any such effects with the exception of the northern boundary opposite Garth Avenue, Glyncoch. However winds blowing in this direction are infrequent, at around 4% of the year.

The external conveyors are fitted with covers and weather boards. The transfer points are generally shrouded and fitted with water sprays to contain and suppress dust. Some deposits are present on the structures and underneath the return belts of several conveyors although visible dust emissions were not observed. Fines and dust are conditioned with water prior to being returned to the quarry void, and are therefore unlikely to give rise to airborne dust.

The ground level aggregate load-out point is open on two sides to permit access by HGVs, but is located in a sheltered position on the lower quarry floor. Transfer operations in this area may result in visible dust, but this is unlikely to travel to the site boundary. During dry conditions, further visible emissions may arise during operations at the adjacent aggregates stocking ground, although again this is in a sheltered location.

12.7.5 Asphalt Plant

The asphalt plant has been subject to a separate air quality assessment but the key findings with respect to PM_{10}s are reproduced below.

Atmospheric dispersion modelling of the predicted stack emissions from the plant using a number of conservative assumptions indicated that the most affected receptor could be Craig Yr Hesg House on Ynysybwl Road. The predicted increase in the annual average PM_{10} concentration due to the plant was 1.73 μg/m^3; this is 4.3% of the Air Quality Objective and is defined as a *small* magnitude change, the overall effect with respect to long term PM_{10} concentrations being *negligible*. The short term (24 hour average) PM_{10} levels from the plant were indicated to be *insignificant*.

It followed that no other receptors would be significantly affected by PM_{10} emissions from the coating plant stack. The modelled increase in PM_{10} concentrations from the plant at the closest area of Glyncoch to the north of the site were between 0.61 and 0.78 μg/m^3 as an annual average, with the 90th percentile increment being ~2.8 μg/m^3. Neither figure is regarded as significant in terms of increased risk of breaching air quality objectives based on the most recent RCT data for Garth Avenue.

Other emissions including volatile organic compounds and odour resulting from oil burning and bitumen coating processes were also modelled, and it was predicted that concentrations would be insignificant at the site boundary; odour nuisance from stack emissions was predicted as unlikely to be experienced by receptors outside the quarry, although slight odours could be experienced infrequently at the closest neighbouring houses.

12.7.6 Stockpiles

Following processing, the aggregates tend to be moist and, as a result, subsequent loading and tipping operations are unlikely to result in significant dust emissions except when the dried surfaces of stockpiled aggregates are disturbed. The stockpiles are contained in a sheltered position within the existing quarry, and significant dust releases from these are considered unlikely.

During dry windy conditions, visible wind blown dust may be raised from large areas of open or bare ground, including stripped and restored areas, stockpiles and other unsurfaced areas, particularly where the materials are loose or have been disturbed by traffic or other operations. The principal areas include the future extraction area to the northeast of the main void, and associated fines tip. The latter is stable and crusted over in its undisturbed state, but will be excavated to gain access to the unworked mineral beneath. In dry conditions, and during strong southerly or southwesterly winds, the area should be conditioned by rain gun prior to extraction to avoid dust being blown through the gap towards Glyncoch. It is proposed to utilise the quarry fines as part of the screening bund construction around the proposed extension; this will be a potentially dusty operation necessitating the use of water conditioning to maintain the material in a damp condition during tipping and grading and before the material is capped with subsoil / topsoil. Similar requirements will apply during restoration of the worked out areas of the quarry.

12.7.7 Transport: Internal movement

Site haulage is typically the greatest source of fugitive dust at quarries, particularly over longer haul distances when speeds tend to be higher and there is an added requirement to maintain a smooth well-drained surface. This is recognised at Craig Yr Hesg and a high standard of maintenance has been adopted on the main haul routes. The deployment of a high capacity water bowser further reduces the magnitude of any impacts. Fixed water sprays are installed to maintain damp surfaces on the haul road leading from the quarry void to the Primary Crusher, and the haul road also runs below adjoining ground level and is screened by a rock wall and woodland to the northwest except adjacent to the Primary Crusher where there is screening bank about 2-3m in height with light tree cover. No visible emissions have been observed from the haul road and primary crusher turning area since installation of fixed water sprays, and dust emission risks appear to be low.

12.7.8 Transport: Access Roads

Road transport accesses the site on fully surfaced roads. Vehicles accessing the aggregates stocking ground travel on compacted gravel surfaces. This may result in localised visible dust emissions and some track-out may also be carried onto the internal access roads and circulation areas, resulting in further dust emissions in dry conditions. In general however, the free-draining nature of the sandstone quarry and surfaces means that mud and silt track-out does not appear to be a significant concern. All departing HGV transport is cleaned at the wheel-wash which appears to be effective. All loaded aggregates lorries are sheeted to minimise the effects of wind-whipping. Overall, road transport does not result in significant dust emissions within or beyond the site boundaries.

12.7.9 Restoration

The principle risk from quarry restoration will relate to the placement of soils and overburden on defined areas of the quarry benches and on the floor of the quarry void. The potential for dust and air quality impacts is considered to be low.

12.8 Risk of impacts

12.8.1 Dust

The estimated effects of dust arising from the proposed quarry extension and continued quarry operations at representative receptors are set out in Tables 12.16 and 12.17 respectively. Individual areas or groups of receptors are discussed below.

Properties along Ynysybwl Road

The extension proposals are sufficiently distant at over 500m from settlements alongside Ynysybwll Road to pose negligible risk of dust impacts.

The prevailing winds blow from the direction of the quarry yard and processing plant up to about 35% of the time, however the hillside between the receptors and sources is heavily wooded and screening of dust is likely to be effective. At distances of between 100m and 200m the potential risks of dust impacts in the absence of control measures are slight.

Glyncoch Estate

The eastern part of the estate at over 200m distance is sufficiently remote and screened by woodland from the proposed extension to be at negligible risk. The areas of the estate to the northeast, in particular Conway Close, are potentially vulnerable to emissions from the extension in the absence of mitigation, being located close to or just inside the prevailing wind direction from the southwest which occurs over around one third of the time. The maximum estimated impact from dust, at Moderate, is predicted for the southern end of Conway Close, however it is likely that the screening bund will provide an effective barrier. Additional mitigation in the form of a rain gun to dampen down surfaces could be employed if required during prolonged dry periods. As the quarry is deepened so the risk of dust escape from the void will diminish.

The presence of old peoples flats on northern flank of the quarry haul road and loading hopper to the primary crusher is viewed as a high sensitivity land use, with vulnerable residents. However winds are infrequent from a southerly direction at around 3% of the time on average. Nevertheless, this southern fringe of the Glyncoch Estate, including a restaurant, shops and residential housing, remains at slight risk from infrequent nuisance dusts and PM_{10} from the site. Emphasis has therefore been placed upon the deployment of dust controls in this part of the quarry. The accumulation of PM_{10} monitoring data combined with local weather records in this area has enabled progress to be made in the detailed assessment of air quality here. Whilst there have been variable air quality levels, and evidence points to intermittent local sources, including the quarry, the recent data demonstrate no breach of the air quality objectives that are set to protect human health.

Other parts of Glyncoch, including the primary school located to the north, are sufficiently remote to be unlikely to be affected by uncontrolled releases of dust from the site. The risks for these receptors reduce to negligible.

Figure 12-13: PM10 Receptor Locations

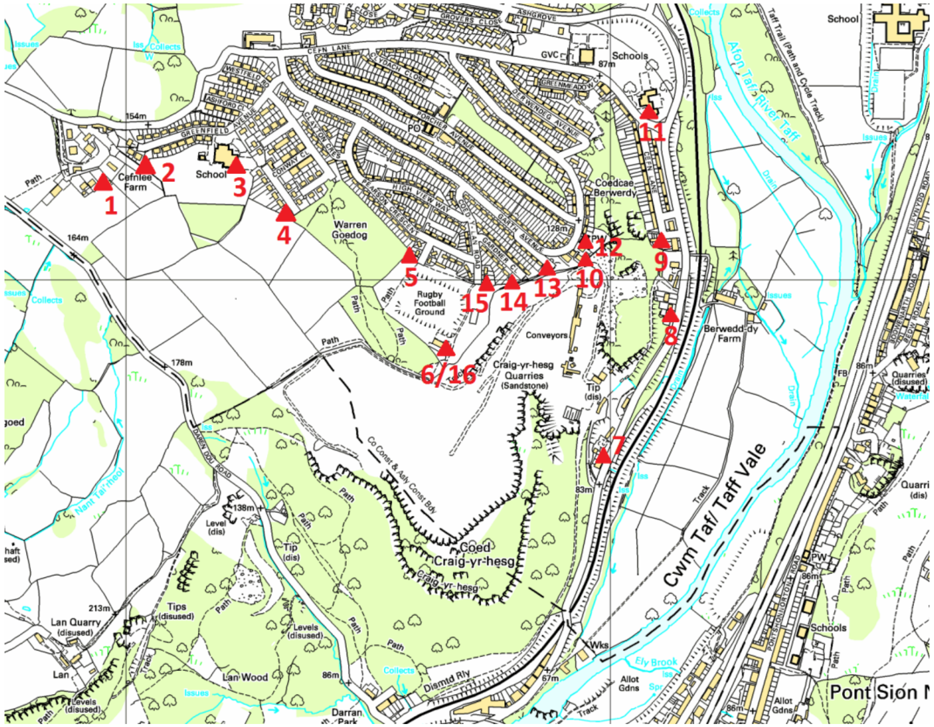


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Table 12-16 Estimated Risks of Dust from Proposed Quarry Extension

(See figure 12-13 for locations of receptors)

Receptor	Minimum distance (m)	Screening	Wind freq %	Probability	Magnitude	Impact	Comments
1. Cefn Cae	250 (phases2 & 3)	partial	7	low	small	negligible	
2. No 46 Greenfield Avenue	265 (phase 2)	partial	7	low	small	negligible	
3. Cefn Primary School	240 (phases 1 - 3)	full	32	high	imperceptible	negligible	Phase 3 area covers prevailing wind direction
4. No 36 Conway Close	175 (phases 1 & 2)	none	32	high	medium	moderate	Western side of Phase 2 covers prevailing wind direction, properties further to west along Conway Close have reduced impact due to very low frequency of southerly winds
5. No 6 Pen Y Bryn	220 (phase 1)	full	23	high	small	slight	
6. Glyncoch RFC	160 (phase 1)	full	23	high	small	slight	

Table 12-17 Estimated Risks of Dust from Existing and Continuing Quarry Operations

receptor	minimum distance (m)	screening	wind freq %	probability	magnitude	impact
7. Rogart Terrace	100	full	17	medium	small	slight
8. Craig Yr Hesg house	170	full	35	high	small	slight
9. No 10 Glyncoed Terrace, Cefn Lane	170	full	35	high	small	slight
10. Garth Avenue Old Peoples Flats, Units 5-12	50	full	3	negligible	large	slight
11. Craig Yr Hesg Primary School	360	full	26	high	imperceptible	negligible
12. Spar Supermarket, Garth Avenue	55	none	3	negligible	large	slight
13. No. 113 Garth Avenue	45	partial	10	medium	medium	moderate
14. No 24 Gardener Close	60	full	9	low	small	negligible
15. No 28 Coed Y Lan Road	110	full	10	medium	small	slight
16. Glyncoch RFC	90	full	45	high	small	slight

Other areas

Dust impacts at Cefn Primary School from the proposed extension are estimated to be negligible given the distance to the school and screening effect of the intervening woodland. Similarly, impacts upon housing alongside Greenfield Avenue and the Cefnlee Farm / Cefn Cae settlement are considered to be negligible due to the distance at >200m and infrequency of winds in these directions from the extension, although screening is relatively sparse.

The sparsely settled areas to the west and south of the site are also very well screened by mature woodland and are remote from the site. No significant impacts are predicted for residential and other receptors in these directions.

Daren Ddu Road is closed to motor vehicles but is a public right of way alongside the western part of the proposed extension. The road is screened by trees and has relatively infrequent winds blowing in this direction; significant dust impacts on transient users of the road appear unlikely.

12.8.2 Fine Particulates

PM_{10} will make up a small proportion of any dust emitted, but may travel 500m or more. Concentrations will however decrease rapidly on moving away from a source due to dispersion and dilution. Former guidance[6] for air quality review and assessment suggested that sources such as quarries, stockpiles and landfill sites could add up to 5 µg/m^3 to annual mean background PM_{10} concentrations at locations close to the source, and up to 3 µg/m^3 within 200 to 400m of the source.

Section 5.92E of LAQM guidance TG[09] outlines the updating and screening assessment process for fugitive and uncontrolled sources, including quarrying. PM_{10} is identified as the relevant pollutant and detailed assessment is required where relevant receptors (houses, schools, etc.) are within:

- 1000m where the background PM_{10} concentration is >28 µg/m^3
- 400m where the background PM_{10} concentration is >26 µg/m^3
- 200m for any background
- 50m of off-site roads used to access the site where the background PM_{10} concentration is > 25 µg/m^3

Given that the measured background PM_{10} concentrations in the Glyncoch area in 2013/2014 are <26 µg/m^3, a semi-qualitative assessment of PM_{10} concentrations has been undertaken for those receptors within 200m of the existing site boundary.

Other studies of air quality around large quarries have found a more typical ~ 2 µg/m^3 increase in PM_{10} concentrations. With respect to receptors near to the proposed extension area, and remote from processing plant, an average 2 µg/m^3 increase in PM_{10} from quarrying is assumed.

It is conservatively assumed that at worst there is an average 5.2 µg/m^3 contribution from the site to the background concentration (based on the RCT/UWE Garth Avenue weekday to Sunday difference of 4.5 µg/m^3, plus the predicted asphalt plant maximum contribution of 0.7 µg/m^3).

Using the IAQM approach detailed in Tables 12.7 and 12.8, the predicted impacts on receptors from PM_{10} from the proposed extension and existing quarry operations are given in Table 12.19.

[6] DEFRA, Local Air Quality Management, Technical Guidance LAQM.TG[02], 2002

Table 12-18 Assessment of Potential Significance of PM10 from Quarrying

Impact Area	Back-ground Conc.	Increase	Predicted Conc.	Change in Conc.	Impact Description
housing within 200m of quarry extension (6 houses)	13.6 (LAQM map)	2 (5% of AQO)	15.6 (39% of AQO)	small-medium	negligible
	20.95 (RCT/UWE Pineview)	2 (5% of AQO)	22.95 (57.4% of AQO)	small-medium	negligible
housing, shop and fast food outlet within 200m of existing quarry operations	21 (Dustscan 2013/14 monitoring)	5.2 (13% of AQO)	26.2 (65.5% of AQO)	large*	negligible
	27.2 (RCT/UWE 2011/12 monitoring)	5.2 (13% of AQO)	32.4 (81% of AQO)	large*	slight adverse

Notes: concentrations in μg/m^3 * refers to potential extension in time only

The assessment indicates negligible impact from PM_{10} for human health at receptors surrounding the proposed extension area.

With respect to the continuing quarry operations and processing plant emissions, the impact is described as negligible based on the most recent 2013-14 monitoring data, or possibly slight adverse based on the UWE indicative monitoring from 2011-12.

12.9 Mitigation Measures

12.9.1 Management and Communication

To minimise the potential impacts, the continuation of quarrying, related operations and the extension development will be conducted in accordance with best practice guidance[7],[6] and, for the prescribed processes, the existing environmental permit conditions. The essence of the guidance is that dust emissions can be controlled by effective site management.

The measures for the control of dust on site will comply with any conditions which may be specified by RTC; will involve a continuation of current visual monitoring and controls; and will accord with the Hansen Environmental Management System. The Quarry Manager will refer to the planning conditions and routine visual inspections to determine his response to potential or actual dust emissions, taking into account current and forecast weather conditions.

The Quarry Manager will record all dust and air quality complaints, identify causes, take appropriate measures to reduce emissions in a timely manner, and record the measures taken. A complaints and activities log will be maintained and made available to RCT if requested.

[7] Best Practice Guide, *Dust and Mineral Operations*, appended to *The Environmental Effects of Dust from Surface Mineral Workings*, DoE, 1995

12.9.2 Development and Restoration

Soil stripping and restoration are generally a short-term seasonal activities and there is considerable flexibility as to timing. Soils handling, particularly of the soils in the extension area closest to Conway Close, will therefore be suspended when wind conditions are likely to result in dust being carried off-site. The effects of wind blow across stripped surfaces and other areas of bare ground will be minimised by ensuring that loose soils and other materials are not left untreated on the ground. During dry conditions, water will be applied as necessary to stabilise any loose bare surfaces. A proprietary stabiliser should be applied to any loose surfaces which are likely to remain bare temporarily; where surfaces are likely to remain bare for a long period then these should be restored with vegetation.

Screening bunds will be seeded at the earliest opportunity to bind the surface and minimise the effects of wind blow.

Impacts during mineral extraction, which are unlikely to be significant, will be controlled by minimising the drop heights of as-dug material onto the ground. If necessary, any dry surfaces at the highest levels of the quarry can be sprayed using a rain gun attached to one of the water bowsers before blasting and excavation is carried out.

Similarly, drop heights will be minimised to reduce any impacts associated with loading and tipping operations, particularly of the quarry fines to be used within the screening bund construction. The fines will be conditioned as necessary to ensure a moist condition and will be placed spread, compacted and covered as quickly as possible to avoid drying out and disturbance by wind or subsequent plant movements.

12.9.3 Haulage

Care will be taken in respect of site haulage, both of soils near the site boundaries and of mineral. The main haul route from the extraction area will be maintained and extended within the quarry void as the quarry develops to the northwest of the quarry.

The main haul route as it approaches the Primary Crusher cannot be re-located away from receptors adjacent to the northern boundary, and there is limited scope of additional screening, in the form of additional perimeter bunds and tree planting here. The main dust mitigation measures for this section of haul road will rely upon:

- dust suppression by regular spraying from fixed spray lines, supplemented as necessary by bowser under in dry conditions,
- avoiding abrupt changes in horizontal and vertical alignment,
- regular compaction, grading and maintenance of haul routes,
- setting a site speed limit of 10 mph,
- fitting all site vehicles and plant with upswept exhausts and radiator fan shields, and
- evenly loading vehicles to avoid spillages,

All site traffic will keep to the designated haul routes to reduce the creation and subsequent entrainment of fine material into the atmosphere.

Water for dust suppression will be provided from the existing mains supplies. The water supply to fixed equipment will be protected from frost.

No additional measures are required in respect of HGV exhaust emissions.

12.9.4 Minerals Processing

The existing Environmental Permit specifies a range of measures designed to manage emissions to air. With respect to processing,

In addition to maintaining the existing covers and weather boards to the conveyors, any minor impacts will be mitigated by:

- maintenance of the structure and rollers to minimise shaking and spillages,
- shrouding of the feed hoppers, transfer points and final discharges,
- clearance of any spilled mineral to avoid accumulations, and
- minimisation of drop heights at loading and discharge points.

The existing wheelwash arrangements are currently undergoing reorganisation to reflect the adoption of a single quarry entrance and two-way traffic.

The mitigation of fine particulates emissions will be achieved primarily by means of the standard mitigation measures for general dust outlined above and continued implementation of the PM_{10} Emmissions Action Plan. In addition, maintenance of dust filters, including the recovery of fines, will be carried out in accordance with existing procedures.

12.9.5 Storage and Loading

General matters and the management of the site can affect the likelihood of significant dust emissions. These include:

- use of clean water for dust suppression, to avoid re-circulating fine material,
- high standards of house-keeping to minimise track-out and wind blown dust,
- a preventative maintenance programme, including readily available spares, to ensure the efficient operation of plant and equipment, including fixed and mobile dust suppression plant, and
- effective staff training in respect of the causes and prevention of dust.

As already takes place, any drying stockpiles which result in wind blown dust or excessive saltation will be sprayed using the rain gun attached to a water bowser, or using fixed sprays.

12.9.6 Monitoring

The current programme of dust monitoring should be reviewed in the light of the findings from the 12 month study period under ROMP condition 32. As further results of RCT monitoring of fine particulates at Garth Avenue become available, a review of the need for additional PM_{10} environmental monitoring at the site boundary should be carried out.

In the event of adverse PM_{10} concentrations being detected, further monitoring surveys within the site may be required to identify key sources, together with the deployment of additional routine monitoring and mitigation measures where appropriate. It is likely that attention will be focussed upon the Primary Crusher feed hopper and process plant area and dust arrestment plant stack where the risks of impacts outside the site appear to be greatest.

There has been no requirement for nuisance dust monitoring around the site to date. Given the low risk of dust soiling at receptors outside the site resulting from the extension proposals, IAQM guidance is that there is no requirement for new deposition monitoring, although the Site Manager should investigate any dust complaints or incidents of visible dust crossing the site boundary.

The site weather station will be maintained and records kept; these may be referred to assist in the investigation of complaints or records of elevated PM_{10} levels to help determine or lemintae sources.

12.10 Residual effects

Assuming that the specified management and monitoring arrangements are maintained and applied to the proposed quarry extension then there are considered to be no long-term significant impacts for air quality or nuisance dust, with Air Quality Objectives designed to protect human health currently being achieved.

The extension area lies closest to properties alongside Conway Close, however the preliminary deposition monitoring on the northern edge of the existing quarry void shows insignificant levels of quarry dust, with concentrations in the expected background range. However, short-term risks could be increased during the initial development of the quarry extension, including during the screening bund construction. Any impacts can be mitigated by dust suppression and careful working or suspension of work during adverse weather conditions when dust could cross the site boundary.

Separate to the development in the extension area, the existing mineral processing operations, and recommencement of asphalt production, will continue to be a source of airborne fine particulates that will require further monitoring and regular re-assessment. At present, there is evidence for the quarry being a minor infrequent source of particulates in the Garth Avenue area of Glyncoch, however the potential exists for intermittent pollution episodes resulting from combinations of weather conditions and site operations.

Further work is needed to understand the occasional identified increases in PM_{10} levels at Garth Avenue, typically developing mid-week in the afternoon, to determine whether this may have a quarry source, and, if so, where appropriate mitigation measures can be reasonably deployed.

Other potential residual effects on air quality, again separate to the development in the extension area, are limited to the extended operation of the asphalt plant, and the potential for bitumen odours to be experienced outside the site. These elements already enjoy the benefit of planning permission and previous assessment of the odour potential indicated this to be slight, and likely to be heavily influenced by a number of factors. The plant is subject to regulation by RCT under an Environmental Permit, and residual effects from the plant operation, many years ahead, can be reasonably assumed to remain minimal.

12.11 Summary and Conclusion

The air quality assessment has considered the impacts of the proposed westward extension of the existing quarry on potential receptors in the vicinity. These include the occupants of houses and a school to the north and northwest at Glyncoch. Due to the separation distances between the potential receptors and the extension, the local presence of screening woodland, and the low frequency of winds between the extension and receptors, the potential impacts from wind-blown dust are generally negligible. An area of housing in Glyncoch around Conway Close does lie sufficiently close and within a more frequent wind direction to potentially experience moderate impact in the absence of mitigation measures. However, preliminary dust deposition monitoring adjacent to the existing quarry shows negligible rates of dust deposition, and when the screening effect of the perimeter bund, and the majority of quarrying operations being at greater depth are taken into account, then the potential impacts from dust at the potentially most vulnerable receptors are likely to be of short duration and slight.

Nuisance dust is not considered to be a significant issue currently outside the site. Whilst recent monitoring results for dust deposition alongside the main quarry haul road have recorded elevated levels of solids, the area in question is subject to dust suppression measures. Air quality observations to the north of the existing quarry processing plant, in the Garth Avenue area of Glyncoch, have been the subject of much analysis over recent years, with monitoring of PM_{10} being carried out by Hanson and RCT. Data over the last 12 months shows no likely breaches of the air quality objectives designed to protect human health. Winds blow from the south, from the quarry towards Garth Avenue relatively infrequently, however elevated levels of PM_{10} have been detected on some occasions, with the quarry being identified as a contributory source. Data obtained over the period 2010 to 2011 by the University of West of England on behalf of RCT showed at worst a potential contribution of about 4.5 $\mu g/m^3$ to long term average PM_{10} concentrations from the quarry to Garth Avenue receptors; this is 11.2% of the air quality objective.

Recent (2014) monitoring by RCT has shown average PM_{10} concentrations at Garth Avenue to be about half of the long term air quality objective, with no significant probability of the short term objective being exceeded. The necessary conclusion is that the existing quarry operations are not causing unacceptable impacts with respect to PM_{10} outside the site. Other residential receptors are more distant from potential quarry sources and are considered to be relatively much less vulnerable to quarry sources of PM_{10}.

The pending re-commencement of asphalt production within the processing plant area will provide an additional source of PM_{10}, and dispersion modelling predicts a potential increase in PM_{10} in the Garth Avenue area of 0.7 $\mu g/m^3$, which is considered to be negligible.

Therefore, the overall effect of an extension to the life of the quarry operations is concluded as acceptable in terms of human health, as air quality objectives outside the site will continue to be met. Nevertheless, the quarry is acknowledged as a potential source of particulate emissions that will require continued management and further monitoring. It is a requirement of the existing Environmental Permit covering the quarry processes and asphalt production that best practicable means are used to control emissions, and the Permit will continue to be reviewed and enforced by RCT.

With regard to other air quality issues, in particular the potential for odour releases from the asphalt plant, the potential for nuisance impact is considered to be slight to negligible.

13.0 TRANSPORTATION

13.1 Introduction

This Chapter of the ES has been prepared by the Hurlstone Partnership, and considers the traffic effects of the proposed extension development which would serve to extend the life of the existing quarry and the duration of traffic movements associated with it.

Chapter 1.0 of the ES sets out the planning history of Craig yr Hesg Quarry and confirms the extant planning permissions under which activities may currently take place. The quarrying activities at the site were subject to a ROMP application, which was determined on 24 April 2013 and included 49 planning conditions (ref 08/1380/10).

The schedule of planning conditions imposes an end date for extraction and processing of materials of 31st December 2022, with a further 12 month period to dispose of processed material. There are no restrictions on output or vehicle movements.

In addition to the quarrying planning permission (08/1380/10), GDPO approval of details under Part 19 of the General Permitted Development Order was issued in November 2013 for the construction of a new asphalt plant (13/0825/23). This permits a new asphalt plant to be constructed within the site, which would effectively be a replacement for the old plant that was decommissioned in 2009.

In terms of highway and transport issues, the proposed development will result in no material change when compared with the existing situation in terms of output or associated traffic movements, noting that recent and historic annual production has been approximately 400,000 tonnes per annum. The proposed extension development is not in itself anticipated to alter the traffic movements to/from the site.

With reserves in the extension area of some 10m tonnes, the proposed development would simply result in the activities at the Quarry continuing for a further period of some 25 years based on a continuation of current output levels of some 400,000 tonnes per annum. The reserves are considered to be a nationally valuable product due to their suitability for the production of skid resistant surfacing.

13.2 Site Access

Historically, the Quarry used two access points to the B4273 Ynysybwl Road / Berw Road, in locaions approximately 440m apart. The B4273 is subject to a 40 mph speed limit in the vicinity of the site.

The southern connection formed the main site access for all vehicles and also the egress for light vehicles. The northern connection served as the egress for HGV traffic leaving the site.

Planning permission (13/1039/10) was issued in March 2014 to improve the southern access to provide for two way HGV traffic which will, when completed, allow the HGV traffic currently using the northern access to be diverted to the southern access. The southern access currently has a superior level of visibility than that to the north, and the existing visibility splays will be further improved as part of the works to achieve 120m in either direction from a 4.5m set-back position, in association with kerb revisions and general widening of the bellmouth and the bend in the access road beyond. The improvements to the southern access will be completed during March / April 2015 and will be fully commissioned prior to the commencement of any extraction within the extension area.

Almost all HGVs travelling to/from the Quarry do so via the B4273 to the south of the site, where they continue to Pontypridd before heading east to join the A470 where they distribute primarily towards the south, where the larger conurbations in South Wales and M4 Motorway may be accessed.

13.3 Baseline Conditions

Output from the quarry averages some 400,000 tonnes per annum, which is distributed in HGVs via the local highway network.

Approval was granted in November 2013 (13/0825/23), for the construction of a replacement asphalt plant within the site. The replacement asphalt plant is under construction, and it is anticipated that the plant will be commissioned in May 2015.

The existing operational hours in terms of HGV movement to/from the site are restricted by planning condition to 07:00 – 19:00 Monday to Friday and 07:00 – 16:00 on Saturday, with no working on Sundays or Bank Holidays (condition 15). However, these time limits do not apply to the asphalt plant, due to the increasing practise of undertaking highway maintenance at night.

13.4 Assessment of Traffic Effects

13.4.1 Study Area

The study area for the assessment of traffic effects includes the site access, the B4273 to the south down to the signal controlled junction with the A4223, and the A4223 link to the A470 dual carriageway.

The access to the site and description of the B4273 is provided in Section 13.2 above.

Continuing south along the B4273 into Pontypridd, the carriageway width varies between 6.4m and 8.9m in width. Approximately 260m to the south of the main access, the B4273 crosses over a railway line through a left-right bend on a bridge.

Immediately to the south of the bridge the speed limit reduces to 30 mph and the route becomes more urban in character, with terraced housing and on-street parking on the west side of the route. In the vicinity of the on-street parking, the effective carriageway width reduces to 4.65m. Observations on site confirm that vehicles are able to pass each other when travelling in opposite directions along this section of the highway.

Approximately 250m southwest of the bridge over the railway line, the carriageway passes below another rail bridge. This railway bridge is immediately to the north of the bridge over the River Taff (which has an 18 tonne maximum gross weight limit in place) and connects to The Parade. From this point the B4273 runs parallel to and west of the River Taff to the signal controlled junction with the A4223. A pedestrian footway is introduced on the east side of the carriageway as it approaches and passes under the railway bridge, which continues to the A4223 and beyond.

To the southwest of the bridge to The Parade, there is further terraced housing extending approximately 110m. The on-street parking along their frontages reduces the effective carriageway width to a minimum of 4.25m. Where vehicles were not parked the width of the carriageway is approximately 6.5m.

Observations on site revealed that some vehicles passed each other with care, whilst others gave way on a give and take basis over the narrowest section.

Towards the southern end of the terraced housing there is a speed camera enforcing the 30 mph speed limit, on street bus stops and further on-street parking. The nominal width of the carriageway beyond the speed camera increases to 8.9m, with a clear width of 6.8m where vehicles were parked on the west side of the route.

Continuing southbound, housing is reintroduced on the west side of the carriageway. Double yellow lines are introduced for a short distance in the vicinity of Lewis Terrace as the road passes through a left hand bend when travelling southbound. Beyond the bend, single yellow lines imposing parking restrictions between 7am to pm Monday to Saturday line both sides of the carriageway, which has a nominal width of 7.3m, narrowing to 6.1m on the approach to the A4223. However, there are two lay-bys on the east side of the carriageway, which were occupied by several vehicles during the site visit.

As the B4273 approaches the A4223, double yellow lines are introduced and the southbound lane widens to provide two traffic lanes at the signal stop line.

The nearside lane is marked for left turning traffic onto the A4223 to cross the River Taff towards the A470 and also ahead movements to Taff Street.

The offside lane is marked for right turning vehicles only, onto the A4223 Gelliwastad Road, which continues south towards the intersection with the A4058.

The majority of Quarry vehicles turn left to cross the River Taff and follow the A4223 for approximately 220m to its grade-separated roundabout junction with the A470 dual carriageway, which is partially signal controlled.

The configuration of the junction allows access to the north facing traffic lanes of the A470 dual carriageway. However, the A470 is elevated above the junction and as a result, in order to access the south facing traffic lanes of the dual carriageway, drivers travel along parallel access roads adjacent to the main route on each side for approximately 0.5km to the grade-separated junction between the A470 and A4058, where access to from the southern section of the A470 is available.

13.4.2 Traffic Conditions

In order to establish baseline traffic conditions in the area, the Highway Authority, RCT, was contacted. The Highway Authority interrogated its database and provided two traffic surveys on the B4273 to the south of the Quarry access.

A 7 day survey undertaken from 09/03/2012 and a 5 day survey undertaken from 01/03/2013 were provided.

In terms of the 7 day survey, the results revealed that the daily traffic flows between Monday and Friday over the 24 hour period ranged between 11114 and 11918 vehicles, giving a day to day variation of 804 movements, with an average over the 5 days of 11584. The flow on Saturday was lower at 8364 vehicles, including 454 (4.8%) HGVs.

The HGV proportion during the 5 day week averaged 7.3%, which equates to 846 vehicles per day.

The AM peak hour flow between Monday and Friday was found to occur between 08:00 – 09:00 with an average of 946 vehicles (246 northbound / 700 southbound), of which 71 (7.5%) were HGVs. The day to day variation during the AM peak hour was 67 vehicles from totals of between 910 and 977 movements.

The PM peak hour occurred between 17:00 – 18:00 with an average flow of 974 vehicles (638 northbound / 336 southbound), of which 46 (4.7%) were HGVs. The PM peak hour flows ranged between 930 and 1010 movements, giving a daily variation of 80 vehicles.

During the weekday working hours of the Quarry (07:00 – 19:00) the traffic flows varied between 8915 (Monday) and 9480 (Friday), giving a range of 565 vehicles. The 5 day average flow during the operating hours was 9222 vehicles, of which 742 (8%) were HGVs

The peak hour flows during the period were as described above. The hourly traffic flows varied between 579 and 1010 movements throughout the working week of the Quarry, giving an hourly variation of 431 vehicles.

On Saturday, the traffic flow between 07:00 – 16:00 was 5556 vehicles, of which 285 (5.1%) were HGVs. The hourly flows on Saturday varied between 251 and 843 movements during this period, giving an hourly variation of 592 vehicles.

The traffic survey commencing on 01/03/2013 recorded data from Friday 1st March to Tuesday 5th March inclusive. The average weekday flows from the Friday, Monday and Tuesday revealed a daily traffic flow of 11649 movements over the 24 hour period from totals of between 10903 and 12240 vehicles; giving a day to day variation of 1337 vehicles. The flow on Saturday was lower at 10297 vehicles, including 493 (4.8%) HGVs.

The HGV proportion during the weekdays surveyed averaged 7.3%, which equates to 847 vehicles per day.

The AM peak hour flow on the three weekdays surveyed was found to occur between 08:00 – 09:00 with an average of 939 vehicles (247 northbound / 692 southbound), of which 75 (8%) were HGVs. The day to day variation during the AM peak hour was 103 vehicles from totals of between 902 and 1005 movements.

The PM peak hour occurred between 17:00 – 18:00 with an average flow of 962 vehicles (633 northbound / 329 southbound), of which 41 (4.3%) were HGVs. The PM peak hour flows ranged between 926 and 992 movements, giving a daily variation of 66 vehicles.

During the working hours of the Quarry (07:00 – 19:00) the weekday flows varied between 8759 (Monday) and 9655 (Friday), giving a range of 896 vehicles. The 3 day average flow during the operating hours was 9301 vehicles, of which 739 (7.9%) were HGVs

The peak hour flows during the period were as described above. The hourly traffic flows varied between 546 and 1015 movements throughout the working week of the Quarry, giving an hourly variation of 469 vehicles.

On Saturday, the traffic flow between 07:00 – 16:00 was 5788 vehicles, of which 390 (6.7%) were HGVs. The hourly flows on Saturday varied between 261 and 831 movements during this period, giving an hourly variation of 570 vehicles.

As can be seen from the survey results above, the total traffic volumes between the two surveys are broadly similar. During some periods of the 2013 survey the traffic volumes were higher and vice versa.

The highest daily flow during the operating hours of the Quarry was recorded in 2013 (9489 vehicles), as was the highest hourly flow (1015 (605 northbound / 410 southbound). These peaks are within 0.1% (9 vehicles) and 0.5% (5 vehicles) respectively of the comparable peaks recorded in 2012, which suggests a normal daily variation, rather than any particular traffic growth pattern.

In terms of the traffic attracted to Craig yr Hesg Quarry, based on 5.75 working days per week, when excluding public holidays and planned shut-downs for extended breaks (such as at Christmas), it is established that there is a total of 287.5 working days per annum.

Based on the average output of 400,000 tonnes material being transported in 20 tonne average payloads, this equates to 70 loads per full working day, which results in 140 total HGV movements per day on the local highway network. If it is assumed notionaly that the movements are distributed throughout the operating hours, then this would result in an average of 6 loads / 12 movements per hour when taking into account the normal operating hours at the site of 07:00 – 19:00 during the week. In practice, loading tends to be concentrated in the period 07.00 – 17.00 which would give an average of 7 loads / 14 movements per hour.

In terms of the recorded HGV movements of some 847 vehicles per day in the 2013 traffic survey, the percentage of HGVs attributable to Craig yr Hesg quarry (some 140 vehicles) is approximately 16.5%.

As is apparent from the observed traffic data, both the hourly and daily total of vehicle movements associated with the Quarry fall well within the normal variations in traffic volumes on the adjoining highway network during the respective time periods.

In order to assess the operational capacity of the B4273, the peak hour traffic volume of 1015 movements has been compared with the design capacity contained in Table 2 of TA 79/99 “Traffic Capacity of Urban Roads”.

Based on Table 1 of TA 79/99, the characteristics of the B4273 are most closely matched to a UAP3 route, which has kerbside bus stops, on-street parking and frontage access.

Table 2 of TA 79/99 confirms the hourly capacity of a 6.1m carriageway of that type is 900 vehicles (one way), increasing to 1110 at 6.75m width and 1300 at a 7.3m width. The flows in Table 2 are based on a 60/40 directional split of traffic with HGV proportions of up to 15%. When allowing for the additional 40%, as the figures in Table 2 represent the higher 60% proportion of the total flow, the total two-way capacity increases to 1500 vehicles at 6.1m, 1850 at 6.75m and 2167 at 7,3m carriageway widths.

By comparing these capacities with the peak hour flow of 1015 movements (605 northbound / 410 southbound), it is apparent that the minimum one-way capacity of 900 vehicles for a 6.1m wide carriageway is approximately 48% higher than the observed flow, as is the combined flow of 1500 when compared with the two-way peak of 1015 movements observed during the 2013 traffic survey.

Based on this information, it is apparent that the current peak hour flows represent approximately 67% of the design capacity of the B4273, leaving a reserve capacity of approximately 33%, which suggests road capacity is not a material concern regarding the determination of the planning application.

13.4.3 Highway Safety Effects

In order to establish whether the activities at Craig Yr Hesg Quarry may have resulted in compromised highway safety, collision data was obtained from the Highway Authority covering the study area during the most recent 5 year period available (01 April 2008 to 31 March 2013).

The area of search included the length of the B4273 from south of the Abercynon Road junction, approximately 0.6km north of the Quarry HGV egress, to the A4223 south of the quarry; along the A4223 to the A470 and along the parallel access roads to the southern junction between the A470 and A4058.

Within this area a total of 19 personal injury collisions had been recorded, of which 17 were classified as slight and 2 as serious.

A review of the collision data revealed that none of the recorded collisions had any HGV involvement.

In the event there is a particular feature of the highway network that results in compromised safety, it is common to find a number of collisions in the same location that share similar characteristics.

In the absence of any recorded collisions involving HGVs on the local roads within the last five years, on a network that routinely accommodates HGV traffic, applying the evidence-based approach advocated in current highway design guidance indicates the existing road network can safely accommodate the HGV traffic associated with the existing activities at Craig yr Hesg Quarry and other businesses which attract such vehicles.

13.5 Development Proposals

13.5.1 Application Details

In the context of transport and highways issues, the key features of the development are summarised as follows:

- The extraction of an additional 10.0 million tonnes of stone from the proposed northwest extension area.
- The extraction of some 5.7 million tonnes of stone from the currently permitted working area.
- Sales of the dust by-product as and when demand exists, or the deposition of the dust within the Quarry void should sales not prove viable.
- The predicted output/throughput at the site is assumed for the purposes of this study to remain at recent levels of approximately 400,000 tonnes per annum on average.
- The combined activities at Craig yr Hesg Quarry are assumed to continue to attract in the order of 140 HGV movements per average day on the local highway network, which is consistent with existing activities on site.
- The existing site access arrangements have been improved in accordance with a recent planning permission.
- The types of HGVs serving the site would be consistent with current and historic operations, which have been safely accommodated on the local highway network.
- The majority of HGVs except for the occasional vehicle making a local delivery to satisfy demand in the area would travel to/from the south along the B4273 to the A4223, then to/from the west to join the A470, where the majority would head to/from the south via the dual carriageway route.

- The operating hours would remain in accordance with the existing planning permission and current/recent activities.
- In effect, in terms of highway and transport matters, the proposed development would not in itself change the current situation beyond the fact that existing hourly, daily, annual traffic movements to/from the site would continue to supply established markets with the nationally important aggregate for an additional period of some 25 years, assuming an output of 400,000 tpa.

13.5.2 Trip Generation

As described within Section 13.4.2, in terms of the traffic attracted to Craig yr Hesg Quarry, based on 5.75 working days per week, when excluding public holidays and planned shut-downs for extended breaks (such as at Christmas), it is established that there is a total of 287.5 working days per annum.

Based on the average output of 400,000 tonnes material being transported in 20 tonne average payloads, this equates to 70 loads per full working day, which results in 140 total HGV movements per day on the local highway network. These movements would be distributed throughout the day, with a notional 6 loads / 12 movements per hour when taking into account the full operating hours at the site of 07:00 – 19:00 during the week, or a notional 7 loads / 14 movements over a loading period of 07.00 – 17.00.

Other than occasional vehicles meeting local demand, all traffic heads to/from the south along the B4273, A4223 and A470.

13.6 Development Impacts

13.6.1 Environmental Impacts

In terms of the environmental effects of the proposed development related to transport matters, these are limited to noise and highway cleanliness. The inclusion of road traffic-related emissions within the Environment Act Review EIA was not undertaken on the basis, inter alia, that the quarry traffic contribution to NO2 concentrations at sensitive road-side receptors is likely to be small. It was agreed via the scoping exercise that a traffic emissions assessment would similarly not be required as part of the air quality study.

In this case, the potentially sensitive receptors are limited to the properties adjacent to the access road and those along the access route described above.

In terms of the limited number of HGVs making local deliveries, if the materials being delivered from the site were sourced from elsewhere, the same types of vehicle would still travel along the local routes, albeit from further afield, with the HGV's thus travelling over a wider area of the network.

It is also noteworthy that the HGVs attracted to the site are already anticipated and permitted to travel along the road network under the extant planning permission until 2023.

There have been no substantive changes to the local road network since that time and therefore there is no reason to believe that the highway impacts would change significantly. Any changes that may occur during the intervening period between 2023 and the end life of the development would naturally take into account the existing activities at the Quarry and the associated traffic movements.

13.6.2 Highway Capacity Impacts

The existing Quarry is permitted to distribute aggregate until 31st December 2022. During this period, it is assumed for the purposes of this traffic assessment that there would not be any significant variation in existing output rates or associated vehicle movements, although there will be fluctuations to reflect market demand.

A review of the main access route to the site confirms that the current traffic demands during the peak hour represents approximately 67% of the design capacity of the route; thus the route retains a reserve or spare capacity of approximately 33%.

As the proposed development would, in effect, simply represent a continuation of current activities for some 25 years beyond the current end date, the only potential changes in terms of highway matters are limited to traffic growth associated with other development or revisions to the highway network.

Given that the majority of new planning permissions have an implementation period of between three and five years, any extant permissions, or new permissions that may be granted up to 2023, will clearly take into account the prevailing traffic conditions on the local highway network, which includes the existing traffic activity associated with Craig yr Hesg Quarry, as would any revisions to the highway network.

Therefore, any extant or subsequently permitted development would, by definition, take into account the cumulative impact with the baseline highway conditions.

Having considered the foregoing, it is concluded that in practical terms, the proposed development would have no adverse impact on highway capacity when compared with the existing situation.

13.6.3 Highway Safety Impacts

As is apparent from the review of recorded collisions over the most recent 5 year period available, that the existing road network is capable of accommodating HGV activity associated with both the site and other businesses in the area which routinely attract such vehicles,

The last 5 years includes a period when operations at the site were ongoing at the levels assumed to continue into the future, resulting in similar traffic volumes on a day to day and annual basis.

In the absence of any recorded collisions involving HGVs on the local road network within the last five years on the routes that routinely accommodate the HGV traffic from the quarry, applying the evidence-based approach advocated in current highway design guidance indicates there is no reason to believe that the HGV activity associated with the ongoing activities at the site would have an unacceptable impact or represent an increased level of risk to safety.

13.7 Mitigation Measures

A designed – in mitigation measure has already bee implemented with the construction of the new two way access to the quarry and the improved visibility and geometry which will be associated with the new junction onto the B4273, compared to the visibility splays and geometry at the historical northern exit.

The existing road network currently accommodates the traffic associated with the activities at Craig yr Hesg Quarry, which are assumed to continue as existing for the life of operations associated with the proposed extension.

As has been established, the existing road network retains sufficient capacity to accommodate the traffic and has a sufficient level of geometric design to facilitate safe access, as demonstrated by the lack of accidents involving HGVs within the study area in recent years.

In general terms, the highway network is therefore considered to be acceptable and no geometric improvements are required to accommodate the ongoing activities at Craig yr Hesg Quarry beyond routine maintenance of the new quarry access road and its visibility splays.

13.8 Residual Impacts

Following completion of the development there should be no residual impacts in terms of transport matters.

13.9 Summary

The assessment of the impact on the local highway network of the proposed northwest extension at Craig yr Hesg Quarry has considered the extant planning permission and the implications of the proposed activities going forward.

The proposals effectively represent a continuation of current activities as the proposed hours of operation, method of transport and types of vehicle used would not materially change. Whilst there has been a revision to the existing access configuration, these works represent an improvement to the current access / egress arrangements. Traffic movements are currently permitted and can continue to the end date of the current planning permission (31st December 2022).

The safety performance of the site accesses and local highway network, which continue to accommodate daily HGV movements, has been reviewed using collision records obtained from the Council. The records confirm that there have been no recorded accidents at the accesses and no recorded accidents involving HGVs on the neighbouring highway network.

The typical rate of extraction would result in an average of 70 loads/140 HGV movements per day on the local road network.

In accordance with the ongoing and historic operations, the majority of HGVs travelling to/from the site would travel to/from the south via the B4273, A4223 and A470.

Traffic flow information provided by the Highway Authority confirmed that the B4273 currently operates at 67% of its design capacity and therefore retains a reserve or spare capacity of approximately 500 vehicles, or 33% of its design flow, under peak hour conditions. As a result, highway link capacity is not considered to be a constraint to the ongoing development at Craig yr Hesg Quarry.

13.10 Conclusions

Following completion of the review of the highway and transport implications of the proposed development it is concluded that:

- The recently improved site access is acceptable to serve the proposed development;
- The quantum of proposed development traffic is already generally accommodated on the local road network, which has been demonstrated to retain substantial spare capacity;
- There are no recent records of accidents involving HGV's in the vicinity of the quarry or on the identified access route to/from the A470; and
- The existing planning permission provides for the existing HGV activity to continue until 31st December 2022. As a result, any current, committed or future development that may be approved, which could have an impact on the local highway network, would take the existing and proposed HGV movements into account.

Accordingly it is concluded that the proposed development is acceptable in terms of highway and transport considerations.

14.0 CULTURAL HERITAGE

14.1 Introduction

This chapter of the ES has been prepared by Cotswold Archaeology and considers the likely significant effects of the proposed development on elements of the archaeological and cultural heritage resource (‘heritage assets’).

The chapter describes the assessment methodology, the baseline conditions currently existing within the site and its environs, the likely environmental direct and indirect impacts of the proposed development, the mitigation measures required to prevent, reduce or offset any significant adverse effects, and the likely residual effects after these measures have been employed.

14.2 Methodology

14.2.1 Guidance

The aim of this chapter is to address the likely significant effects of the proposed development on the cultural heritage resource, including archaeological remains and built heritage assets. This assessment has been carried out with reference to the following professional guidance documents:

- *Standard and Guidance for Desk-Based Assessment* (Institute for Archaeologists 2012);
- *Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment in Wales* (Cadw 2011);
- *The Setting of Heritage Assets: English Heritage Guidance* (English Heritage 2011).

The methodology for the assessment of development effects has been informed by *The Design Manual for Roads and Bridges*, Volume 11, Section 3, ‘Part 2: Cultural Heritage’ (Highways Agency document referred to as HA 208/07), which provides the most recent, suitable and widely-acknowledged guidance on heritage impact assessment (Highways Agency 2007).

14.2.2 Baseline Methodology

This ES chapter is informed by *Craig yr Hesg Quarry, Pontypridd, Rhondda Cynon Taff: Cultural Heritage Assessment,* prepared for the quarry as part of the ROMP review (Cotswold Archaeology 2010), and included as part of the 2010 ES submitted in support of the ROMP application.

The 2010 Assessment aimed to establish the known cultural heritage resource within the ROMP Review site and its environs, and the significance of any cultural heritage assets. The current assessment also seeks to establish the archaeological potential within the site, including the extension area, through the examination of available resources.

The baseline survey involved the consultation of readily available archaeological and historic information from documentary and cartographic sources. The major repositories of information consulted comprised:

- UNESCO World Heritage Site list;
- Cadw heritage designations: Listed Buildings, Scheduled Ancient Monuments; Register of Landscapes of Outstanding and Special Historic Interest in Wales; Register of Parks and Gardens of Special Historic Interest in Wales and Register of Battlefields;
- COFLEIN database of archaeological sites and events maintained by the Royal Commission on the Ancient and Historical Monuments of Wales;
- Aerial photographs held at the National Assembly for Wales;
- Glamorgan-Gwent Archaeological Trust (GGAT) Historic Environment Record (HER);
- Glamorgan Record Office;
- Online sources, including the local planning policy for Rhondda Cynon Taff County Borough Council;

- Site visit.

As part of this ES chapter, some of the sources mentioned above, including the Cadw, HER and COFLEIN datasets as well and the local planning policy information, were reviewed and updated to ensure that the cultural heritage baseline is accurate.

This chapter has considered a study area of minimum 500m around the site, although heritage assets within the wider surroundings of the site were also considered, where deemed necessary.

14.2.3 The Value of Heritage Assets

The assessment of value has been primarily guided by the policies and guidance contained in the document *Conservation Principles* (Cadw 2011). This states that: 'the objective of understanding the heritage values of an historic asset and assessing its significance is to enable an authoritative statement of significance to be made, and allow for the effects of proposed changes to be evaluated' It goes on to describe value as a combination of the following four aspects:

- Evidential value, derived from the potential of a place to yield evidence about past human activity and primarily associated with physical remains or historic fabric;
- Historical value, derived from the ways in which past people, events and aspects of life can be connected through a place to the present. This can derive from particular aspects of past ways of life, or association with notable families, persons, events or movements;
- Aesthetic value, derived from sensory and intellectual stimulation and including design value, i.e. aesthetic qualities generated by the conscious design of a building, structure or landscape as a whole. It may include its physical form, and how it lies within its setting. It may be the result of design, or an unplanned outcome of a process of events; and
- Communal value, derived from the meanings of a place for the people who relate to it". Communal value derives from the meanings that an historic asset has for the people who relate to it, or for whom it's in their collective experience or memory. It may be commemorative or symbolic, such as meaning for identity or collective memory.

The value of some cultural heritage assets may already be formally recognised though designation. Relevant guidance on informing judgement of heritage value includes the aims and objectives set out in 'Research Framework for the Archaeology of Wales' and Tables 5.1, 6.1 and 7.1 of Annexes 5, 6 and 7, respectively of HA 208/07.

Ranking of Value

The value of individual elements of the cultural heritage resource is presented on a six point scale Table 14-1 (after HA 208/07) and illustrates the approach employed to assess the value of heritage assets.

Table 14-1 Value of heritage assets (sensitivity of receptors)

Value of Resource	Description
Very High	World Heritage Sites. Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives. Historic landscapes of international value (designated or not) and extremely well preserved historic landscapes with exceptional coherence, time depth, or other critical factor(s).
High	Scheduled Monuments and non-designated assets of Schedulable quality and importance, as according to the non-statutory criteria for scheduling ancient monuments utilised by the National

Value of Resource	Description
Medium	Assembly for Wales (via Cadw, an Executive Agency within the Assembly). Grade I and II* Listed buildings and other Listed buildings that can be shown to have exceptional qualities in their fabric or associations not adequately reflected in their Listing grade. Conservation Areas containing very important buildings. Designated and non-designated historic landscapes of outstanding historic interest (including Grade I and Grade II* Registered Parks and Gardens); non-designated landscapes of high quality and importance of demonstrable national value; and well preserved historic landscapes exhibiting considerable coherence, time depth or other critical factor(s). Assets that can contribute substantially to acknowledged national research objectives, in particular those identified in A Research Framework for the Archaeology of Wales
	Designated or non-designated assets that contribute to regional research objectives, in particular those identified in the Research Framework for the Archaeology of Wales. Grade II Listed buildings or other historic, non-designated buildings that can be shown to have exceptional qualities in their fabric or historical association. Conservation Areas containing important buildings that contribute significantly to

Value of Resource	Description
	their historic character, or historic townscapes with important historic integrity in their buildings, or built settings (for example including street furniture or other structures). Designated landscapes of special historic interest (including Grade II Registered Parks and Gardens); non-designated landscapes that would justify such a designation; averagely well preserved historic landscapes with reasonable coherence, time depth or other critical factor(s); landscapes of regional value.
Low	Designated and non-designated assets of local importance including those compromised by poor preservation and/or poor survival of contextual associations. Assets displaying limited evidential, historic, aesthetic or communal value, as defined by Conservation Principles, but with potential to contribute to local research objectives. Locally Listed buildings and historic (unlisted) buildings of modest quality in their fabric or historical association. Historic townscape or built-up areas of limited historic integrity in their buildings or built settings (for example including street furniture or other structures). Robust non-designated historic landscapes; historic landscapes with importance to local interest groups; and historic landscapes whose value is limited by poor preservation and/or poor survival of contextual

Value of Resource	Description
	associations.
Negligible	Assets with very little or no surviving archaeological interest, and with little or no evidential, historic, aesthetic or communal value as identified by *Conservation Principles*. Buildings of no architectural or historical note and buildings of an intrusive character. Historic landscapes exhibiting little or no coherence, time depth or other critical factors, and displaying no evidential, historic, aesthetic and communal value as identified by *Conservation Principles.*
Unknown	The importance of the resource has not been ascertained. Archaeological resources the importance of which cannot be ascertained. Buildings with some hidden (i.e. inaccessible) potential for historical significance.

14.2.4 Assessment of Magnitude of Impact

The impact is defined as the change resulting from the proposed development that affects the cultural heritage resource. The classification of the magnitude of impact on heritage assets is rigorous and based on consistent criteria. This takes account of such factors as the physical scale and type of disturbance anticipated to affect them and whether features or evidence would be lost that are fundamental to their historic character and integrity. Changes may be adverse or beneficial. Depending on the nature of the change and the duration of development, effects can be temporary and/or reversible or permanent and irreversible.

The descriptions of change describe the ways in which an asset or elements of its setting may be modified or removed by the proposed development, and will include the consideration of such issues as which, and how many, elements of an asset are affected; whether the change physically modifies the asset or whether it comprises changes in visual aspects, noise or access that would alter its setting; and whether the change in the significance of an asset will be adverse or beneficial.

The magnitude of impact (summation of direct and indirect impacts) on each individual heritage asset is assessed using the criteria in Table 14-2 below (based on HA 208/07).

Table 14-2 – Assessment of magnitude of impact

Magnitude of impact	Description
Major	Change to most or all key archaeological or historic building elements, such that the asset is totally altered. Total changes to setting of archaeological or historic building assets. Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to the character of a historic landscape area.

Magnitude of impact	Description
Moderate	Changes to many key archaeological or historic building elements, such that the asset is noticeably modified. Changes to setting of archaeological or historic building assets, such that it is noticeably modified. Changes to many key historic landscape elements, parcels or components; visual change to many key aspects of the historic landscape; noticeable differences in noise or sound quality; considerable changes to use or access; resulting in moderate changes to the character of a historic landscape area.
Minor	Changes to key archaeological or historic building elements, such that the asset is slightly modified. Changes to setting of archaeological or historic building assets, such that it is slightly altered and noticeably changed. Change to few key historic landscape elements, parcels or components; slight visual changes to few key aspects of historic landscape; limited changes to noise levels or sound quality; slight changes to use or access; resulting in limited changes to the character of a historic landscape area.
Negligible	Very minor changes to archaeological or historic building elements or their settings. Very minor changes to key historic landscape elements, parcels or components; virtually unchanged visual effects; very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in very small change to the character of a historic landscape area.
No change	No change to heritage assets or their settings

14.2.5 Determination of Significance of Effects

The significance of effect upon any heritage asset is a product of the value/significance of the resource, and the magnitude of impact upon it. This is illustrated in Table 14-3 (after HA 208/07). Where two alternatives are given in the table, professional judgement is used to decide which best reflects the significance of effect upon the heritage asset.

The significance of effect is then discussed. Key principles to be considered are whether the effect comprises substantial harm or total loss, and whether the asset is of a value that such a change should be exceptional or indeed wholly exceptional. In Environmental Impact Assessment terms, 'significant' effects are considered to be of Moderate significance of effect, or higher for the purposes of the cultural heritage assessment. When a significant effect is identified, it may be appropriate to propose suitable mitigation measures in order to remove, reduce or offset the level of impact.

Table 14-3 – Significance of effect upon cultural heritage resource

Value of	Magnitude of Impact

resource	No change	Negligible	Minor	Moderate	Major
Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight
Unknown	Neutral	Neutral	Unknown	Unknown	Unknown

The significance of effect can be adverse or beneficial. Such impacts may also be temporary and/or reversible, or permanent and irreversible. The final significance of any effects arising from the proposed development is therefore evaluated using a seven-point scale, as outlined in Table 14-4. The criteria given within this table take account of the guidance documents outlined above, as well as the current legislation and planning policy (see below).

Table 14-4 – Qualitative description of the significance of effect

Significance of effect	Criteria
Large Adverse	Substantial harm or total loss of the value of a designated heritage asset (or asset worthy of designation) such that Development should not be consented unless substantial public benefit is delivered by the Development. Total loss of a non-designated heritage asset of medium value (i.e. which may contribute to regional research objectives) without compensatory mitigation measures agreed with statutory consultees
Moderate Adverse	Less than substantial harm or total loss of the value of a designated heritage asset (or asset worthy of designation), such that the harm should be weighed against the public benefit delivered by the Development to determine consent. Total loss of a non-designated heritage asset of medium value (i.e. which may contribute to regional research objectives) with compensatory mitigation measures agreed with statutory consultees. Harm to a non-designated heritage asset, of a greater degree than that perceived of as Minor Adverse, which should be taken into account in determining an application
Slight Adverse	Harm to a non-designated heritage asset that can be adequately compensated through the implementation of a programme of industry standard

Significance of effect	Criteria
	mitigation measures. Less than substantial harm to the value of a designated heritage asset, of a lesser degree than that perceived as Moderate Adverse, but which should still be weighed against the public benefit delivered by the Development to determine consent
Neutral / not significant	Effect that is nil, imperceptible and not significant
Slight Beneficial	Development will deliver a positive contribution and / or better reveal the value of a non-designated heritage asset
Moderate Beneficial	Development will deliver a positive contribution and / or better reveal the value of a designated heritage asset (or asset worthy of designation) such that an application should be treated favourably
Large Beneficial	Development will deliver a positive contribution and / or better reveal the value of a heritage asset of recognised international value such that an application should be treated very favourably

14.2.6 The Setting of Heritage Assets

Potential non-physical impacts of development upon designated heritage assets within the environs of the site have been assessed in this chapter. The methodology for potential development impacts has followed that recommended in *The Setting of Heritage Assets: English Heritage Guidance* (English Heritage 2011). Although produced by English Heritage, this volume is recognised by consultees as appropriate guidance for use within Wales.

This document provides guidance on setting and development management, including assessment of the implication of development proposals. A staged approach is recommended for the latter, the first step of which is to identify the heritage assets affected and their setting. Step 2 is to assess whether, how, and to what degree, these settings make a positive contribution to the significance of the heritage asset. This includes a consideration of the key attributes of the heritage asset itself, the physical surroundings of the asset, the way in which the asset is appreciates and the asset's associations and patterns of use.

The third step (where appropriate) is to assess the effect of the proposed development on the value of the asset through the consideration of the key attributes of the proposed development in terms of its location and siting, form and appearance, additional effects and permanence.

The fourth step is to maximise enhancement and minimise harm, which may be achieved through appropriate design, and Step 5 is making and documenting the decision and monitoring outcomes.

14.3 Planning Policy

14.3.1 Legislative Context

This chapter has been prepared within the following key legislative, planning policy and guidance context:

- 'Planning ('Listed Buildings and Conservation Areas Act' (1990);
- 'Planning Policy Wales' (Edition 7, 2014);
- Welsh Circular 60/96 'Planning and the Historic Environment: Archaeology' (1996);
- Welsh Circular 61/96 'Planning and the Historic Environment: Historic Buildings and Conservation Areas' (1996);
- 'The Hedgerows Regulations' (1997);

- *Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment in Wales* (Cadw 2011);
- *The Setting of Heritage Assets: English Heritage Guidance* (English Heritage 2011).

14.3.2 National Planning Policy

The principal guidance for Wales on the importance, management and safeguarding of the historic environment resource within the planning process is in Planning Policy Wales Edition 7: Chapter 6 – Conserving the Historic Environment (July 2014; hereafter referred to as PPW). This updates the earlier planning advice contained within Welsh Office Circular 60/96 (December 1996) Planning and the Historic Environment: Archaeology. The guidance states the importance of protecting the historic environment, encompassing archaeology and ancient monuments, listed buildings, Conservation Areas and historic parks, gardens and landscapes.

PPW states that, where nationally important archaeological remains, whether scheduled or not, and their settings are likely to be affected by a proposed development, there should be a presumption in favour of their physical preservation *in situ*. In cases involving lesser archaeological remains, local planning authorities will need to weigh the relative importance of archaeology against other factors, including the need for the proposed development (paragraph 6.5.1).

Where a development proposal affects a Listed Building or its setting, the primary material consideration is the statutory requirement to have special regard to the desirability of preserving the building, or its setting, or any features of special architectural or historic interest which it possesses (paragraph 6.5.9).

Local planning authorities should protect parks and gardens and their settings included in the first part of the *Register of Landscapes, Parks and Gardens of Special Historic Interest in Wales*. The effect of proposed development on a park or garden contained in the Register of Landscapes, Parks and Gardens of Special Historic Interest in Wales, or on the setting of such a park or garden, may be a material consideration in the determination of a planning application (Paragraph 6.5.25).

14.3.3 Local Planning Policy

Local planning policy is contained in the 'Rhondda Cynon Taf Local Development Plan up to 2021' which was adopted by Rhondda Cynon Taf County Borough Council in March 2011. Relevant policies relating to the historic environment include the following:

- Policy AW 7 – Protection and Enhancement of the Built Environment: '*Development proposals which impact upon sites of architectural and/or historical merit and sites of archaeological importance will only be permitted where it can be demonstrated that the proposal would preserve or enhance the character or appearance of the site.*

Further guidance on the safeguarding of the historic environment within the boundaries of Rhondda Cynon Taf County Borough Council is provided in 'Supplementary Planning Guidance: the Historic Built Environment', which was adopted in March 2011.

14.4 Cultural Heritage Baseline

14.4.1 Introduction

The following section provides an overview of the archaeological and historical background of the site and its environs. The known heritage assets within the surroundings of the site are referred to in the text by a unique reference number, from **1-16**. A gazetteer of these assets is provided in Table 14-5, below, and they are illustrated in **Figure 14-1,** below.

The baseline has been informed by the previous *Cultural Heritage Assessment* (Cotswold Archaeology 2010) and the updated HER information.

14.4.2 Designated Heritage Assets

There are no World Heritage Sites or sites included on the Tentative List of Future Nominations for World Heritage Sites issued by the Secretary of State for Culture, Media and Sport situated within the site or its environs.

There are no Scheduled Ancient Monuments, Registered Parks or Gardens, Registered Battlefields or Landscapes of Outstanding and Special Historic Interest within the site or the study area.

There are no Listed Buildings within the 500m study area around the boundary of the site. However, a small number of Listed Buildings are located within the wider environs of the site. These include:

- Grade II* White Bridge (Figure 14-1, **1**), located *c*. 770m to the south-east of the site;
- Grade II Railway bridge over Graig-yr-Hesg (Figure 14-1, **2**), *c*. 740m to the south;
- Grade II Taff Vale Railway viaduct over the River Taff (Figure 14-1, **3**), *c*. 750m to the south-east;
- Grade II Railway viaduct over Nant Clydach and Grade II Taff Vale Railway Bridge over Cwm Clydach (Figure 14-1, **16**), which are located approximately 820m to the north-east; and
- Grade II Road Bridge over Nant Clydach (Figure 14-1, **17**), *c*. 900m to the north-east.

14.4.3 Previous Investigations

There is no record of previous intrusive archaeological investigations within the study area. The single archaeological study within the surroundings of the site comprises the previous heritage assessment undertaken for the quarry (Figure 14-1, **15**), immediately to the south of the site.

14.4.4 Geology and Topography

The site occupies the north-western spur of a ridge, the central part of which has already been quarried. The land within the site falls from approximately 200m above Ordnance Datum in the north to *c*. 170m above Ordnance Datum in the south west.

The underlying geology comprises sandstone of the Lower Pennant Measures.

14.4.5 Prehistoric (500,000 BC – AD 43)

Evidence for Palaeolithic activity in Wales is limited, but includes cave sites and finds-pots. The activity during the Mesolithic period was more widespread, and evidence comprises a number of flint scatters. The evidence for Neolithic and Bronze Age activity in Wales includes monumental funerary remains, in addition to find-spots of diagnostic artefacts, such as polished stone axes. From the Late Bronze Age and into the Iron Age period, the evidence for settlement activity, including hut circles and associated enclosures, became more widespread.

There is no evidence for prehistoric activity within the 500m study area around the site. In the wider landscape, a Neolithic axe head was found in a foundation trench approximately 745m to the north-west, although no features indicating occupation were revealed.

14.4.6 Romano-British (AD 43 – AD 410)

No Roman period finds or features are recorded within the site, or in its environs. Rural Romano-British settlement in Wales, both enclosed and unenclosed, was largely focused on lowland areas, and displays continuity with the Iron Age. There was a temporary marching camp at Pontypridd, with a more permanent installation approximately 10km to the east in Caerphilly.

Table 14-5 – Heritage assets within the surroundings of the site

No.	Name	Period	Status	Reference
1	White Bridge (also	Modern	Grade II*	Cadw No.

No.	Name	Period	Status	Reference
	known as Berw Bridge)		Listed Building	24848
2	Railway bridge over Graig-yr-Hesg Road, including integral stone drainage channel	Modern	Grade II Listed Building	Cadw No. 24889
3	Taff Vale Railway viaduct over River Taff	Modern	Grade II Listed Building	Cadw No. 24849
4	The Glamorganshire Canal	Post-medieval	-	HER No. 01628.0s
5	Lan farmhouse	Modern	-	HER No. 300598
6	Berw aqueduct	Modern	-	HER No. 407023
7	A feeder probably associated with industrial use of water	Modern	-	-
8	Taff Vale Railway	Modern	-	HER No. 01570.0s
9	Daren-ddu Colliery and associated tramway	Modern	-	HER No. 33471
10	Congregational Hall, English Independent Church, Bonvilstone Road	Modern	-	HER No. 10133
11	Norton Bridge	Modern	-	HER No.

No.	Name	Period	Status	Reference
	Wesleyan Zethodist Chapel, Pontsion-Norton Street			14196
12	St Luke’s Church, Bedw Road	Modern	-	HER No. 14192
13	A 19th century wall painting in what is believed to have been a chapel	Modern	-	HER No. 116847
14	Findspot of a Neolithic axe head	Prehistoric	-	HER No. 01026m
15	Desk based assessment for development at Craig-yr Hesg Quarry	Previous investigation	-	HER No. E003276
16	Railway viaduct over Nant Clydach; Taff Vale Railay Bridge over Cwm Clydach	Modern	Grade II Listed Buildings	Cadw No. 24853, 81031 and 80764
17	Road Bridge over Nant Clydach	Modern	Grade II Listed Building	Cadw No. 80762

14.4.7 Medieval (AD 410 - 1539)

There are no medieval finds or features recorded within the study area. Historically, the site lies within the southern limits of Llanwonno Parish.

14.4.8 Post-medieval (1540 - 1800) and Modern (1801 – present)

The earliest cartographic depiction of the site and its surroundings is provided by the 1799 George Yates' map of Glamorgan. The map is not detailed, but it shows that the site lay to the north of wooded area occupying the hillside to the west of the River Taff and is likely to have comprised farmland. A more detailed depiction of the site is provided on the 1842 Llanwonno Tithe map. In the mid-19th century, the site was occupied by a number of enclosed agricultural fields, surrounded to the east and south by woodland plantation. The 19th and 20th century maps show that the site continued to have been occupied by farmland.

There is evidence for historic quarrying to the east of the site, as an old quarry is marked within the woodland on the First Edition Ordnance Survey map (1873-76). The Craig-yr-Hesg quarries are recorded by name to the south-east of the site on the 1900 Second Edition Ordnance Survey map. The area of activity focused on woodland to the south-east and the 20th century maps indicate that modern quarrying did not extend into the site.

A number of post-medieval and modern remains are recorded within the study area and in the wider surroundings of the site. These include the Glamorganshire Canal, built from 1790 along the eastern side of the Taff valley (Figure 14-1, **4**), *c*. 800m to the east. Assets recorded on the Tithe map within the environs of the site include the farmhouse at Lan (Figure 14-1, **5**), *c*. 530m to the south, Berw aqueduct (Figure 14-1, **6**), *c*. 740m to the south-east, and a feeder related to industrial activity which runs along the river valley (Figure 14-1, **7**).

The Taff Vale Railway (Figure 14-1, **8**) is located *c*. 440m to the east of the site, and was opened in 1840-41. The Listed Buildings associated with the railway include the Grade II Listed Taff Vale Railway viaduct (Figure 14-1, **2**), Railway bridge over Graig-yr-Hesg (Figure 14-1, **3**), the viaduct over Nant Clydach, and Taff Vale bridge (Figure 14-1, **16**).

The Daren-ddu colliery (Figure 14-1, **9**) was established in the second half of the 19th century, approximately 230m to the south of the site, with a tramway built towards the railway. The historic maps indicate that the mining and tipping activity associated with the colliery did not extend into the site.

Other heritage assets within the study area include three religious buildings (Figure 14-1,**10**-**12**), and a wall painting thought to have been associated with a former chapel (Figure 14-1, **13**). The White Bridge, a Grade II* Listed Building located *c*. 770m to the south-east of the site, was built in 1907 (Figure 14-1, **1**).

14.4.9 Potential and Survival

There are no heritage assets recorded within the site. Within the surroundings of the site, evidence for pre-modern activity is limited and includes a chance find of a Neolithic axe head. The reviewed historic cartographic evidence has also indicated that modern industrial and transport activity, recorded within the study area and in the wider environs of the site, did not extend into the site.

There is a low potential for the presence of as yet unknown archaeological features within the site. The value of these assets cannot be established at present and it remains **Unknown**, although, based on the available information, the potential for remains of high value is considered unlikely.

The historic maps indicate that, at least from the late 18th century, the site comprised farmland. There is no evidence for modern activity within the boundaries of the site which may have impacted upon any archaeological remains.

14.5 Direct Impacts

14.5.1 Development Impacts

Full details of the proposed development are provided in Chapter 3 of this ES.

The proposed development will involve the extension of quarrying into previously undisturbed areas, as shown on Figure 14-1, with related development in the form of a northern screening landform and western screen bund adjoining the extension area, and the excavation of a trench as part of the diversion of the east – west water main. Any impacts resulting from the quarrying and related activities upon any archaeological features present within the site would be direct, permanent and irreversible, leading to a total loss of significance of these assets.

The magnitude of impact of the proposed development upon any potential archaeological remains which may be located within the footprint of the quarry extension, screening landform / bund, and water main diversion would be, prior to mitigation, **Major Adverse**.

No impacts are anticipated with regard to the archaeological remains located outside the proposed footprint of these defined areas. The magnitude of impact with regard to any potential archaeological remains located within these areas would be **No Change**.

14.5.2 Likely Development Effects

Due to the **Unknown Value** of potential archaeological remains within the footprint of the quarry extension, it is not possible at present to assess the significance of effect of the **Major Adverse** impacts upon this resource, and it therefore remains **Unknown**.

Any potential archaeological remains of **Unknown Value** located outside of the footprint of the existing or proposed quarry will not be impacted on as part of this development (**No Change**), and therefore the significance of effect upon this resource is **Neutral**.

14.6 Indirect Impacts

14.6.1 Development Impacts

The proposed development may result in indirect adverse effects, which include visual alterations to the settings of designated heritage assets. The development proposes to replace agricultural fields with a quarry extension and screening landform / screen bund, and such change may lead to adverse visual impacts on the settings of any designated heritage assets.

14.6.2 Likely Development Effects

The assessment of the indirect impacts of the proposed development upon the designated heritage assets followed the methodology set out in *The Setting of Heritage Assets: English Heritage Guidance* (English Heritage 2011).

The first step of the assessment of probable impacts upon the settings of designated heritage assets utilises readily available information in order to establish whether a heritage asset or its setting may be affected by the proposed development. Designated heritage assets within a 1km radius were considered at Step 1. These include the following Listed Buildings:

- Grade **II*** White Bridge of **High Value** (Figure 14-1, **1**), *c*. 770m to the south-east of the site;
- Grade **II** Railway bridge over Graig-yr-Hesg of **Medium Value** (Figure 14-1, **2**), *c*. 740m to the south;
- Grade **II** Taff Vale Railway viaduct over the River Taff **Medium Value** (Figure 14-1, **3**), *c*. 750m to the south-east;
- Grade **II** Railway viaduct over Nant Clydach and Grade **II** Taff Vale Railway Bridge over Cwm Clydach of **Medium Value** (Figure 14-1, **16**), approximately 820m to the north-east; and
- Grade **II** Road Bridge over Nant Clydach of **Medium Value** (Figure 14-1, **17**), *c*. 900m to the north-east.

The initial review of the site, topography and screening provided by the development has indicated that the Listed Buildings located to the north-east of the site (Figure 14-1, **16**-**17**) are separated from the site by extensive modern development, and therefore the proposed development will not affect the settings of these assets. Due to the effects of topography, screening provided by the existing quarry and woodland to the south of the site, and the location of the Listed Buildings south of the site (Figure 14-1, **1**-**3**) within an urban environment, the proposed development will not have the potential to affect the setting of these designated heritage assets.

As such, the Listed Buildings located within the environs of the site have been scoped out at Step 1, and the proposed development will not affect the settings of these designated heritage assets of **High** and **Medium Value** (**No Change**), leading to a **Neutral** significance of effect.

14.7 Mitigation Measures

It is considered that the risk of loss of archaeological resource as a result of extraction within the footprint of the quarry extension and screening landform / screen bund / water main diversion footprint could be satisfactorily mitigated by way of a standard archaeological condition. The proposed mitigation measures with regard to the potential remains of **Unknown Value** would include a programme of archaeological monitoring, which will ensure preservation by record of the archaeological remains. The scope and methodology of these works will be agreed with the LPA in consultation with the Archaeological Planning Manager for Glamorgan Gwent Archaeological Trust.

No mitigation is required with regard to any potential archaeological remains located outside of the proposed quarry extension and related works areas, as these remains will not be impacted upon.

No mitigation measures are required with regard to impacts upon designated heritage assets, as it has been established that the proposed development will not affect the settings of Listed Buildings located within the environs of the site.

14.8 Residual Effects

Following the implementation of these mitigation measures, the residual significance of effect upon any buried archaeological remains within the site will be substantially reduced. Although the significance of this effect on the potential archaeological remains within the site of **Unknown Value** cannot be at present established, the residual significance of effect is unlikely to exceed **Slight Adverse**.

There will be no adverse impacts upon the settings of Listed Buildings located within the wider environs of the site, and the residual significance of effect with regard to these assets will be **Neutral**.

14.9 Recommendations

It is considered that an archaeological watching brief during initial topsoil stripping prior to extraction within the footprint of the proposed quarry extension and related works areas would secure the preservation by record of any previously unknown archaeological remains which may be present within the site.

14.10 Summary

This chapter has considered the likely significant effects of the proposed development in terms of archaeology and cultural heritage.

There are no known heritage assets within the site. With the exception of a single chance find of a Neolithic flint tool within the wider environs of the site, the recorded activity with the study area and within the broader surroundings of the site consists entirely of later post-medieval and modern remains, mostly associated with industry and transport. This chapter has established that there is a low potential for the presence of archaeological remains within the site although, due to the lack of modern disturbance, the survival of archaeological features within the site cannot be wholly ruled out.

The extraction activity within the footprint of the proposed quarry extension and screening lanform / bund would lead to a permanent removal of any archaeological remains which may be present, leading to **Major Adverse** impacts upon the archaeological resource.

Proposed mitigation measures with regard to the archaeological resource include archaeological monitoring in the form of a watching brief, which would ensure the preservation by record of any remains which could be impacted upon by the development. The scope and methodology of these works will be agreed with the LPA through consultation with the

Archaeological Planning Manager for Glamorgan Gwent Archaeological Trust prior to development.

This chapter has established that the proposed development will not affect the settings and the significance of any designated heritage assets within its environs, which comprise a number of Listed Buildings, leading to a **Neutral** significance of effect.

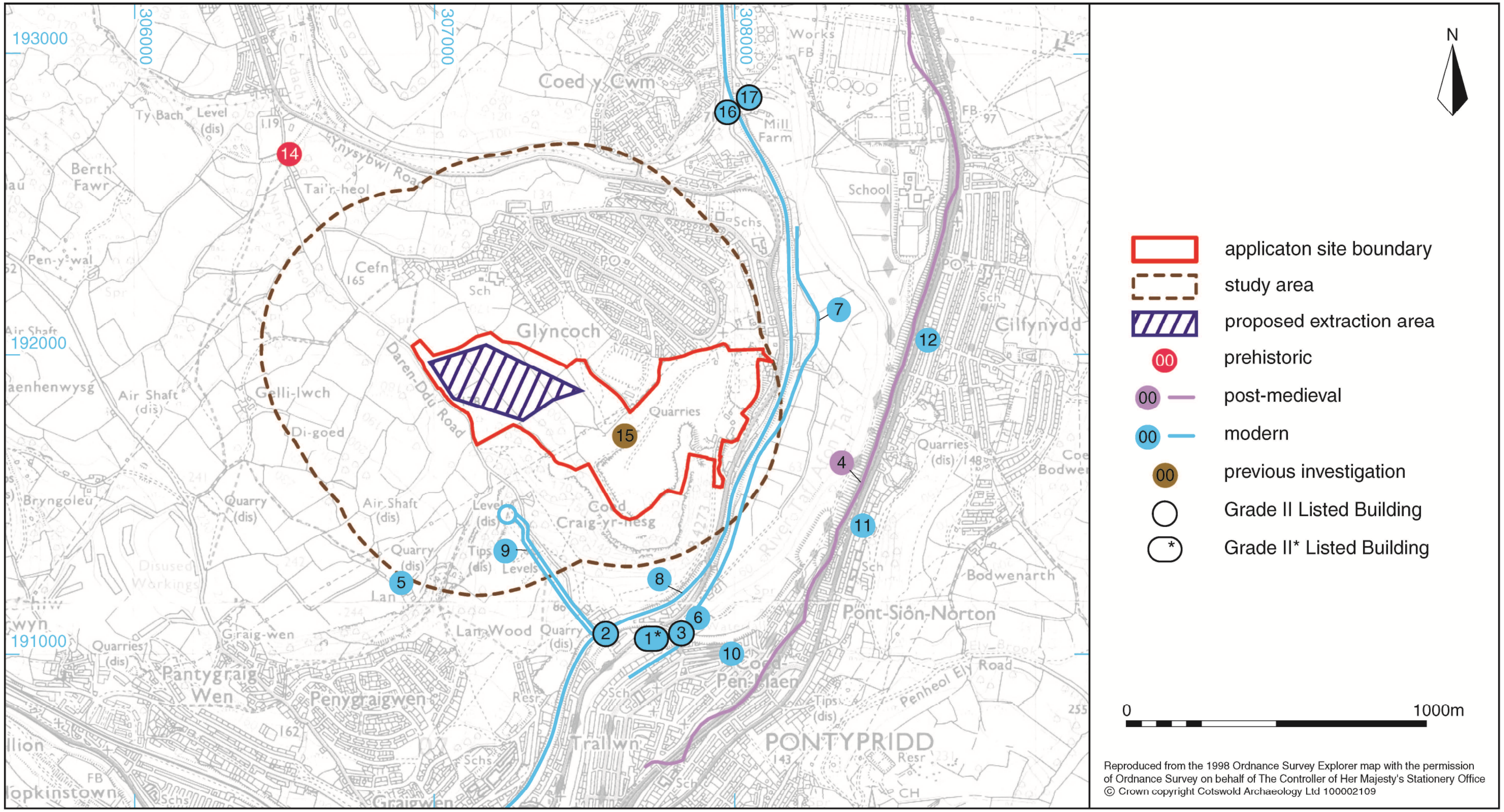
14.11 Conclusions

It has been established that the proposed development will not result in significant adverse effects upon the cultural heritage resource.

It is anticipated that following the implementation of an agreed scheme of archaeological mitigation in the form of an archaeological watching brief, the residual effects of the proposed development upon below ground archaeological resource will be **Slight Adverse**.

No significant effects upon designated heritage assets within the surroundings of the site are anticipated as a result of the proposed development (**Neutral** effect).

Figure 14.1 Cultural Heritage Assets



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15.0 SUMMARY OF ENVIRONMENTAL EFFECTS

15.1 Introduction

The preceding chapters 6.0 to 14.0 have considered the potential environmental effects of the proposed western extension to Craig yr Hesg Quarry, the continuation of processing and related operations within the existing quarry, and the restoration of the overall application site including the extension area and existing quarry. Based upon the studies and content of the individual chapters, the underlying conclusion of the EIA is that there is no single topic, or combination of issues which should objectively prevent the development from proceeding.

This is re-enforced by the allocation of the extension area in the RCT Local Development Plan as a preferred area for future quarrying, being the only such preferred area allocated in the LDP.

The respective environmental studies have paid due regard to the environmental issues identified in the scoping exercise undertaken with RCT relating to environmental effects. Where relevant, the studies have made a series of recommendations for measures which could minimise effects.

These issues are summarised below as a brief resumé of the preceding chapters and the conclusions which are drawn. For each topic, the summary describes the key elements of the study which has been undertaken, the mitigation measures which have been incorporated into the development scheme or which will be implemented as part of the ongoing development, and the assessed residual effects taking into account the mitigation measures.

15.2 Landscape and Visual Effects

15.2.1 LVIA Study

The proposed extension site is approximately 400m long and 300m wide at its widest part. It is located along a ridgeline with a highpoint located at the western boundary of the existing quarry. The higher part of the site is around 200m AOD where it joins the top of the northwest face of the quarry. From this point the land falls away in all directions to a low point of around 170m AOD in the westernmost corner of the site.

The site is currently semi-improved pasture with acid grassland and it includes two large fields and part of two other small fields. Field boundaries are dry stone walls; these are generally discontinuous with frequent gaps and partly collapsed sections.

Along the northern boundary of the site there is an area of plantation woodland and a row of trees, which are probably an overgrown hedgerow. This vegetation provides some screening from Cefn Primary School and adjacent properties at Cefn.

A continuous band of deciduous woodland extends along the southwest site boundary which is associated with Darren Ddu Road. This woodland links to Coed Craig yr Hesg through an area of rough grassland, bracken and scrub. The road is inaccessible to vehicles but is used as a public footpath. Publicly accessible, low level views of the site are available from Darren Ddu Road.

To the northeast of the proposed extension site there are two fields, similar in character to those within the site. Beyond these fields to the northeast is an area of rough grassland, bracken and scrub which provides screening between the site and the Glyncoch Rugby Ground, which is not visible from the site. The settlement of Glyncoch is located to the northeast of this area at a lower level than the site. Although house roofs are visible, views from the settlement towards the site, without mitigation / additional screening, would be limited to first floor windows due to the topography, garden boundary fences and vegetation.

Hedgerow trees, small areas of woodland and larger blocks of deciduous woodland on valley side slopes are characteristic of the area. Coed Craig yr Hesg, adjacent to the southern boundary of Craig yr Hesg quarry, is a densely wooded ridge rising from the valley floor at around 80m to a height of 200m AOD.

There are no public rights of way within the proposed extension site, and no public right of way links from Glyncoch westwards into open countryside. The nearest public route in the vicinity of the site is Darren Ddu Road, a track which is impassable to vehicles, believed to be a public right of way which runs generally north – south from Ynysybwl Road to the south west of the existing quarry, northwards to Ynysybwl. Public footpaths cross agricultural pasture land to the west of the site and connect with the minor road between Penygraigwen and Ynysybwl.

15.2.2 Landscape Mitigation measures

The key measures would comprise:

(i) The construction of a screening landform along the eastern, and northern site boundaries, with a smaller soil screen bund to be established along the western boundary. These bunds would be designed to encourage tree growth and natural re-colonisation and create a new woodland corridor to link with adjoining woodland. The screening landform and soil screen bund are particularly important to screen views from Darren Ddu Road and properties at Glyncoch and Cefn.

(ii) The proposed extension will result in the removal of approximately 500m of dry stone field boundary walls, much of which is in a poor state of repair. It is proposed to re-use the stone recovered from these walls to build a section of wall along the northeast side of the site. This will restore the field pattern and assist with screening of low level views from Glyncoch.

(iii) In order to maintain security within the extension site a palisade security fence would be located on the inner quarry side of the screening landform and soil screen mound.

(iv) It will be desirable to protect the retained vegetation along Darren Ddu Road and the western site boundary. A corridor of land averaging 35m wide would thus be retained between the quarry edge and Darren Du Road which would accommodate the soil screen bund, and which would be allowed to re-colonise with trees as an enhanced woodland corridor.

(v) The final restoration and after use proposals for the site represent the principal long-term measure in mitigation of potential landscape and visual effects. The quarry benches and faces would be restored when no longer required for operational purposes. A variety of treatments would be used to enhance the ecological and landscape value of the site.

(vi) Management of the site, including the growth and aftercare of vegetation, would focus on its nature conservation interest and amenity potential, resulting in substantial beneficial impacts on the biodiversity of the site. The landscape and visual appearance of the site would be improved as the tree planting and natural re-colonisation establishes and matures.

15.2.3 Landscape Impact

There would be a change in the character of the site associated with the introduction of the quarry extension, from that of grassland to an active quarry site.

The change to the landscape associated with the introduction of the quarry extension would be viewed in the context of the existing quarry development, urban development on the Taf Valley floor, roads and high voltage power lines within the area.

There would be a moderate to slight adverse impact on the setting of public footpaths within the study area, dependent on the dominance of the quarry extension in relation to the setting of the path. For a small section of footpath closest to the quarry extension the impact would be major adverse during construction of the screen bunds, but then reducing to moderate to slight adverse as vegetation on the bund establishes. The impact on views from roads within the study area would be slight adverse-negligible.

Most properties closer to the site in Glyncoch have their views screened by landform and vegetation. Construction of the screening landform would have temporary short term slight-moderate adverse impact on some properties in Glyncoch and Cefn, however following its construction views of quarrying activities would be entirely screened from these properties.

Properties with direct views towards the site are more likely to experience moderate adverse impacts. Impacts on residential dwellings and settlement range from moderate adverse-negligible.

There would be no direct impacts on the physical historic landscape resource of the area. There would be no impact on the nearby Listed buildings, ancient monuments, Conservation Areas or Landscapes of Special Historic Interest.

The quarry extension would not be a dominating feature within the area to such an extent that it would alter the character and perception of the Llwyncelyn Slopes Special Landscape Area. The overall impact on the SLA is assessed as slight adverse during operation, with the introduction of quarrying activities, reducing to negligible following restoration.

15.2.4 Visual Impact

The visual appraisal, informed by the Zone of Theoretical Visibility (ZTV) study identified a number of locations from which the proposed extension site is visible. Six viewpoints were identified as representative of the most sensitive views available. The visual impact is assessed as major to slight adverse during construction of the screening landform, reducing to slight to moderate adverse during quarrying operations.

The progressive restoration of the quarry faces and benches would be visible, and selective areas of quarry bench planting, would soften their appearance. Following restoration of the site the visual impact would be negligible to slight beneficial.

The extent of the proposed extension area has been defined to retain important features and minimise impact on nearby properties and settlements. The western extent is defined by the retention of vegetation and stone walling along Darren Ddu Road. The northern extent is defined by the dry stone walls and vegetation along the field boundaries. Also, there is a gentle gradient towards this northern boundary before the land become steeper to the north. The eastern extent of the proposed quarry extension has been defined by the screening landform. The establishment of the screening landform would have the greatest effect in reducing potential adverse impacts from this direction.

Major adverse impacts identified are from selected areas close to the site boundary and will be short term, temporary impacts, which will reduce following the construction and seeding of the screening landform and natural regeneration of the bund which act to reduce landscape and visual adverse impacts during the operational period.

15.2.5 Conclusions

The mitigation measures proposed would reduce the negative landscape and visual impacts associated with the extension of Craig yr Hesg quarry to an acceptable level.

15.3 Ecology

15.3.1 Ecology Study

The application site itself is not subject to any statutory designations.

One statutory designated site occurs within the 2km search area defined in the Ecology study (ES Chapter 7.0). Craig-yr-Hesg Local Nature Reserve lies immediately to the south of the existing quarry.

The application site includes a small area of the Craig yr Hesg / Lan Wood SINC which comprises an extensive area to the south west of the application site. The small area included within the application site lies outside the proposed area of extraction.

A further three SINC's occur within the 2km wide search area, namely Lower Clydach Woodland SINC, Llys Nant and Craig Twyn-y-glog SINC and Taff and Rhondda Rivers SINC.

These SINC's have been selected as sites of County-level ecological importance i.e. they are important within RCT, although unlikely to meet the criteria for selection as a site of national importance and receive a statutory designation.

The application site largely occurs within two fields enclosed by dry stone walls. The fields contain a sward of predominantly semi-improved grassland, which was found to be relatively species poor in terms of herbaceous species.

The majority of the grassland area was found to be very closely grazed by horses at the time of both the Phase 1 and Phase 2 surveys, showing signs of more intensive agricultural improvement in places through the localised dominance of white clover (*Trifolium repens*). The south-western field was found to contain localised areas where the sward showed increased floristic diversity, although remained heavily grazed and dominated by grasses, with areas of bracken (*Pteridium aquilinum*) also present with scattered scrub species.

The perimeter field boundaries were marked by dry stone walls, which were generally intact, with bracken fringing the walls in places. The internal field boundaries are in a poorer state of repair and are absent over certain stretches.

The wider surroundings comprise of the existing quarry void broadly to the south, semi-improved grassland and small woodland blocks to the north and east, with Craig-yr-Hesg/Lan Wood SINC extending slightly within and to the west of the application site.

The extension area lacks potential bat roost sites, and as such, has no value to roosting bats.

The extension area has been assessed as having limited opportunities for bats to forage and commute, due to the nature of habitats present and general setting/elevated position and exposure that the application site has. The habitats adjacent to the extension area i.e. woodland represent higher value foraging habitats and provide more sheltered commuting linkages for bats.

No evidence of badger has been recorded although a very low level of evidence was recorded in the wider site area during 2009 surveys undertaken as part of the ROMP Review EIA.

The occasional presence of badgers, as part of foraging in a wider territory, is a possibility. However, based on the absence of any field signs within the extension area itself, it is considered unlikely at the current time. As such, the extension area is assessed as having no value to badgers.

The presence of reptiles has been confirmed within the extension area, as one common lizard was observed during the Phase 1 survey.

The 2009 surveys also recorded adder and slow worm in the wider site, with the potential for grass snake to occur also being a possibility.

The extent of habitats that are suitable for reptiles to use within the extension area is limited, as the majority of the extension area comprises of closely grazed grassland that lacks the features required by reptiles.

Based on the extent and connectivity of suitable reptile habitats within the extension area, it is likely that relatively low numbers of common lizard and slow worm are present. The occasional presence of individual adders cannot be fully discounted as they are known to occur in the wider site.

Opportunities for birds to nest within the extension area are limited, due to the relatively low occurrence of scrub and the predominantly open/closely grazed nature of the grassland which is of low suitability for ground-nesting species.

As such, given that areas of higher quality habitat for birds occur in the wider Craig-yr-Hesg quarry, the extension area itself is assessed as being of less than site level value for birds.

15.3.2 Ecology Mitigation measures

The most important opportunities to deliver biodiversity gains will arise during site restoration works, although preliminary works would also take place with habitat creation taking place along the northern screening landform, natural regeneration of the proposed western bund and re-creation of dry stone wall boundaries to replicate and enhance the existing network of habitats bordering the extension area.

The proposed restoration has been designed to maximise ecological gains and to complement the surrounding Craig yr Hesg/Lan Wood SINC. The proposed restoration has also been designed to complement the permitted restoration scheme for the wider site and includes the following key elements:

- Natural woodland regeneration along the western screening bund to strengthen adjacent woodland habitat corridor associated with Craig y -Hesg wood and Darren Ddu Road;
- Woodland creation through tree seeding along the northern screening bund to increase habitat linkage and provide screening for landscape purposes;
- Natural regeneration of pioneer vegetation and grassland communities on quarry benches; and
- Exposed quarry faces.

Mitigation for Loss of Habitat – Creation of New Habitats

The majority of the extension area comprises of species-poor grassland and is not assessed as having any particularly high habitat value. This is supported by the fact that with the exception of a small area at the southern extremity of the site, the extension area is excluded from the adjacent Craig yr Hesg / Llan Wood SINC.

The northern screening landform would be surfaced with soil stripped from phase 1 of the extension area, with the surface to be tree seeded designed to complement the wider woodland resource. The objective is to establish an area of woodland which would link with, and strengthen existing woodland blocks that border the northern areas of the application site and create both a landscape and wildlife corridor.

The western screen mound and average 35m wide corridor along the southern boundary would be allowed to naturally re-colonise with the objective of establishing a wider corridor of woodland and acid grassland along the eastern side of Darren Ddu Road.

As the proposed restoration is dedicated to the creation of habitats of nature conservation value, including grassland and scrub woodland, no further mitigation is deemed to be required.

Moreover, since the proposed restoration places an emphasis on natural regeneration, this would also ensure that species of local provenance would occur in the restored site.

No offsite/indirect habitat impacts have been predicted, although the proposed restoration would complement and contribute to the surrounding network of non-statutory designated habitats.

Mitigation for Impacts to Species

The potential for negative impacts to bats and invertebrates, that would require specific mitigation, has been scoped out based on the nature of the proposed quarry extension. The proposed restoration, including initial screening measures, would nonetheless provide gains for these groups which would represent a positive impact.

To ensure that the development proposed within the extension area complies with the relevant legislation and conservation objectives for reptiles, a Reptile Mitigation Strategy (RMS) will be prepared in consultation with the LPA to set out a procedure for the clearance of known or potential reptile habitats.

This is considered an appropriate and proportional approach due to the small scale, and localised occurrence of habitat involved, the wider resource of habitats to be retained and the longer term inclusion of suitable reptile habitats during site restoration.

The potential impacts to breeding birds are most likely to occur during vegetation removal. Such works can be timed to avoid the nesting season (the season is March to August) thus removing the potential for an impact in a given season to occur.

15.3.3 Ecology Conclusions

No significant adverse ecological impacts have been predicted and it is considered that the proposed nature conservation based restoration would provide a net gain for biodiversity in the long term.

15.4 Agriculture and Soil Resources

15.4.1 ALC and Soil Study

A soil survey has been undertaken by sampling soil at twenty locations using a 1.2 metre dutch auger and spade. This was supplemented by examining detailed records from a trial pit survey which described 18 profile pits excavated to sandstone bedrock. Further information has been obtained from the Soil Survey of England and Wales, and information on detailed land classification has been obtained from the Land Use Planning Unit of Wales.

A typical soil profile comprises dark brown sandy clay loam topsoil 0.15 to 0.3m deep overlying a variable depth of orange brown sandy clay loam subsoil containing sandstone cobbles and slabs. Occasionally there is a shallow depth (0.05 to 0.15m) of pale grey sandy loam (weathered sandstone) overlying bedrock.

The Agricultural Land Classification study concludes that the majority of the site is Grade 4, with isolated areas of Grade 5 rock outcrops on the south west flank. The site does not contain land classified as being of best and most versatile quality. The requirement of MPPW is that best and most versatile land should only be used for mineral extraction if, inter alia, land of a lower quality is not available. These issues are thus addressed in the case of the Craig yr Hesg extension development which is confined to land of a lower grade (grade 4 and 5).

The key issue is thus the beneficial sustainable use of the soil resources present at the site.

15.4.2 Mitigation Measures

The main negative agricultural impact of the proposals is the loss of agricultural land, albeit a maximum of grade 4 quality, and the nature of the quarry development and resulting restoration profiles means that it is not possible to restore any substantive areas to future productive agricultural use. The scheme has however been designed to ensure the sustainable use of all the indigenous soils for the amenity/ nature conservation based restoration land uses which are proposed.

As part of the preliminary works, the soils from phase1 would be used to provide a soil profile of 0.4m of top soil and 0.6m of sub soil / overburden on the final contours of the screening landform, and the area would then be tree seeded in accordance with the details set out in section 3.0 of the ES. Residual soil would be placed on a permanent soil bund along the western boundary of the quarry.

All other soils, including those stripped from phases 2 and 3, and existing soil resources within stockpiles in the existing quarry would be used for restoration of the quarry benches and profiled final floor of the quarry.

15.4.3 Agriculture and Soils Conclusions

The nature of the quarry development and resulting restoration profiles means that it is not possible to restore any substantive areas to future productive agricultural use.

The effect of the extension development would thus be that some 9 hectares of land associated with the quarry extension and screening landform / screen bund would be lost to agricultural use. However, this relatively small area does not contain land of best and most versatile quality, and there would be no material effects on farm holdings.

The scheme has, however, been designed to ensure the sustainable use of all the indigenous soils for the amenity / nature conservation based restoration and after uses which are proposed.

Overall, the effects on agriculture and soil resources are considered to be minor / negligible

15.5 Hydrology and Hydrogeology

15.5.1 Hydrology and Hydrogeology Study

The River Taf forms the major surface water drainage feature in the vicinity of Craig yr Hesg Quarry, flowing from north to south approximately 350 m to the east. The stage of the River Taf ranges from 80 m AOD in the vicinity of Abercynon to 49 m AOD in Pontypridd. The Afon Cynon joins the River Taf at Abercynon, approximately 3 km north (upstream) of Craig-yr-Hesg Quarry. Downstream of the site, the River Taf continues to flow south, joined by the River Rhondda approximately 1.6 km south of the site, through the suburbs and inner city of Cardiff, to discharge to Cardiff Bay.

The Nant Clydach flows from west to east approximately 850 m to the north of the Craig yr Hesg Quarry, at an elevation of between 80-90 mAOD. The Nant Clydach joins the River Taf 850 m north of Craig-yr-Hesg Quarry, east of Coed-y-Cwm. The river is largely sourced from compensation release from Clydach reservoir located 6.6 km north-west of the quarry, and is augmented by numerous spring fed springs originating on both eastern and western valley slopes upstream of the confluence with the River Taf.

Numerous smaller features were identified during the water features survey, comprising springs, streams and small wetland areas.

Groundwater levels in the Pennant Measures within the quarry are monitored via an observation borehole which supports the conclusion that the elevation of the regional water table is lower than the permitted base of the excavation (100 m AOD) with maximum water levels of 96.77 m AOD being observed. The base level of the existing quarry is thus above the level of the water table. Surface water within the existing quarry infiltrates into the ground via a sump and soakway at the base of the void. No changes would occur as a result of the proposed extension development which would similarly be above the water table level, and where surface water will continue to infiltrate into the ground from the base of the existing quarry and extension area.

Several minor streams were identified during the water features survey in the direct vicinity of the quarry. These originate from spring flows on the mid slope areas. Stream flows are ephemeral, with lengths of dry channel, sinking and re-emergence behaviour identified in the upper reaches.

Groundwater levels recorded in a monitoring borehole immediately north-west of the quarry are between 15-25 m below the elevation of the springs at Cefn (165-167 m AOD). This indicates that these springs are likely fed from an upper groundwater system on the north-western slopes of Craig yr Hesg which is independent of that adjacent to the quarry.

The following features are considered to be potentially at risk of impacts from the quarry development:

- Minor spring flows feeding the Nant Tai’r-heol at Cefn and Daren-Ddu Stream. However, it is considered that the streams are likely to be fed by a separate perched groundwater system and the effect of quarrying would be negligible. It is therefore considered that the impact on these springs and stream flows at present is minor (i.e. not significant) and that increasing the area of the quarry base at 100 m AOD will have no further impact upon these surface waters.
- Groundwater quality in the Pennant (Upper Coal) Measures minor aquifer. The development and operation of excavations which require the collection and discharge of site water have inherent potential to affect groundwater and surface water quality. This potential includes increased sediment loads and pollution from spillages of fuel oil etc. However, established procedures are in place at the existing quarry to minimise the potential for such occurrences, including the storage of fuel in appropriately

constructed and maintained tanks within bunded areas and the use of oil interception screens.

With the mitigation incorporated in the existing and proposed operation (as described above) the degree of effect on surface water and groundwater quality is negligible and hence the impact is also considered negligible.

- <u>Surface water quality in the River Taf</u>. The quality of discharge from the site is controlled by the on-site attenuation and settlement system and regulated by the existing discharge consent to the River Taf (Consent Number AF4029101). To date, due diligence has ensured that the quality of surface water leaving the site has not been of concern; this is not expected to change as a result of the extension development given that the water which is discharged originates from the processing plant area and not the quarry workings.
- <u>Effects on wetland areas to the south of the Craig yr Hesg Local Nature Reserve (LNR)</u>. A wetland and spring was observed immediately to the south of the boundary of the LNR but outside the LNR at between 80 to 90 m AOD. However, a level of 107 m AOD has already been reached in the southern end of the quarry It is considered that any effects on these features would already have occurred and that extending the area of the quarry to the north at 100 m AOD would have negligible further effect either on these or similar features in the vicinity of the LNR.

15.5.2 Mitigation Measures

Given that there are not expected to be any significant impacts to the receptors defined, mitigation measures are not required. Due diligence will be maintained throughout the proposed development to ensure this remains the case. This includes the continued employment of settlement lagoons to ensure suspended solid loads remain below the consented limit and receiving water courses are not adversely affected by the quarry discharge. The proposed quarry extension does not impact on the existing situation for the quarry discharge.

15.5.3 Hydrology / Hydrogeology Conclusions

Regional groundwater levels are considered to be below the current and proposed minimum base level of the quarry (100 m AOD) given the locality of the quarry on top of Craig yr Hesg hill and evidence from groundwater level monitoring via on site piezometers.

Spring flows on the western and southern slopes are likely to be associated with the presence of perched groundwater flowing within faults and juxtaposing of coal seams.

No active dewatering of the bedrock is currently required or is anticipated to be needed for the working of the quarry within the current site and proposed extension area.

Minor spring flows feeding the Nant Tai'r-heol at Cefn and Darren Ddu streams in the vicinity of the quarry are the only potential surface water receptors that have been considered to be potential at risk of impact from the proposed quarry operations. The risk of potential impact is considered to be low, and any minor impact is likely to already have occurred historically as the quarry base is already well below the elevation of these springs.

Potential impacts on surface water and groundwater quality will be adequately mitigated by standard quarrying good practice measures and the existing discharge consent.

Following the cessation of operations at Craig yr Hesg Quarry, it is proposed to cease management of surface water within the quarry.

It is considered that there will be no significant impact to hydrological/hydrogeological receptors from the proposed development at Craig yr Hesg.

15.6 Noise

15.6.1 Noise Study

The noise assessment follows a conventional approach of establishing current background noise levels, via noise monitoring at representative properties in the vicinity of the extension area; determining the sound power levels of plant to be utilised; calculating site noise levels; and comparing the site noise levels with conventional criteria set out in MTAN1.

Whilst the application will be for an extension to the quarry, it is also a consolidation application and therefore it is appropriate to comment on the noise contribution from the processing plant and related operations at the quarry which will form part of the overall noise climate.

The noise study undertaken as part of the 2010 EIA and ES submitted in support of the Environment Act ROMP Review, and the resulting updated planning conditions form a context to the study, together with more recent noise monitoring which has been undertaken by WBM.

In undertaking the study, reference has been made to the current planning conditions relating to noise which were imposed as part of the Environment Act 'ROMP' Review, guidance on the approach to noise studies and noise limits set out in MTAN1, and additional guidance on noise levels at schools.

As part of the study, noise measurements were taken in July and November 2014 at representative properties in proximity to the extension site, and reference has been made to noise levels recorded in a similar noise monitoring exercise undertaken as part of the ROMP Review noise study in 2009.

The recorded average background noise levels have been used to inform suggested noise limits at the defined properties which could form the basis of a planning condition in a similar form to that imposed as part of the ROMP Review, but with the condition amended and updated to include the additional monitoring locations referred to.

15.6.2 Noise Mitigation Measures

The principal noise mitigation measure is the proposed construction of the northern screening landform. The noise attenuation which could be provided by the landform has been a significant factor influencing the design of the landform with particular reference to the height of the landform and the barrier attenuation it can provide. This is of key relevance to operations (shot hole drilling) which will take place on the top level of the quarry on the inner side of the screening landform.

The other main mitigation measure is the selection and use of a rock drill with a sound power level not exceeding 116 $dBL_{WA,}$ and maintaining quarry benches with a minimum height of 7m to provide further noise barrier attenuation.

It is also proposed that the northern screening landform and western screen bund would be constructed over a short term duration within a period of up to 8 weeks in a calendar year. This will ensure that these noisier activities are completed within a short period of time and in accordance with the temporary noise limits prescribed in government guidance (MTAN1).

15.6.3 Conclusions

The noise assessment follows a conventional approach of establishing current background noise levels, via noise monitoring at representative properties in the vicinity of the extension area; determining the sound power levels of plant to be utilised; calculating site noise levels; and comparing the site noise levels with conventional criteria set out in MTAN1.

Noise limits have been proposed which adopt the current noise limits imposed at No 3 Pen y Bryn, Garth Avenue and No 1 Rogart Terrace (ref ROMP Review condition 18), but with a suggested lower noise limit at Conway Close (no 36) compared to the limit imposed in condition 18 of the

ROMP conditions. Noise limits have also been proposed for a representative property to the north (Cefn Heulog) and at Cefn Primary School.

The calculated site noise levels for the extraction operations, with the barrier attenuation afforded by the screening landform, for daytime operations are around 45 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ at the nearest dwellings and the school. For some locations, the calculated site noise levels for the extraction operations are slightly more than 10 dB(A) above the average daytime background noise levels. However, the calculations confirm that the development could proceed in compliance with the noise limits which have been proposed.

The calculated site noise levels for the construction of the screening landform are around 60 dB $L_{Aeq,\ 1\ hour,\ free\ field}$ at the nearest dwellings depending on the amount of equipment that is used for that operation. For all receiver locations, the calculated site noise levels are below the noise limit in MTAN1 for temporary operations.

It is recommended that the existing site noise monitoring scheme be amended, to include additional monitoring locations at Cefn Heulog and Cefn Primary School that are representative of the nearest noise sensitive properties to the north of the proposed extension area, so that noise monitoring would be undertaken in the event of work in that area.

15.7 Blast Vibration

15.7.1 Blast Vibration Study

At Craig yr Hesg Qarry the rock is extracted by a succession of controlled blasts from quarry faces. Each blast is individually designed with boreholes charged with explosives and detonated in a way which loosens and breaks up the rock, which can then be excavated from a rock pile and transported to the exiting crushing and screening plant for processing.

Ground vibration arsing from blasting is calculated in terms of ‘peak particle velocity’ (PPV), and is measured in millimetres per second (mms). Detailed research has determined that vibration levels well in excess of 50 mms are necessary to produce structural damage to residential type properties. For human perception, government advice is that levels should be set in the range of 6-12 mms as discussed further below.

Vibration is also generated within the atmosphere where the term ‘air over pressure’ is used to encompass both its audible and sub audible frequency components. Again, experience and knowledge and blast type and design enables prediction of levels and an assessment of their significance.

However, unlike with ground vibration, predictions of air overpressure can be made less certain by the fact that air over pressure levels may be significantly influenced by atmospheric conditions. Hence, the most effective method of control is its minimisation at source.

It is important to realise that for any given blast it is very much in the operators interest to always reduce vibration, both ground and air borne to the minimum possible in that this substantially increases the efficiency and hence the economy of blasting operations.

Minerals Technical Advice Note 1: Aggregates (MTAN1) published by the Welsh Assembly Government in March 2004 gives advice on suitable planning conditions to control the environmental impact of blasting operations at quarries. This includes the advice that:

> *“Maximum level of ground vibration at sensitive locations: ground vibration as a result of blasting operations should not exceed a peak particle velocity of 6 mms $^{-1}$ PPV in 95% of all blasts measured over any 6 month period, and no individual blast should exceed a peak particle velocity of 10 mms $^{-1}$ PPV”.*

The current planning conditions in place at Craig yr Hesg Quarry are consistent with these limits.

A criterion of 75 mms^{-1} measured on the pipeline has been deemed suitable for the protection of the water main which will lie in proximity to the extension area.

All blasts are monitored at Craig yr Hesg Quarry, and detailed records are maintained. These records confirm that the currently imposed ground vibration limits are being adhered to, and can continue to be adhered to as part of the extension development scheme. This includes quarrying to the proposed limit of within 175m of the closest property to the extension area.

As part of the vibration study, a review has been undertaken of blast vibration monitoring data recorded between January 2012 and April 2014, comprising a total of 30 No. blasting events. The blasting was undertaken with either nonel (electric) or “Hotshot” (electronic) detonating systems. Examination of the data indicates that the electronic detonation system consistently produces lower PPVs than the equivalent blast using electric detonators, with recorded PPVs well below the criterion level of 6mms^{-1} PPV.

15.7.2 Blast Vibration Mitigation Measures

In view of adherence to the current blast vibration limits (and the MTAN 1 recommended limits), no specific additional mitigation measures are considered to be necessary.

However, the Operator’s Good Practice Guide outlined in the DETR report The Environmental Effects of Production Blasting from Surface Mineral Workings is already, and would continue to be, adopted to ensure that the potential for ground-borne and airborne vibration would be minimised at Craig yr Hesg Quarry.

15.7.3 Blast Vibration Conclusions

Vibration criteria for restricting vibration levels from blasting operations at Craig yr Hesg Quarry have been recommended in order to minimise impacts on nearby residents. Accordingly, a criterion of 6 mms^{-1} for 95% of events in any six month period, with an overall maximum of 10mms^{-1} has been suggested for residential locations. This criterion is in line with the recommended planning conditions pertaining to blasting operations contained within MTAN 1, and would be entirely safe with respect to the possibility of even the most cosmetic of plaster cracks.

With such low ground vibration levels, accompanying air overpressure would also be of a very low and hence acceptable level, although possibly perceptible on occasions at the closest of properties.

With respect to the water main pipelines a criterion of 75mms^{-1} at 99.99% confidence limit has been suggested.

There are likely to be some occasions, particularly during working of the north eastern extremities of the extraction area, where there will be a need to exercise particular care in minimising vibration levels. This would involve using charge reduction techniques to ensure that a peak particle velocity limit of 6 mms^{-1} at a 95% confidence is not exceeded at any property. Similar considerations would also apply for blasting adjacent to the water mains, but these are conventional blasting design activities which can ensure adherence to the prescribed limits.

15.8 Air Quality

15.8.1 Air Quality Study

The air quality assessment has considered the impacts of the proposed westward extension of the existing quarry on potential receptors in the vicinity. These include the occupants of houses and a school to the north and northwest at Glyncoch. Due to the separation distances between the potential receptors and the extension, the local presence of screening woodland, and the low frequency of winds between the extension and receptors, the potential impacts from wind-blown dust are generally negligible.

An area of housing in Glyncoch around Conway Close does lie sufficiently close and within a more frequent wind direction to potentially experience moderate impact in the absence of mitigation measures. However, preliminary dust deposition monitoring adjacent to the existing quarry shows negligible rates of dust deposition, and when the screening effect of the perimeter bund, and the majority of quarrying operations being at greater depth are taken into account, then the potential impacts from dust at the potentially most vulnerable receptors are likely to be of short duration and slight.

Nuisance dust is not considered to be a significant issue currently outside the site. Whilst recent preliminary monitoring results for dust deposition alongside the main quarry haul road have recorded elevated levels of solids, the area in question is subject to dust suppression measures which serve to minimise the extent of dust arisings.

Air quality observations to the north of the existing quarry processing plant, in the Garth Avenue area of Glyncoch, has been the subject of much analysis over recent years, with monitoring of PM_{10} being carried out by Hanson and RCT. Data over the last 12 months shows no likely breaches of the air quality objectives designed to protect human health. Winds blow from the south, from the quarry towards Garth Avenue relatively infrequently, however elevated levels of PM_{10} have been detected on such occasions, with the quarry being identified as a likely source. However, data obtained over the period 2010 to 2011 by the University of West of England on behalf of RCT showed at worst a potential contribution of about 4.5 $\mu g/m^3$ to average PM_{10} concentrations from the quarry to Garth Avenue receptors; this is 11.25% of the air quality objective.

Recent (2014) monitoring by RCT has shown average PM_{10} concentrations at Garth Avenue to be about half of the long term air quality objective, with no significant probability of the short term objective being exceeded. The necessary conclusion is that the existing quarry operations are not causing unacceptable impacts with respect to PM_{10} outside the site. Other residential receptors are more distant from potential quarry sources and are considered to be relatively much less vulnerable to quarry sources of PM_{10}.

The pending re-commencement of asphalt production within the processing plant area will provide an additional source of PM_{10}, and dispersion modelling predicts a potential increase in PM_{10} in the Garth Avenue area of 0.7 $\mu g/m^3$, which is considered to be negligible.

15.8.2 Air Quality Mitigation Measures

To minimise the potential impacts, the continuation of quarrying, related operations and the extension development will be conducted in accordance with best practice guidance and, for the prescribed processes, the existing Environmental Permit conditions. The essence of the guidance is that dust emissions can be controlled by effective site management.

The measures for the control of dust on site will comply with any conditions which may be specified by RTC; will involve a continuation of current visual monitoring and controls; and will accord with the Hansen Environmental Management System. The Quarry Manager will refer to the planning conditions and routine visual inspections to determine his response to potential or actual dust emissions, taking into account current and forecast weather conditions.

The Quarry Manager will record all dust and air quality complaints, identify causes, take appropriate measures to reduce emissions in a timely manner, and record the measures taken. A complaints and activities log will be maintained and made available to RCT if requested.

The current programme of dust monitoring is being reviewed in the light of the findings from the 12 month study period undertaken in accordance with the planning conditions imposed on the existing quarry. Subject to this review, further monitoring surveys within the site may be required, together with the deployment of additional routine monitoring and mitigation measures if appropriate.

15.8.3 Conclusions

Therefore, the overall effect of an extension to the life of the quarry operations is concluded as acceptable in terms of human health, as air quality objectives outside the site will continue to be met. Nevertheless, the quarry is acknowledged as a potential source of particulate emissions that will require continued management and further monitoring. It is a requirement of the existing Environmental Permit covering the quarry processes and asphalt production that best practicable means are used to control emissions, and the Permit will continue to be reviewed and enforced by RCT.

With regard to other air quality issues, in particular the potential for odour releases from the asphalt plant, the potential for nuisance impact is considered to be slight to negligible.

15.9 Traffic

15.9.1 Traffic Study

The assessment of the impact on the local highway network of the proposed northwest extension at Craig yr Hesg Quarry has considered the extant planning permission and the implications of the proposed activities going forward.

The proposals effectively represent a continuation of current activities as the proposed hours of operation, method of transport and types of vehicle used would not materially change. Whilst there has been a revision to the existing access configuration, these works represent an improvement to the current access / egress arrangements. Traffic movements are currently permitted and can continue to the end date of the current planning permission (31st December 2022).

The safety performance of the site accesses and local highway network, which continue to accommodate daily HGV movements, has been reviewed using collision records obtained from RCTI. The records confirm that there have been no recorded accidents at the site accesses and no recorded accidents involving HGVs on the neighbouring highway network.

The typical rate of extraction would result in an average of 70 loads/140 HGV movements per day on the local road network.

In accordance with the ongoing and historic operations, the majority of HGVs travelling to/from the site would travel to/from the south via the B4273, A4223 and A470.

Traffic flow information provided by RCT confirmed that the B4273 currently operates at 67% of its design capacity and therefore retains a reserve or spare capacity of approximately 500 vehicles, or 33% of its design flow, under peak hour conditions. As a result, capacity is not considered to be a constraint to the ongoing development at Craig yr Hesg Quarry.

15.9.2 Traffic Mitigation Measures

A designed – in mitigation measure has already been implemented with the construction of the new two way access to the quarry and the improved visibility and geometry which will be associated with the new junction onto the B4273, compared to the visibility splays and geometry at the historical northern exit.

The existing road network currently accommodates the traffic associated with the activities at Craig yr Hesg Quarry, which are assumed will continue as existing.

As has been established, the existing road network has sufficient capacity to accommodate the traffic and has a sufficient level of geometric design to facilitate safe access, as demonstrated by the lack of accidents involving HGVs within the study area in recent years.

In general terms, the highway network is therefore considered to be acceptable and no geometric improvements to the site access are required to accommodate the ongoing activities at Craig yr Hesg Quarry beyond routine maintenance of the new quarry access road and its visibility splays.

15.9.3 Traffic Conclusions

Following completion of the review of the highway and transport implications of the proposed development it is concluded that:

- The recently improved site access is acceptable to serve the proposed development;

- The quantum of proposed development traffic is already generally accommodated on the local road network, which has been demonstrated to retain substantial spare capacity;
- There are no recent records of accidents involving HGV's in the vicinity of the quarry or on the identified access route to/from the A470; and
- The existing planning permission provides for the existing HGV activity to continue until 31st December 2022. As a result, any current, committed or future development that may be approved, which could have an impact on the local highway network, would take the existing and proposed HGV movements into account.

Accordingly it is concluded that the proposed development is acceptable in terms of highway and transport considerations.

15.10 Cultural Heritage

15.10.1 Cultural Heritage Study

There are no known heritage assets within the site. With the exception of a single chance find of a Neolithic flint tool within the wider environs of the site, the recorded activity with the study area and within the broader surroundings of the site consists entirely of later post-medieval and modern remains, mostly associated with industry and transport.

There is thus a low potential for the presence of archaeological remains within the site although, due to the lack of modern disturbance, the survival of archaeological features within the site cannot be wholly ruled out.

The extraction activity within the footprint of the proposed quarry extension and screening landform / bund would lead to a permanent removal of any archaeological remains which may be present, leading to Major Adverse impacts upon any archaeological resource.

The proposed development will not affect the settings and the significance of any designated heritage assets within its environs, which comprise a number of Listed Buildings, leading to a Neutral significance of effect.

15.10.2 Cultural Heritage Mitigation measures

Proposed mitigation measures with regard to the archaeological resource include archaeological monitoring in the form of a watching brief during soil stripping, which would ensure the preservation by record of any remains which could be impacted upon by the development. The scope and methodology of these works will be agreed with the LPA through consultation with the Archaeological Planning Manager for Glamorgan Gwent Archaeological Trust prior to development.

15.10.3 Cultural Heritage Conclusions

It has been established that the proposed development will not result in significant adverse effects upon the cultural heritage resource.

It is anticipated that following the implementation of an agreed scheme of archaeological mitigation in the form of an archaeological watching brief, the residual effects of the proposed development upon below ground archaeological resource will be Slight Adverse.

No significant effects upon designated heritage assets within the surroundings of the site are anticipated as a result of the proposed development (Neutral effect).

16.0 CONCLUSIONS

This ES provides a detailed and objective analysis of the potential environmental effects which would be associated with the proposed extension to Craig yr Hesg Quarry and the related operations within the existing quarry.

The application site boundaries have been drawn to encompass the proposed extension area and existing Craig yr Hesg Quarry as part of a ‘consolidation application’. This is designed to facilitate the issuing of a single planning permission, covering all extraction, restoration, processing and related operations at the Quarry.

The ES confirms the details of the proposed extension development and related operations which provides a single quarry development and restoration scheme for the site. The restoration scheme builds upon the details of the currently approved restoration concept for the existing quarry and its nature conservation after use objectives by applying the same restoration treatments and principles within both the existing quarry and extension area as part of a comprehensive and consistent approach to restoration of the overall site.

The scope of the EIA and the content of this ES have been informed by a Scoping Opinion issued by RCT Council in November 2014 which confirmed the topics and issues which should be addressed as part of the EIA. All identified topics and issues have been duly considered and are reported in this ES (ref Table 1.1).

The ES draws together the inputs from specialist consultants who have undertaken the EIA, and sets out the results of very careful, detailed and systematic research into each of the potential environmental effects of the development. Where relevant, the technical chapters make recommendations for measures to mitigate the environmental and amenity effects of the development which, in the majority of cases draw upon existing, well established and effective controls at the existing quarry.

The ES also draws upon mitigation measures which have been designed in to the proposed development scheme, central to which is the proposed establishment of a northern screening landform designed to minimise visual and noise effects of extraction operations within the extension area.

All quarry developments will give rise to some degree of environmental effects, and this is inevitable given the nature of the operations which are involved. However, the requirement of national planning policy (MPPW) and the advice in MTAN1 is to ensure that effects are “minimised” and maintained “within acceptable limits” rather than eliminated. The conclusion reached by the ES is that the proposed scheme would successfully “minimise” the environmental effects, and that the existing substantial package of mitigation measures is capable of being adopted in relation to the ongoing and future operations at the site which would ensure that the effects of operations are maintained “within acceptable limits” (ref *(MPPW para 5 and 7).*

The limited residual environmental effects need to be balanced against the wider planning policy considerations which are discussed in the accompanying Planning Application Statement. Of particular relevance is the high quality of the aggregates produced at Craig yr Hesg which national planning policy recognises as a ‘special case’ in terms of supply, and where Planning Authorities are urged to recognise the UK importance of the resource (ref MPPW para 69 and MTAN 1 para 42). This importance is reflected in the content of the RCT Local Development Plan which allocates a ‘preferred area’ for an extension to Craig yr Hesg Quarry (the extension area within the current application site) as the only preferred area allocation in the Plan for future aggregates extraction in the RCT area.

In the light of the above considerations, it is concluded that the development could proceed in accordance with the underlying objectives of policies relating to the extraction of aggregates, and, in particular, within the context of the national policies which have been highlighted.

The planning policy analysis also concludes that the development could proceed in accordance with the development plan policies for the area.

In all these circumstances it is considered that there should be a firm presumption in favour of permission being granted.