

R I C H A R D S
M O O R E H E A D & L A I N G L T D

**Engineering works and use of land relating to the
construction of the proposed A487 Caernarfon Bontnewydd
Bypass and existing minerals permission**

ENVIRONMENTAL STATEMENT

for

JONES BROS. CIVIL ENGINEERING LTD

December 2016

3030



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ENGINEERING, ENVIRONMENTAL and LANDSCAPE SPECIALISTS

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Rev 1 (February 2017)

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QUALITY ASSURANCE PROCEDURES: QP4

Prepared by:	Andrew Sumner	Date:	December 2016
Checked by:	Shan Wyn-Jones	Date:	December 2016
Approved by:	David Richards	Date:	December 2016

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PART A: NON-TECHNICAL SUMMARY

INTRODUCTION

This is a summary of the Environmental Statement (ES) for proposals (referred to here as ‘the scheme’) in the Caernarfon Brickworks Quarry, which includes an existing planning permission. The site lies immediately to the south of the town of Caernarfon and consists of an existing clay quarry, large areas of hard surfaced yard on both sides of the River Seiont and an area of pasture to the east. Road access to the quarry is from Pont Seiont roundabout and Seiont Mill Road. A detailed site description is included in Chapter 4 of the ES.

The need for an ES has been confirmed by the Minerals Planning Authority, and has been completed by the Applicant in accordance with the requirements of the Environmental Impact Assessment Regulations. This NTS includes a summary of the findings of each environmental chapter in the ES.

The scheme

The Balfour Beatty and Jones Bros Joint Venture, is the contractor likely to be responsible for construction of the proposed A487 Caernarfon to Bontnewydd Bypass. They propose to resume extraction of minerals in the quarry under the existing minerals planning permission and to modify restoration scheme to improve safety and slope stability. ‘The scheme’ will also include engineering works to existing quarry haul road on south eastern side of quarry void and a new permanent haul road on the north and east side, for use in bypass construction.

Associated with this scheme the small compound on the brickworks yard will be expanded to provide additional staff accommodation, welfare area, car parking, a plant maintenance shed and bunded fuel store for the duration of the bypass construction contract.

Consultations

Consultations have been carried out with Statutory and relevant non-statutory consultees throughout the development of the proposals and a full list of consultees is provided in the ES Chapter 5. In late 2016 a formal Pre-Application Consultation (PAC) was completed and the results set out in a separate report.

The reasons for the development

The Applicant (Jones Bros) wishes to use the quarry in connection with construction of the proposed A487 Caernarfon to Bontnewydd bypass. There are economic, logistical and environmental benefits to be derived and these are set out in Section 2.6 of the ES. Substantial volumes of fill will be needed to construct embankments. Some excavated poor quality soil within the bypass site would need to be removed. Quarries in the area have been considered as sources of fill and suitable sites sought to receive poor quality soils (see Chapter 5 of the ES).

Seiont Quarry has proved to be the best option because it lies beside the proposed bypass and will satisfy most of minerals requirements of the scheme. It also would provide a large flat site, suitable for use as a construction compound. Using Seiont Quarry will avoid around 88,000 HGVs journeys, and any thousands of HGV miles, on public roads over the 2 years of construction. Consequently, there will also be considerable savings in the amount of fuel used, reductions in vehicle emissions, and completion of quarry restoration sooner than 2042, when the existing minerals permission expires.

Description of the project

The proposals will be mostly contained within the existing quarry and brickworks and will include continued extraction of up to 400,000m³ of clay which is permitted under the existing planning permission. The proposals are described in Chapter 6 of the ES.

Temporary activities associated with the bypass construction would include a secure contractor's compound with offices, welfare facilities and car parking for personnel, fuel store, a building to service plant and a plant washing facility. These would remain on the former brickyard for 2 and 7 years. Private vehicles and delivery vehicles will access this compound along Ffordd Felin Seiont. All other vehicles will arrive from the bypass construction site.

A new temporary access road would be formed, leading into the quarry from the bypass construction site, part of which would require a road cutting through a field on the east side of the quarry. Within the quarry the processing minerals and mixing concrete would be carried out. An existing haul road would be improved.

Following extraction of the clay required for the bypass the quarry would be restored using surplus fill not suited to forming bypass embankments and some material brought from alternative sources if there is a shortfall in quantities. In place of the hazardous steep-sided waterbody the restoration will fill the sump with around 248,000m³ of fill to form a dry land. The quarry slopes would be restored to shallower, more stable gradients with approximately 152,000m³. The restored areas would be covered with soil and seeded as necessary. Tree and shrub planting would also be carried out. Restoration would be completed within 5 to 10 years.

The brickyard to the west of the River Seiont would be excavated to remove 11,000m³ of made-ground to provide infill material to form a basin with a shallow, permanent waterbody and restored for nature conservation and amenity.

Air Quality assessment (Chapter 6 of the ES)

Air quality is a matter of concern for human health and for the wider environment. European and national legislation sets objectives for air quality and this assessment examines whether the proposed scheme in the quarry will cause dust and emissions to exceed the objectives.

The existing air quality in the vicinity of the quarry is good. The air quality effects on human receptors associated with the scheme are unlikely to prevent the implementation of measures

by Gwynedd Council to meet national air quality standards. There is unlikely to be an exceedance of UK air quality objectives, nor would a new Air Quality Management Area be declared.

Occurrences of dust in the quarry will be limited and of short duration and will be minimised by implementation of dust control measures. Increased HGV and plant exhaust emissions in the quarry would stay well below Air Quality Objective thresholds for the annual daily average.

Other developments in the area that could affect air quality include the A487 Caernarfon bypass scheme which will pass to the east and south of the application site. The bypass is expected to bring about an overall beneficial impact on air quality because it will reduce the traffic pollution concentrations in some of the more congested areas along the existing road. Works within the application site will be completed, or virtually completed, when the bypass is in operation. The period of greatest concern is the construction phase when the activities with greatest dust-producing potential will be occurring within the application site and on the bypass construction corridor.

Whilst there will be cumulative activity with construction plant moving along the bypass construction corridor, and transporting materials for concrete and asphalt preparation, the potential for the spread of dust towards sensitive receptors is unlikely to have a greater cumulative impact so long as mitigation measures are properly implemented to control dust.

Cultural Heritage (Chapter 7 of the ES)

Cultural heritage includes archaeological remains, Listed Buildings, Ancient Monuments, Conservation Areas and other heritage sites. The assessment describes how these sites might be affected and assesses the impacts that construction and operation of the quarry and its associated infrastructure may have and identifies mitigation measures to avoid, reduce or offset any adverse impacts.

36 heritage sites have been identified within the quarry or the immediate surrounding area that include houses, farms and other buildings, gardens, walls, crop marks, a former railway, a former clay pits and other industrial features. The impacts for almost all of the sites were assessed as Neutral or Neutral to Slight, meaning that there was either no change in the condition of the site, or that there was a possibility of minor alteration to one or more characteristics such as the setting. None of these impacts were considered to be Significant. Mitigation would include landscape planting and restoration of the quarry to address the adverse impacts on the landscape setting. An Archaeological Watching Brief and recording would be maintained in the critical areas during excavation.

Landscape and visual amenity (Chapter 8 of the ES)

This assessment, which considers the likely effects of the proposed scheme on the landscape and visual amenity of the surrounding areas, shows that there would be no significant adverse

impact to designated landscapes. In particular, the scheme would not be noticeable in views from Snowdonia National Park.

A number of local properties experience views of the existing quarry, but no significant visual impacts are predicted as a consequence of the scheme. Properties overlooking the quarry are predicted to suffer a slight adverse impact when the quarry is being worked, but on restoration of the quarry these detrimental impacts will be alleviated. No significant visual impact is predicted as a consequence of any lighting required in the scheme.

Whilst the impact of 'the scheme' alone would not be significant, the cumulative impacts caused by the proposed scheme in the quarry, in addition to the bypass, would not increase an already significant direct detrimental landscape impact on the locality.

Ecology and nature conservation (Chapter 9 of the ES)

This assessment covers the effects of the proposals on biodiversity and nature conservation sites. There are a range of statutory and non-statutory nature conservation sites within a distance of 5km. The site includes trees, scrub and grassland habitat of a kind associated with natural regeneration on bare soils. Bats use a roost on the fringes of the scheme and otter use the river corridor, while a range of bird species use the site and setting.

Mitigation measures will be included will protect important habitats and sites during the period of use of the quarry. The restoration scheme will enhance existing habitat and allow the development of grassland and scrub habitat associated with natural regeneration. The proposed shallow waterbody west of the river will provide new wetland habitat. There will be no impact on Lesser horseshoe bats using a roost on the edge of the site, on bat species foraging in the surrounding area and on otter using the river corridor.

The assessment has also demonstrated that, provided the mitigation measures are implemented there will be no cumulative impact on bat species or on otter from the proposals.

Geology and soils (Chapter 10 of the ES)

This assessment covers the effects of construction and operation of the quarry and its associated infrastructure on site designations, geology and geomorphology, mineral reserves and soils. It also assesses the risk to receptors, such as rivers and people, if contaminated land were to be disturbed.

A ground investigation has been completed, to better understand the risks of any ground contamination, but no concentrations of contaminants were identified above guideline concentrations. A small fraction of asbestos fibres was detected in 4 of the 11 soil samples tested but the samples are from an area that will remain sealed beneath the concrete slab of the former brickworks so there is negligible risk of human exposure to the ground strata. However, if further contamination were found during quarrying, the contamination could

pose a very low risk. Water samples taken in the River Seiont, show there is no existing impact from the quarry on water quality.

The clay quarry has been excavated into Pen-y-Bryn for many decades, and small landslips are evident on the east side of the quarry. The south slope of the quarry is designated as a 'Regionally Important Geodiversity Site' (RIGS). Further excavation of the clays is permitted under an existing planning permission. The proposed restoration scheme for the quarry will address slope instability as well as repairing the landscape. These impacts have been assessed as slight to moderately beneficial. The scheme will have a Large Beneficial Impact on the remaining Designated RIGS site.

Noise and Vibration (Chapter 11 of the ES)

This assessment considers the proposed scheme in terms of the potential noise impact and identifies suitable measures to mitigate the impact. The assessment undertakes predictions of noise levels at the closest Noise Sensitive Receptors (NSRs) and compares these with the existing noise and noise limits set by national standards, policy and guidance.

The assessment has shown that worst-case noise levels generated by operations during all anticipated phases of the development are predicted to be at or below the adopted noise level limits at all identified receptor locations. Features incorporated into the design of the scheme will aid in the mitigation of noise. A number of good site practices are proposed to further reduce the risk of potential noise impacts. Noise should not pose a material constraint for the proposed scheme.

Effects on Community Assets (Chapter 12 of the ES)

This assessment considers the potential impacts on the local community and community facilities such as public rights of way, public roads, public open space, or community buildings, brought about by the movement of construction vehicles, or temporary or permanent changes. The assessment also takes account of any measures to avoid or to mitigate for the effects.

A preliminary examination demonstrated that some community facilities would be sufficiently affected to make a more detailed assessment necessary. These facilities included Footpath 13 which follows the north bank of the River Seiont, Footpaths 26, 31 and 32 in Caethro, Ffordd Felin Seiont, Ysbyty Eryri and the Care Home, and 'The Park' public open space.

During the period when the quarry and brickyards would be in use the impact on all the facilities listed above would be 'Slight Adverse'. Once the quarry is restored the impact on community facilities will be with Moderate Beneficial, while the residents on Ffordd Felin Seiont would benefit from a Moderate to Substantial Improvement. The impact on users of public footpaths 26,31 and 32 would be Neutral.

Cumulatively the quarry and bypass scheme would result in Slight adverse impacts on the Footpaths 26, 31 and 32 because the bypass scheme will require users to cross the new road.

Traffic generation and effects (Chapter 13 of the ES)

This assessment considers the potential impacts on local access and traffic on local roads associated with the scheme and has taken into consideration the type and volume of traffic generated.

The A487 bypass scheme will require up to 400,000 cubic metres of rock and soil for embankments. Soils that are excavated from the bypass, but do not meet engineering requirements are available for quarry restoration. The total volume of fill would require nearly 890,000 return journeys by 20 tonne Heavy Goods Vehicles (HGV). If Caernarfon Quarry is used to both supply engineering fill and to receive poor quality soils, there will be no need for these HGVs to travel to more distant quarries and disposal sites on public roads. This will mean less use of fuel, reduced construction costs and vehicle emissions.

Some HGVs will still use public roads, but careful planning of routes for HGVs and prohibitions on site HGVs using certain roads sensitive local roads will reduce impacts. Staff will arrive at the construction site before the morning rush hour (8am to 9am) and leave after the afternoon rush hour (4pm to 5pm).

The residual impacts, taking into account proposed mitigation, would be an increase in traffic on most local roads of around 1% or less. The greatest impact would be on traffic using Ffordd Felin Seiont which serves a limited number of residential properties and the quarry. Current traffic on this route is estimated to be around 200 vehicles per day. Adding proposed quarry traffic would increase use of the road by a daily average of 84 vehicles (41%). This increase will have a Moderate Impact.

Cumulative impact with the bypass construction project would slightly increase traffic overall, with the possibility of temporary increased congestion at the Goat and Plas Menai roundabouts and other access points onto the bypass construction corridor. On completion of the quarry and bypass, roads would no longer be affected by the construction traffic.

Drainage and the Water Environment (Chapter 14 of the ES)

This assessment describes the existing flood risk at the site, assesses the potential impacts of the development during construction and restoration phases on flood risk elsewhere and on groundwater.

The site is located within Flood Zones shown on Welsh Government and Natural Resources Wales Flood Maps. These maps show that the site is at risk of flooding from the River Seiont. However, there are no historical records of floods in the quarry or brickworks yard to support this. With the agreement of Natural Resources Wales (NRW) the Applicant undertook 2-Dimensional (2D) hydraulic modelling of the Afon Seiont and the surrounding floodplain, using an accepted method, to estimate potential flood levels and extents, water depths and flow velocity.

The assessment demonstrated that the proposed development, including most of the former brickworks yard and the existing access road, is actually flood-free. A small area in the northwest corner of the brickyard is still at risk of flooding. The proposed temporary contractor's compound and the quarry and will not use the area at risk of flooding. The proposed quarry restoration would not increase flood risk. The brickyard west of the river is shown to be at risk of flooding. Proposals to excavate a basin in this area would provide a measure of additional flood storage capacity but would not adversely affect the flow in the river.

Water Quality (Chapter 15 of the ES)

This assessment describes the potential impacts on the quality of water in the ground and in watercourses during the establishment, operation and restoration of the proposed scheme in the quarry. If there is a source of pollution and a pathway by which the pollution can be transferred to water then contamination of water could occur. Sources of contamination in the site could include clay soils, which could be washed into the river causing turbidity; contamination in the ground; and fuel, lubricants and other pollutants which could be spilled. Testing of soil samples from made ground have not identified pollutants that could be cause water pollution.

Water resources that could be affected by the scheme include the River Seiont, which supports Salmonid species and flows into the Menai Strait & Conwy Bay Special Area of Conservation (SAC); an un-named seasonal watercourse of relatively poor quality which flows to the south of the quarry to ultimately discharge into the Afon Gwyrfai SAC; and a spring on the south west side of the quarry; and the pool of water in the quarry sump.

Mitigation would remove sources and pathways that allow water pollution of watercourses to occur. These measures will include settling lagoons for silty water; bunded fuel storage and careful handling of material from made ground and imported fill. With mitigation, the impacts on sensitive receptors such as the River Seiont would be Neutral.

Consideration of cumulative effects

Using the former brickworks quarry site in the manner proposed (Chapter 2) will provide substantial economic and environmental benefits. A large proportion of the materials required for construction can be obtained from the quarry with minimal transport costs, reduced fuel use and much reduced carbon emissions. Similarly, any fill material excavated from the bypass that cannot be used for engineering works will be used for quarry restoration purposes. Both these operations will avoid the need to use local roads for access to more distant quarries in Gwynedd, or elsewhere in North Wales, will ensure that a very large number of journeys by heavy goods vehicles will not be required, with the result that traffic congestion on the road network will not be worsened by the haulage of fill material and vehicle emissions will not be increased on the roads that might otherwise be used.

A benefit to local residents is that restoration of the quarry and the cessation of mineral extraction will be completed well before the current planning permission for clay extract expires.

Overall cumulative impacts with other developments would be greatest during the period of bypass construction but declining once the bypass construction and quarry restoration are completed. Overall environmental impacts will be limited and temporary due to the short-term nature of the proposed activity. In the medium to long term the impacts would become positive with the restored quarry contributing to the quality of amenity and to biodiversity nature conservation.

The visual impact of the bypass on receptors around the quarry will remain adverse for several years, but diminishing as proposed mitigation planting on the side of the road grows to screen views

PART B: INTRODUCTION TO THE ENVIRONMENTAL STATEMENT

1 THE PROJECT

1.1 Context for this Environmental Statement

1.1.1 This Environmental Statement (ES), produced by Richards, Moorehead & Laing Ltd (RML) on behalf of the Jones Bros Civil Engineering Ltd, covers the Environmental Impact Assessment (EIA) of a proposed scheme within the existing Caernarfon Brickworks Quarry. The site lies immediately to the south of the town of Caernarfon beside the River Seiont and consists of an existing quarry, large areas of hard surfaced yard on both sides of the river and areas of pasture to the east. A full description of the site, the setting and location are provided in Section 3.1. The location of the quarry is shown in Figure 2.1.

1.1.2 The proposed scheme includes:

Engineering works and use of land relating to the construction of the proposed Bontnewydd bypass and existing minerals permission (code C00A/0441/14/MW issued in 2007) to include the following:

- A) Temporary use of land as an extension to the existing site compound and the provision of a maintenance shed and construction traffic haul route, to be used during the construction of the proposed A487 Caernarfon and Bontnewydd bypass route, covering a period between 5-10 years.**
- B) Formation of a new, permanent access haul road on north and east side of the existing quarry void to serve the quarry site on completion of the proposed A487 Caernarfon and Bontnewydd bypass route, together with the use of off-site fill material (from the bypass construction site) for quarry engineering and restoration purposes.**

1.1.3 A full description of the development is set out in Section 2.

1.2 Twin-track planning application

1.2.1 A separate planning application has been submitted for a more extensive proposal which includes:

- Temporary use of land as an extension to the existing permitted site compound;

- provision of a maintenance shed and construction traffic haul route, to be used during the construction of the proposed A487 Caernarfon and Bontnewydd bypass route, covering a period between 5-10 years.

Existing planning permissions on the site

- 1.2.2 There is an existing permission for extraction of clay from the quarry and the processing and use of the clay for brick making on site. Permission to extract clay remains until 2042. Permission has recently been granted for a Change of Use within the site of the former brick factory to allow a temporary compound to be established with secure office space, welfare facilities and car parking. The access for this temporary compound will be via the existing quarry access road and across the existing bridge over the River Seiont. The area of brickyard to the west of the River Seiont has a current Lawful Use permission for use as a brickyard.

1.3 Statutory Framework for EIA

- 1.3.1 The ES has been produced in accordance with the requirements of the Environmental Impact Assessment Regulations and the following legislation, which implements European Council Directives 85/337 and 97/11/EC on the Assessment of Certain Projects on the Environment. A number of amendments have taken place since the original EIA Regulations came into effect, including a 2016 update. In Wales, this became law through the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2016 [2016 No.58 (W.28)]
- 1.3.2 The need for an ES has been confirmed following a screening process associated with these regulations. The scope of the EIA has been agreed following a request for a scoping opinion from the Minerals Planning Authority.
- 1.3.3 A separate Non-Technical Summary (NTS) has been produced and is provided separately, and as Part A of this document.

1.4 Screening and Scoping

- 1.4.1 A Request for a Screening Opinion was submitted to North Wales Joint Minerals Planning Authority (NWJMA) on the 16th July 2015. A written response was received from the Authority on the 30th July indicating that an ES would be required under Schedule 2, Paragraph 11 the Environmental Impact Assessment (Planning) England and Wales, Regulations 1999 (as amended) for the proposed scheme, as described in paragraph 1.1.2 (points A to D). The conclusion for an ES was given on the basis that the development falls within the applicable thresholds and criteria, as set out in Schedule 2 of the Regulations.

- 1.4.2 A Scoping Request was sent on the 7th October 2015, with a Scoping Report which set out what was considered appropriate. The NWJMA confirmed receipt of the request on the 9th October and undertook a formal consultation with the statutory consultees. Natural Resources Wales (NRW) did not respond within the statutory period, requiring an extension of time. The NWLMA requested an extension until the 20th November on behalf of the NRW. The full written Scoping Opinion, dated the 16th November, was provided by the NWLMA. The Screening Opinion and Scoping Opinions are included in *Appendix 1.1*.
- 1.4.3 Since the NWLMA's Scoping Opinion was received the scheme has undergone a number of changes which generally change the extent and environmental impact of the new proposals. However, the changes were not considered of sufficient scale to require a further request for a scoping opinion.

1.5 The assessment process

- 1.5.1 An ES must contain information as outlined in Annex IV of council directive 97/11/EC (amending directive 85/337/EEC, June 1985) as is reasonably required to assess the environmental effects of the development. The scope of the ES is guided by the scoping opinion of the planning authority. In particular, the ES should cover:

A Description of the project, including in particular:

- a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases;
- a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used;
- an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, , light, heat, radiation, etc.) resulting from the operation of the proposed project.

B An outline of the main alternatives studied by "The Developer" and an indication of the main reasons for this choice, taking into account the environmental effects.

C A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological

Located

Part B
Chapter 2

Part B
Section 2.4

Throughout

Part B
Chapter 4

Part C
Chapters 6 to
16

	Located
heritage, landscape and the inter-relationship between the above factors.	
D A description of the likely significant effects of the proposed project on the environment resulting from: <ul style="list-style-type: none"> the existence of the project; the use of natural resources; the emission of pollutants, the creation of nuisances and the elimination of waste; the description by “The Developer” of the forecasting methods used to assess the effects on the environment. 	Part C Chapters 6 to 16
E A description of the measures envisaged to prevent, reduce and, where possible, offset any significant adverse effects on the environment.	
F A non-technical summary of the information provided under the above headings.	Part A
G An indication of any difficulties (technical deficiencies or lack of know-how) encountered by “The Developer” in compiling the required information.	Chapters 6 to 16

1.6 Consultations

1.6.1 Consultations have been carried out throughout the development of the proposals for the Seiont Brickworks Quarry. Organisations involved include:

Organisation	Key to symbols:			
	Feasibility	Screening	Scoping	EIA
Gwynedd Planning Authority	T M		M	C
North Wales Minerals Planning	T M	C M	C M	C M
Welsh Government Transport Division Development Control Team and New Roads Section	C		C	C M
Natural Resources Wales (NRW): Biodiversity and Invasive species	C M	C	C	C
NRW: Flood Risk, Foul drainage and Groundwater	C M	C	C	C
NRW: Contaminated Land and waste	C M		C	C

Organisation	Key to symbols: C = Correspondence T = Telephone Call M = Meeting	Feasibility	Screening	Scoping	EIA
Regionally Important Geodiversity Sites Group (regarding RIG site within quarry)	C	T	T	M	
Gwynedd Archaeological Trust				C	C
Welsh Water: foul drainage				C	C
Scottish Power: electricity supply to site					
North Wales Police: security	M				
Gwynedd Council Public Protection: Environmental Health: Air Quality, Traffic, Noise and Vibration, Water Quality, Lighting, Minerals processing			C	C	C
Gwynedd Council Public Protection: Contaminated Land			C	C	
Gwynedd Council Biodiversity				M	CT
North Wales Wildlife Trust and Gwynedd Bat Group					C
Regionally Important Geological Sites (RIGS) Group				C	C
Some local residents where direct contact has been made					

1.6.2 The Response to a request for Screening Opinion and Scoping Opinion are included in *Appendix 1.1*.

Pre-Application Consultations

1.6.3 Due to the large of the area required for the proposed development, the planning application is defined as 'Major' and as a consequence a formal Pre-Application Consultation (PAC) was completed in October and November 2016 and the details are set out in a Pre-Application Consultation report. During the consultation, a full set of draft application documents were made available to 'Special Consultees', Community Consultees' and 'Adjoining landowners'.

1.7 Considerations

1.7.1 The reason the Applicant has chosen to seek planning permission to use the quarry in the manner described in this Environmental Statement is that a number of economic, practical and environmental benefits will accrue. These can be summarised as follows:

- Use of the quarry will substantially reduce the number of HGVs using public roads;

- The brickyard has a large area of hard surfacing that would be required for the construction compound and site offices. Use of this site will reduce the need to create hard surfaced yards elsewhere along the bypass scheme.
- There will be considerable savings in the amount of fuel and reductions in vehicle emissions;
- More economic and efficient construction practices become possible;
- The mineral resources in other quarries and space in landfills away from the road will not be taken up;
- Restoration of the quarry will be completed much earlier than the current permitted date of 2042;
- There could be considerable savings to the cost of construction of the A487 Caernarfon and Bontnewydd bypass.

1.7.2 With these circumstances in mind the various assessments will make reference to and comparisons between the following circumstances, where:

1. The contractor chooses to open up borrow pits along the route instead of using the quarry;
2. The site owner uses the existing planning permission to allow clay quarrying and brick manufacture until 2042, versus restoration of the quarry by around 2020 if this new proposal goes ahead;
3. The contractor chooses to use various other landfills or quarries in the vicinity, instead of using the quarry, which would result in large numbers of HGVs using the road network to carry materials;

2 DESCRIPTION OF THE PROJECT

2.1 The purpose and reasons for the project

2.1.1 It is proposed by the Applicant to commence work of various kinds at the Seiont Quarry which they intend to purchase from the current owner. Their proposals are conditional upon the Welsh Government decision to build the proposed A487 Caernarfon and Bontnewydd Bypass. Much of the proposal relates to the current planning permission to extract minerals and to restore the quarry by 2042. Whilst the proposed development at the quarry and the proposed bypass are linked, the two projects are entirely separate in terms of the process by which formal consents are given and in terms of ownership. Whilst this ES will accompany a planning application, it is understood that a separate ES has been prepared for the bypass, by others, published under the Highways Act, alongside Draft Orders.

2.1.2 The quarry and brickworks with generous hard standing and the surrounding areas of farmland lie close to the line of the proposed bypass and are of sufficient size that they would serve as a site compound for the bypass construction works. The site would provide the project with space for:

- office accommodation, welfare facilities and car parking for construction personnel;
- storage and maintenance space for construction plant, haulage vehicles and imported construction materials and components;
- extraction of minerals for bypass construction (mainly within the existing permitted area);
- stockpile areas for soils brought from the construction site;
- processing to maximise the engineering qualities of excavated materials;
- new haul roads which would provide temporary access to the bypass construction site;
- capacity to deposit suitable soils to restore the quarry on completion. The restoration will include the infilling of the quarry sump, to remove a significant hazard of deep water and steep sides.

2.1.3 Because there may not be sufficient soils to spare from bypass construction for restoration of the quarry void, the import, processing of suitable materials, and the placing of waste soils to create a final ground surface for planting and seeding, might continue for a period of several years after the road is complete.

2.1.4 A set of drawings showing the development sequence are provided in Figures 2.2 to 2.5.

2.2 Physical characteristics and land use requirements of the project

2.2.1 The proposals are closely tied to the construction of the proposed bypass and it is the requirements of that project that the applicant wishes to meet by using the quarry.

Table 2.1: Requirement of the scheme

Aspect of the proposals	Approximate requirement
Close proximity to the proposed bypass to minimise haulage of bulk materials on the public road network.	As close as possible to minimise haulage and travel for personnel
Level ground for plant maintenance and storage and for construction related activities. Accessible from working areas.	Approximately 0.5 hectares
Covered workshop space with access doors on the gable ends. Height to be confirmed. Accessible from working areas.	Portal frame workshop building 10m x 25m
Plant wash-off slab accessible from working areas.	8m x 20m
Bunded fuel tanks and filling space above flood plain and accessible from working areas.	8m by 10m
Area of hard standing for use as the site compound floor area of temporary offices and welfare facilities during construction of the bypass. To include 30 temporary cabins including 3 canteens, 2 shower and toilet blocks, 3 meeting rooms and 2 drying rooms.	1.3 to 1.5 hectares of level dry ground and hard surfaces
Mains services already present and adequate for the proposed use, including electricity and water.	Adequate for between 30 and 50 people in the site including site staff, plant operators and visitors.
Foul drainage for the site is also available, but Welsh Water are objecting to any connection. Consequently, the applicant has chosen to use a foul sewage storage tank, raised above any flood level. The tank will be regularly maintained and emptied in accordance with relevant consents.	Adequate for between 30 and 50 people in the site including site staff, plant operators and visitors
Area of clean hard standing to provide a car park to be accessed from public roads and segregated from works access.	Approximately 50 cars

Aspect of the proposals	Approximate requirement
Reasonable separation, from residential areas and public open space.	A suitable man-made or natural safety and security barrier
Adequate separation, for reasons of noise, vibration, dust and visual impact.	50 metres or more from adjacent residential or more sensitive receptors
Adequate protection against the consequences of flooding.	Above the 0.1% Flood Risk or better.
Capacity within the existing permitted quarry, factory and brickyard areas to supply suitable engineering fill to build embankments for the bypass scheme.	Up to 400,000m ³
Area of open roughly level ground above the flood plain, required for processing of fill and mixing materials required for construction, to maximise the engineering value of excavated fill from the quarry and from cuttings on the proposed bypass.	Approximately 0.5 to 1 hectare
Haul roads from the bypass into the quarry for large construction plant and dumper trucks. Adequately separated from the flood plain and river.	Two way routes for large plant to pass safely
Temporary bridge across the River Seiont, if required, subject to a structural survey of the existing bridge.	To carry off-road 30 and 40 tonne dumpers from the brickyard to the quarry.
Weighbridge to record the weight of bulk materials	25m long by 6m wide area
Capacity to take surplus soils from the bypass scheme that are unsuitable for use as engineering fill. ¹	Up to 400,000m ³
Capacity within the site to contain potential construction related pollution from entering sensitive watercourses.	Space to hold effective silt lagoons, attenuation basins and other pollution control measures.

¹ **Case precedent:** THE QUEEN on the application of TARMAC AGGREGATES LIMITED (formerly LAFARGE AGGREGATES LIMITED) versus Secretary of State for Environment, Food and Rural Affairs and another. (Known as The Tarmac Case). [2015] EWCA Civ 1149; [2015] WLR (D) 473. Lord Justice Mcfarlane, Lord Justice Floyd and Lord Justice Sales; Royal Courts of Justice 17th November 2015.

2.3 Approximate quantities

2.3.1 Some of the approximate quantities for the project are set out in Table 2.2a, b and c.

Table 2.2a: Areas within the site

Area of the site east of the river (excluding former brick factory and yards, fields and woodland)	14.3 hectares
Area of fields and woodland	13 hectares
Area of brick yard west of the river	1.1 hectares
Area of hard standing east of the river Seiont for use as the site compound during construction of the bypass	1.7 hectares
Total area of the site (not the same as planning application area)	30 hectares

Table 2.2b: Estimated volumes of mineral for extraction and recovery

Excavation of cutting for haul road outside quarry	45,000m ³
Excavation of prepared clay placed in stockpiles near the former factory site.	14,000m ³
Volume of sand, gravel, boulder and clay overburden that can be extracted from the area of unstable slopes on the east side of the quarry and from within the areas of the quarry to be remodelled to provide a haul road and processing area.	155,000m ³
Excavation of clay and associated minerals within the area of permitted extraction	175,000
Excavation of made ground beneath the brickyard west of the river	11,000m ³
Total volume extracted or recovered	400,000

Table 2.2c: Estimated volume of materials that could be available for restoration

To infill the floor of the void to form a safe, free-draining surface above existing sump level.	248,000m ³
To stabilise the sides of the quarry bowl with slopes with a preferred gradient of between 1:3 and 1:4 and to allow maintenance access. This figure includes some topsoil from the bypass, which will be used selectively to assist in the revegetation of surfaces.	152,000m ³
Estimated volume of material required to restore quarry (surplus soils from the bypass scheme that are unsuitable for use as embankment fill).	400,000m³

2.4 Processes, operations and phases

2.4.1 The proposal will require the following engineering activities and land uses.

Contractor's site compound ('Clean' zone)

2.4.2 The bypass contractors will require a secure temporary compound to locate offices and private and staff car parking. This area will be located on the former brick factory hard standing, to remain in place until bypass construction is completed. This would extend the permitted small temporary compound that is already established, by providing space for a more extensive range of essential facilities. The compound will be accessible from the A487 at Pont Seiont roundabout along the existing quarry access road and will constitute the 'clean' zone. Use of the existing access road is already established under existing planning permissions for the quarry.

Contractors works storage area ('Working' zone)

2.4.3 Beside the 'clean' zone will be an zone dedicated to the storage of fuel and for day-to-day maintenance of construction plant. This area will be formed within the quarry and adjacent brickyard, with drainage into the silt attenuation lagoons in the sump of the adjacent quarry. This area would be entered from the bypass construction site to the south and east. The quarry sump will be pumped out to remove existing water before other activities commence. In discussion with the NRW Fisheries Officer, it was agreed that fish are unlikely to be present, but to ensure that none are harmed a series of precautionary measures would be implemented, including:

- A 10mm cage will be fitted around the pump inlet to exclude fish,
- If fish are observed at any time during pumping the NRW Fisheries Officer will be informed and an application for a permit to remove the fish would be submitted with a receptor site for the fish agreed.

Concrete batching plant

2.4.4 A mobile concrete batching plant and a mobile asphalt batching plant will be located within the 'working' zone, but with clean access from the public road for delivery of cement. Both plant, for which permits to work already exist, will be contained within bunding to ensure that any spillage is contained. The concrete plant will recycle high pH (alkaline) water to minimise the discharge of potential pollutants into the drainage system. When operating at full capacity the plant will be able to produce a maximum of 1,500 tonnes of concrete each working day. The asphalt plant will operate at around 750 tonnes per day to produce a total of 60,000 tonnes for surfacing the bypass.

Minerals processing and stockpile area

- 2.4.5 A mobile mineral processing plant, which already has a permit to operate, will be sited on a purpose made platform within the existing quarry. Fill from the quarry and from the bypass construction site will be brought to this area, crushed and screened to form sand, aggregate and fill to maximise the value for construction.
- 2.4.6 Some processing of materials could continue after the bypass is completed, subject to the need for more quarry restoration materials. Inert construction waste would be imported and processed to separate recoverable construction materials, such as aggregate, for reuse.

Construction of haul roads

- 2.4.7 Linking the 'Working Zone' of the construction compound and the quarry to the proposed bypass construction site the applicant proposes to improve existing quarry haul roads up the north east and south slopes to carry construction plant, as well as empty and laden 30 and 40 tonne dumpers, for the duration of the bypass construction. The improvements would include reforming the existing quarry slopes to provide a safe and stable road surface. The haul routes would remain in use during construction and restoration of the quarry. A length of the northeastern haul road would require excavation of a cutting across a field in the northern part of Penybryn to link to the bypass site to the north east.

Weighbridge

- 2.4.8 A weighbridge would be required to record bulk fill materials and processed aggregates on leaving or entering the site. This would be a temporary facility which is likely to remain until all restoration has been completed.

Extraction of mineral from within the existing permitted scheme

- 2.4.9 Extraction will be carried out to steepen the sides and deepen the void within the existing permitted limits.

Deposit of excavated materials to restore the quarry

- 2.4.10 Materials arising from the bypass scheme, but unsuitable for construction, will be used to fill the quarry sump and provide a soiled surface. An estimated volume of between 300,000m³ and 400,000m³ of unsuitable materials is thought like to arise during bypass construction. In case a lesser quantity is derived from the bypass and restoration cannot be satisfactorily completed, further material would be imported. The processing of inert construction waste would continue, with recovered material exported for reuse and remaining soils placed within the quarry until the restoration is completed. Topsoil that is not required for the finishing of surfaces on the bypass will

be spread over completed areas of the quarry landform to aid in restoration. An application for a Bespoke Permit for this activity is currently in preparation and a draft Waste Recovery Plan has been submitted to Natural Resources Wales.

Excavation of made-ground west of the River Seiont

2.4.10 The former brickyard to the west of the river will be partially excavated to reduce ground levels and provide fill material for construction. The stone revetment on the river bank and riverside trees will be retained for amenity reasons. The hollow created by excavation will provide a shallow water habitat for the benefit of wildlife. This basin is expected to fill with and retain water in extremely high flow conditions and so could provide some flood storage capacity with potential to reduce flood risk downstream. However, this measure has not been taken into consideration as formal flood mitigation.

Slope instability

2.4.11 Evidence of instability in the eastern slopes of the quarry void have been noted in a recent geotechnical assessment and by quarrymen and geologists over a period of at least 20 years. The site contains visual evidence of cracking and slips. Options to address the problem have been considered including the excavation and removal of the ground above the slope, and the placing of fill against the slope. The former scheme would require additional land outside the existing minerals permission, while the latter, which would still require substantial earthmoving, would remain within the area of the existing permission.

Phasing/sequencing

Table 2.3: Phasing of the project

Step	Purpose of phase	Approximate sequence or timing
1	Small site compound established under a recent planning permission to provide a local office for the bypass project team	Early 2016
2	Emptying of the quarry sump by pumping. Expected to take several weeks.	Following planning consent
3	Finalising site drainage measures to separate and clean and potentially silty water.	Once pumping of the sump is adequately advanced
4	Expansion of secure compound for full bypass construction team. Formation of haul roads, installation of weighbridge and processing platform within quarry to meet the proposed bypass construction corridor. Installation of	Following award of bypass construction contract to the joint venture contractors

Step	Purpose of phase	Approximate sequence or timing
	a temporary bridge (if required) across the River Seiont.	
5	Recovery of mineral from quarry sump and former factory site. Commencement of rock and brick processing to form construction materials.	Following Step 4
6	Commencement of import and export of materials to and from the quarry.	Following Step 4
8	Completion of bypass construction	2 years from commencement
9	Removal of contractor's compound	Following Step 8 with final elements removed within 5 years of Step 4.
10	Completion of quarry sump filling, soiling of slopes and restoration of quarry.	Unknown at this stage, but estimated at around 5 to 10 years after Step 8 and subject to availability of restoration materials.

2.5 The proposed quarry restoration scheme

2.5.1 The various activities described previously will contribute to a completed restored landscape that will include:

- improvements to the quality of the local landscape and views from residential properties and public areas,
- Removal of the hazardous deep water and steep slopes of the flooded quarry sump;
- Stabilisation of the unstable steep quarry slopes;
- Cessation of further permitted clay extraction;
- Habitat creation measures and enhancements.

2.5.2 The importation of large volumes of fill material will allow the base of the quarry to be raised so that there will no longer be a water-filled void. The surface will be gently inclined to the west so that the natural movement of water will be towards the river.

2.5.3 The east, west and south quarry slopes will be covered in a sufficient depth to form shallow gradients of around 1:4, although some variation of between 1: and 1:5 could occur. The large volume of fill will help to stabilize the slopes and will be sufficiently gentle for pedestrian access, to be mown or grazed by sheep. These slopes will be finished with topsoil to provide a fertile surface for productive grasses and tree plantations.

- 2.5.4 The northern slope, which is formed of previously quarried overburden will be restored with low fertility materials such as boulder clay, to have a finished gradient of around 1:3. No topsoil will be spread to avoid increasing soil fertility. The slope will be seeded with a low-fertility grass seed mix incorporating grassland species found locally, to stabilise the soil surface and encourage the development of a diverse sward. The seed will be spread at a low seeding rate to encourage natural colonisation by self-sown species. This sheltered, dry, low-fertility, south-facing slope should provide a valuable habitat for reptiles and invertebrates. A minimal maintenance regime is proposed, although periodic grazing might occur if sheep are used for grazing the other slopes. The objective of maintenance on this slope is to maintain diversity and allow the development of scrub as an medium term objective.
- 2.5.5 The generally flat area in filled quarry void will be separated from the surrounding slopes by a wide waterbody. This linear waterbody will be fed by surface water draining from the restored quarry slopes. The intention is that this ditch will have varied width, from 2m to 3metres and depth with weirs and short lengths of dry channel (9500mm wide) linking them into a complete ring of wetland habitat. Water would be up to 600mm deep but with large areas of very shallow water and marginal habitat. These wetland areas would be allowed to develop vegetation cover by natural regeneration.
- 2.5.6 Cut-off ditches along the north-eastern haul road will catch surface water and discharge into the linear wetland at the base of the slopes. Water in the wetland will discharge into an open channel 270 metres long which in turn will discharge into the river via the existing silt attenuation basin at the south end of the quarry. This channel will be a deep ditch excavated to provide further shallow water.
- 2.5.7 Sometime between 1999 and 2008 a drainage channel was excavated to traverse the slope of the quarry and discharge into the River Seiont. The channel provided a route for water from a spring, which was discovered during quarrying, high on the south west side of the quarry. This channel will be retained in the restoration scheme.
- 2.7.8 Once the temporary construction compound is removed the existing factory yard is not included in the 2000 ROMP permission and the intention is to retain this area as a flat open space.

Brickyard

- 2.7.9 Across the River Seiont lies the former storage brickyard. This area sits on a peninsula within a loop of the river. The area will be excavated to form a basin, with the existing tree-lined banks of the river retained in their existing form. The area of the basin will be restored to flood plain function. A permanent shallow waterbody will be formed in the centre with a nominal water depth of around 600mm to 1.5 metres

deep, but with shallow graded banks and a wide strip of ground to provide marginal wetland habitat. The area will be roughly finished without topsoil and seeded with suitable locally indigenous grasses and damp grassland wildflowers and allowed to develop without cutting. It is expected that permanent water level will be contained within the existing material and fed by surface water. Periodic flooding will occur, through the permeable retained river banks, when the River Seiont is in spate. The wetland, contained within a ring of trees and the river, will provide foraging habitat for bat species in close proximity to the established bat roost.

- 2.7.10 Haul Roads will be retained as terraces to provide vehicular access for maintenance. Where appropriate a shallow layer of soil will be spread, and seeded. There will be no access from the haul roads to the completed bypass.
- 2.7.11 In accordance with the recommendations of the RIGS group, they will be offered the opportunity to maintain a watching brief during any works associated with the quarry that affect the the RIGS site. On completion any exposures of the relevant layers within the quarry will be left open to view and any proposed planting scheme will be modified to avoid seeding and planting on the exposed faces.

2.6 The nature conservation benefits of the restoration scheme

Table 2.4: Wetland habitat

Predicted additional or replacement habitat type	Brickyard pond	Ring (cut-off) ditch	Drainage channel	Watercourse from spring	Habitat lost by infilling sump	Difference
Open water (between 600mm and 1.5m depth)	490m ²	N/A	N/A		800m ²	- 310m ²
Shallow water (between 200mm and 600mm)	500m ²	850m ²	100m ²		1,900m ²	- 450m ²
Marginal habitat (between 0mm and 200mm)	360m ²	1,700m ²	200m ²		237m ²	+ 1,680m ²
Seasonally flooded habitat/marshland/wet grassland	5,800m ²	850m ²	Possible		N/A	+ 6,650m ²
Flowing water (additional)	N/A	140m (linear)	N/A	210m (linear)	N/A	+ 350m
Total area of wetland habitats created	5,800m²	3,540m²	300m²		- 2,937	+ 7570m²

Predicted additional or replacement habitat type	Area created
Grassland on topsoiled slopes	71,500m ²
Grassland and scrub on low fertility substrate	25,500m ²
Native tree and shrub planting	10,000m ²
Total area of habitats created	107,000m²

2.6.1 For comparison purposes, Table 9.9 indicates the areas of habitats surveyed on site.

3 THE SITE AND ITS SETTING

3.1 Location

3.1.1 The site lies beside the River Seiont, to the south of Caernarfon. Current access is via a private road that extends south eastwards from the A487 Seiont Bridge roundabout and Seiont Mill Road. The access road crosses the River Seiont at the site entrance where there is a locked security gate. The site location is shown in Figure 2.1.

3.2 Physical features of the site

3.2.1 The land holding extends to approximately 24 hectares and consists of the quarry void, agricultural land on the north east, east and south sides, an access road, the site of a former brick factory and brickyards of the former Seiont Brickworks, all of which are within the same ownership. There is a separate brickyard (approximately 1 hectare), also in the same ownership and included within the proposed development, to the south west of the quarry, and physically separated from it by the River Seiont. Access to the site is via bridges over the river. The locations of site features are shown in Figure 4.1.

3.2.2 The factory and office buildings, which stood in the concrete-paved brickyard east of the river, have been demolished and the remaining brick stocks and two 5-metre high stockpiles of brick clay have been abandoned.

The existing minerals planning permission

3.2.3 Whilst there is an existing planning permission to allow another 26 years of quarrying to extract brickclay, no extraction has taken place for several years. If resumed the extraction could continue until 2042 and by that time the quarry floor would be a further 28 metres deeper with considerably steeper side slopes and a much larger, deeper quarry pool. An interim restoration scheme for parts of the site was completed around 2008 and this included the formation and planting of a large earth mound around the west side of the quarry which screens the quarry void from residential areas to the north. The west slopes of the mound have a well-established plantation of native trees and shrubs. The bottom of the quarry, known as the sump, contains a substantial body of water with an overflow channel into the river Seiont. This sump provides a sequence of silt lagoons to remove suspended silt from water in the working quarry. The final restoration scheme would be completed following completion of extraction in 2042.

- 3.2.4 The sides of the quarry bowl, and a substantially area to the east which has been stripped of soil and overburden, are cut into well-defined berms (terraces) which are in an unrestored condition ready for further extraction.
- 3.2.5 Land to the east of the quarry bowl is agricultural grazing, while a belt of land to the south east has been stripped of overburden in preparation for mineral extraction.

3.3 Site history and current planning permissions

Site history

- 3.3.1 The history of the site on both sides of the river can be interpreted from historical Ordnance Survey mapping. In 1889 the site of the current quarry is shown as enclosed agricultural land. The Seiont Brickworks and the Seiont Corn Mill are shown occupying the peninsula enclosed by the river Seiont to the south west. The brickworks, disused by the time the map was drawn, was located to the south eastern extreme of the peninsula served by a road linking it to a railway siding that served the Corn Mill. The Caernarfon to Llanberis Railway branch line crossed the river and the site to the northwest.
- 3.3.2 By 1900 the brickworks were in use again with new buildings served by an extension to the railing siding. A bridge had been built across the River Seiont immediately south east of the brickworks and a small clay pit had been excavated into the hillside on the eastern bank of the river. By 1914 the clay pit had more than doubled in size.
- 3.3.3 In the 1960s the brickworks had been extended to fill most of the peninsula with three very large buildings. The clay pit to the east of the river was now so big that it had taken up several fields to the east of the river. However, between 1965 and the 1975 Ordnance Survey maps the Caernarfon to Llanberis railway was closed, but the siding remained. The brickworks was also relocated across the river to stand within the claypit. The former railway bridge was being used for the main access road. The former brickworks buildings remained on the peninsula and the bridge linking both sites across the river remained in use.
- 3.3.4 By 1989 the former brickworks had been partly demolished and the peninsula area was being used as a yard to store bricks. However, by 1995 the yard is shown as rough or abandoned ground. By the end of the 20th century this yard was in use again for brick stockpiles. The new brickworks continued in productive use until around 2008 when production ceased and the building was demolished. Clay extraction from the clay pit was suspended. The existing permissions allowing clay extraction and brick manufacture remains in place until 2042. Further historical information is provided in Chapter 7 Cultural Heritage and Archaeology.

Planning permissions/planning history

- 3.3.5 Until 2007, a limited number of permissions existed for quarrying works and activities connected with the site. The main quarry existed before any formal town and country planning controls were in place.
- 3.3.6 To the south of the main quarry site, another type of planning permission, known as a 'lawful use' permission, related to the 'existing use of site as a brick stacking area' was issued in 2002 (under code number C01A/0750/14/TC). No conditions were included with this type of permission. This 'lawful use' application regularised an activity/use of land within the site which had taken place, unhindered, over 10 years.
- 3.3.7 National legislative requirements, including health and safety, introduced a number of controls on minerals. Consequently, on the 10 May 2007 Seiont Quarry received a minerals planning permission, which represented a review of an older permission (ROMP), code 390, dated 22 November 1951. The 10 May 2007 permission was issued by Gwynedd Council, under code number C00A/0441/14/MW.
- 3.3.8 Overall, the 2007 planning permission secured planning measures to control a lengthy period of quarry work activities at the site. May 2007 also secured a minerals permission for the continuation of use of land within the quarry site for the re-use/dispersion of mineral waste (under code number C00A/0442/14/MW.) Figures 4.2 and 4.3 illustrate the main 2007 permission.
- 3.3.9 The main (2007) planning permission (code number C00A/0441/14/MW) relates to clay working, re-use of soil waste and restoration work together with associated and additional works at Seiont Quarry. Plans illustrating the scheme at an Interim Restoration and the final Conceptual Restoration are provided in Figures 4.2 and 4.3. A number of conditions were attached to this permission.

The quarry sump

- 3.3.10 The water-filled void within the quarry is not a permanent feature and has only filled in the last few years. In the Review of Old Minerals Permissions (ROMP) it was recognised that the quarry would fill with water once the minerals planning permission ceased in 2042. That permission to extract clay still applies, but the presence of the water body is a consequence of suspending periodic pumping out.
- 3.3.11 In April 2000, when photographs of the quarry were taken for the ROMP application the sump was in operation and the water level was around 1.5 metres below Ordnance Survey Datum. At that time the waterbody was slightly above the top level of the small sump that was cut in the floor of the quarry, and awaited seasonal pumping down. An

adjacent waterbody, to the south west of the sump, and at a higher level, a secondary silt settling lagoon had been excavated for water pumped from the sump.

- 3.3.12 In summer 2006 the water level had risen again to around 6 or 7 metres AOD because no quarrying below the water level was required. Extraction in the quarry was carried out on a campaign basis (as required) by earthworks contractors who would excavate clay and place it in stockpiles for the brickworks to use. The situation in 2006 can be seen in Google Earth. The water is stained turquoise blue – indicating it carried a heavy burden of suspended clay. At that time the factory was still producing bricks. The expectation was that extraction and brickmaking would continue until the full extent of the ROMP Permission was achieved. However, the factory stopped production in 2008 and was mothballed pending an upturn in demand for bricks.
- 3.3.13 In January 2009, the quarry was resurveyed on behalf of the owners, Hanson. The survey showed the water level in the sump as pumped down to the full depth, with water remaining only in the sumps, at the designed level of 4.7m AOD which would mean a depth of 6.2 metres of water.
- 3.3.14 By May/June 2009, the sump had filled to around 10.8 metres AOD. This is shown in the Google Earth aerial view of summer 2009. By May/June 2010 the level had risen very slightly, as shown in the Google Earth aerial view of that date.
- 3.3.15 A revision of the topographical survey in September 2011 shows that the water level in the sump was now 12.8m AOD. The survey is annotated with a brief note stating that the proposed drainage ditch invert should be 13.5 m AOD. By May 2012 the water had risen to the invert of the ditch. This is the level that the water retains in 2016.

3.4 Key Policy framework:

- 3.4.1 A number of national and local policy documents, including those that are specific to town and country planning, are relevant. For ease of referencing, a full synopsis of all the following documents are included in Appendix 4.

National Strategic documents

- The Environment (Wales) Act 2016
- Wellbeing of Future Generations (Wales) Act 2015
- The Wales Transport Strategy (2010)
- People, Places, Futures: The Wales Spatial Plan (2008 update)

- Towards Zero Waste 'One Wales: One Planet' – The Overarching Waste Strategy for Wales
- Construction and Demolition Sector Plan (2012)
- Wales Future Waste Arisings up to 2024-25

National Planning Policies and related guidance.

- Planning (Wales) Act 2015
- Planning Policy Wales (Edition 9) 2016., and related Technical Advice Notes
- Welsh Government Aggregate Safeguarding Maps 2010 and 2012
- MTAN 1 Aggregates (2004)
- MPGN's No.2,4,5,11,14
- PPG 14 Development on unstable land 1990 Appendices A
- Welsh Office Circulars:
 - 22/87 - Development of Contaminated Land
 - 5/93 - Public Rights of Way
 - 26/94 - Environmental Protection Act 1990: Part II, Waste Management Licensing,
 - 60/96 - Planning and the Historic Environment: Archaeology
 - 13/97 - Planning Obligations
 - 11/99 - Environmental Impact Assessment.
 - 36/87: Use of Waste Material for Road Fill.

Policy framework: Regional Policy Guidance

- Regional Planning Guidance for North Wales Adopted 2002
- Regional Aggregates Technical Statements
- North Wales Regional Waste Plan 1 St Review (2009)
- North Wales Joint Local Transport Plan 2015

3.5 Planning policy context.

Unitary Development Plan (UDP)

- 3.5.1 The Town and Country Planning Act 1990, as amended by the Local Government (Wales) Act 1994, requires each planning authority in Wales to prepare a Unitary Development Plan (UDP) for its area. The current, development plan in force is the

adopted Gwynedd UDP 2001- 2016, which is currently being updated with a deposit Local Development Plan.

Figure 4.4 is an extract from the Gwynedd UDP showing key land use notations for the site and surrounding locality.

The Anglesey and Gwynedd Joint Local Development Plan (JLDP)

3.5.2 The current UDP will be superseded by the Anglesey and Gwynedd Joint Local Development Plan (JLDP). This Plan (shorter than the current UDP) sets out the land use planning policy framework over a 15 year period (2011 – 2026). It covers the Anglesey and the Gwynedd Local Planning Authority areas and has, in August 2016, reached the Independent Examination stage, with an Inspector’s Hearing tentatively scheduled for September 2016. Although the proposed policies remain to be tested as part of the Examination process, the most specific planning policies relevant to this proposal, as defined within the JLDP Composite Plan, includes the following:

- TRA1: transport network developments.
- TRA3: safeguarding disused railway lines.
- TRA4: managing transport impacts.
- PCYFF1: development criteria.
- PCYFF3: design and landscaping.
- PCYFF5: water conservation
- MWYN4: mineral developments
- MWYN6: buffer zones around mineral sites
- MWYN10: restoration and after care

3.5.3 Two of the JLDP preparation documents are of specific relevance, these are Topic Papers:

- No.11’ Minerals’, dated February 2015;
- ‘Waste’, dated February 2015.

4 CONSIDERATION OF ALTERNATIVES

4.1 Context

4.1.1 In 2015 JBBB were awarded the contract to commence development of the A487 Caernarfon to Bontnewydd Bypass scheme based on the Minister's Preferred Route. In the interests of reducing the costs of public construction contracts JBBB have to find the most economically-advantageous sources of materials and services. They carefully consider the price paid, but also the cost and environmental impact of haulage and the potential for delays to the tight construction programme. Addressing this commercial and environmental imperative, JBBB examined a range of alternatives to provide:

- A best balance between excavation and deposition within the construction site boundary;
- Sources of fill material and rock for engineering uses where these do not arise within the scheme boundary, or where a balance between excavation and deposition cannot be achieved;
- Sites for disposal of any excavated soils that are unsuitable for use as embankment fill;
- Locations for construction and materials storage compounds.

4.1.2 The quarry and associated former brickworks and brickyards were considered as one of the best sites for a construction compound along the proposed bypass route. Selecting a site compound was the starting point for the investigation of suitable sources of construction fill and disposal of surplus earthworks materials. There had been no expectation that all these requirements could be met by a single site. The matters that have been considered are set out in the following paragraphs.

Sustainability

4.1.3 The requirement for sustainability in Wales are set out as a duty of government within the Government of Wales Act 2006. Planning Policy Wales (9) 2016, with accompanying technical guidance notes translates this duty through the overarching objective in planning for aggregates provision, (paragraph 7 of MTANI),

"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".

4.1.4 Subsidiary objectives in paragraph 29 of MTANI, relate to delivering a more sustainable pattern of supply, including:

- Actively reducing the proportion of primary aggregates used in relation to secondary, recycled or waste materials;
- Minimising the transportation of aggregates by road.

4.1.5 The Mineral Planning Authority advised that slate waste materials, which are exempt from the aggregates levy, are readily available at existing slate quarries within a 10-mile radius of the proposed bypass scheme. These materials need to be considered as potential sources of recycled or secondary aggregates which could substitute for primary aggregate extraction in construction of the bypass. Because waste slate is available, this discussion of alternative sources examines several slate quarries in the area and further afield (refer to Table 5.1), which were considered by JBBS.

4.2 Making best use of site materials

4.2.1 The bypass designers have developed the design of the earthworks with these goals:

- Making the best use of ‘engineering quality’ materials excavated within the bypass construction corridor, for construction;
- Minimising the distances, cost and environmental impact of haulage within and beyond the bypass construction site;
- Minimising waste through the recovery and positive re-use of all other excavated material in a manner that avoids costly and unnecessary disposal into licenced landfill and allows the quarry sump and steep side slopes to be restored;

4.2.2 The Waste Hierarchy sets out, in generic form, a preferential sequence of options for the fate of surplus and used materials. In earthworks projects the normal engineering principles of classifying materials according to their properties and the requirements of each element of construction can be compared to this hierarchy.

Prevention and re-use

4.2.3 To achieve the earthworks design goals, all excavated rock and soils arising from proposed cuttings and having the properties needed for engineering works, will be used to form embankments and some of the rock will be processed for use in concrete. The design seeks to achieve the optimum balance of cut and fill, consistent with a good horizontal and vertical highway alignment, so that site materials can be used in this way.

Preparation for re-use

- 4.2.4 To make the best use of excavated rock and soils, a processing plant will be used to crush, grade and wash some material to generate raw material suitable for special uses, such as aggregate and sand suitable for use in mixing concrete.

Recycling

- 4.2.5 The former brickworks closed leaving a substantial quantity of unsold, damaged and excessively-weathered bricks in and around the stockyards together with stockpiles of prepared brick clay. Demolition material from the yard, together with that from demolished structures and hard surfaces removed as part of the highway scheme, will also be available. This material will be processed into new aggregate for use in the construction.

Other recovery

- 4.2.6 Ground conditions along the line of the bypass are not consistent. The ground investigation carried out by JBBB has found that while there are large volumes of 'engineering quality' rock and soil, there are pockets of other soils that are not suitable for highway construction. The volume of this material (commonly referred to in construction as 'Unsuitable' because it is saturated and cannot be compacted to an engineering standard) has been estimated at around 400,000m³. This material is in addition to the subsoil and topsoil that will be used for highway landscape works, and so must be removed from the highway scheme as surplus to requirements. This material can be recovered by using it for another use, such as in the restoration of worked-out quarries or other brownfield land where opportunities exist within a reasonable haulage distance. The works within the quarry will include the filling of the quarry sump.

Filling of the quarry sump

- 4.2.7 Concern has been expressed about the dangers posed by the existing quarry sump which has filled with water since 2008 so that the surface level is now at the invert of the drainage ditch. The water is at least 15 metres deep with steeply shelving sides. The Minerals Planning Authority, whilst expressing these concerns, also indicated that the sump shore needed to be made safe with shallow banks to sufficient depth to reduce the risks of drowning. The current restoration plans for the quarry are based on the existing planning permission which would create a substantially bigger and deeper sump with a proposed future use for managed and supervised water-based recreation. Because brick clay extraction ceased in 2008 it is unlikely that the intended 7 hectare recreational lake will be formed to sufficient size for the intended afteruse, nor would the required gently-sloping sump edge profile be formed.

- 4.2.8 The Applicant has considered how best to use the quarry and what form the restoration should take. Recognising the hazard posed by the waterbody in its current form, the applicant proposes infilling the sump with excavated 'Unsuitable' material from the bypass.
- 4.2.9 Current water level is 13.5m above ordinance datum (AOD). The volume of water is estimated to be around 162,800m³ and so backfilling the sump would allow the recovery and reuse of at least 162,800m³ of material that could not be used for embankment fill and would otherwise go to landfill. Assuming that between 300,000 and 400,000m³ of this material is available from the bypass construction there would be a surplus of up to 237,200m³ that would be available to assist in restoration of the quarry slopes. An estimated volume of 100,000 m³ of topsoil will also be available for finishing of the restored slopes.
- 4.2.10 Whilst filling the quarry sump forms an integral part of the proposed restoration scheme and would constitute an engineering operation, the depth of imported fill would exceed the depths that are considered reasonable as restoration fill. Consequently, the scheme will require a permit under the waste management regulations.
- 4.2.11 By following the waste hierarchy as described in paragraphs 5.1.3 to 5.1.5, the quantity of material that must eventually be sent for disposal at a distant landfill will be minimised. The engineering operation to fill the quarry sump will enable much of the excavated material that cannot be used or reprocessed for use as road construction fill, to be recovered.

4.3 Consideration of alternatives – sources of materials

Materials needed

- 4.3.1 The bypass will require the import of good quality rock and soils to form engineered embankments. The quantity is expected to be at least 300,000m³, but could rise to 400,000 as a consequence of poor weather or ground conditions.
- 4.3.2 Further materials with specialist engineering properties (hardness, resistance to abrasion) that cannot be found within the highway scheme will also have to be imported to the scheme. These materials are only available from particular quarries, and are outside the scope of the Seiont Brickworks and Quarry project so are not considered here.

Approach to material supply

- 4.3.3 Welsh Office Circular 36/87 (The Use of Waste Material for Road Fill) highlights that,
- '...at the earliest opportunity, the highway authority, in consultation with the minerals and local planning authority and waste producers, will identify whether any suitable waste material is likely to be available within an economic transportation distance of the prospective routes of a new road. That distance will vary from place to place, but as a general guide, beyond a radius of about 10 miles transport costs are likely to make the use of waste material uneconomic except where no environmentally acceptable alternative sources of fill are available locally.'*
- 4.3.4 The Welsh Government have previously confirmed² that the use of the Seiont Brickwork in connection with the proposed bypass, would support the principles of Circular 36/87.
- 4.3.5 The EIA Scoping exercise provided an opportunity to identify suitable sources of waste material within 10 miles of the proposed bypass route. The Applicant has considered several ways to obtain bulk construction fill and non-specialist aggregates:
- A. Purchasing rock, sand, gravel or slate waste from an active quarry: an expensive option, providing quarried stone which would be of a higher quality than necessary for use as bulk fill. Using higher-grade aggregate where lower-grade material can be used is not sustainable;
 - B. Extracting slate waste or other quarry waste from existing deposits: potentially an inexpensive and local source. A new mineral planning permission might be required, and there could be unacceptable environmental impacts;
 - C. Opening one or more 'borrow pits' alongside the proposed bypass: likely to be an expensive and time-consuming process that could have unacceptable environmental impacts, but minimal transport if close to the proposed bypass. Minerals planning permission might be required;
 - D. Reopening an inactive quarry to make use of established permissions and facilities: a process that could have negative or positive environmental impacts, but minimal transport if close to the proposed bypass. Minerals planning permission might be required.

² Email dated 16 October 2015 from Peris Jones, Project Director, Transport, Economy, Science and Natural Resources Group, Welsh Government to Shan Wyn Jones, Principal Planning Consultant, RML

4.3.6 Sites within reasonable distance of the bypass scheme, or which offered some advantage, were identified and evaluated. Mostly these sites were within 40 miles, but an active slate quarry owned by one of the contracting joint venture partners, located at the Horseshoe Pass in Denbighshire, was also considered for cost comparison purposes.

4.3.7 The evaluation applied several criteria:

- a) The suitability of the available material for required purposes. Using high-quality stone (e.g. limestone or granite) as ordinary fill would be wasteful; lower-grade material such as slate waste would not meet many requirements of construction.
- b) The cost of the material. Higher quality material commands a higher price than low quality, and so matching sources to uses is essential if waste of public money is to be avoided;
- c) The distances that loads would be hauled, calculated as mileage, fuel use and carbon production;
- d) The use of public roads, because haulage vehicles would need to use local roads, some of which are narrow, and / or congested;
- e) Whether or not the haulage route passed through urban and residential areas.

4.3.8 The details of the assessment of existing sites that were investigated are set out in summary in Table 5.1. The locations of each site is indicated on Figure 5.1.

Consideration of borrow pits

4.3.9 Borrow pits are short duration quarries from which road construction material is excavated and then the hollow backfilled or restored with soils that could not be used in construction. Borrow pits are normally located close to or beside the location where the excavated material will be used.

4.3.10 The potential need for borrow pits for extraction of mineral were considered during early phases of design for the bypass. A single large new quarry would have a considerable adverse environmental impact. Alternatively, providing the required volumes of fill from several smaller borrow pits could be considered. Following careful examination of potential borrow pit sites the scale of landscape and environmental impact, which would significantly increase the overall environmental impact of the bypass scheme as a whole was recognised. Furthermore, the processes required to obtain planning permissions and other permits and licences for a series of sites was considered too complex and drawn out.

Existing quarries

- 4.3.11 The Draft Joint Local Development Plan identifies Active, Inactive and Dormant quarries in the area. A list of local quarries was selected for further evaluation. A few more distant quarries have been included to allow a comparison with local quarries. The selected quarries are set out in Table 4.1.
- 4.3.12 The assumption is that all rock and soil imported to the scheme and any unusable rock and soil that is removed, will be carried on public roads in rigid-bodied Heavy Goods Vehicles which typically carry a maximum of 18 tonnes when loaded. There are around 2 tonnes of excavated rock and soil per cubic metre and so each HGV will carry approximately 9 m³ when fully laden. Based on the assumption that 400,000m³ is needed (approximately 800,000 tonnes), an estimated 44,450 return journeys would be required. The HGVs travel an average of 9.4 miles per gallon of fuel (2.29 miles per litre) and release 1,078 g/mile of CO₂ into the atmosphere (670 g/km). The calculations used to produce Tables 5.1 and 5.2 are based on these assumptions.
- 4.3.13 Table 4.1 uses standard data from the Department of Transport Road Freight Statistics Table RFSO141. The volumes carried by road would be placed in 20 tonne HGVs designed for road use these would be able to carry 18 tonnes of excavated rocks and soils and then would have to make a return journey to pick up the next load. However, if the Seiont Quarry were the source of material, then off-road 40 tonne dumpers would be used to carry material to and from the bypass site. No road HGVs would be required and public roads would not be used. For comparison purposes the bottom two rows in the table show the same data for Seiont Quarry using either 20 tonne HGVs or 40 tonne Dumpers. These rows show that whilst fuel used and carbon produced would be similar, the total number of journeys would be halved if using dumpers.
- 4.3.14 The evaluation demonstrated that Seiont Quarry could provide the required volume of 'Suitable' fill material at lowest cost, least road miles and fuel use, and with the least environmental impact. Further examination of the quarry demonstrated that the site could not only provide suitable fill material to form embankments, but could also provide aggregate, in the form of gravel, pebbles and glacial boulders, that could be crushed and graded to provide aggregate for concrete. Making the maximum use of the resources available within this quarry would substantially reduce the use of public roads by HGVs, and avoid emissions and increased traffic passing through urban and residential areas. Traffic and its impact on local roads is addressed in Section 13.

4.4 Consideration of alternative sites for disposal

Material unsuitable for use as fill

- 4.4.1 As described in paragraph 4.2.2 there will be pockets of soils that are not suitable for use in construction of embankments. This 'Unsuitable' material is material which, owing to its physical constituent or wetness, is not capable of being engineered to achieve the strength to carry loads, to support rigid engineering structures or modern highways. 'Unsuitable' materials are typically used for landscaping or are taken to landfill. However, much of this material can, given time, be dried or treated so that it is useable to create stable landforms and slopes that do not have to support a road.
- 4.4.2 A major factor in the formation of 'Unsuitable' material is exposure of soils to wet conditions. Engineers prefer to excavate and place fill material in dry weather, but due to the uncertainty of weather conditions during construction, this is not always possible. In a dry summer the volume of 'Unsuitable' created during earthworks will be less than in a wet summer or in winter. Unsuitable materials have to be removed from the construction site and replaced with better soils or rock. The volume of 'Unsuitable' material likely to arise from the bypass scheme is estimated to be in the order of 300,000m³ to 400,000m³.
- 4.4.3 This volume could be removed from the site as surplus to requirements, and carried by road vehicle to be placed in a licenced landfill, which would be both costly and wasteful. The choices for disposal of this material have been the subject of an evaluation similar to that used to select sources of fill.

4.5 The landfill selection process

- 4.5.1 The joint venture considered several alternative sites for disposal of inert excavated materials that are unsuitable for construction:
- Hauling the material to licenced landfill sites and payment of landfill charges and Landfill Tax;
 - Hauling the material to active or inactive quarries for use in surface restoration of worked our phases;
 - Hauling the material to dormant quarries for use in surface restoration, for which minerals planning permission might be required;
 - Using the material as backfill in one or more borrow pit alongside the proposed bypass, if these are considered commercially viable;
 - Recovery of the material for engineering purposes.

4.5.2 A wide range of sites within reasonable distance of the bypass scheme, or which presented some other advantage, were identified and evaluated. Mostly these sites were within 40 miles. A summary the assessment of existing sites that were investigated are set out in Table 4.2.

4.5.3 The evaluation applied several criteria:

- a) Avoiding long journeys to haul loads (mileage, fuel use and carbon production);
- b) The suitability and cost of disposal;
- c) The use of public roads (haulage vehicles would need to use local roads, some of which are narrow and could be congested);
- d) Whether or not the haulage route passed through urban and residential areas.

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Table 4.1: Quarries that could provide suitable fill material and aggregates

Quarries	Material, quality, cost		Fuel & miles for a single round trip		Total miles and carbon produced hauling 400,000m ³ (22,222 return journeys)			Journey details			
	Name and location	Material	Relative cost on a scale of 1(Low) to 3 (High)	Round trip distance Site to mid bypass	Fuel use (gallons) based on a rate of 9.4 mpg (1)	Total mileage assuming 18 tonnes per load.	Total carbon (tonnes) (average of 1078.3g/mile)	Ratio of Carbon or mileage against the least (Seiont Quarry)	Assessment of route to site based on quality of roads	Passage through urban or residential areas required	Max number of loads per HGV/dumper per day
Cefn Graianog Quarry, Llanllyfni	Sand and gravel	3	22.00	2.34	733,335	790.77	3.08	Good	N	7	159
Dorothea Slate Quarry, Talysarn	Slate waste	2	26.00	2.77	866,670	934.54	3.64	Adequate	Y	5	159
Pen-y-orsedd Quarry, Nantle	Slate waste	2	22.00	2.34	733,335	790.77	3.08	Adequate	Y	6	159
Bryncir Quarry	Sand and gravel	3	26.00	2.77	866,670	934.54	3.64	Good	N	5	159
Hafod y wern, Betws Garmon	Slate waste	2	14.00	1.49	466,670	503.22	1.96	Poor	N	7	111
Ty Mawr West and East, Talysarn	Slate waste	2	14.00	1.49	466,670	503.22	1.96	Poor	Y	7	111
Tyn y Werglodd, Nantle	Slate waste	2	14.00	1.49	466,670	503.22	1.96	Poor	Y	7	111
Blaenau Ffestiniog quarries (several)	Slate waste	2	66.00	7.02	2,200,000	2372.30	9.23	Good	Y	3	370

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Quarries	Material, quality, cost		Fuel & miles for a single round trip		Total miles and carbon produced hauling 400,000m ³ (22,222 return journeys)			Journey details			
	Name and location	Material	Relative cost on a scale of 1(Low) to 3 (High)	Round trip distance Site to mid bypass	Fuel use (gallons) based on a rate of 9.4 mpg (1)	Total mileage assuming 18 tonnes per load.	Total carbon (tonnes) (average of 1078.3g/mile)	Ratio of Carbon or mileage against the least (Seiont Quarry)	Assessment of route to site based on quality of roads	Passage through urban or residential areas required	Max number of loads per HGV/dumper per day
Gwalchmai, Anglesey	Granite	3	48.00	5.11	1,600,000	1725	6.71	Good	N	4	222
Gwyndy, Anglesey	Granite	3	52.00	5.53	1,733,335	1869	7.27	Adequate	N	3	278
Rhuddlan Bach	Limestone	3	42.00	4.47	1,400,000	1510	5.87	Adequate	Y	4	185
Hengae and Gaerwen Quarries, Anglesey	Granite	3	38.00	4.04	1,266,670	1366	5.31	Good	Y	4	222
Moel-y-faen, Ruthin	Slate waste	1	126.00	13.40	4,200,000	4529	17.62	Good	Y	2	556
Seiont Quarry, Caernarfon Using 20 tonne road HGVs	Rock, clay, recycled brick/concrete	1	7.15	0.76	238,335	257	1.00	Not required	No	9	79
Seiont Quarry, Caernarfon Using 40 tonne dumpers.	Rock, clay, recycled brick/concrete	1	7.15	1.02	119,170	257	1	Not required	No	9	40

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Table 4.2: Landfill sites in the area around the quarry

Landfill			Fuel & miles for a single round trip		Total miles, fuel used and carbon produced hauling 400,000m ³ (22,222 return journeys)			Journey details	
Name and location	Wastes accepted	Relative disposal cost (1=high, 3=low)	Round trip distance Site to mid bypass	Fuel use (gallons) based on a rate of 9.4 mpg	Total mileage assuming Road HGVs: 18 tonnes, or Off-road dumper: 37 tonnes	Total carbon (average of 670gms/km or 1078.32gms/mile) (tonnes)	Ratio of Carbon/mileage compared to least (Seiont Quarry)	Assessment of route based on quality of roads	Passage through urban or residential areas required
Llwyn Isaf Site, Clynnog Fawr, Penygroes,	Household, commercial, industrial	3	20	2.13	666,667	718.88	2.80	Good	N
Cilgwyn, Carmel, Penygroes	Household, commercial, industrial	3	12	1.28	400,000	431.33	1.68	Adequate	Y
Ffridd Rhasus landfill, Morfa Road, Harlech	Household, commercial, industrial	3	92	9.79	3,066,667	3,306.85	12.87	Adequate	Y
Cae Main Farm, Waunfawr, Caernarfon	Landfill , non-biodegradable	1	10	1.06	333,334	359.44	1.40	Adequate	Y
Wern Farm, Llanfrothen, Penrhyn-daedraeth	Landfill , non-biodegradable	1	50	5.32	1,666,667	1,797.20	6.99	Adequate	Y
Plas Gwernoer, Nantle	Landfill , non-biodegradable	1	22	2.34	733,334	790.77	3.08	Adequate	Y
Pontrug, Nantle,	Landfill, non-biodegradable	1	22	2.34	733,334	790.77	3.08	Adequate	Y

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Landfill			Fuel & miles for a single round trip		Total miles, fuel used and carbon produced hauling 400,000m ³ (22,222 return journeys)			Journey details	
Name and location	Wastes accepted	Relative disposal cost (1=high, 3=low)	Round trip distance Site to mid bypass	Fuel use (gallons) based on a rate of 9.4 mpg	Total mileage assuming Road HGVs: 18 tonnes, or Off-road dumper: 37 tonnes	Total carbon (average of 670gms/km or 1078.32gms/mile) (tonnes)	Ratio of Carbon/mileage compared to least (Seiont Quarry)	Assessment of route based on quality of roads	Passage through urban or residential areas required
Nantlle Gwernaer Farm, Penygroes	Landfill, non-biodegradable	1	52	5.53	1,733,334	1,869.09	7.27	Adequate	Y
Vaynol Woodlands, Coed Nant Y Garth, Felinheli	Landfill, non-biodegradable	1	42	4.47	1,400,000	1,509.65	5.87	Good	N
Greenafon Slate Quarry, Adjoining Lwyn Coed, Llanllyfni	Other wastes	2	22	2.34	733,334	790.77	3.08	Adequate	Y
Coed Bolyn Mawr Farm, Bethel	Other wastes	2	56	5.96	1,866,667	2,012.86	7.83	Adequate	Y
Ty Mawr East Quarry Landfill, Talysarn	Other wastes	2	22	2.34	1,533,334	1,653.42	3.08	Adequate	Y
Penhesgyn Gors landfill (Area 3), Llansadwrn	Co-disposal landfill	2	22	2.34	733,334	790.77	3.08	Good	N
Seiont Quarry, Caernarfon using 20 tonne road HGVs	overburden, clay, crushed brick/concrete	1	7	0.76	238,334	257.00	1.00	Good	N
Seiont Quarry, Caernarfon Using 40 tonne dumpers.	Quarry	1	3.58	7.15	119,170	188.73	0.73	Not applicable	N

4.6 More distant landfill sites

4.6.1 The landfills listed in Table 4.2 are all located within Gwynedd. A number of more distant licenced landfills were also considered, see Table 4.3, but were excluded from more detailed assessment summarised in Table 4.2 because of the mileage that would be required on public roads.

Table 4.3: Distant landfill sites

Landfill name	Relative disposal cost (1=high, 3=low)	Location	Approximate distance (miles)	Total mileage required for 300,000m ³
Bryn Posteg Landfill	3	Welshpool, Powys	162	5,399,994
Hooton Brickworks Landfill	3	Ellesmere Port, Cheshire	170	5,666,610
Gowy Landfill	3	Wimbolds Trafford, Cheshire	150	4,999,995
Hapsford Landfill	3	Hapsford, Cheshire	147	3,266,634
Moel y Faen Quarry landfill	1	Ruthin, Denbighshire	126	4,199.955

Consideration of borrow pits

4.6.2 Using borrow pits to dispose of Unsuitable materials is only a solution if they are also required for the extraction of minerals for construction. Following careful consideration of potential sites, the decision was made not to rely on opening borrow pits (Paragraph 4.3.7). Furthermore, the processes required to obtain planning permissions and other permits and licences to place fill in the ground was considered too complex and drawn out.

Existing landfill sites

4.6.3 The North Wales Regional Waste Plan 2003 to 2013 identifies active landfill sites in the area. No subsequent plan has been produced. A list of local landfills was selected for further evaluation and these are set out in Table 4.2. Some of these sites identified in the waste plan are small and do not offer sufficient capacity, while others are be closed.

4.7 Alternative locations for a site compound

4.7.1 Having identified that Seiont Quarry is suitable source of fill and other construction materials and has space for disposal of excavated soils that are unsuitable for use in road construction, the case for also locating the main construction compound in the same site is very strong. The site offers:

- Close proximity to the bypass construction corridor;
- Access from the local road network;
- Adequate reasonably flat ground (preferably hard surfaced) that is free from 1% risk of flood;
- Established power and water supplies;
- Foul and surface water drainage acceptable to Natural Resources Wales;
- Construction related activity can be carried out without harm being caused to the environment;
- Activity within the site compound should be considered acceptable.
- An existing planning permission for quarrying, processing of clay and for the manufacture and storage of bricks;

4.7.2 The brickworks quarry meets all of these criteria, but also would benefit from infilling of the sump and stabilisation of some unstable slopes (paragraph 4.8.3).

4.8 Conclusions

4.8.1 The evaluation carried out to identify sources of fill and locations for disposal or re-use of material that cannot be used to form embankments, demonstrated that Seiont Quarry could provide the required fill and would have capacity to receive imported soils for a restoration scheme. The existing planning permission for the quarry, dated August 2000, includes a Conceptual Restoration scheme that could use soils available on the site. Planning Condition (6) stipulates that:

Only mineral waste derived from operations hereby permitted shall be deposited within the site. Except for soils, subsoils and other plant growing media, which shall not be imported without the prior written consent of the minerals planning authority, no refuse or waste material of any description from within or outside the site shall be disposed of or deposited therein.

4.8.2 Importing and exporting material to and from the quarry and the bypass construction site will require the consent of the Minerals Planning Authority. Even taking into account the costs of obtaining planning consent, the proposed development represents the best option because it will:

- Provide a source of construction fill and for disposal of 'Unsuitable' material at the lowest cost;
- Substantially reduce the use of public roads by HGVs (44,450 HGV movements each for export and import – 88,900 in total), and increased traffic passing through urban and residential areas, over the two years of construction;
- Avoid unnecessary burning of fossil fuels and the consequential release of vehicle exhaust emissions;
- Provide a site for the recovery of inert waste by processing and reuse as construction materials (permit application in preparation);
- Allow the existing quarry access road to be closed to traffic at least 20 years earlier than would be the case otherwise;
- Cease quarrying at the site earlier than current planning permission;

Additional benefits

4.8.3 A geotechnical study of the quarry has shown that there are problems with slope stability on the western slopes. This arises from the nature of the clay which has lenses of other materials which become more mobile in wet conditions, this is known as liquefaction. Dr Ken Addison³ has reported observing slips and the results of slips in this area. Slope movement has occurred not only on the face of the quarry, but can also be seen in the field to the east of the face. The geotechnical report⁴ concludes that,

'there is a high risk of landslides associated with the former clay pit and quarry immediately to the south of the area of investigation'.

The Geotechnical report is included as Appendix 10.1. Further excavation in accordance with the existing planning permission will steepen the slopes of the quarry risking further instability. Excavation of the unstable slopes can be made good by

³ Email communication from Dr Ken Addison of St Peter's College Oxford, and Stewart Campbell of NRW to Andrew Sumner of RML; dated February 2016

⁴ Geological Ground Investigation Report February 2016; e-gio Solutions; rpt ref E0756.GGI.R1

placing imported fill at more gentle slopes against the unstable faces. This approach has recently been permitted at Cambrian Quarry, in Gwernymynydd, Flintshire.

- 4.8.4 The quarry sump is a deep pool with steeply shelving margins which presents a hazard to people who venture into the cold water or fall in accidentally. Deep water in quarries in North Wales is recognised as an attraction to swimmers, divers and fishermen. Sadly, there have been a number of deaths in recent years at various quarry pools or sumps. While access can be restricted in a working quarry, it cannot be prevented in an inactive quarry. The proposed scheme of filling at the site will remove the hazard of deep water and steep slopes to provide a restored site that will be less dangerous than the permitted Conceptual Restoration.
- 4.8.5 Long term responsibility for the waterbody and for public safety will fall on the future owner of the site. It is considered that the opportunity to fill the sump, displace the waterbody and form dry land and shallow quarry slopes is a responsible solution that will result in a better restoration scheme.
- 4.8.6 While loss of any water-filled hollow has the potential to adversely affect wildlife by removing habitat, the sump at the quarry is steep sided and contains deep water. The best habitat is found at the shallow fringes, although the relatively young shoreline has little in the way of biodiversity. The majority of the sump provides very deep water with little biodiversity value. It is highly unlikely that fish are present, however, if they were to be found they would tend to congregate around the shallower fringes of the sump. The deeper water tends to be of less value. Recognising that shallow water habitat will be lost, the scheme includes a number of measures to provide replacement habitat and these are set out in Chapter 9 and include: a new shallow pool and marginal habitat formed in the former brickyard and a series of shallow pools and ditches around the restored quarry.

5 THE ENVIRONMENTAL ASSESSMENT

5.1 The content and scope of the EIA

5.1.1 Part C, which follows this page, includes environmental impact assessments that have been prepared by environmental specialists. Each assessment has been prepared in response to the Scoping Opinion from the Minerals Planning Authority, which took into account the views of the statutory consultees.

5.1.2 The following chapters include:

- 6 Air quality
- 7 Cultural Heritage
- 8 Landscape and Visual Amenity
- 9 Ecology and Nature Conservation
- 10 Geology and Soils
- 11 Noise Effects
- 12 Effects on Community Assets
- 13 Traffic generation and Effects
- 14 Drainage and the Water Environment
- 15 Water Quality

PART C ASSESSMENT OF ENVIRONMENTAL EFFECTS

6 AIR QUALITY

6.1 Introduction

6.1.1 This chapter considers the effects of air quality from the proposed extraction of clay and overburden as well as the recovery of bricks, stone and concrete, and the processing of these materials and movement around the site. The air quality assessment has been undertaken in accordance with the guidance for dust emissions, including the advice contained in TAN 11 (Noise) 1997, Chapter 14 of Planning Policy Wales (9) 2016, the Mineral Planning Guidance 11: The Control of Noise at Surface Mineral Workings (April 1993) and the Minerals Technical Advice Note (Wales) 2004 and supporting guidelines .

6.2 Air Quality Legislative Framework

European Legislation

6.2.1 European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive is designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include:

Directive 99/30/EC – the First Air Quality "Daughter" Directive – sets ambient air limit values for NO₂ and NO_x, sulphur dioxide, lead and particulate matter;

Directive 2000/69/EC – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene and carbon monoxide;

Directive 2002/3/EC – the Third Air Quality "Daughter" Directive – seeks to establish long term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air;

Directive 2004/107/EC – The fourth Daughter Directive, which was not included within the consolidation, sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

UK Legislation

- 6.2.2 The **Air Quality Standards Regulations 2010**, seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, Daughter Directives within the United Kingdom (UK). The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. SI 2007 No. 64 Regulation 14 extends powers, under Section 85(5) of the Environment Act (1995), for the Secretary of State to give directions to Local Authorities (LAs) for the implementation of these Directives.
- 6.2.3 The **UK Air Quality Strategy** is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland, and provides a framework for improving air quality and protecting human health from the effects of air pollution. For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the AQO for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (England) Regulations (2000) SI 928, and subsequent amendments.

National Planning Policy Guidance

- 6.2.4 **Planning Policy Wales (PPW)** Edition 9 2016 (Chapter 13 Minimising and Managing Environmental Risks and Pollution Section 13.12). The Policy states that material considerations in determining applications for potentially polluting development are likely to include impacts on health, amenity and nuisance. MTAN 1 describes those circumstances which creates the potential for a range of pollutant and provides additional technical guidance in reducing the impact of aggregates production, including dust and emissions. It lists the main potential effects of dust and dust emissions as:

- Their impact on air quality and human health;
- The physical need for cleaning, and the soiling of surfaces;
- The contamination of soils and vegetation, impacting on agriculture and/or ecology;
- The contamination of water courses;
- The visual impact of dust plumes and reduced visibility.

- 6.2.5 PPW suggests that the use of planning conditions (para. 77) can control certain dust activities but that these should not duplicate other legislative controls. MTAN 1 provides further cross-references for assessing and measuring dust emissions.

Local Policy

- 6.2.6 The relevant Gwynedd Unitary Development Plan (GUDP) includes the following:

Strategic Policy 1. Taking a precautionary approach. Development proposals that would have an adverse or uncertain impact on the environment, economy or cultural character (including the Welsh language) will be refused unless it can be conclusively shown by an appropriate impact assessment that this can be negated or mitigated in a manner acceptable to the Planning Authority. **DD**

Strategic Policy A1 – Environmental or other impact assessments. This suggests that the lack of sufficient information concerning and significant likely environmental or other impacts could justify a refusal of planning permission.

Strategic Policy A3 – Precautionary Principle. Proposals will be refused if there is any possibility of serious or irreversible damage to the environment or the community unless it can be shown conclusively at the end of an appropriate Impact Assessment that the impact can be negated or mitigated.

Strategic Policy 5 Development which creates risk. Developments that’create a risk of unacceptable damage to health, property or the environment, will be refused.’

POLICY B33 - Development that creates pollution or nuisance. Proposals that will cause significant harm to the quality of public health, safety or amenities, or to the quality of the built or natural environment as a result of higher levels of air, water, noise, or soil pollution will be refused unless adequate controls can be attained by means of planning conditions and powers of regulatory bodies, and that arrangements can be made to monitor discharges.

MINERALS -Strategic Policy 7. Development proposals to make use of mineral resources, including secondary aggregates, will be approved provided they do not significantly harm the environment or the amenities of local residents. These resources will be protected from development in order to safeguard Gwynedd’s contribution towards meeting the regional and national demand.

POLICY C9 - Mineral development outside the Llŷn Area Of Outstanding Natural Beauty. In permitting proposals for mineral exploration, working or extension to existing operations to maintain the Plan area’s landbank of aggregates and to meet the demand for slate products provided one, amongst a range of criteria, includes that

there is no unacceptable harm to the amenity of local residents in terms of levels of dust.

6.3 Baseline climatic conditions

6.3.1 The generation of and dispersal of dust is highly dependent upon meteorological conditions prevalent at the time. Meteoblue is an independent meteorological organisation that produces detailed local weather modelling. Hourly simulations of the wind speed, wind direction, rainfall and sunshine have been gathered over 30 years to compile the relevant wind rose and data charts.

Landform effects

6.3.2 From our site inspection we consider that this local wind direction and strength data, simulated for Caernarfon, is representative of the quarry's location. Wind strength and direction is likely to be affected by the topography around the site. The notable shape of the quarry, created by deep excavation into a south-east facing slope, and then the formation of a substantial earth mound on the north side, means that the dust-generating activities and materials will be contained within the bowl-shaped void. The bowl-shaped landform and the adjacent valley slopes and higher land around would influence dust entrainment and dispersal.

Wind direction and frequency of occurrence

6.3.3 The highest potential for dust dispersal and deposition occurs on dry windy days, and the risk of dust deposition at a particular location is determined by the frequency of these dry winds blowing towards the location from a dust-generating activity. Dust is not likely to be carried by winds of less than 5.6 ms^{-1} (i.e. less than 12.66mph, Beaufort Scale Force 4 – '*Moderate Breeze: Dust and loose paper raised. Small branches begin to move*').

6.3.4 This value of 5.6 ms^{-1} derived from the Beaufort Wind Scale is very much in line with the value of 5.4 ms^{-1} as used by the United States Environmental Protection Agency in their dust emission calculations. The value is also below the 5.8 ms^{-1} stated within guidance from MIRO and the Department of the Environment for the initiation of dust emission for disturbed pebbly soils.

6.3.5 In the guidance 'The Environmental Effects of Dust from Surface Mineral Workings' published in 1995 by the DoE (now part of DEFRA) together with guidance in the former MPS2, it is generally accepted that wind blow of dust does not occur on days when rainfall is above 0.2mm because of the dampening effect of rainfall.

6.3.6 The meteorological data for wind speed and direction has been combined with the frequency of rainfall in order to estimate the number of dry working days in which the wind direction is in a particular sector. The annual wind rose for the Caernarfon area is presented in Table 6.1. Modelling results for the 30-year average distribution of wind direction (overall and for speed exceeding 5.3ms^{-1}) are shown in Table 6.1.

Table 6.1 Meteorological data: wind direction, speed and frequency

Wind Direction	Total hours / year	Proportion of Occurrence %	Total hours / year $>5.3\text{ms}^{-1}$	Proportion of Occurrence %
North	330	3.8	124	1.4
North North East	310	3.5	97	1.1
North East	335	3.8	126	1.4
East North East	467	5.3	154	1.8
East	452	5.2	137	1.6
East South East	413	4.7	100	1.1
South East	358	4.1	84	1.0
South South East	408	4.7	121	1.4
South	887	10.1	456	5.2
South South West	1178	13.5	736	8.4
South West	925	10.6	561	6.4
West South West	719	8.2	456	5.2
West	661	7.5	370	4.2
West North West	478	5.5	248	2.8
North West	486	5.6	229	2.6
North North West	330	3.8	124	1.4
Calm/variable	18	0.2	N/A	N/A
TOTAL		100%		47.1%

Rainfall Data

6.3.7 North-west Wales is one of the wetter regions of the UK receiving about 154 days a year with more than 2mm of rain. The 30-year annual average number of dry days (i.e. no precipitation) for the quarry (Caernarfon) is 146 days per year i.e. about 40 % of the year. The monthly range is 10.3 days in February to 14.1 days in October.⁵

⁵ www.meteoblue.com/en/weather/forecast/modelclimate/caernarfon_united-k4.0ingdom_2654092

Table 6.2: Days per month without precipitation

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Number of dry days	10.4	10.3	12.3	12.4	13.7	13.7	12.8	13.1	14.1	11.8	10.5	11.1

6.3.8 Making proportional adjustment to allow for 235 working days only (5 days per week and 47 weeks per year), the average number of working days per year with no rainfall would be 94. The number of dry working days each year has been combined with the wind direction and speed data, as shown in Table 6.3, to estimate the frequency of potential dust movement. This figure is likely to be an over-estimate because following wet weather it could take several dry days before soils and surfaces dry sufficiently for dust to be liberated.

Table 6.3 Estimated dry working days in each year, by wind direction

Wind Direction	A: % hrs of wind speed $>5.3\text{ms}^{-1}$	B: No. of dry working days with wind speed $> 5.6 \text{ms}^{-1}$
North	1.4	1.3
North North East	1.1	1.0
North East	1.4	1.4
East North East	1.8	1.7
East	1.6	1.5
East South East	1.1	1.1
South East	1.0	0.9
South South East	1.4	1.3
South	5.2	4.9
South South West	8.4	7.9
South West	6.4	6.0
West South West	5.2	4.9
West	4.2	4.0
West North West	2.8	2.7
North West	2.6	2.5
North North West	1.4	1.3
Wind less than 5.3ms^{-1}	52.9	49.8
TOTAL	100	94

A: from Table 6.1. B: = A x 94 days

Existing Air Quality: Deposited Dust

6.3.9 Existing rates of dust deposition will typically be of the order of 56 mg/m²/day (milligrams per square metre per day) annual median, for a general deposit in residential areas and town outskirts, MIRO February 2011. Obviously, values vary daily, particularly during dry weather but also because of local industry. Median (50th percentile) levels, of 38 mg/m²/day for open country and 90 mg/m²/day for commercial town centres, are also given by that source. Table 6.4 shows these and other dustfall rates.

Table 6.4: Dust fall rates

Location	Median (50th percentile) mg/m ² /day	90 th percentile mg/m ² /day	95 th percentile mg/m ² /day
Open Country	38	103	140
Residential areas and town outskirts	56	146	203
Commercial Town Centres	90	199	261

6.3.10 Within the area around the site the existing deposited dust levels are influenced mainly by quarry activity and farming activity. The site is in open countryside, but lies beside the town outskirts. There is a current planning permission, which allows extraction of mineral until 2042, although the site is currently inactive. The owners, Hanson, could resume extraction at any time when there is a renewed demand for the mineral. The baseline used for this assessment should take account of airborne dust generated if the permitted extraction from the site was in progress.

PM₁₀ Particulates

6.3.11 Particulate matter is generally categorised on the basis of the size of the particles. PM₁₀ roughly equates to the mass of particles less than 10 micrometres in diameter. Particulate matter is made up of a wide range of materials and arises from a variety of sources. Concentrations of particulate matter comprise particles emitted directly into the atmosphere from combustion sources and secondary particles formed by chemical reactions in the air. Particulate matter derives from both human activity and natural sources (such as sea spray and Saharan dust). In the UK the biggest human activity sources are stationary fuel combustion and transport.

6.3.12 The clay fractions of the soils found on the site consist of a range of particle sizes with a large percentage PM₁₀ or smaller. Whilst such small particles are considered to be aerodynamic when freed from the soil and thus able to form dust, clay particles have

chemical properties that allow them to bind ('aggregate') to other clay particles and to fine silt particles of less than 10 µm in diameter. When not aggregated, these clay and fine silt particles may contribute to PM₁₀ from the soil. The ability to cohere allows clay particles to form aggregations ranging in size from crumbs to large clods. These will cohere, even in very dry conditions, and are resistant to the creation of dust when the soils are disturbed. Aggregated clay and silt grains, particularly when damp, can withstand the mechanical disturbance of excavation and movement and thus do not freely produce PM₁₀. Research (Carvacho et al., 2004) has shown that soils with the highest dust emissions had abundant fine particles but low clay content. Experiments on air-dry soils showed that as the proportion of clay in the <10µm fraction increased, generation of PM₁₀ decreased by an exponential function ($R^2=0.68$).

6.3.13 In extreme circumstances these aggregated particles can be separated in more than saturated conditions such as in puddles, or through determined grinding such as under heavy wheels, to form a powder from which fine particles can then be lifted into the air. These conditions are most usually found on haul roads and loading areas of a quarry or construction site.

6.3.14 As an indication of the likely background concentration of PM₁₀ particulates at the site, data has been taken from the Department for Environment Food and Rural Affairs data archive for the area of the quarry and the surrounding receptors. The archive provides data for a range of pollutants including PM₁₀ for 1km x 1km grid squares. The data for the years 2001, 2007 and 2014 for the Seiont Quarry and Brickworks are within two grid squares (SH48100 36100 and SH49100 36100). The data for these squares are presented in Table 6.5.

Table 6.5: background PM₁₀

(Particulate Matter < 10µm) Background Annual Mean µg m⁻³

Measurements	2001	2007	2014
MIN	11.61 µg m ⁻³	12.48 µg m ⁻³	11.39 µg m⁻³
MAX	11.63 µg m ⁻³	14.49 µg m ⁻³	13.29 µg m⁻³
MEAN	11.62 µg m ⁻³	13.51 µg m ⁻³	12.03 µg m⁻³

6.3.15 The current planning permission allows for the extraction of clay and the manufacture of bricks until 2042. In the surroundings of the quarry, PM₁₀ concentrations would be influenced by traffic movements on the local road network and by global PM₁₀ emissions. At present, with the quarry inactive since 2008, the site will not be a significant source of PM₁₀ or dust. Table 6.5 shows Minimum, Maximum and Mean airborne PM₁₀ for the years 2001, 2007 and 2014. The readings for 2001 and 2007

were carried out while the quarry was still active. In 2007 the quarry was being prepared for expansion with widespread topsoil and overburden removal and the extraction of clay. The Archaeological Watching Brief⁶ for the soil stripping in 2007 records that the soil stripping activity only took two days in July. Photographs show that soil-moving activities occurred when the soils were generally damp and therefore less conducive to the generation of airborne dust than if the soils had been dry. In these circumstances it is unlikely that the quarry was the only source of the slight increase in airborne dust in 2007.

Air Quality Standards: Deposited Dust

6.3.16 Dust is normally perceived as an accumulated deposit on surfaces such window ledges or drying washing, paintwork and other surfaces, e.g. car roofs. When the rate of accumulation is sufficiently rapid to cause noticeable fouling, discoloration or staining (and thus decrease the periods between cleaning) then the dust is generally considered to be a nuisance. The point at which an individual becomes concerned about dust and makes a complaint is highly subjective.

6.3.17 In the UK and Europe there are no definitive standards for deposited particulates, but many other countries have criteria and guidelines. Studies undertaken in Australia, for example, have resulted in the adoption of a deposited dust criteria linked to the onset of loss of amenity of about 133 mg/m²/day, averaged over one month. In the UK, long term deposited dust nuisance criteria have been suggested for urban/semi-rural areas at, typically 200 mg/m²/day, averaged over a monthly period.

6.3.18 Custom and practise at quarries, coal mines and construction / demolition sites have used the figure of 200 mg/m²/day as a nuisance threshold for sites in the UK.

Air Quality Standards: PM₁₀ Particulates

6.3.19 The local data presented in Table 6.5 should be seen in the context of national standards. The UK National Air Quality Strategy (NAQS) defines air quality standards for eight major pollutants, one of which is for PM₁₀ and sets objectives for reductions in the concentrations of those pollutants to be achieved by 2005.

6.3.20 The original PM₁₀ standard of 50 µg/m³ as a 24 hour running mean was to be achieved by the end of 2005 with no more than 4 exceedances per year. This was considered to be an unrealistic target and as such it was replaced by the limits within the EU Daughter Directive on Air Quality which set a limit of 50 µg/m³ as a daily mean to be achieved by

⁶ Gwynedd Archaeological Trust Report No 687, dated August 2007

31st December 2004 and maintained thereafter, with no more than 35 exceedances and an annual average of 40 µg/m³.

6.3.21 Studies have found evidence which suggested PM₁₀ might not be the most representative measurement of the total particle mix responsible for harmful effects on health. Toxicity may lie in a finer fraction of particles as small as 2.5 µm (PM_{2.5}) or even smaller, which can be taken further into the lungs when breathing. Following a review, the Expert Panel on Air Quality Standards¹ concluded that measurement of particulate air pollution as PM₁₀ will include essentially all respirable particles and provides the most appropriate basis for an air quality standard in the UK.

Health Impact Studies

6.3.22 Medical studies have consistently failed to find any link between dust arising from mineral working and public health. A doctor who claimed that a nearby site produced demonstrable adverse medical effects upon his patients presented evidence to the Derlwyn Public Inquiry in South Wales. However, that evidence has since been discredited and shown, as an epidemiological study, to be fundamentally flawed (British Medical Journal 305, 1992).

6.3.23 In 1992 the Institute of Occupational Medicine (IOM) concluded a three-year epidemiological study of the respiratory health of some one thousand two hundred and forty-nine opencast mine employees working over nine sites selected by the IOM (Institute of Occupational Medicine Ltd 1992). The main conclusions of that study were that dust exposures were low for most occupational occurrences and that neither asthma nor chronic bronchitis is related to exposure to dust in any part of opencast workings. It is only for those workers exposed for 10 years or more in the dustiest of opencast jobs that a small risk of pneumoconiosis was demonstrated.

6.3.24 The Health and Safety Executive have set the occupational exposure limit for inhalable dust at 10 mg/m³ as an 8-hour time weighted average. As previously mentioned such a figure may have significance within a site if workers are immediately adjacent to a particular operation prone to high dust emissions. However, due to dilution and dispersion it is extremely unlikely that any residential property around a site would ever experience concentrations of dust as high as this, with environmental dust levels some one-hundredth of this figure being the norm.

Significance of existing air quality

6.3.25 The extension area and the immediate vicinity around the quarry do not fall within an Air Quality Management Area for any of the UK National Air Quality Strategy pollutants.

6.4 Potential emissions

6.4.1 Operations at the quarry have the potential to generate dust emissions, particularly in dry conditions; Table 6.6 lists those operations.

Table 6.6: Activities with the potential to cause dust

Activity	Phase			
	Establishment	Operation	Quarry Restoration	Post restoration
Formation of quarry haul roads	Y	Y		
Excavation of brick clay and overburden (already permitted under the existing planning permission);	Y	Y		
Recovery of bricks and concrete (a requirement of the existing permission to restore the site);		Y		
Crushing and grading of hard materials for recycling and reuse;		Y	Y	
Haulage of excavated material into the site, and transport of processed material for use in construction of the bypass;		Y	Y	
Placing and spreading of excavated material from the bypass to restore the quarry progressively over the period of the bypass construction and for a period after completion if further unsuitable material is required to complete. This activity would involve processing of the material to recover aggregate for recycling and reuse;		Y	Y	
Concrete batching plant to use site generated sands and aggregates;		Y	N	
The use of diesel powered plant and equipment	Y	Y	Y	

Formation of haul roads, working areas and excavation of soils, clay and overburden

- 6.4.2 The extraction of mineral will be carried out as required to satisfy the demands for fill on the bypass construction site. A hydraulic excavator will excavate and load material into dump trucks for transportation to the existing processing plant.
- 6.4.3 Consideration will be given to the prevailing weather conditions, in particular wind direction, in order to minimise the potential for windblown dust to disperse from the site.
- 6.4.4 The drop height from the excavator bucket to the dump truck will be minimised and vehicles will be loaded evenly to avoid spillage and thus the generation of dust from this activity should be minimal.

- 6.4.5 The major source of potential dust emissions on any minerals site is from the movement of heavy plant on haul roads. The dump trucks will comply with the site speed limit of 10 mph on the site haul road. The site haul road will be regularly graded and the use of a water bowser will be deployed during dry conditions. Restrictions will be placed on the use of the haul route in adverse weather conditions and any spillages will be dealt with promptly in order to reduce the potential for a dust event occurring.
- 6.4.6 Mobile plant exhausts and cooling fans will be discharged away from the ground to prevent dust mobilisation. All mobile plant is to be maintained regularly to minimise exhaust emissions.

Mineral processing

- 6.4.7 Mineral processing will be carried out using a mobile processing plant which will crush and grade stone, bricks and concrete to form aggregate. The processing plant will be served by loading shovels. Vehicle speeds around the processing plant will be limited and water will be applied as required around the plant to limit dust.
- 6.4.8 Where possible, stockpiled material which is awaiting processing or has been processed will be protected from the prevailing wind and dampened as required to minimise dust generation. The moisture content of the material will help to ensure that the dust emissions from this process are minimal.

Haulage of material on and off site

- 6.4.9 The main source of potential dust emissions will be the movement of road and off-road lorries. All road lorries leaving the site will be sheeted. The site speed controls of 10 mph will be implemented on the quarry haul roads. All goods vehicles that have used the haul roads, processing area or bypass construction site will be required to pass through the site wheel wash before using public roads. Haul roads will be hard surfaced in critical locations to minimise dust raising potential.

Restoration activities

- 6.4.10 Any soils handled as part of restoration activities will be managed in accordance with the site restoration scheme as soon as is practicable in order to minimise the potential for dust generation. Progressive restoration will minimise the land area of the extension from which dust events can occur.

Importation of inert materials for processing, recycling and quarry restoration

- 6.4.11 Following completion of the bypass construction there might be a further period of several years when further material will be imported for processing, re-use and export

as construction fill. Some of the material will be used to complete the quarry restoration.

6.4.12 Vehicles carrying material for importation to the site will be sheeted and the appropriate documentation verified as part of the site notification scheme before the vehicle can proceed. Vehicles will observe the site speed limit on the access road. Water will be used as required to minimise dust generation from the importation process.

6.5 Assessment of air quality effects

Assessment criteria for dust

6.5.1 If dust was to be raised and dispersed by site activities without mitigation, then the magnitude of the impact on receptors would be classified according to the frequency of occurrence and the distance between source and receptor (Table 6.7). Because some receptors are more sensitive to dust than others, the significance of that impact relates to the type of receptor (Table 6.8 and Table 6.9).

Table 6.7 Magnitude of Impact if dust is not controlled

Receptor distance from source	Dust emission days per year as % of 365		
	0 - 2%	3 - 5%	6% or more
0 - 100	Minor	Moderate	Major
101 - 500m	Negligible	Minor	Moderate
500 - 1000m	Negligible	Negligible	Minor

Table 6.8 Determination of Impact Significance if dust emission occurs

Magnitude of impact in Table 6.5	Negligible	Minor	Moderate	Major
Sensitivity of Receptor				
High	Minor	Moderate	Major	Major
Medium	Negligible	Minor	Moderate	Major
Low	Negligible	Negligible	Minor	Moderate

6.5.2 The former Technical Guidance to the National Planning Policy Framework, presents examples of dust sensitive facilities as shown in Table 6.9 (after Ireland M, 1992).

Table 6.9: Dust sensitivity of receptors

High sensitivity	Medium sensitivity	Low sensitivity
Hospitals and clinics, Retirement homes, Hi-tech industries, Painting and furnishing, Food processing	Schools, Residential areas, Offices, Food retailers, Glasshouses nurseries and Horticultural land,	Farms, Light and heavy industry, Outdoor storage

6.5.3 Land uses surrounding Caernarfon Brickworks Quarry are classed as high, medium and low sensitivity. Figure 2.3 shows the residential and other buildings in the vicinity of the proposal site. All residential properties and the Hospital lie 200m or further from the proposed concrete batching plant and asphalt plant, and from quarrying operations. All (with the exception of those alongside the bypass route) would also be 200m or further from the nearest point of approach for the movement of materials via the haul road.

Particulate matter and nitrous oxides

6.5.4 The use of diesel-powered plant and equipment on site is a further source of emissions, principally fine particulate matter (PM₁₀) and oxides of nitrogen (NO_x), within the exhaust emissions. However, the engines of much of the machinery used will operate to strict emission limits. For non-road mobile machinery with power outputs up to 560 kW there is a requirement to satisfy UK legislation enacted as a result of a European Directive. Any larger equipment not covered by this legislation is likely to have the latest technology fitted to it and thus would also meet the above requirements. As this equipment is similar to heavy road vehicles, guidance for road traffic is applicable.

6.5.5 Defra 2014 monitoring data for Nitrogen Dioxide shows the annual mean concentrations as 5.39µg/m³, which is well below the Annual Mean Air Quality Objective for this pollutant of 40 µg/m³.

6.5.6 Guidance in the Environmental Protection UK (EPUK) document “Development Control: Planning for Air Quality (2010 update)” and the Design Manual for Roads and Bridges suggests a change of 200 HGV movements per day as an indicative trigger level for when the operational traffic of the development could have a significant effect on air quality. DMRB states that ‘Only properties and Designated Sites within 200m of roads affected by the project need be considered. If none of the roads meet any of the traffic/alignment criteria or there are no properties or relevant Designated Sites near the affected roads, then the impact of the scheme can be considered to be neutral

in terms of local air quality and no further work is needed.’ (DMRB Vol11 Sect3 Part 1 Chapter 3 para 3.13 – 3.14)

6.5.7 Table 6.10 shows the months when the predicted daily average of HGV movements within the quarry working area could exceed 200. Although there would be periods when the number of HGV movements per day transporting materials to and from the processing area would exceed 200, the nearest residential property to the application site is not within 200m. For this reason, the question of PM₁₀ and NO_x is not considered further.

Table 6.10: Months when average HGV movements within the working area of the quarry will exceed 200 in a day

Month	Average daily vehicle movements in the working area of the quarry rising above the 200 per day threshold
March to October 2017	Average 708 movements (min. March: 267, max. July: 1257)
January to August 2018	Average 355 movements (min. July: 200, max. Apr: 579)

Discussion of dust generation and suppression

6.5.8 The proposed methods of dust suppression are recognised as industry best practice and are undertaken by the contracting team on their construction sites following many years of experience in handling potentially dusty materials in a wide variety of situations. These tried and tested methods of dust suppression have been successfully used at numerous minerals and construction sites.

6.5.9 A dust event will only occur if a fine material can be picked up or disturbed, carried by the wind and then deposited.

- Dust-forming materials are more readily available if dry (on many days the material is too damp to form dust or the particles are too coarse to be lifted);
- Materials must be physically disturbed so that they are lifted into the air (not all site operations are dusty because some do not involve physical disturbance);
- There must also be a wind of sufficient strength to keep fine particles airborne (such winds are infrequent);
- For a particular receptor to be at risk, the wind must blow in that particular direction from the source.

6.5.10 The critical wind speed at which a particle becomes airborne depends on many factors including particle size, shape and density. For most mineral dusts the critical wind

speed is about 5.6 ms^{-1} (12 mph - 11kts - Force 4 on Beaufort Scale). For a dust event to occur there must also be a failure of dust control measures. Particles greater than $30\mu\text{m}$ make up the greatest proportion of dust emitted from mineral processing and are largely deposited within 100m of source – this is because they are too heavy for the wind to carry them far. Particles between 10 and $30\mu\text{m}$ are likely to travel between 250 and 500m from the source, while sub- $10\mu\text{m}$ particles, which make up a small proportion of dust emitted from most mineral processing operations, may travel up to 1km from sources.

6.5.11 Data in section 6.3 shows that winds exceeding 5.3 ms^{-1} come predominantly (52%) from the south-west quadrant. This proportion of the estimated number of dry windy working days is 23, from an annual total of 235 working days. Given that the operations which could generate dust will not take place on a continuous basis, the indication of 23 days from this quadrant is likely to be an over-estimate. Furthermore, the bowl-shaped void will tend to shelter the working areas of the quarry, and so have the effect of reducing wind speeds and reducing the dispersal of airborne dust.

6.5.12 Table 6.11 sets out the implications of dust dispersion on nearby receptors, including residential areas, schools, industrial buildings, parks and hospitals. Areas of nature conservation interest are also covered.

6.6.13 The impact on air quality from site operations with suitable mitigation measures is expected to be negligible, in line with The National Planning Policy Framework, which states that '*unavoidable dust emissions should be controlled, mitigated or removed at source*'. The following measures will be taken to ensure that the dust control measures are effectively implemented.

1. The quarry operator will negotiate and comply with planning conditions which may be specified by the Mineral Planning Authority relating to dust. The operator will refer to the planning conditions and determine an appropriate response, taking into account current and forecast weather conditions.
2. All site personnel shall be trained as to the potential sources and effective mitigation of dust.
3. Regular visual inspections will be conducted within the site and on the local road network by the site personnel, as deemed necessary and especially during dry windy conditions to ensure that any dust sources are identified and dealt with promptly.
4. A complaints log will be held on site. In the event of receiving a dust complaint, the name and location of the complainant, the nature of the dust related

complaint, the site activity and prevailing weather conditions at the time of the complaint shall be noted. The site foreman shall investigate the complaint and take any remedial action which is deemed appropriate.

5. In the event of a failure of dust mitigation measures, for example in extreme weather conditions, the dust generating activity shall be temporarily suspended, until appropriate dust mitigation is implemented or until a change in weather condition occurs.

Table 6.11: Potential receptors of dust from the quarry

Receptor	Sensitivity (Table 6.10)	Distance measurements (metres)			Wind sector from centre of quarry bowl	Number of dry days/year when wind direction and speed > 12mph could carry dust to receptor	Expressed as % of year (365 days)	Potential impact Significance	
		from closest area of short duration earthworks	from nearest proposed haul road	From processing area				No mitigation	With mitigation
Industrial units in Peblig Industrial Park, Llanberis Rd.	Low	130	155	155	S	7.6	2.1%	Minor	Negligible
Plas Treflan	Medium	185	185	380	SSW	12.3	3.4%	Minor	Negligible
Bryn Eden	Medium	170	220	540	WSW	7.6	2.1%	Minor	Negligible
Tryfan	Medium	340	350	720	WSW	7.6	2.1%	Minor	Negligible
Properties on Stad Glyndwr and Erw Wen	Medium	500	500	780	WSW	7.6	2.1%	Minor	Negligible
Properties on Bryn Y Gof	Medium	490	500	790	W	6.2	1.7%	Minor	Negligible
Properties around Bryn Mair, Mes y Coed, Bryn Eglwys, Ger y Twr, Garreg Lwyd	Medium	235	235	610	ESE -SE	1.4-1.7	0.4-0.5%	Negligible	Negligible
Properties at Glyn, Lynn Lea and Cae Phylip on Penbryn Lane	Medium	127	160	430	SSE	2.0	0.6%	Negligible	Negligible
Rhydallt Ganol	Medium	270	300	620	NNW	2.1	0.6%	Negligible	Negligible

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Receptor	Sensitivity (Table 6.10)	Distance measurements (metres)			Wind sector from centre of quarry bowl	Number of dry days/year when wind direction and speed > 12mph could carry dust to receptor	Expressed as % of year (365 days)	Potential impact Significance	
		from closest area of short duration earthworks	from nearest proposed haul road	From processing area				No mitigation	With mitigation
Properties to the west of Rhydallt Ganol	Medium	330	320	530	N	2.1	0.6%	Negligible	Negligible
Properties on the Pen y Bryn cul-de-sac	Medium	240	590	550	ENE	2.6	0.7%	Negligible	Negligible
Closest properties on Felin Seiont	Medium	80	280	310	ENE	2.6	0.7%	Minor	Negligible
Bodfan	High	90	280	310	ENE	2.6	0.7%	Moderate	Negligible
Ysbyty Eryri	High	60	230	240	E	2.3	0.6%	Moderate	Negligible
Closest properties on Tyddyn Llwydyn	Medium	150	175	165	E-ESE	1.7-2.3	0.6-1.4%	Negligible	Negligible
Closest Chalets on Glan Gwna estate	Medium	300	300	580	SW	9.4	2.6%	Minor	Negligible
School	Medium	480	550	500	SE	2.0	0.4%	Negligible	Negligible
Public Park at Pont Seiont	Medium	270	440	500	E	2.3	0.6%	Negligible	Negligible
Ancient woodland to the south west of the quarry	Medium	30	160	275	SW	2.1	0.6%	Moderate	Negligible
River Seiont	Medium	30	30	70	N-W-SW	2.1-6.2-9.4	0.6-1.7-2.6%	Moderate	Negligible

6.6 Cumulative impacts

- 6.6.1 Other developments in the area that could affect air quality include the A487 Caernarfon bypass scheme which will pass to the east and south of the quarry.
- 6.6.2 The bypass is expected to bring about an overall beneficial impact on air quality because it will reduce the traffic pollution concentrations in some of the more congested areas along the existing road. However, works within the quarry will be completed, or virtually completed when the bypass is in operation. The period of greatest concern is the construction phase when the potentially greatest dust producing activity will be occurring within the quarry and on the bypass construction corridor.
- 6.6.3 For the bypass in the vicinity of the quarry, the soil types, rainfall, soil moisture and wind speed and direction will be similar to those in the quarry. Whilst there will be cumulative activity with construction plant moving along the bypass construction corridor, entering and leaving the quarry and processing excavated materials, the potential for the spread of dust towards sensitive receptors is unlikely to have a greater cumulative impact so long as adequate mitigation measures are properly implemented to control dust.
- 6.6.4 A comparison between the potential impact of the bypass using the quarry as a source of fill, versus the use of remote quarries and landfill sites has shown that short term traffic impacts are substantially reduced if the proposed scheme for Seiont Brickworks Quarry is permitted, with consequential construction phase reductions in adverse air quality impacts in the wider area.

6.7 Conclusions

- 6.7.1 The air quality in the vicinity of the quarry is generally good. It is unlikely that any significant decrease in local air quality will occur due to the proposed extension area at Caernarfon Quarry and Brickworks site. The proposals are fully compliant with national and local planning policy.
- 6.7.2 Overall the air quality effects on human receptors associated with the scheme are unlikely to interfere or prevent the implementation of measures by Gwynedd Council to improve air quality. There is unlikely to be an exceedance of UK air quality objectives, nor cause a new Air Quality Management Area to be declared.

Dust

- 6.7.3 Any dust occurrence event will be limited and of short duration and will be minimised by implementation of the dust control recommendations.

Particulate Matter and NOx

- 6.7.4 The increased movements of HGVs and other large vehicles involved in moving materials would remain sufficiently distant from properties that air quality effects need not be considered.

7 CULTURAL HERITAGE

7.1 Introduction

7.1.1 This chapter identifies baseline conditions with reference to archaeological sites and other cultural heritage and describes how they may be affected by the development. It sets out the impacts that the construction and operation of the quarry and its associated infrastructure may have and identifies mitigation measures to avoid, reduce or offset any adverse impacts. Specifically, this chapter considers impacts on:

- Designated site;
- Known, undesignated sites.

7.1.2 The study area is the quarry and surrounding land where sites could be affected as a consequence of quarrying activity.

7.2 Consultations

7.2.1 The Gwynedd Archaeological Trust Planning Service in Bangor were contacted and a scope of work prepared for the study.

7.3 Legislation and policy

7.3.1 The Ancient Monuments and Archaeological Areas Act 1979 is the primary legislation for protecting archaeological remains and their settings and requires the Welsh Government to compile and maintain a schedule of Ancient Monuments of national importance.

7.3.2 The Planning (Listed Buildings and Conservation Areas) Act 1990 requires the Welsh Government to compile a list of buildings of special architectural or historic interest and provides for the protection of such Listed Buildings. The Act also places a duty on local planning authorities to identify '*areas of special architectural and historic interest, the character of which it is desirable to preserve or enhance*' and to designate them as protected Conservation Areas.

7.3.3 The executive agency of the National Assembly for Wales with overall responsibility for the archaeological resource and the built heritage is CADW: Welsh Historic Monuments. Where development proposals are likely to affect the site or setting of a Scheduled Ancient Monument (SAM), or have a substantial effect on a listed building, Cadw must be consulted and its consent obtained.

7.3.4 Gwynedd Archaeological Trust (GAT) maintains the official register of archaeological sites and monuments (SMR) for North West Wales. There are many archaeological features, of varying importance, recorded on the County Sites and Monuments

- Record (SMR), held by GAT. The SMR indicates whether archaeological remains are known or likely to exist on a particular site. However, the absence of a record of a site on the regional SMR does not necessarily indicate that no archaeological interest exists as the database is being continually updated with new sites.
- 7.3.5 Gwynedd Council (GC) maintain their own specialist conservation staff that have responsibility for the built heritage.
- 7.3.6 The planning policy framework for the archaeological resource in Wales is established in Circular 60/96 '*Planning and the Historic Environment: Archaeology*'. This guidance establishes that where nationally important archaeological remains and their settings, whether Scheduled or not, are affected by a proposed development, there should be a presumption in favour of their preservation. Remains of regional or local importance may also be worthy of preservation in situ or alternatively preservation by record.
- 7.3.7 The planning policy framework for the built heritage resource in Wales is established in Circular 61/96 '*Planning and the Historic Environment: Historic Buildings and Conservation Areas*'. This guidance establishes that it is an objective of central government policy to secure the preservation of Listed Buildings and any features of special architectural or historic interest, which they might possess. It establishes that Conservation Areas are protected as areas of '*special architectural or historic interest*', which it is the duty of the local authority to preserve or enhance. The setting of a Listed Building or a Conservation Area is also a material consideration in determining the effect of developments in close proximity. Buildings are classified in grades (I, II* and II) to indicate their relative importance. Cadw and the Council hold copies of the statutory list.
- 7.3.8 The Hedgerow Regulations (Section 97, The Environment Act, 1997) protects hedgerows over 20m in length and older than 30 years, which are considered to be historically, ecologically or visually important. Such hedgerows are protected by a presumption in favour of their retention. A hedgerow is defined as '*a row of bushes forming a hedge, with the trees etc. growing in it*' and also includes 'hedgebanks', which are a feature of the landscape of much of Gwynedd (Welsh Office, 1997).
- 7.3.9 In addition the Gwynedd Council include within its Unitary Development Plan (UDP) and in the emerging Joint Local Development Plan a number of policies concerning the archaeological and built heritage which afford appropriate protection to ancient monuments and other archaeological remains, listed buildings, locally listed buildings, Conservation Areas and Historic Parks, Gardens and Landscapes as required by legislation and Planning Policy Wales.

7.3.10 The UDP strategic policies include the following:

STRATEGIC POLICY 1- Taking a Precautionary Approach

Development proposals that would have an adverse or uncertain impact on the environment, economy or cultural character (including the Welsh language) of the Plan area will be refused unless it can be conclusively shown by an appropriate impact assessment that this can be negated or mitigated in a manner acceptable to the Planning Authority.

POLICY A1 - Environmental or Other Impact Assessments

Proposals will be refused unless sufficient information is provided with the planning application concerning any significant likely environmental or other impacts (e.g. ecological, noise, traffic, health, retail, linguistic, archaeological).

POLICY A2 - Protecting the Social, Linguistic and Cultural Fabric of Communities

Proposals that would, because of their size, scale or location cause significant harm to the social, linguistic or cultural cohesion of communities will be refused.

POLICY A3 - Precautionary Principle

Proposals will be refused if there is any possibility of serious or irreversible damage to the environment or the community unless it can be shown conclusively at the end of an appropriate Impact Assessment that the impact can be negated or mitigated.

STRATEGIC POLICY 3 - Built and Historic Environment

The area's built and historic environment will be protected from development that would significantly harm it and new developments in historic areas will be expected to conform to particularly high design standards which will maintain or improve their special character.

7.3.11 In relation to specific policies:

Listed Buildings

POLICY B3 - Development Affecting the Setting of Listed Buildings

Proposals on sites affecting the setting of Listed Buildings will only be approved provided that all the following criteria can be met: that the design of the development enhances the special quality of the main building as well as the positive qualities of the local environment; that it does not lead to the loss of features such as walls, railings, ancillary buildings, landscaping, hedges, trees, associated objects, surfaces or archaeological remains that contribute to the special character of the Listed Building; that it does not cause significant harm to important views of and from the building.

Explanation -Features around a Listed Building, either within its curtilage or beyond, very often form an integral part of its character. This is particularly true where the gardens or grounds form an integral part of the original layout/plan of the property. The Local Planning Authority will pay particular attention to the need to safeguard the setting of Listed Buildings. The addition of intrusive elements or the loss of important features would be unacceptable.

Conservation areas

POLICY B6 - Caernarfon Castle and Town Walls World Heritage Site

The Castles and Town Walls of King Edward in Gwynedd, which include Caernarfon Castle and Town Walls, were added to the list of World Heritage Sites (WHS) as a cultural site of outstanding universal value in 1987. Proposals that would cause significant harm to the monuments within the boundaries of the Caernarfon Castle and Town Walls World Heritage Site or within the identified buffer zones, or which would restrict existing or proposed safe public access to the Site will be refused. Planning applications will be assessed against the World Heritage Site Management Plan published by Cadw.

This would apply to proposed development within the WHS, or that form part of areas outside the inscribed boundary which form the essential setting. This latter point is clarified by an indication that important historic views into and out of each monument in the WHS, which generally extend beyond the areas of essential setting will need to be taken into account. Inappropriate development will include any development that makes it more difficult for the public to appreciate the history of a monument.

Archaeological remains

POLICY B7 - Sites of Archaeological Importance

Proposals that will damage or destroy archaeological remains of national importance (whether scheduled or not) or their setting will be refused. A development which affects other archaeological remains (entered on the Sites and Monuments Record (SMR)) will be permitted only if the need for the development overrides the significance of the archaeological remains.

In areas where there are likely to be archaeological remains, the developer will be required to commission either an Archaeological Assessment and/or field evaluation in order to determine the archaeological impact of the proposed development before the Planning Authority determines the application. The assessment/evaluation results must be submitted with the planning application, in addition to a plan showing how the impact of the proposal on the archaeological remains will be mitigated.

If a proposed development would affect nationally important archaeological remains, then the developer should prepare sympathetic plans, which retain the remains in situ. Where preservation in situ is not feasible planning conditions or agreements will be used in appropriate cases to ensure that the work of excavating and recording the remains takes place prior to commencement of the development.

Schemes that will facilitate the appropriate management and interpretation of archaeological sites for educational or tourism purposes will be supported.

Historic landscapes

POLICY B12 - Protecting Historic Landscapes, Parks and Gardens

Proposals that are within or on sites visible from a park and garden identified and described in Part 1 of the Register of Historic Landscapes, Parks and Gardens of Special Interest in Wales will be refused.

The Local Planning Authority will seek to ensure that registered historic landscapes, parks and gardens are protected and enhanced. When assessing the suitability of proposals within or in close proximity to registered Historic Parks and Gardens, consideration will be given to the impact of the development on the features that make the area important, as identified in the relevant part of the Register.

7.4 Archaeological and historical background

- 7.4.1 The local topography is formed of deep reserves of Ordovician Clays overlain by glacial sediments. Sections cut through these sediments in the 1980s and 1990s revealed organic sediments of great significance to the understanding of Quaternary events in western Britain. These have included peat and fragments of coniferous wood cones and needles, seeds, pollen and insect remains which help to date the material and provide environmental information. The data is evidence of wetland margin habitats with two episodes, one of open tundra-like conditions and the other of coniferous forest. Radio-carbon dating suggest an age of around 60,000 years BP for the latter and 40,000 years BP for the former. The Quaternary sediments have been found to be in the best condition in the south west corner of the quarry and these have been designated as a RIGSⁱⁱ. An Archaeological Watching Brief on topsoil and overburden stripping within the quarry in 2007 was reported by GAT⁷.
- 7.4.2 Little is known of prehistory in the area of the quarry, but further north and east prehistoric sites have been found. Investigations along the line of the proposed A487 bypass route have confirmed that there is little known in and around the site.

⁷ Archaeological Watching Brief 2007 GAT Project Number G1952; Report Number 687 August 2007

7.4.3 Caernarfon is known to have been a Roman fortification and settlement, known as Segontium. As a political, military and administrative centre in the region, Segontium was the most important settlement in North Wales. Roads radiated out from the town into the countryside, and alongside a range of related features such as signal stations and bridges, significant lengths of road have been identified. The site of a possible Roman bridge over the Seiont on the north side of the quarry has been investigated by GAT in the recent past. It has been suggested that a Roman road may once have passed through the landscape of Pen y Bryn Hill, although it will have been destroyed over the past 60 years of extraction.

7.4.4 The history of quarrying and brickmaking continued on the site through the 19th century destroying the underlying agricultural landscape, but overlaying the ground with an industrial landform.

7.5 Methodology

7.5.1 The method of assessment is based on that set out in DMRB Volume 11, Section 3 Part 2 HA 208/07. The area was assessed for sites of heritage value by means of an examination of various historical sources of information and a site visit. Information of features of heritage interest located within one kilometre of the site boundary were assessed for significance and impact potential using standard EIA criteria.

7.5.2 The following sources were used to perform the assessment of the cultural heritage features in the development area:

- Gwynedd Archaeological Trust HER shown on the internet
- NMR sources from the Royal Commission on Historical Monuments and Sites, including aerial photographs up to 1970
- Lists of Scheduled sites and Listed building from the Cadw database
- Various published reports
- Historic mapping sources
- Site visits in November 2015

7.5.3 All sites identified within 1 kilometre radius of the brickworks. Sites were characterised for their current condition, status and value, in accordance with criteria based upon EIA standard guidelines (Table 6.1-3). The **Value** of a heritage asset is determined by reference to Annex 5 of the above document. For ease of reference Table 7.1 sets out how Value is determined.

Condition

7.5.4 The condition of each site as is currently known is indicated as following:

- Intact;

- Destroyed;
- Unknown

7.5.5 The **Magnitude of Change** that is predicted for a heritage asset is graded from Major, Moderate, Minor, Negligible to No Change. These are applied without making reference to the Value of the resource. Criteria are set out in the Annexes 5, 6 and 7 of the DMRB guidance and included in Table 7.2.

7.5.6 The **Value** of an Asset and the predicted **Magnitude of Change** are used to assess the **Significance of Effects**: Table 7.3 brings together the value of the object and the Magnitude of Change to determine the significance of the effect: Very Large, Large, Moderate, Slight and Neutral. Impacts that should be regarded as Significant are Moderate through to Very Large.

Table 7.1: Value of heritage asset

Importance	Criteria	Typical Examples
Very high	Attribute has a high quality and rarity on regional or national scale.	Site protected by International or EU legislation (World Heritage Site, Geoparks), Human populations close to source.
High	Attribute has a high quality and rarity on a local scale.	Site protected by UK legislation, e.g. Site of Special Scientific Interest. Human populations located at some distance from source.
Medium	Attribute has a medium quality and rarity on a local scale.	Site of local geological importance (Regionally Important Geological Site (RIGS)), areas of mineral resource, or areas of soils of best and most versatile agricultural value.
Low	Attribute has a low quality and rarity on a local scale.	Sites with little or no local geological/soils interest.
None	Attribute quality and rarity is irrelevant.	Sites where mineral extraction is permitted

Table 7.2: Criteria to determine Impact Magnitude

Magnitude	Criteria	Typical Example
Major Adverse	Results in loss of attribute and or its quality and integrity.	Loss or severe damage to key characteristics, features or elements, or permanent harm to human beings.
Moderate Adverse	Results in impact on and integrity of the attribute, or loss of part attribute and or quality.	The integrity will not be adversely affected, but the scheme may lay lead to a loss of or damage to key characteristics, features or elements, or temporary concerns about human health

Magnitude	Criteria	Typical Example
Minor Adverse	Results in some measurable change in attributes, quality or vulnerability.	Minor negative impact on key characteristics, features or elements.
Negligible	Results in impact on attribute, but of insufficient magnitude to affect the use and integrity.	Minor alteration to one or more features, characteristics or elements or no observable impact.
Minor beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring.	A measurable minor positive impact on key characteristics, features or attributes is evident.
Moderate beneficial	Results in moderate improvement of attribute quality.	A moderate positive impact on key characteristics, features or attributes is evident.
Major beneficial	Results in major improvement of attribute quality.	A major positive impact on key characteristics, features or attributes is evident.

Table 7.3: Significance of Effects Matrix

IMPORTANCE OF ATTRIBUTE	Very High	Neutral	Slight	Moderate/ Large	Large or Very Large	Very Large
	High	Neutral	Slight	Moderate Slight	Moderate/ Large	Large or Very Large
	Medium	Neutral	Neutral/ Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/ Slight	Neutral/ Slight	Slight	Moderate Slight
	Neutral/None	Neutral	Neutral	Neutral	Neutral	Neutral
		No Change	Negligible	Minor	Moderate	Major
MAGNITUDE OF IMPACT (Adverse or Beneficial)						

7.6 Baseline description

7.6.1 The site lies within 1.3 km of the Caernarfon Castle World Heritage Site and within 5.7 km of the Snowdonia National Park. All other National Monuments Record (NMR) sites are listed in Table 7.2 Gazetteer.

7.6.2 The tithe map of 1842 for Llanbeblig Parish shows an agricultural landscape of farmsteads and fields. Table 7.1 lists the names of fields given on the Tithe Map. Only the Seiont corn mill (CH9) powered by its leat (CH19) is evidence of any form of

industrial activity. The Seiont Valley underwent a change over the next 40 years with new industrial enterprises which used the Afon Seiont as a power source. These were the Glan Morfa slate works (CH3), the Seiont Tannery (CH17) and the Seiont Brickworks (CH16) as well as the continuing operation of the Seiont corn mill (CH9). These industries were accompanied by their power sources from the river, consisting of weirs, mill races and sluice gates to control the water.

- 7.6.3 The major industry was the brickworks (CH16). This was first established in about 1850 on a meander of the River Seiont. The clay for the works was supplied from two clay pits as shown on the 1889 Ordnance Survey map. The southern pit (CH18) was soon abandoned. The main clay pit (CH35) supplying the brickworks lay to the north of the river and gradually grew in size as can be seen from maps of various times. The pit also supplied brickworks at Peblig, one kilometre to the north which also developed as an industrial centre with an ironworks and later an aluminium furniture factory (CH22).

Table 7.4: Field names recorded on the 1842 Tithe map in the vicinity of the later brickworks

Field	Name
1088	Gors Fawr
1089	Cae Ymryson
1092	Y Ddol Ganol
1093	y Ddol
1464	Llain Spencer Ucha
1465	Llain Spencer Isa
1466	Cae Cefn yr Ardd

- 7.6.4 The site was crossed by the line of the Caernarfon and Llanberis railway line (CH15). This was built about 1860.
- 7.6.5 Access to the brickworks area was by two means. The northern route to the clay pit was a track running from the west beside the workhouse (CH8) over a bridge (CH12) and under the railway line (CH15) into the clay pit. The main access to the brickworks came from the west which was also the route of the mineral line carrying products out of the brickworks.
- 7.6.6 A new kiln was built in 1934 at a raised level to escape the effects of periodic flooding from the river. The raised level was supported on the riverbank by a stone revetment or wall which remains in place today. A further kiln was added after the Second

World War. Brickmaking continued at the original site until a new factory was built in 1966 on the north of the river within the floor of the clay pit.

- 7.6.7 The site of the former Seiont Brickworks Manager's house, known as Rhydallt Fawr, which stood close to the summit of the hill, was eventually destroyed by mineral extraction. This property is shown on the 1899 OS map as consisting of two groups of buildings and what might be a walled garden within a woodland.
- 7.6.8 Extraction continued until 2007 when the brickworks was closed and later demolished. The sequence of development is shown in Figure 7.1.
- 7.6.9 The location of known archaeological sites is shown in Figure 7.2 and the details of these are shown in the Gazetteer of sites Table 7.6.

7.7 Limitations and Assumptions in baseline data

- 7.7.1 As the site has been dramatically changed by clay extraction in the late nineteenth and twentieth centuries, it is assumed that all archaeological features pre-dating the brickmaking industry have been entirely removed within the development boundary. It is also assumed that physical evidence of the earliest phase of brickmaking may lay beneath the brick store. This cannot be determined based on present evidence. There is a possibility that some information on historic or earlier use of the landscape may exist around the margins of the development boundary, although there is no strong evidence to suggest there is a potential for this.

7.8 Identification of direct and indirect impacts and mitigation

- 7.8.1 The assessment of cultural heritage sites needs to consider the potential impact of the scheme on sites that are either:
- directly (physical damage will result);
 - or, not directly affected (by damage or change within the setting of the site).
- 7.8.2 The gazetteer (Table 7.6) of sites gives the name, description, location, condition, National Monuments Record (NMR) reference, its 'Value' (see Table 7.2) as a heritage site, the Predicted Magnitude of Change (see Table 7.3) brought about by the proposed scheme in the quarry, and in the far-right hand column is given the Significance of Impact (see Table 7.4).

Direct impacts and mitigation

- 7.8.3 Most of the mineral extraction and the placing of fill in the quarry will be contained within the existing industrial site of the quarry and former brickworks. There will be

excavation within the open quarry void, where no archaeological remains are likely to be found.

- 7.8.4 An area of land will be taken to the immediate east of the quarry void in the northerly of two fields to provide a haul road from the floor of the quarry to the bypass construction site. No known sites lie within this area. A watching Brief will be maintained during topsoil stripping.
- 7.8.5 The site of the brickworks (CH16) is currently covered by stacks of stored unused bricks. There is no information on survival or current condition of sub-surface features of the nineteenth century brickworks. The renewal of structures and constant activity on the site for over a hundred years is shown by the maps at various dates. Remains of the early brickwork may be uncovered during excavation in the brickyard to the west of the river. An archaeological watching brief on this work should be undertaken and as part of that the remaining buildings should be recorded. Provision should be made for the archaeological recording of any other features related to the brickworking industry in the area. The Direct Impact on this site is shown to be Moderate/Slight, which is on the fringes of being classified as Significant. Proposed mitigation, will include a watching brief during excavation.

Indirect impacts and mitigation

- 7.8.6 The World Heritage Site of Caernarfon Castle lies 1.3 kilometres to the northwest and there is no inter-visibility with the quarry. The proposed scheme at the quarry will have no impact on the setting of the castle, although the restoration of the quarry will contribute to an overall improvement to the quality of the wider landscape setting.

Table 7.5: assessment of impact on indirectly affected heritage sites

Name & site description	Status of site and impact	Potential indirect impact
Bryn Eglwys, house, stables, coach house and garden walls	All Listed Grade II Medium value Neutral/Slight Impact Not Significant	Close to the south east edge of the quarry, but intervening trees and hedges screen views into the quarry so extraction and filling will not adversely affect the setting, but restoration will have a beneficial impact. The proposed bypass in cutting would lie between Bryn Eglwys and the quarry. The bypass on embankment might be visible to the north.
Bryn Eden house and terrace walls	Listed Grade II Medium value Slight Impact Not Significant	Some distance from quarry with the summit of Pen y Bryn Hill intervening, so extraction and filling will not adversely affect the setting, but restoration will be a beneficial impact. The proposed bypass on embankment and in cutting would lie between Bryn Eden and the quarry.

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Morfa Common Park	Grade II Registered Park and Garden Medium Value Slight impact Not Significant	A 19th-century public park designed around an artificial lake located beside Ffordd Felin Seiont about 250 metres from the nearest part of the quarry site with some inter-visibility.
Penrhos house and garden	None Low value Neutral Impact Not Significant	Close to the southeast edge of the quarry, but intervening trees and hedges screen views into the quarry so extraction and filling will not adversely affect the setting, but restoration will have a beneficial impact. The proposed bypass in cutting would lie between Penrhos and the quarry. The bypass on embankment might be visible to the north.
Clay Pit	None Low value Neutral impact Not Significant	Incorporated within Seiont quarry and now much of this area is restored and planted.

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Table 7.6: Gazetteer of cultural heritage sites within one kilometre of the Seiont brickworks

Code	Title	Description	Condition	Source Reference	Period	Value	Status	NGR	Magnitude of Change	Significance
CH00	Caernarfon Castle	World Heritage Site in medieval castle in townscape setting	Intact		Medieval	Very High	WHS	247400, 362606	No Change	Neutral
CH01	Pen y Bryn	Formal garden	Intact	NMR 86445	Post Medieval	Low		248436, 361230	Negligible	Neutral/ Slight
CH02	Slate Works	Glan Morfa Slateworks	Unknown	NMR 420113	Post Medieval	Low		248438, 361446	Minor	Neutral/ Slight
CH03	Mill race	Supply to Glan Morfa Slateworks	Unknown		Post Medieval	Low		248483, 361416	Minor	Neutral/ Slight
CH04	Weir	Weir Leading water to the Glan Morfa Slateworks	Unknown	GAT 57049 GAT 57048	Post Medieval	Low		248532, 361414	Negligible	Neutral/ Slight
CH05	Morfa Common Park	Public gardens	Good	PGW (Gd) 38	Post Medieval	Medium	Grade II Listed Park	248548, 361383	Minor	Slight
CH06	Ty'n Llain	Farmstead shown on Tithe map and 1st edn OS	Destroyed		Post Medieval	Negligible		248558, 361816	n/a	n/a
CH07	Workhouse Garden	Formal garden	Intact	NMR 86329	Post Medieval	Low		248601, 361475	Minor	Neutral/ Slight
CH08	Workhouse	Caernarvon and Union Workhouse	Intact	GAT 17187 NMR 404484	Post Medieval	Medium		248660, 361497	Minor	Slight

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Code	Title	Description	Condition	Source Reference	Period	Value	Status	NGR	Magnitude of Change	Significance
CH09	Seiont Mill	Corn Mill	Intact	NMR 24689	Post Medieval	Medium		248725, 361383	Negligible	Neutral/ Slight
CH10	Mill race	Supply to Seiont Corn Mill	Intact		Post Medieval	Low		248737, 361410	Minor	Neutral/ Slight
CH11	Tyddyn Llwydyn	Farmstead shown on Tithe map and 1st edn. OS	Destroyed		Post Medieval	Negligible		248741, 361747	n/a	n/a
CH12	Abutments	Bridge abutments	Intact	GAT 37205	Post Medieval	Low		248755, 361519	Negligible	Neutral/ Slight
CH13	Sluice gate	Part of CH10 and Seiont Corn Mill	Intact		Post Medieval	Low		248756, 361456	Negligible	Neutral/ Slight
CH14	Bridge	Railway bridge	Intact		Post Medieval	Low		248759, 361474	Negligible	Neutral/ Slight
CH15	Railway	Carnarvon and Llanberis Line	Intact		Post Medieval	Low		248880, 361584	Negligible	Neutral/ Slight
CH16	Brickworks	Remains of Seiont brickworks under brick stack	Unknown	GAT 20738	Post Medieval	Low		248887, 361294	Major	Moderate/ Slight
CH17	Tannery	Seiont Tannery	Unknown		Post Medieval	Low		248898, 361645	Minor	Neutral/ Slight
CH18	Clay pit	Clay pit associated with brick works; shown on 1st edn and subsequent OS maps. Still extant as an area	Unknown	GAT 35166	Post Medieval	Neutral		248918, 361181	Negligible	Neutral

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Code	Title	Description	Condition	Source Reference	Period	Value	Status	NGR	Magnitude of Change	Significance
		of disturbed ground in woodland								
CH19	Mill Race	Mill race leading to Seiont Tannery	Unknown	GAT 57051	Post Medieval	Low		248957, 361704	Negligible	Neutral/ Slight
CH20	Rhyddallt Bach	Single storey vernacular cottage; no longer shown on modern mapping	Destroyed	GAT 406163 NMR 406163	Post Medieval	Low		248967, 361179	n/a	n/a
CH21	Sluice	Shown on 1st edn OS	Unknown		Post Medieval	Low		249012, 361752	Negligible	Neutral/ Slight
CH22	Industrial works	Hunting Aviation Furniture	Destroyed	NMR 418864	Post Medieval	Low		249118, 361881	n/a	n/a
CH23	Rhyddallt; garden	Square enclosure within the property; which has all the indications of a formal garden or kitchen garden.	Destroyed	GAT 86466 NMR 86466	Post Medieval	Low		249134, 361416	n/a	n/a
CH24	Cae Philip	Building shown on Tithe Map and 1 st edn OS maps. Still extant	Destroyed		Post Medieval	Low		249267, 361210	n/a	n/a
CH25	Treflan Isaf	Building shown on Tithe map and 1 st edn OS maps. No longer extant	Destroyed		Post Medieval	Negligible		249323, 361847	n/a	n/a

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Code	Title	Description	Condition	Source Reference	Period	Value	Status	NGR	Magnitude of Change	Significance
CH26	Plas Treflan	Building shown on Tithe Map and 1 st edn OS maps. Still extant	Intact		Post Medieval	Low		249402, 361940	Minor	Neutral/ Slight
CH27	Cropmark	Linear cropmark, line of possible Roman road	Unknown	NMR 420983	Unknown	Low		249581, 361661	Negligible	Neutral/ Slight
CH28	Bryn Eglwys	Stables/Coach House	Intact	GAT 22039	Post Medieval	Medium	LB II	249591, 361311	Negligible	Neutral/ Slight
CH29	Bryn Eglwys	House	Intact	GAT 22038 NMR 417791	Post Medieval	Medium	LB II	249596, 361331	Negligible	Neutral/ Slight
CH30	Bryn Eglwys	Boundary wall	Intact	GAT 22040	Post Medieval	Medium	LB II	249616, 361344	Negligible	Neutral/ Slight
CH31	Bryn Ellen	Farmstead shown on Tithe map and 1st edn OS	Intact		Post Medieval	Low		249643, 361763	Negligible	Neutral/ Slight
CH32	Bryn Eden	House and terrace walls	Intact	GAT 22041	Post Medieval	Medium	LB II	249648, 361782	Minor	Slight
CH33	Penrhos	Georgian country house	Intact	GAT 306631 NMR 306631	Post Medieval	Low		249670, 361420	No Change	Neutral
CH34	Penrhos; garden	This garden is depicted on the 2nd Edn OS 25-inch map of Caernarvonshire XVI; sheet 5 (1900).	Intact	GAT 86439 NMR 86439	Post Medieval	Low		249690, 361397	No Change	Neutral

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Code	Title	Description	Condition	Source Reference	Period	Value	Status	NGR	Magnitude of Change	Significance
CH35	Clay Pit	Shown on 1 st edn OS maps and later extended in size. Currently abandoned	Intact		Post Medieval	Low		248933, 361437	No Change	Neutral
CH36	Conservation Area	The town centre of Caernarfon	Intact		Medieval and post medieval	High	Conservation Area	248800, 362800	No Change	Neutral

7.9 Mitigation

- 7.9.1 A programme of recording and watching briefs will be maintained on the two areas where stripping of topsoil or removal of made ground will be excavated, namely in the brickyard west of the river and the field through which the haul road is to be formed.
- 7.9.2 The proposed quarry restoration scheme will be carried out after the bypass has been completed and will involve grading of shallow slopes (between 1:4 and 1:3 on the side slopes) with revegetating and selective tree planting. The restored and planted landscape will improve the existing setting of the sites.

7.10 Residual impacts

- 7.10.1 Residual impacts on sites in the surrounding landscape will be brought about by quarry restoration and by the Archaeological Watching Brief and Recording. Once completed the 'Moderate/Slight', 'Neutral / Slight' and 'Slight' Impacts will be reduced to Slight Adverse or Neutral.
- 7.10.2 Direct residual impact on sites within the planning application area will be limited to any evidence for the early brick kiln (CH16), if this is found to exist during site clearance. Impact on these features will be mitigated by the archaeological watching brief and the recording programme that will form part of that work.

7.11 Cumulative impacts

- 7.11.1 The residual impacts of the quarry scheme will be slightly adverse or Neutral. However, the quarry scheme will only be implemented if the bypass proceeds to construction, in which case, many of the residual impacts of the quarry will be subsumed into those of the bypass which passes to the east and south and affects many of the same sites.
- 7.11.2 The bypass extends to approximately 10km of new road which has the potential to affect a number of heritage sites including the settings of those listed in the table below. Whilst the precise details of the bypass scheme and the impacts it will have on heritage sites will not be known until the ES is published, it is possible to list the kind and numbers of known sites likely to be affected and to estimate the nature and scale of impact it will cause. Table 7.7 lists the categories of sites and sets out cumulative impacts.

Table 7.7: Potential impacts of the bypass on heritage sites

Category and status of heritage site	Value	Impact		
		Magnitude	Significance	Cumulative
The World Heritage Site	Very High	Negligible	Slightly beneficial	Slightly beneficial
Conservation Area	High	Negligible	Slightly beneficial	Slightly beneficial
A Scheduled Ancient Monument (SAM)	High	Moderate	Moderate/Large adverse	Moderate/Large adverse
Several Grade II and Grade II* Listed Buildings	Medium	Negligible to Moderate	Neutral/Slight to Moderate adverse	Neutral/Slight to Moderate adverse
Morfa Common Park	Medium	No change	Neutral	Neutral to Slight adverse
Approximately 40 sites listed in the Historic Monuments Record (HMR), Heritage Environment Record or identified by the bypass project team	Medium or Low	Negligible to Minor	Neutral/Slight adverse	Neutral/Slight adverse
Crosses the line of up to 7 Roman Roads extending out from the former Roman fort and town of Caerleon.	Low	Minor	Neutral/Slight adverse	Neutral/Slight adverse
Other areas with high archaeological potential identified within the study area by the bypass archaeology team.	Unknown	Major**	Moderate/Slight ** adverse	Moderate/Slight* * adverse

** indicates an assumption that destruction by excavation of the site will occur, although there may be no sites worthy of investigation or excavation. Some sites could be buried under embankments.

7.11.3 The overall cumulative impact of the two schemes will be broadly similar to that of the bypass.

7.12 Sources

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8 LANDSCAPE AND VISUAL AMENITY

8.1 Introduction

8.1.1 This Landscape and Visual Impact Assessment (LVIA) has been prepared to assess the likely effects of the proposed development of Caernarfon Brickworks Quarry (hereafter referred to as the 'proposed development') on the landscape and visual amenity of the defined study area.

8.1.2 The proposed development is located within the local authority of Gwynedd and consists of:

- Continued extraction of mineral under an existing minerals planning permission to include use of fill material for engineering purposes;
- Additional staff accommodation, welfare and car parking associated with the proposed Caernarfon and Bontnewydd Bypass;
- Engineering and surfacing works to an existing quarry haul road for use in the construction of the proposed bypass;
- Construction of a new permanent haul road to enable access from the A4085.

8.1.3 This LVIA describes and evaluates the existing landscape character and visual amenity and assesses the potential effects of the proposed development during construction, operation and restoration phases.

8.1.4 Land within the proposed development site and the wider landscape surrounding the proposed development site require the consideration of topographic, land-use, condition, quality, aesthetic and visibility aspects. These aspects help define the sensitivity and robustness of the landscape of the study area and its capacity to accommodate the proposed development.

8.1.5 Landscape and visual impact assessment applies two related, but distinct methods. The landscape assessment considers the topography, land cover, land-use and condition to produce an understanding of the quality and character of a landscape and its sensitivity to change. The visual impact assessment builds upon the outcome of the landscape assessment and considers the potential effect on people's visual amenity.

8.2 Legislation and Policy Context

National Planning Policy

Planning Policy Wales Edition 9, 2016

8.2.1 This document sets out the current land use planning policies for Welsh Government. Of relevance to landscape and visual impact assessment is the grading of statutory and

non-statutory designations in *Chapter 5.3 Measures to conserve landscape and biodiversity*. Planning Policy Wales (PPW) also supports the use of Natural Resources Wales LANDMAP system as an important information resource.

- 8.2.2 PPW is supplemented by Technical Advice Notes (TANs). *TAN 12 Design (2016)* is concerned with design issues within a planning context. In terms of Landscape and Townscape TAN 12 states:

The distinctive settlement patterns which characterise much of Wales have evolved in part in response to the country's diverse landscape and topography. The way in which development relates to its urban or rural landscape or seascape context is critical to its success. Because of this, an understanding of landscape quality, including its historic character, is fundamental to the design process.

Local Planning Policy

- 8.2.3 The current adopted Development Plan for the study area is the Gwynedd Unitary Development Plan 2001-2016, adopted in July 2009. Strategic policies concerned with landscape issues that are relevant to the proposed development include:

Strategic Policy 1 – Taking a precautionary report

Development proposals that would have an adverse or uncertain impact on the environment, the economy or cultural character (including the Welsh language) of the Plan area will be refused unless it can be conclusively shown by an appropriate impact assessment that this can be negated or mitigated in a manner acceptable to the Planning Authority.

Strategic Policy 2 – The natural environment

The area's natural environment and its landscape character, and views in and out of the Snowdonia National Park and the Anglesey and Llŷn Areas of Outstanding Natural Beauty, will be safeguarded, maintained or improved by refusing development proposals that will significantly harm them.

Strategic Policy 3 – Built and historic environment

The area's built and historic environment will be protected from development that would significantly harm it and new developments in historic areas will be expected to conform to particularly high design standards which will maintain or improve their special character.

Strategic Policy 4 – Design standards

Development will be expected to be of a good design in order to ensure that it makes a positive contribution, wherever possible, to the landscape, built environment and sustainable development.

Strategic Policy 6 – Land development and reuse

Priority will be given to making appropriate and suitable use of previously developed land, which is suitable for development, or buildings that are vacant or not used to their full potential. Development should make the most efficient and practicable use of land or buildings in terms of density, siting and layout.

Strategic Policy 7 – Minerals

Development proposals to make use of mineral resources, including secondary aggregates, will be approved provided they do not significantly harm the environment or the amenities of local residents. These resources will be protected from development in order to safeguard Gwynedd's contribution towards meeting the regional and national demand.

8.2.4 In respect to landscape, policies of relevance to the proposed development include:

Policy B8 – The Llŷn and Anglesey Areas of Outstanding Natural Beauty

The aim will be to safeguard, maintain and enhance the character of Areas of Outstanding Natural Beauty. Development proposals that would cause significant harm to the area's landscape and coastline (including views into and out of the area), wildlife, historic remains and buildings, language and culture and its quiet, unpolluted nature will be refused, unless, in exceptional circumstances, all the following criteria will be met:

- *that a significant national economic or social need has been established for the development and refusing permission would be extremely detrimental to the local economy;*
- *that consideration has been given to the cost and scope for providing the development outside the area or of meeting the need for it in some other way;*
- *that consideration has been given to limiting any detrimental effect on the area's character and measures to attain this have been included as part of the application.*

It will be necessary to show that detailed consideration has been given to the character of the area in every development proposal and that a suitable design, site and materials are selected in order to minimise the impact of the development.

Policy B11 – Open spaces between or in villages or towns

Proposals that would cause significant harm to the role or importance of open land between or within towns/villages or on land important to the rural/urban character of the area, town or village will be refused.

Policy B12 – Protecting Historic Landscapes, Parks and Gardens

Proposals that are within or on sites visible from a park and garden identified and described in Part 1 of the Register of Historic Landscapes, Parks and Gardens of Special Interest in Wales will be refused if they cause significant harm to their character, appearance or setting.

Consideration will be given to the information about the historic landscapes identified in Part 2 of the same Register when assessing the impact of proposals that are of such a scale and magnitude as to have more than a local impact.

- 8.2.5 The Anglesey and Gwynedd Joint Local Development Plan, which is due to be adopted in 2016, currently under Deposit. Strategic policies concerned with landscape issues that are relevant to the proposed development include:

Strategic Policy PS16 – Conserving and enhancing the natural environment

The Councils will manage development so as to conserve and enhance the Plan area's distinctive natural environment, countryside and coastline, and proposals that have an adverse effect on them will be refused. When considering permitting an application the Planning Authorities will ensure that they are:

- *Safeguarding the Plan area's habitats and species, geology, history and landscapes;*
- *Protecting and enhancing sites of international, national, regional and local importance and, their settings in line with National Policy;*
- *Having regard to the relative significance of the designations in considering the weight to be attached to acknowledged interests in line with National Policy;*
- *Protecting and enhancing biodiversity within the Plan area and enhancing and/or restoring networks of natural habitats in accordance with the Local Biodiversity Action Plan and Policy AMG4;*
- *Protecting and enhancing biodiversity through networks of green/ blue infrastructure;*
- *Safeguarding internationally, nationally and locally protected species;*
- *Protecting, retaining or enhancing the local character and distinctiveness of the individual Landscape Character Areas (in line with Policy AMG2) and Seascape Character Areas (in line with Policy AMG3);*
- *Protecting, retaining or enhancing trees, hedgerows or woodland of visual, ecological, historic cultural or amenity value.*

- 8.2.6 Detailed policies concerned with landscape issues that are relevant to the proposed development include:

AMG2 – Protecting and enhancing features and qualities that are unique to the local landscape character

Proposals that would have an adverse impact upon landscape character as defined by the Landscape Character Areas included within the current Landscape Strategy for the relevant authority, must demonstrate through a landscape assessment how landscape character has influenced the design, scale, nature and site selection of the development. A proposal will be granted provided that it doesn't have an adverse impact upon features and qualities which are unique to the local landscape in terms of visual, historic, geological, ecological or cultural aspects. Measures should be taken to ensure that the development doesn't:

- Cause significant adverse impact to the character of the built or natural landscape;
- Fail to harmonise with, or enhance the landform and landscape;
- Lose or fails to incorporate traditional features, patterns, structures and layout of settlements and landscape of both the built and natural environment.

Particular emphasis will be given to the landscapes identified through the Landscape Character Areas as being of high and outstanding quality because of a certain landscape quality or a combination of qualities. Additional consideration will also be given to developments which directly affect the landscape character and setting of the AONBs or the National Park.

AMG5 – Protecting sites of regional or local significance

Proposals that are likely to cause direct or indirect significant harm to Local Nature Reserves (LNR), Wildlife Sites (WS) or regionally important geological / geomorphologic sites (RIGS) will be refused, unless it can be proven that there is an overriding social, environmental and/or economic need for the development, and that there is no other suitable site that would avoid having a detrimental impact on sites of nature conservation value and local geological importance. When development is granted, assurance will be required that there are appropriate mitigation measures in place. It will be possible to use planning conditions and/or obligations in order to safeguard the site's biodiversity and geological importance.

8.3 Information Sources and Assessment Methodology

8.3.1 This assessment was carried out using a methodology developed from the following guidance:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition (2013): The Landscape Institute and Institute of Environmental Management and Assessment;
- LANDMAP.

8.3.2 The method used follows an accepted approach derived from published guidance as outlined above. The guidance is not prescriptive and recognises that each project requires its own set of criteria and thresholds, adapted to suit local conditions and circumstances.

8.3.3 Field work and desk study are required to understand the existing landscape and to prepare a written or drawn description of the study area. The description addresses forces for change that would occur whether or not the development happens.

Baseline Assessment of Landscape Character

Identification of Landscape Character Areas

8.3.4 The baseline is derived from local authority Strategic Landscape Character Areas (LCA) and Natural Resources Wales's LANDMAP data system. Data within Strategic LCAs and the five LANDMAP aspect layers is combined with field work to define the boundaries and sensitivity of the LCAs relevant to the project.

8.3.5 The first stage in evaluating the sensitivity of LCAs is a filtering of LANDMAP aspect areas to identify those to be analysed in more detail and eliminate those unlikely to suffer a significant impact.

8.3.6 For the purpose of this assessment, an initial 5km radius study area is initially defined for the Visual and Sensory Aspect Layer. To determine which areas within the study area where the proposed development could be visible, a Zone of Theoretical Visibility (ZTV) model was produced (shown on Figure 8.9). The ZTV is created using specialist software and Ordnance Survey (OS) terrain data. The OS Digital Terrain Model (DTM) does not include surface features such as buildings and vegetation so the model generated can be considered a 'worst case' scenario in terms of potential visibility. The ZTV is then overlaid with each LANDMAP Aspect Layer to determine where the proposed development is theoretically visible. Aspect Areas where the ZTV indicates that there could be no possible visibility can be excluded from further assessment. The proposed development would not affect these areas.

8.3.7 LANDMAP Aspect Areas that intersect the ZTV are further assessed using the evaluation data to determine their sensitivity to potential effects. Aspect areas given low evaluation classifications are eliminated from further analysis whereas those given a high evaluation are retained for further assessment.

8.3.8 Those Aspect Areas that are directly affected by the development, usually containing wholly or partly the development area or lying next to the development area are those most likely to suffer significant change. Geological Landscape and Landscape Habitat Aspect Layers that are not directly affected by the proposed development can be excluded from further consideration irrespective of theoretical visibility.

8.3.9 The criteria used for refining assessment of LANDMAP Aspect Areas is summarised in Table 8.1.

Table 8.1: Filtering of LANDMAP Aspect Areas

Aspect	Search Range	Evaluation Filtering	Figure
Landscape Habitats	Areas which contain site boundary and adjacent ones with good connectivity	Areas with outstanding or high overall evaluation, or outstanding or high connectivity / cohesion	Figure 2
Geological Landscape	Areas which contain site boundary and adjacent ones with special relationship	Areas with outstanding or high overall evaluation, or outstanding or high rarity / uniqueness	Figure 3
Visual and Sensory	Areas which are inter-visible with the development, and are within 5 km of the development boundary	Areas with outstanding or high overall evaluation, scenic quality or character	Figure 4
Cultural Landscape	Areas which are inter-visible with the development, and are within 2 km of the development boundary	Areas with outstanding or high overall evaluation, rarity, group value or vulnerability	Figure 5
Historic Landscape	Areas which are inter-visible with the development, and are within 2 km of the development boundary	Areas with outstanding or high overall evaluation	Figure 6

8.3.10 Following the filtering, those Aspect Areas identified for detailed assessment are overlaid and combined to create project specific LCAs. When combining Aspect Areas Strategic LCAs and Visual and Sensory Aspect Areas are regarded as a start point, then refined by the other four Aspect Layers as appropriate. A summary of the LCAs

Assessment of the Significance of Landscape Effects

8.3.11 Direct impact on landscape is measured in terms of the change made to the surface of the landform, to the pattern of vegetation and field boundaries and to any features of significant or historical cultural value. Indirect impact on landscape is measured in terms of the visibility of change experienced from LCAs.

8.3.12 The significance of effects on landscape character are determined by combining the sensitivity of LCAs with the magnitude of change that would occur.

Susceptibility of Landscape Receptors to Change

8.3.13 The susceptibility of the landscape to accept change is assessed on its vulnerability to degradation through the introduction of new and loss of existing, elements as a result of the proposal. The ability of a landscape to accommodate change depends on the physical nature of the areas affected and their vulnerability, not necessarily the quality of the landscape. For example, a high-quality landscape with an interesting varied landform and dense woodland cover would have a higher capacity to

accommodate changes than a flat open landscape. The adverse effects would be more widely visible in an open landscape even if it was of lower quality.

- 8.3.14 This assessment uses three categories of capacity to accept change ranging from high to low. These are shown in Table 8.2. The landscape character units defined as 'high' are considered particularly vulnerable to change and those categorised as 'low' are considered able to accept change.

Table 8.2: Susceptibility of landscape receptors to change

HIGH	Change would have a significantly adverse impact on the existing landscape character that cannot be mitigated
MEDIUM	Change can be accommodated with some mitigation measures. The result may cause some adverse impact on the existing landscape character.
LOW	Change can be accommodated with minimal disturbance to the existing landscape character if appropriate mitigation measures are introduced

Value of Landscape Receptors

- 8.3.15 The value attributed to the landscape is important when assessing the sensitivity of a landscape. The value of each LCA is defined through a combination of professional judgement, field work and desktop work using LANDMAP. This assessment uses four categories of value ranging from outstanding to low. Values can be determined by applying the criteria shown in Table 8.3.

Table 8.3: Landscape value categories

OUTSTANDING	Internationally recognised value and importance, e.g. World Heritage Site. Aesthetically pleasing areas with a strong sense of place and may be rare in terms of character type. Usually containing sites of historic, cultural, geological or natural habitat importance. These areas may be important tourist destinations.
HIGH	Nationally recognised value and importance, e.g. National Park, Area of Outstanding Natural Beauty, etc. Unique, visually attractive areas of naturally well-structured landscape comprising complementing components and a strong sense of place. These areas may be popular tourist destinations.
MEDIUM	Locally recognised value and importance as defined by local authority designations, e.g. Special Landscape Area or Historic Landscape Area. Some picturesque attributes that are aesthetically pleasing, and some features that are fragmented and/or spoilt. The area may be associated with tourism although it would not be the main destination.
LOW	Landscape with limited aesthetically pleasing scenery, where characteristics are fragmented and/or spoilt. The areas are unlikely to contain tourist attractions and are unlikely to be rare in character type.

	Not likely to contain sites of local importance as define by local authority designations.
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Landscape Sensitivity

8.3.16 Judgements of the relationship between the susceptibility to change attached to landscape receptors and their value are combined to determine the landscape sensitivity, using the matrix shown in Table 8.4.

Table 8.4: Landscape Sensitivity matrix

		SUSCEPTIBILITY TO CHANGE		
		HIGH	MEDIUM	LOW
VALUE	OUTSTANDING	High	High	Medium
	HIGH	High	Medium	Medium
	MEDIUM	Medium	Medium	Low
	LOW	Medium	Low	Low

Magnitude of Landscape Effects

8.3.17 The magnitude of impact on landscape character is determined by the degree of change that would be introduced by the proposed development. It is determined by factors including size or scale, extent of area influenced, duration and reversibility.

8.3.18 Table 8.5 Outlines the general principles used to define the magnitude of landscape effects.

Table 8.5: Magnitude of landscape effects

Major	The development would cause a substantial loss or major alteration to key elements of landscape character, to the extent that there is permanent or long term change over an extensive or wide area.
Moderate	The development would cause a noticeable loss or moderate alteration to one or more key elements of landscape character, to the extent that there is a partial long-term change over a notable area.
Minor	The development would cause a slight loss or minor alteration to one or more key elements of landscape character, to the extent that there is a slight change over a limited area.

None	The development would cause no discernible or such a negligible alteration to key elements that there would be no fundamental change.
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Significance of landscape effects

8.3.19 The significance depends on the items considered within the landscape sensitivity assessment and the factors that influence the magnitude of change upon it. The relationship between sensitivity and magnitude informs the effects for the proposed development, using the matrix shown in table 8.6.

Table 8.6: Landscape effects matrix

		SENSITIVITY		
		HIGH	MEDIUM	LOW
MAGNITUDE	MAJOR	Severe	Significant	Slight
	MODERATE	Significant	Slight	Negligible
	MINOR	Slight	Negligible	None
	NONE	Negligible	None	None

8.3.20 This process is carried out for the construction, operation and restoration stages of the project.

Baseline Visual Assessment

Receptors of visual effects

8.3.21 The method of visual impact assessment is based on knowledge of the site and surrounding landscape. Surveys are carried out during weather conditions that provide good visibility, to establish the degree of inter-visibility between the development and visual receptors. The visual survey provides an opportunity to test the ZTV.

8.3.22 Impacts on visual amenity is involved with the changes in views and the response of people to these views. From within the study area the views that could suffer a significant impact are assessed to represent various receptor groups and noteworthy viewpoints.

8.3.23 Visual surveys note the components of the existing view and a comparison is made with the visual experience of the proposed development. Views could be static or transitory, direct or indirect, extensive or narrow.

Sensitivity of visual receptor

8.3.24 The activity and location of the visual receptor experiencing a view determines the viewer's susceptibility to change. Sensitive visual receptors are likely to be located in scenic areas and using public rights of way or visiting popular visitor attractions. Table 8.7 outlines the general principles used to classify a receptor's susceptibility to change.

Table 8.7: Susceptibility to change

HIGH	Typically, residents of private dwellings and accommodation guests where the main view is facing the proposed development; or participants of recreational activities where the landscape that contains the development is the primary attraction or reason for visit. Receptors are likely to be located in an area of high scenic value, a designated landscape or a heritage asset or attraction.
MEDIUM	Typically, receptors that are able to get used to some new visual elements of the type proposed depending on their existing view and location. Receptors may be susceptible to change but are less likely to be in an area of high scenic value or a designated landscape. They may include road or rail passengers.
LOW	Typically, receptors that could readily adapt to new visual elements of the type proposed depending on their existing view and location. Receptors are not likely to be at a location recognised for its scenic value. Receptors may include participants of outdoor recreation where the activity does not rely on an appreciation of scenery or people at work whose attention is not focussed on their surroundings.

8.3.25 Definitions to classify the value attached to a view are shown in Table 8.8. This takes account of the recognition that a particular view may have.

Table 8.8: Value attached to view

Outstanding	Promoted viewpoint denoted in guidebooks or maps, or one to or from a recognised heritage asset, or referred to in art or literature. Often facilities provided for their enjoyment such as interpretive material, sign boards or car parking. No significant detracting elements
High	Scenic value of importance to community but one which may not be formally promoted or valued. Very few detracting elements to degrade the view.
Medium	Scenic value of importance to individual or single dwelling. View not promoted or formally valued. Significant detracting factors degrading the view.
Low	View affected by many landscape detractors and not valued.

- 8.3.26 The sensitivity of visual receptors depends on how susceptible to change an individual or group of people are likely to be affected and the value that is attached to a certain view. The relationship between susceptibility and value informs the sensitivity for the visual; receptor, using the matrix shown in table 8.9.

Table 8.9: Sensitivity of receptor matrix

		SENSITIVITY		
		HIGH	MEDIUM	LOW
VALUE	OUTSTANDING	High	High	Medium
	HIGH	High	Medium	Medium
	MEDIUM	Medium	Medium	Low
	LOW	Medium	Low	Low

Magnitude of visual effect

- 8.3.27 The magnitude of the effect on visual amenity is evaluated as the amount of change that would occur should the proposed development happen. It depends on the size, scale and geographic extent of the change in view, also the duration and reversibility
- 8.3.28 Judgements of how size, scale and geographical extent of the change in landscape as experienced by each receptor are needed. This should include a statement of existing landscape elements that would be lost, the proportion of the view that this represents and how views would be changed (e.g. broadened or narrowed), by the exclusion or inclusion of surface elements.
- 8.3.29 The duration of visual effect is simply judged on a scale of short term – 0 to 5 years, medium term – 5 to 10 years and long term 10 to 25 years. The development in question involves the temporary use of an established brickworks site as a works compound during the construction of the Caernarfon and Bontnewydd Bypass. Material required for its construction would be extracted from the established quarry and material which is deemed unsuitable for road construction would be used to restore the quarry.
- 8.3.30 Reversibility of visual effect is a judgement about whether the effects of a development can be removed and the land reinstated to its original condition. Housing and road developments would be considered permanent and irreversible, lasting for a generation or more. This development would eventually restore a quarry to a landscape that would be similar, but not the same as the landscape that existed

before mineral extraction began. This would be considered to be partially reversible. Should the development be entirely removed and the land reinstated to its current condition the visual effect would be considered fully reversible.

- 8.3.31 Judgement on duration, reversibility, size and scale together form the magnitude of visual effect using the definitions shown in Table 8.10.

Table 8.10: Magnitude of visual effect

Major	The development would be immediately apparent and form a major adverse or beneficial component of the view, severely changing its character.
Moderate	The development would be apparent and recognisable and contribute a moderate component of the view, significantly changing its character.
Minor	The development would contribute a minor adverse or beneficial component of the wider view, slightly changing its character.
None	The development or ancillary works would be barely perceptible or unnoticeable.

Significance of visual effect

- 8.3.32 The significance depends upon the judgements of receptor sensitivity, the factors that influence the magnitude of change and the relationship between sensitivity and magnitude. Receptors affected are described in terms of location, distance from proposed development boundary and the nature of the existing view. The information is presented in tabular form as Visual Impact Schedules (Appendix 2), and represented in drawing form (Figure 8.10).
- 8.3.33 The relationship between sensitivity and magnitude informs the impact significance of each receptor based on the matrix in table 8.11. The significance can be either adverse or beneficial. Evaluations that are judged to be negligible or slight are not considered to have any significance.
- 8.3.34 The assessment of the significance of visual effects is carried out for Construction, Operation, and Restoration phases of the development.

Table 8.11: Significance of effect matrix

		RECEPTOR SENSITIVITY		
		HIGH	MEDIUM	LOW
MAGNIT UDE	Major Detriment	Severe adverse	Significant adverse	Slight adverse
	Moderate Detriment	Significant adverse	Slight adverse	Negligible

	Minor Detriment	Slight adverse	Negligible	No change
	None	Negligible	No change	Negligible
	Minor Benefit	No change	Negligible	Slight benefit
	Moderate Benefit	Negligible	Slight benefit	Significant benefit
	Major Benefit	Slight benefit	Significant benefit	Significant benefit

8.4 Scoping

- 8.4.1 RML consulted with GCC to establish the scope of the EIA to ensure that the likely significant effects of the proposed scheme are considered within the LVIA. The responses received are provided in Table 8.12.

Table 8.12: Consultee responses

Consultee	Response
Gwynedd County Council: Minerals and Waste	Appraisal to be carried out in accordance with GLVIA 3 rd Edition and use of LANDMAP data. Visual impact of development on surrounding settlements to include publicly accessible viewpoints beyond 500 m at Cibyn Industrial Estate, Hendre School and St Peblig Church to assess impact of proposed haul road in particular. Assessment to include appraisal of site as existing, working and restoration stages.
Gwynedd County Council: Public Protection	Assessment of site's lighting requirements during hours of darkness and for security measures.

8.5 Baseline Conditions

Study area and context

- 8.5.1 For the assessment of effects on landscape character and visual amenity, the study area boundary extends from the development boundary, for a distance of 5 km. It partially includes the local authorities of Gwynedd and Anglesey.
- 8.5.2 The Seiont Brickworks is located in an area of low rolling hills which form the broad transition between the mountains of Snowdonia to the narrow coastal strip. The topography has a broad north-east to south-west grain which is expressed as a range of parallel ridges and shallow valleys. Many of the valleys contain watercourses which have formed steep sided and wooded valleys.

- 8.5.3 The proposed development is situated in the Afon Seiont valley directly south-east of Caernarfon. Brick working is a long established activity within the valley and is shown on the Ordnance Survey Six Inches to One Mile maps published in the late nineteenth century.
- 8.5.4 To the north-west, across the River Seiont a broad agricultural plateau, which the Roman fort Segontium forms the highest point, has gradually been developed into housing and industry since the Second World War. The Roman Road (A4085) bisects the plateau, the modern industrial development areas tend to be located to the north of this road. The plateau is separated from the proposal site by the steep and partially wooded slopes of the Seiont Valley. Properties sited at the south-eastern limit of the plateau overlook the Afon Seiont.
- 8.5.5 Upstream and north of the proposal site is the small Peblig Industrial Park, which is sited on the former Peblig Brick Works and Peblig Woollen Factory site. To the north-east, the land is pasture grassland mixed with scattered detached dwellings that have developed along the A4085 Constantine Rd/Waunfawr road. Mur Mathew predates brick work activities whereas Pras Treflan and Bryn Eden appear on the 19th Century Ordnance Survey maps. Field boundaries are a mixture of dry-stone walls and hedgerows with mature trees.
- 8.5.6 South-east of the proposal site the pasture land rises gently to a ridge that runs from Caeathro to Bontnewydd. Dwellings have developed along the road that links these two communities. Penrhos with its woodland garden and Rhyddallt Ganol farm pre-date brick work activities. Several other dwellings were developed in the 19th Century along the ridge.
- 8.5.7 To the west and downstream of the proposal site the Afon Seiont winds its way through a steep sided valley that opens out at it reaches the old town, where it flows into the Menai Strait. The southern side of the river is steep sided and wooded. The valley floor to the north side of the river is wider and includes the Morfa Common Park. This public park was laid out in the 19th Century, it is close to the former Caernarfon Union Workhouse, which now forms part of the Eryri Hospital. Several detached dwellings have been developed on the site of the old mill.
- 8.5.8 Further afield, to the north-west is the 19th century and medieval walled town and riverside quays of Caernarfon.

Statutory Landscape designations

- 8.5.9 **UNESCO World Heritage Site – Castles and Town Walls of King Edward in Gwynedd:** approximately 1.5 km north-west of the development site is the fortified complex that is Caernarfon Castle and Town Walls. Constructed around the turn of the thirteenth

century (1283-1330), the extremely well-preserved fortifications are examples of the colonization and military architecture of the time. The ZTV (Figure 8.9) indicates that there would be no visibility from the area encompassing the World Heritage Site. The tallest part of the castle is the western Eagle Tower, views of the development from here would be interrupted by intervening landform and buildings on the Llanbeblig ridge.

- 8.5.10 **National Park – Snowdonia National Park:** at its closest point the boundary of Snowdonia located at Betws Garmon is approximately 5.7 km south-east of the proposed development. The National Park was established in 1951 and is managed predominantly to conserve and enhance natural beauty, wildlife and cultural heritage. Covering an area of over 2,000 km², the diverse landscape features mountain ranges, river valleys, forest and estuary.
- 8.5.11 From a distance of over 5 km, the proposed development would be very difficult to distinguish from the existing landscape. As a result, it would bear little or no influence on the west facing slopes and peaks of the uplands.
- 8.5.12 **Area of Outstanding Natural Beauty – Ynys Môn/Anglesey:** AONB designation gives statutory recognition to the high scenic quality and distinctive landscape of the Anglesey coastal zone. The main purpose of the AONB designation is to conserve and enhance the natural, historic and cultural elements of the landscape.
- 8.5.13 Another key management objective is the needs of local communities to maintain their social and economic wellbeing. Proposed development deemed damaging to the environmental quality would not be permitted within an AONB.
- 8.5.14 At its closest point the boundary of the AONB located on the Menai Strait is approximately 2.5 km north-west of the development. The ZTV indicates that visibility of parts of the development from within the AONB would be available from the Newborough Warren and Traeth Abermenai.

Non-statutory landscape designations

- 8.5.15 The following classifications are non-statutory designations and may be taken into consideration when formulating planning policy.
- 8.5.16 **Special Landscape Area: Special Landscape Areas (SLA)** are considered to be attractive and locally significant landscapes that are worthy of protection under planning policy. Two SLAs are located partially within the 5 km study area. The Foryd Bay and North-Western Fringes of Snowdonia SLAs are illustrated in Figure 8.7.
- 8.5.17 The ZTV indicates that parts of the proposed development would be visible from parts of the SLAs.

- 8.5.18 Landscapes of Historic Interest in Wales:** The Register of Landscapes of Historic Interest in Wales was established by Cadw, Countryside Council for Wales and the International Council on Monuments and Sites (ICOMOS UK), in collaboration with the Royal Commission on the Ancient and Historical Monuments in Wales (RCAHMW), the four Welsh Archaeological Trusts and Welsh local authorities.
- 8.5.19 The Register is a means of identifying and providing information on the most important and best-surviving historic landscapes so that any necessary change is done in a way that is sensitive to the historic character of the landscape.
- 8.5.20 Two Landscapes of Outstanding Historic Interest are partly within the 5 km study area. At about 2.7 km to the east of the development site is the Dinorwig Historic Landscape. Dinorwig is one of the major slate producing regions in Wales and is associated with the Vaynol Estate.
- 8.5.21 Situated approximately 3.5 km to the south-east of the proposed development is the Nantlle Valley Historic Landscape. Another of the major slate producing regions in Wales, the historic area consists of a large number of independent quarries, associated worker settlements and transport systems.
- 8.5.22 Registered Parks and Gardens of Historic Interest:** the Register of Parks and Gardens of Historic Interest in Wales was established by Cadw and ICOMOS UK to identify designed sites that could be considered important within Wales. Within the study area there are three, and their locations are shown in Figure 8.7. The ZTV indicates that the development would be visible from two of these.
- 8.5.23 Immediately downstream of the proposal site lies the Morfa Common Park laid out in the 19th century. Parts of the development would theoretically be visible from this site. Approximately 4.9 km due east of the site is Bryn Bras Castle Gardens near Llanrug. Parts of the development would theoretically be visible from parts of the registered garden.
- 8.5.24 National Trails and Long Distance Paths:** although there are no National Trails within the study area, there are six Long Distance Paths. These are shown in Figure 8.8.
- 8.5.25 The Wales Coast Path is a 1386 km continuous walking route around the coast of Wales. Where physically and legally possible the path is as close to the coastline as it can be. The section of the path that lies within the study area runs from Caernarfon Airport to Y Felinheli in Gwynedd and from Brynsiencyn to Newborough Warren on Anglesey.
- 8.5.26 The North Wales Pilgrims Way is a mainly inland route that links the Dee Estuary with the Llyn Peninsula. The path, which was officially launched in 2015, celebrates the

heritage of Celtic saints. The section of the path within the study area runs from Waunfawr to Rhosgadfan.

8.5.27 Lôn Eifion runs from Caernarfon southward to Bryncir and runs alongside the narrow gauge Welsh Highland Railway for part of its length. It is also Part of the National Cycle Network. The section of path within the study area runs from Caernarfon to Bontnewydd.

8.5.28 The Llyn Peninsula Coast Path runs from Caernarfon Castle to Porthmadog. It shares part of its alignment with the Wales Coast Path, the North Wales Pilgrims Way and Lon Eifion. The section of path within the study area runs from Caernarfon to Llanfaglan, which is west of Bontnewydd.

8.5.29 The Four Valleys Path is a route that skirts the western fringes of Snowdonia through the slate mining valleys of Gwynedd, namely Nantlle, Gwyrfai, Padarn (Dinorwig) and Ogwen. It follows a similar alignment to the North Wales Pilgrims Way within the study area.

8.5.30 The Anglesey Coastal Path follows the island's coastline and largely falls within the AONB. The section of path within the study area runs from Brynsiencyn to Newborough Warren and shares its alignment with the Wales Coast Path.

8.5.31 **National Cycle Routes:** National Cycle Routes (NCR) are traffic free lanes and quiet roads that form a network of paths throughout the UK. Shown on Figure 8.8, there is one route within the study area.

8.5.32 NCR 8, also known as Lôn Las Cymru connects Holyhead to Cardiff. Within the study area, the route follows Lôn Eifion between Bontnewydd and Caernarfon, and Lôn Plas Menai from Caernarfon to Bangor.

8.5.33 A regional cycling route, which is not part of the National Cycle Network, runs from Waunfawr to Caernarfon. Regional Route 61 includes a mixture of traffic free and on-road sections and runs to within 500 m of the development site.

Baseline character assessment: Landscape Character Areas (LCA)

8.5.34 Following the methodology outlined in Section 8.3 above, 26 no. LCAs have been identified intersecting the study area and ZTV. These are listed in Table 8.14 along with their susceptibility to change, landscape value and landscape sensitivity.

8.5.35 A detailed description of each is provided within Appendix 1 of the LVIA and the areas are shown in Figure 8.1.

Table 8.13: Summary of Landscape Character Areas (LCA).

LCA Ref	LCA Name	Susceptibility to change	Value of receptor	Landscape sensitivity
<i>East Central Anglesey</i>				
1.1	Abermenai Rolling Lowland	MEDIUM	LOW	LOW
<i>Newborough</i>				
2.1	Llanddwyn Intertidal Zone	HIGH	HIGH	HIGH
2.2	Newborough Dunes	HIGH	HIGH	HIGH
2.3	Abermenai Lowlands	MEDIUM	HIGH	MEDIUM
2.4	Abermenai Intertidal Zone	HIGH	HIGH	HIGH
<i>Penisarwaen Plateau</i>				
3.1	Llanddeiniolen Lowland	MEDIUM	MEDIUM	MEDIUM
<i>Llanberis - Bethesda</i>				
4.1	Waunfawr Upland	MEDIUM	MEDIUM	MEDIUM
4.2	Mynydd Du Upland	HIGH	MEDIUM	MEDIUM
<i>Caernarfon Coast and Plateau</i>				
5.1	Saron Lowland Farmland	MEDIUM	LOW	LOW
5.2	Llanfaglan Lowland Farmland	HIGH	MEDIUM	MEDIUM
5.3	Gwyrfae Lowland Valley (W)	HIGH	MEDIUM	MEDIUM
5.4	Llanwnda Rolling Lowland	HIGH	LOW	MEDIUM
5.5	Caernarfon Historic	HIGH	OUTSTANDING	HIGH
5.6	Caernarfon 19 th Century	HIGH	HIGH	HIGH
5.7	Bontnewydd Settlement	HIGH	LOW	MEDIUM
5.8	Caernarfon Modern	HIGH	LOW	MEDIUM
5.9	Rhosgadfan/Rhostryfan	MEDIUM	HIGH	MEDIUM
5.10	Seiont Lowland Valley	HIGH	MEDIUM	MEDIUM
5.11	Caethro Rolling Lowland	HIGH	MEDIUM	MEDIUM
5.12	Gwyrfae Lowland Valley (E)	HIGH	LOW	MEDIUM
5.13	Moel Smytho/Moel Tryfan	HIGH	MEDIUM	MEDIUM
5.14	Bethel Rolling Lowland	HIGH	MEDIUM	MEDIUM
<i>Menai Coast</i>				
6.1	Fort Belan Dunes	HIGH	MEDIUM	MEDIUM
6.2	Dinas Dinlle Lowland	MEDIUM	LOW	LOW
6.3	Foryd Intertidal Zone	HIGH	MEDIUM	MEDIUM
6.4	Seiont Estuary Lowland	HIGH	LOW	MEDIUM

Baseline Visual Assessment: Zone of Theoretical Visibility (ZTV) Analysis

- 8.5.36 The ZTV shows that part of proposed works, be it ground disturbance or the operation of machinery, would theoretically be visible from approximately 13% of the 5 km study area. When compared to the ZTV of the existing quarry and permitted development, there is less than 1% difference in area.
- 8.5.37 Broadly, the ZTV shows that the proposed works and operations would be visible from locations within the immediate vicinity including the developed areas of Caernarfon from the south-west clockwise to the north-east. From north-east clockwise to the south-west the ZTV indicates that the proposed development would be visible from rural areas and scattered dwellings situated on a ridge that runs from Caethro to Bontnewydd.
- 8.5.38 From locations at a distance of 0.5 to 2 km from the development boundary, the ZTV indicates that operations would be visible from the elevated ground with slope aspects facing the proposal site. In Caernarfon, these areas include residential and industrial areas. To the south-east, views are limited to a small number of scattered dwellings that are situated on a broad ridge that runs from Llanrug to Bontnewydd.
- 8.5.39 Within a radius of 2 to 5 km from the proposed development, the ZTV indicates that there would be a theoretical view from parts of the coastline which fall within the Isle of Anglesey AONB. To the south-east, the development would theoretically be visible from the Snowdonia Foothills SLA. A view of parts of the development would also theoretically be possible small part of the Foryd SLA to the west.

8.6 Mitigation Measures

- 8.6.1 The proposed development lies within an existing quarry, which has established mitigation measures for its own needs over its lifetime. The main mitigation feature is a vegetated bund generated from quarry overburden. This screens much of the quarry from the developed parts of Caernarfon. Elsewhere, traditional field boundaries and woodland have been retained to provide a degree of visual screening of operation works within the quarry.
- 8.6.2 The intention is to retain where possible the established mitigation features in order that they continue to perform their function. During the EIA process, the design layout has changed in order to mitigate against new operations within the proposed development.

8.7 Predicted Environmental Effects

8.7.1 This section of the LVIA determines the predicted effects on landscape character and visual amenity during different phases of the proposed development. An assessment of the magnitude of these effects and their significance is made on the basis of the criteria set out in the methodology and the assessment of the baseline landscape character and visual amenity. The phases of development are:

- *Construction*, anticipated to last for approximately three months;
- *Operation*, anticipated to last two years, running concurrently with the construction of the Caernarfon and Bontnewydd Bypass;
- *Restoration*, anticipated to last for five years when any landscape mitigation has become established.

8.7.2 The process is carried out for landscape using the defined character areas and for visual amenity by assessing visual impact on properties affected by the development.

8.7.3 The site is currently an inactive quarry. Buildings and structures associated with the Brickworks have been demolished with the concrete yard and internal road layout, including two bridges over the Seiont, retained. The clay pit is flooded which has created a deep fresh water sump. To facilitate the development this sump would require emptying so that access to the mineral is available.

8.7.4 The brickworks site has been selected as the preferred location for the proposed Caernarfon and Bontnewydd Bypass Contractor's site compound. The temporary site compound would house offices, staff welfare units and car-parking within a secure area. This area would be reached using the existing road access from the A487 via Seiont Mill Road.

8.7.5 Next to the site compound would be a works area dedicated to construction and vehicle maintenance activities associated with the proposed bypass. A transportable concrete batching plant and cement silos would be manoeuvred into position and a temporary workshop building would be constructed. Some form of noise attenuation would be necessary to mitigate sounds generated by the batching plant. These would be in the form of soil bunds.

8.7.6 Access to this works area from the proposed bypass site would be via existing haul tracks within the quarry to begin with. This access would then be supplemented by an improved haul road which would provide an alternative connection to the bypass construction site. The construction of this new haul road would change the rolling pasture of one field to the north-east of the clay pit.

Potential Effects on Landscape Character

- 8.7.7 **LCA 1.1 Abermenai Rolling Lowland** would suffer no direct landscape impact. It is a long distance from the development (beyond 2 km). ZTV analysis suggests that a minor part of the LCA could be indirectly influenced by the proposal. Any influence that the development may have would be cancelled out by developed areas of Caernarfon which block the connectivity between LCA 1.1 and the proposed development.

LCA 1.1 - Abermenai Rolling Lowland [Strategic LCA - East Central Anglesey]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Low	None	None
Operation		None	None
Restoration		None	None

- 8.7.8 **LCA 2.1 Llanddwyn Intertidal Zone** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that a minor part of the LCA could be indirectly affected by the proposal. Any influence that the development may have would be cancelled out by the terrain and surface features of the intervening area of Llanfaglan.

LCA 2.1 – Llanddwyn Intertidal Zone [Strategic LCA: Newborough]			
Development phase	Sensitivity	Magnitude	Significance
Construction	High	None	Negligible
Operation		None	Negligible
Restoration		None	Negligible

- 8.7.9 **LCA 2.2 Newborough Dunes** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that most of LCA could be indirectly affected by the proposal, although only a small part of the LCA at Abermenai Point is within the 5 km study area. Any influence that the development may have would be cancelled out by the terrain and surface features of the intervening area of Llanfaglan.

LCA 2.2 – Newborough Dunes [Strategic LCA – Newborough]			
Development phase	Sensitivity	Magnitude	Significance
Construction	High	None	Negligible
Operation		None	Negligible
Restoration		None	Negligible

- 8.7.10 **LCA 2.3 Llangeinwen Rolling Lowland** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that a major part of the

LCA could be indirectly affected by the proposal. Any influence that the development may have would be cancelled out by developed areas of Caernarfon which block the connectivity between LCA 2.3 and the proposed development. Very good views of Caernarfon Castle across the Menai Strait are available from the coastline. The foothills and mountains of Snowdonia provide a dramatic setting.

LCA 2.3 – Llangeinwen Rolling Lowland [Strategic LCA – Newborough]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.11 **LCA 2.4 Abermenai Intertidal Zone** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that a major part of the LCA could be indirectly affected by the proposal. Any influence that the development may have would be cancelled out by developed areas of Caernarfon which block the connectivity between LCA 2.4 and the proposed development. Very good views of Caernarfon Castle across the Menai Strait are available during when tides permit access. The foothills and mountains of Snowdonia provide a dramatic setting.

LCA 2.4 – Abermenai Intertidal Zone [Strategic LCA – Newborough]			
Development phase	Sensitivity	Magnitude	Significance
Construction	High	None	Negligible
Operation		None	Negligible
Restoration		None	Negligible

- 8.7.12 **LCA 3.1 Llanddeiniolen Rolling Lowland** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that a major part of the LCA could be indirectly affected by the proposal, although only a small part of the LCA north of Llanrug is within the 5 km study area. Any influence that the development may have would be cancelled out by substantial vegetation which has become established along the Afon Seiont Valley slopes and the line of the Former Caernarfon and Llanberis Railway.

LCA 3.1 – Llanddeiniolen Rolling Lowland [Strategic LCA – Penisarwaen Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.13 **LCA 4.1 Waunfawr Upland** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that a major part of the settled area within the LCA could be indirectly affected by the proposal. Expansive views of Caernarfon, the Arfon Plateau, the Menai Strait and Anglesey are available to the north-western facing slopes within this LCA. The site of the proposed development is difficult to distinguish from its surroundings due to the screening effect of established woodland in the Caeathro area and the integrating effect of woodland and field boundaries surrounding the quarry site.

LCA 4.1 – Waunfawr Upland [Strategic LCA – Llanberis / Bethesda]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.14 **LCA 4.2 Mynydd Du Upland** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that a major part of the LCA could be indirectly affected by the proposal. Expansive and uninterrupted views of Caernarfon, the Arfon Plateau, the Menai Strait and Anglesey are available to north-west facing slopes within this LCA. The site of the proposed development is difficult to distinguish from its surroundings due to the screening effect of established woodland in the Caeathro area and the integrating effect of woodland and field boundaries surrounding the existing quarry site. The experience of the proposed development gained from these uninhabited uplands would be similar to those from the uplands of Snowdonia National Park a little further to the south-east.

LCA 4.2 – Mynydd Du Upland [Strategic LCA – Llanberis / Bethesda]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.15 **LCA 5.1 Saron Lowland Farmland** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that a minor part of the LCA could be indirectly affected by the proposal. Connectivity between this gently undulating landscape and the development site is interrupted by a series of linear strips of mature vegetation established along field boundaries, road edges and railway embankments.

LCA 5.1 – Saron Lowland Farmland [Strategic LCA – Caernarfon Coast and Plateau]

Development phase	Sensitivity	Magnitude	Significance
Construction	Low	None	None
Operation		None	None
Restoration		None	None

- 8.7.16 **LCA 5.2 Llanfaglan Lowland Farmland** would suffer no direct landscape impact. Parts of the LCA are at an intermediate distance from the development (between 500 m and 2 km), with the remainder being long distance. ZTV analysis suggests that a moderate part of the LCA could be indirectly affected by the proposal. The connectivity between the proposal site and this LCA is interrupted by mature field boundary vegetation, areas of woodland within the Seiont river valley and clusters of dispersed settlements or small housing estates in neighbouring LCA *Caethro Rolling Lowland*.

LCA 5.2 – Llanfaglan Lowland Farmland [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.17 **LCA 5.3 Afon Gwyrfai Lowland Valley (West)** would suffer no direct landscape impact. Parts of the LCA are at an intermediate distance from the development, with the majority being at a long distance. ZTV analysis suggests that a very minor part of this LCA could be indirectly affected by the proposal. Connectivity is completely interrupted by established vegetation along field boundaries and beside rivers, and dispersed rural settlements.

LCA 5.3 – Afon Gwyrfai Lowland Valley (West) [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.18 **LCA 5.4 Llanwnda Rolling Lowland** would suffer no direct landscape impact. A small part of this LCA is at an intermediate distance from the development, with the majority being long distance. ZTV analysis suggests that a very minor part of this LCA could be indirectly affected by the proposal. Connectivity is completely interrupted by established woodland within the Afon Gwyrfai valley and the village of Bontnewydd.

LCA 5.4– Llanwnda Rolling Lowland [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.19 **LCA 5.5 Caernarfon Historic Settlement** would suffer no direct landscape impact. This LCA is at an intermediate distance from the proposal. Although Caernarfon Castle and town walls would suffer no indirect impact, the ZTV suggests that Segontium could be indirectly affected. The Roman fort is sited on a hilltop which overlooks the surrounding area. A glimpse of a small part of the development may be available when viewed along the line of the A4085. Views the vast majority of the development would be completely interrupted by developed areas of Caernarfon and as a result the magnitude of change is considered to be *none*.

LCA 5.5 – Caernarfon Historic Settlement [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	High	None	Negligible
Operation		None	Negligible
Restoration		None	Negligible

- 8.7.20 **LCA 5.6 Caernarfon 19th Century Settlement** would suffer no direct landscape impact. The road used to access the clay pit and brickworks site is within this LCA. Formed on the line of the former Caernarfon and Llanberis railway line, this access is a long established connection to the proposal site. During the construction of the bypass site compound the access road would be used heavily to deliver construction equipment and materials. Some management of vegetation along the road edge may be required to allow delivery of the larger loads such as the proposed concrete batching plant but vegetation management would have been carried out on a regular basis when the brickworks was in operation. Should vegetation management along the road edge be required, we wouldn't consider this to be a change to landscape character.
- 8.7.21 Once the operational phase of the development has begun the road to the bypass site compound would be used frequently by staff, visitors and delivery vehicles for the duration of the bypass construction. This new road would use haul roads within the quarry to gain access to the compound area and could lessen the use of the Seiont Mill Road.

- 8.7.22 Parts of this LCA are near to the development area (within 500 m). The majority of the LCA is at an intermediate distance and would suffer no indirect impact due to intervening terrain and development. One part of the LCA near to the development includes Seiont Park, the Morfa Common playing fields and the Eryri hospital site which are west of the existing clay pit. Another part of this LCA near to the development includes the site of the Peblig Brickworks and A4085 Constantine Road north of the clay pit. The playing fields and public park are disconnected from the development site due to mature woodland within the Seiont valley and the Eryri hospital complex.
- 8.7.23 Views of the existing Brickworks site are available from Eryri hospital complex, and views of proposed buildings and activities would have an indirect effect on this part of the LCA. The change to the landscape would occur during the restoration phase when the bare working faces of the quarry pit and concrete yard would be replaced by vegetated slopes and an area of grassland. The restored landscape would seem to have a more rural character albeit one which is less visually stimulating as activities cease.
- 8.7.24 The Peblig Brickworks site would experience an indirect impact to the landscape during the construction phase. Parts of the LCA that overlook the Peblig Industrial Park would see a reduction of undeveloped ground and an increase in activities associated with mineral extraction works. Throughout the operational and restoration phases the landscape within the development site, as experienced from the Peblig Brickworks area, would remain unchanged. The construction of the bypass would be a cumulative effect on this area, further reducing the amount of undeveloped ground visible. Although Peblig was industrially active in the 19th Century, the area has been completely redeveloped in the 20th Century, and little remains of the 19th Century character or features. The Peblig area is less sensitive to development than other parts of this LCA.
- 8.7.25 One prominent area of the LCA at an intermediate distance that would experience an indirect impact is Llanbeblig Church and the adjacent graveyard. This location is near a hilltop that overlooks neighbouring housing estates and experiences views of Snowdonia, its foothills and the intervening undulating plain. Part of the existing quarry extraction face is visible, as are two hills that define the older western and eastern faces of the quarry. These used to form a single hill on the summit of which the Rhyddallt-fawr farmstead once stood. The church area would experience an indirect impact during construction and restoration phases. During construction the amount of undeveloped land visible would be reduced, which in time would be reversed during the restoration phase.

8.7.26 Isolated parts of this LCA would experience change at different parts and stages of the development. The Eryri hospital site is a sensitive receptor which is near to the development and it would be affected by the establishment of the bypass site compound, the operation of the borrow pit and the restoration of the site. It has resided alongside the brickworks site for decades and the proposed activities would not signify a change. It would eventually benefit from the restoration of the site. Llanbeblig Church is a sensitive receptor which is at an intermediate distance to the development and it could be slightly affected by the construction of a new haul road and the restoration of the site. The construction phase would be detrimental but eventually the church would benefit from the restoration phase.

LCA 5.6 – Caernarfon 19 th Century Settlement [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	High	Minor	Slight adverse
Operation		Minor	Slight adverse
Restoration		Minor	Slight benefit

8.7.27 **LCA 5.7 Bontnewydd Settlement** would suffer no direct landscape impact. It is at an intermediate distance from the proposal. The ZTV suggests that there could be an indirect impact from the fringes of the settlement although connectivity to the proposal site is completely interrupted by established woodland within intervening LCAs of *Caethro Rolling Lowland* and *Afon Seiont Lowland Valley*.

LCA 5.7 – Bontnewydd Settlement [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

8.7.28 **LCA 5.8 Caernarfon Modern Settlement** would suffer no direct landscape impact. A minor part of this LCA is near to the proposal site with the majority being at an intermediate distance. The ZTV suggests that a moderate part of the LCA could be indirectly affected by the proposal. Residential zones in Llanbeblig have been developed to the edge of a plateau gently sloping in the direction of the Seiont river valley. Properties at the south-eastern edge of the development area overlook the Seiont river. Mitigation measures developed during the lifetime of the Brickworks provide an effective barrier to the existing quarry. These measures add to the filtering effect of established vegetation within the river valley.

- 8.7.29 The residential area would experience an indirect impact to the landscape during the construction phase. There would be a reduction in the visibility of undeveloped ground and an increase in activities associated with mineral extraction works. Throughout the operational and restoration phases the landscape within the development site, as experienced from the houses, would remain unchanged. The construction of the bypass would be a cumulative effect on this area, further reducing the amount of undeveloped ground visible.
- 8.7.30 The industrial area associated with Cibyn occupies high ground to the east of Caernarfon. Buildings in this industrial estate are prominent when viewed from the Snowdonia foothills in the south-east of the study area. The southern part of the industrial estate overlooks the Seiont valley and it is evident that there would be an indirect impact from the construction of the proposal site. The industrial estate would benefit from improved access to the trunk road network as a consequence of the proposed bypass. It is unlikely that the development associated with the Seiont brickworks would contribute a detrimental landscape impact to this industrial estate.

LCA 5.8 – Caernarfon Modern [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	Minor	Negligible
Operation		None	None
Restoration		Minor	Negligible

- 8.7.31 **LCA 5.9 Rhosgadfan / Rhostryfan Upland** would suffer no direct landscape impact. The vast majority of this LCA is at a long distance from the proposal. The ZTV suggests that a major part of the LCA could be indirectly affected by the proposal. Expansive views of Caernarfon, the Arfon Plateau, the Menai Strait and Anglesey are available to the north-western facing slopes within this LCA. The site of the proposed development is difficult to distinguish from its surroundings due to the screening effect of established woodland in the Caethro area and the integrating effect of woodland and field boundaries surrounding the quarry site.

LCA 5.9 – Rhosgadfan / Rhostryfan Upland [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.32 **LCA 5.10 Afon Seiont Lowland Valley** would be directly affected by the proposed development. Two bridges cross the Seiont, the more northern would be used as the main access to the site compound during the development's construction and operation phases. The more southern would be used for a short period during the operation phase as hard surface material associated with the Brickworks and storage yard would be removed and recycled for use in the bypass construction. Ground levels within the old storage yard would be reduced to create a shallow dish that could be allowed to flood occasionally. Its restoration would be managed to benefit wildlife.
- 8.7.33 A small part of the bypass site compound's car park would be located within this character area. This would not be a change to the character as the existing hard surface would be used. Care has been taken to position the elements of the site compound away from parts of the river valley that are liable to flood.
- 8.7.34 Parts of the character area indirectly affected by the proposal are limited to a section of the river bank on the Caernarfon side and a small number of dwellings in the former Seiont Mill area. Views of activities within the development area would be available from the public footpath that runs alongside the river and views of vehicles accessing the site compound would be available from the Seiont Mill area. There is no intention to access the former storage yard along Seiont Mill Road.
- 8.7.35 The riverside footpath provides an insight of the Seiont valley's industrial heritage. The river valley has actively been used for a number of differing industries during the last two centuries. The continued use of the Brickworks site should not cause a change in landscape character until the restoration phase when bare working faces of the quarry pit and concrete yard would be replaced by vegetated slopes and an area of grassland.
- 8.7.36 The vast majority of the LCA is north of Pont Peblig and the A4085 as it meanders in between the Bethel and Caethro LCAs. Connectivity between the northern part and the development site is completely interrupted by mature vegetation which has become established along the river valley.

LCA 5.10 – Afon Seiont Lowland Valley [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	Slight	Negligible
Operation		Slight	Negligible
Restoration		Slight	Negligible

- 8.7.37 **LCA 5.11 Caethro Rolling Lowland** would be directly affected by the proposed development. The majority of the development is located within this LCA. There

would be a noticeable change to part of the LCA, although unlikely to alter its overall character. The construction of the bypass site compound would not alter the character but the creation of a new haul road would change one field. All proposed construction and operation works within the clay pit would not affect the character of the quarry. The change to the quarry would come about as part of the restoration when steep and unstable slopes are slackened to an even gradient and benches restored with soils to establish vegetation.

- 8.7.38 The LCA terrain is formed of a series of soft ridges and shallow valleys which run parallel with the Afon Seiont. Indirect effects are predicted from the gentle slopes with a north-western aspect facing Caernarfon. Apart from a minor road which connects Caeathro and Bontnewydd the predicted influence that the development would have on the LCA is insignificant. Dwellings and outdoor spaces sited on the north-western side of the minor road, which runs along one of the ridges, experience views of the existing quarry. All phases of the proposed development would be visible. The construction of the bypass would be a cumulative effect on this area as it would run on ground in-between the quarry and the properties' garden boundaries.
- 8.7.39 Landscape sensitivity is predicted to be medium within *Caeathro Rolling Lowland* and the magnitude of landscape effects would be slight as any effects would be limited to a small portion of the overall LCA that is already influenced by industrial activities.

LCA 5.11 – Caeathro Rolling Lowland [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	Slight	Negligible
Operation		Slight	Negligible
Restoration		Slight	Negligible

- 8.7.40 **LCA 5.12 Afon Gwyrfai Lowland Valley (East)** would suffer no direct landscape impact. Parts of the LCA are at an intermediate distance from the development, with the majority being at a long distance. ZTV analysis suggests that a very minor part of this LCA could be indirectly affected by the proposal. Connectivity is completely interrupted by established vegetation along field boundaries and beside rivers, and dispersed rural settlements.

LCA 5.12 – Afon Gwyrfai Lowland Valley (East) [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None

Operation		None	None
Restoration		None	None

- 8.7.41 **LCA 5.13 Moel Smytho and Moel Tryfan Upland** would suffer no direct landscape impact. It is a long distance from the development. ZTV analysis suggests that a moderate part of the LCA could be indirectly affected by the proposal. Expansive and uninterrupted views of Caernarfon, the Arfon Plateau, the Menai Strait and Anglesey are available to north-west facing slopes within this LCA. The site of the proposed development is difficult to distinguish from its surroundings due to the screening effect of established woodland in the Caethro area and the integrating effect of woodland and field boundaries surrounding the existing quarry site. The experience of the proposed development gained from these uninhabited uplands would be similar to those from the uplands of Snowdonia National Park a little further to the south-east. A local viewpoint that is marked on Ordnance Survey maps is located in this LCA.

LCA 5.13 – Moel Smytho and Moel Tryfan Upland [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.42 **LCA 5.14 Bethel Rolling Lowland** would suffer no direct landscape impact. A minority of this LCA is at an intermediate distance from the proposed development and the majority is at a long distance. This gently undulating plateau experiences views of Snowdonia, the Menai Strait and Anglesey. Connectivity between this LCA and the development site is interrupted by developed areas of Caernarfon and well established vegetation within the Seiont river valley.

LCA 5.14 – Bethel Rolling Lowland Farmland [Strategic LCA – Caernarfon Coast and Plateau]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.43 **LCA 6.1 Fort Belan Dunes** would suffer no direct landscape impact. This LCA is at a long distance from the proposed development. ZTV analysis suggests that the LCA could be indirectly affected, but intervening surface features within the *Llanfaglan Rolling Lowland* LCA interrupt the connectivity with the development site.

LCA 6.1 – Fort Belan Dunes [Strategic LCA – Menai Coast]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.44 **LCA 6.2 Dinas Dinlle Lowland** would suffer no direct landscape impact. This LCA is at a long distance from the development site, with only a very minor part within the 5 km study area. ZTV analysis suggests that the area west of Caernarfon Airport could be indirectly affected by the development. An accumulation of intervening surface features within Llanfaglan, Saron and Caethro LCAs completely interrupt the connectivity with the proposal site.

LCA 6.2 – Dinas Dinlle Lowland [Strategic LCA – Menai Coast]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Low	None	None
Operation		None	None
Restoration		None	None

- 8.7.45 **LCA 6.3 Foryd Intertidal Zone** would suffer no direct landscape impact. This LCA is at a long distance from the proposed development. ZTV analysis suggests that the LCA could be indirectly affected, but intervening surface features within the Llanfaglan Rolling Lowland LCA interrupt the connectivity with the development site.

LCA 6.3 – Foryd Intertidal Zone [Strategic LCA – Menai Coast]			
Development phase	Sensitivity	Magnitude	Significance
Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.46 **LCA 6.4 Seiont Estuary Lowland Valley** would suffer no direct landscape impact. This LCA is at an intermediate distance from the proposed development. ZTV analysis suggests that a very minor part of the area could be indirectly affected by the proposal. Connectivity with the proposal site is completely interrupted by the established woodland, parkland trees and structures within the Seiont Valley.

LCA 6.4 Seiont Estuary Lowland Valley – Fort Belan Dunes [Strategic LCA – Menai Coast]			
Development phase	Sensitivity	Magnitude	Significance

Construction	Medium	None	None
Operation		None	None
Restoration		None	None

- 8.7.47 In summary the development would introduce slight adverse effects to *Caernarfon 19th Century* LCA. The LCA is accorded a high sensitivity mainly due to important cultural and historical landscape aspects and historic sites acknowledged at a national level. Adverse effects would be indirect and eventually reversed on restoration of the former brickworks site. Overall the change in landscape character to this LCA would be neutral.
- 8.7.48 Negligible detrimental effects are predicted for LCAs within the Isle of Anglesey AONB. These are accorded a high sensitivity due to nationally recognised landscape values and very high value visual and sensory landscape aspects. The combination of distance and the presence of intervening surface features would mean that there would likely be no impact as a consequence of the development. This demonstrates that the significance of landscape effects matrix errs on the side of higher sensitivity.
- 8.7.49 Negligible detrimental effects are predicted for the LCAs directly affected by the development. These areas are accorded medium sensitivity as although the areas have high value historic and cultural aspects, they are not recognised at a national level or they are considered unremarkable in terms of habitat and visual and sensory landscape aspects.

Table 8.14: Summary of Landscape Impact Significance

Landscape Character Area	Landscape Impact Significance		
	Construction	Operation	Restoration
1.1: Abermenai Rolling Lowland	None	None	None
2.1: Llanddwyn Intertidal Zone	Negligible	Negligible	Negligible
2.2: Newborough Dunes	Negligible	Negligible	Negligible
2.3: Abermenai Lowlands	None	None	None
2.4: Abermenai Intertidal Zone	Negligible	Negligible	Negligible
3.1: Llanddeiniolen Lowland	None	None	None
4.1: Waunfawr Upland	None	None	None
4.2: Mynydd Du Upland	None	None	None
5.1: Saron Lowland Farmland	None	None	None
5.2: Llanfaglan Lowland Farmland	None	None	None
5.3: Gwyrfai Lowland Valley (W)	None	None	None
5.4: Llanwnda Rolling Lowland	None	None	None
5.5: Caernarfon Historic	Negligible	Negligible	Negligible
5.6: Caernarfon 19 th Century	Slight adverse	Slight adverse	Slight benefit
5.7: Bontnewydd Settlement	None	None	None
5.8: Caernarfon Modern Settlement	Negligible	None	Negligible
5.9: Rhosgadfan/Rhostryfan	None	None	None

Landscape Character Area	Landscape Impact Significance		
	Construction	Operation	Restoration
5.10: Afon Seiont Lowland Valley	Negligible	Negligible	Negligible
5.11: Caeathro Rolling Lowland	Negligible	Negligible	Negligible
5.12: Gwyrfai Lowland Valley (E)	None	None	None
5.13: Moel Smytho/Moel Tryfan Upland	None	None	None
5.14: Bethel Rolling Lowland	None	None	None
6.1: Fort Belan Dunes	None	None	None
6.2: Dinas Dinlle Lowland	None	None	None
6.3: Foryd Intertidal Zone	None	None	None
6.4: Seiont Estuary Lowland	None	None	None

Potential Effects on Visual Amenity

8.7.50 The visual influence of the existing quarry extends north-westward as far as the Cibyn to Llanbeblig ridge, which runs in-between the Cadnant and Seiont rivers. Westward influence is terminated by the wooded slopes of the Seiont. To the south, scattered settlements experience views from the north-western slopes of the Caeathro to Bontnewydd ridge that runs between the Seiont and Beuno rivers. To the east woodland and roadside vegetation along the A4085 and Seiont valley interrupt views.

Views from statutory designated landscapes

8.7.51 *Snowdonia National Park* is just beyond the limit of the study area but the ZTV, which extends beyond the 5 km boundary, suggests that uninterrupted views would be available from upland slopes with a north-western aspect and summits. Due to the undulating terrain and blocks of woodland or linear belts of mature hedgerows the quarry is undistinguishable from its surroundings. The town of Caernarfon, the Menai Strait and Anglesey beyond are the main components of north-westward views.

8.7.52 *Isle of Anglesey AONB* would not experience any view of the proposed development. In views across the Menai Strait the main component is the historic part of Caernarfon with a dramatic background provided by the uplands of Snowdonia.

Views from non-statutory designated landscapes

8.7.53 Intervening surface elements within Llanfaglan and Saron completely interrupt the view from the *Foryd Bay SLA*.

8.7.54 From the *North-Western Fringes of Snowdonia SLA* direct and distant views are predicted from bare slopes and summits with north-westward aspects, including promoted viewpoints. Parts of Caernarfon town are visible and distinguishable. These include the Coed Helen folly, Caernarfon Castle, housing estates on the Llanbeblig plateau, industrial estates on the Cibyn plateau and scattered dwellings on the ridge between Caeathro and Bontnewydd.

- 8.7.55 Being able to distinguish parts of Caernarfon makes it possible to determine the position of the proposed development. Small parts of the quarry can be seen, if looked for. Detrimental factors in the near view include National Grid pylons, depending on viewer position these can impinge on the view of Caernarfon. The sensitivity of receptor is judged to be high, and the magnitude of effect is judged to be none. Using the methodology, the significance of change is judged to be negligible adverse and not a significant impact.
- 8.7.56 Both *Dinorwig* and *Nantlle Valley* Historic Landscapes share an area of upland that is also within the *North-Western Fringes of Snowdonia* SLA. The area would experience direct and distant views of the proposed development. The significance of change is judged to be identical to that of the SLA and not significant.
- 8.7.57 From Bryn Bras Castle Gardens the view of the development is only theoretically visible from a small part. Distant views would actually be interrupted by a substantial depth of woodland to the south-west of the Registered Garden.
- 8.7.58 A belt of young woodland, with the occasional mature tree separates Morfa Common Park from Seiont Mill Rd. Traffic accessing the proposed development during Construction and Operation phases would be noticeable to users of the park. Views of the brickworks site and clay pit are interrupted by woodland at the eastern edge of the park where it bounds Bodfan. Sensitivity of receptors is judged to be medium and the magnitude of effect is judged to be none. The visual influence would be short term and reversible. Significance is judged to be no change.

Views from Long Distance Paths

- 8.7.59 There would be no view available to users of the Wales Coast Path, Lôn Eifion, Lley Peninsula Coast Path or Anglesey Coastal Path.
- 8.7.60 The North Wales Pilgrims Way and Four Valleys long distance paths share a section that runs along the north-western slopes of Moel Smytho, near to its summit. Broad views of the Arfon plateau are available, the arc of view ranges from the mountains of northern Lley to Bangor. The proposed development would not be distinguishable from these footpaths.

Views from National Cycle Routes

- 8.7.61 No view of the proposed development would be available to NCR 8 (Lôn Las Cymru).

Views from Public Footpaths

- 8.7.62 From a public footpath that runs alongside the river Seiont from the A4085 to Seiont Mill Rd, the influence of construction would be limited by the screening effects of topography. Construction and Operation activities taking place in the site compound

and works area would be visible from a short section near to Eryri Hospital. Construction activities of the new haul road would be visible from a section that overlooks the Peblig industrial area. The riverside footpath provides the user with an experience the valley's historic and modern industrial activity.

- 8.7.63 The sensitivity of receptors using this footpath is considered to be medium and the magnitude of change to views experienced to be a minor detrimental one due to the partial reversibility and short-term duration. The significance of visual effects is judged to be negligible detrimental and thus not likely to suffer significant detrimental impact.
- 8.7.64 The public footpath that runs from Pont Peblig to Penrhos would be directly impacted by the proposed development. The alignment of the proposed haul road would intersect that of the footpath. The proposal is entirely dependent on the development of the Bypass and this footpath would be disrupted by the new road also. It has been suggested that this right of way be diverted along the A4085 from Pont Peblig, to a point where it passes under the new Bypass, from there it would follow the eastern boundary of the new road before reconnecting with the footpath to Penrhos.
- 8.7.65 The new footpath alignment would be further from the quarry and unlikely to experience views of works within the development boundary. Views would be interrupted by a new embankment, the small hill at the clay pit's north-eastern boundary and linear belts of mature trees.
- 8.7.66 The footpath that runs from the Pont Peblig-Penrhos path to Bryn-eglwys would also be directly affected by the proposed Bypass. This path would have connected Rhyddallt-fawr to Bryn-eglwys on the ridge road between Caethro and Bontnewydd. Rhyddallt-fawr has long been lost to the clay pit and the footpath diverted to its current position which follows the quarry's site boundary to the crest of the hill, then turns north-eastward following a stone wall to meet the Pont Peblig-Penrhos path. It has been suggested that this footpath should be diverted to follow the line of the proposed Bypass on its eastern side until it meets the Pont Peblig-Penrhos path.
- 8.7.67 The existing footpath already experiences direct and uninterrupted views into the clay pit. Where it runs through private gardens trees provide a filter to views. Where it runs next to the quarry a low bund and some scattered scrub interrupt views of the flooded pit and the brickworks yard. The diversion would turn the footpath north-eastward before to follow the edge of the new road where it would be in cutting. A hedgerow is proposed at the top of the cutting slopes on both sides of the Bypass which would eventually screen views of the quarry from this footpath.
- 8.7.68 The sensitivity of receptors using the two public footpaths from Pont Peblig to Penrhos and Bryn-eglwys is judged to be medium. As these footpaths would be directly affected by the proposed Bypass the magnitude of effect would be major. When

considering the suggested new alignments and their relationship with the proposed works in the existing quarry only, the magnitude of effect becomes a minor one. A medium sensitivity and minor magnitude is judged to be of negligible detrimental significance.

Views from residential properties

- 8.7.69 Visual Impact Schedules include the judgement of potential effects of the proposed development on dwellings within 500 m of the site boundary. Broadly, direct views of the development would be available to dwellings that reside on the south-eastern edge of the Llanbeblig plateau (Tyddyn Llwydyn and Glan Seiont estates), and a few properties scattered along on the ridge between Caethro and Bontnewydd and along Penybryn Road. Penybryn Road runs close to the quarry's south-eastern boundary.
- 8.7.70 Properties with direct views towards the development site are accorded a high susceptibility to change. Views are considered important to individual dwellings, but they are not formally valued or within designated landscape and are judged to be of medium value. The brickworks and clay pit would have been in operation before houses on the Llanbeblig plateau were built.
- 8.7.71 The quarry site operators have responded to the increased occupation by screening elements of the clay pit that are visual detractors from view. Woodland planted on the north-western face of the substantial screen bund adds to the effectiveness of this screen and helps integrate it with other areas of woodland within the Caethro landscape.
- 8.7.72 Many of the older properties that reside on Penybryn Rd and the ridge road have witnessed the expansion of the quarry over the years and have responded by strengthening the screening effect provided by field boundaries within their own grounds and gardens.
- 8.7.73 No individual residences have been judged to suffer a significant detrimental change to their view. Either existing visual screens are adequate for the proposed development or the activities proposed do not constitute a significant change in view or a change in visual elements.
- 8.7.74 The greatest visual change would occur to the north-west of the clay pit where a new haul road is required in an area that is currently grazed farmland. Construction and Operation combined would be short term activities and once the cutting slopes are restored the surface would be of a similar appearance to the existing. This is judged to be partially reversible. Some dwellings within Glan Seiont and Bryn Eilian estates would experience a change in view. The sensitivity of these receptors is judged to be medium and the magnitude is judged as minor. Dwellings overlook Pont Peblig

Industrial area which is a visual detractor. The significance of change is judged as slight adverse during Construction and negligible adverse during Operation and Restoration phases.

Views from community facilities

- 8.7.75 Visual Impact schedules consider the potential effects of the proposed development on community facilities with views of the development.
- 8.7.76 St Peblig Church and cemetery is near to the summit of Bryn Llanbeblig / Llanbeblig Plateau, and overlooks residential areas to the south-east in the direction of the proposed development. Two high points which mark the south-western and north-eastern limits of the existing clay pit are visible from this location. Also visible is the boundary wall and a part of the field in which the haul road would be constructed. It is likely that views of the proposed works would be interrupted by buildings, although some movement of construction traffic may be noticeable in the gaps in-between buildings.
- 8.7.77 The sensitivity of the receptor is judged as medium. Although the value attached to the view is high, the susceptibility to change is considered to be medium. There are visual detractors and the proposed development would be a minor change within a wider view. Consented development of land next to Tyddyn Pandy would contribute more visual detractors. The duration of change would be medium term and the area would be restored to a condition which is similar to the existing situation. Overall the magnitude of effect is judged as none, and the significance of effect negligible adverse during Construction and Operation and then negligible beneficial after Restoration.
- 8.7.78 The Eryri Hospital and Bodfan area would be influenced by construction activities within the bypass site compound and works area. Also there may be experience of activity on improvements to the existing quarry haul roads. Views of the site of the brickworks are available although trees on the banks of the river Seiont. These trees provide some filtering to these views.
- 8.7.79 The hospital complex has a long established visual relationship with the brickworks site and activities associated with the proposed development would not constitute a change in visual elements. Since the brickworks site has been inactive since the buildings were demolished, renewed activities are considered to have a negligible adverse significance during Construction and Operation, then a negligible beneficial significance after restoration.

8.8 Lighting

8.8.1 Due to the presence of nocturnal Protected Species in the area, lighting proposals include measures to avoid or minimise their disturbance. However, due regard must also be given to the safety of personnel and visitors to the compound and the security of the site, by applying relevant guidance and advice to design out the potential for accidents and crime.

8.8.2 Mitigation measures have been prepared in accordance with the guidance published by the Bat Conservation Trust and, the advice set out in the Bats and Lighting Research Project report, published by University of Bristol in 2013.

8.8.3 The normal working day will commence at 7.00am in the morning and finish by 6.00pm at night. In exceptionally circumstances, such as public exhibitions and meetings, the offices might be used until later in the evening.

8.8.4 The overall lighting scheme mitigation will adopt the following principles:

- Avoidance of the need for external lighting when and where possible;
- Minimisation of the period when external lighting is turned on;
- Directional control of lighting to minimise spillage beyond security fencing;
- Shielding of light from the adjacent river and woodland.

8.8.5 In more specific, site terms, the following mitigation objectives are proposed.

Internal lighting

8.8.6 Artificial lighting within cabins will be provided to the normal standards required for the intended use and is likely to be required through much of the working day. Cabins will be provided with lockable steel shutters which will be closed and locked at night to limit the spillage of artificial light after dusk. At the end of each shift a site check is carried out for security and safety reasons. The check list will include a duty to turn off all internal lights.

PIR controlled external lighting

8.8.7 The Police recommend that no external lighting is installed at all because the site is so isolated with no permanent occupation. External lights are considered to assist criminals. However, health and safety of the site staff and visitors is also a consideration. External lighting will be required at night to allow the safe movement of pedestrians around the compound, mainly from the car park to the temporary cabin door, but will only be actively used in the seasons when the use of the compound overlaps with dusk and dawn.

- 8.8.8 External lighting will consist of a pair of low-rated, low-level, PIR controlled LED lighting units mounted on the south west corner of the temporary building facing north and north east towards the car park. LED lighting is proposed because the light produced is more directional with less spill than other forms and is easier to control and more reliable with rapid on-off response to PIR control. Lighting hoods will minimise light spillage outside the compound area. The PIR units will be adjusted to ensure that LED lighting is turned off when there is no activity within areas of the compound where illumination is required. Further control will be provided with a time switch to ensure that when the compound is not in use there will be no external lighting on the site.

Car parking access and egress

- 8.8.9 No lighting will be provided on or near the existing river bridge and site entrance gates. If required white lining and reflective paint will be used, to guide drivers towards the car parking spaces. Use of the car park during the period between dusk and dawn, in the seasons when bats are flying will be minimal. External lights will be illuminated by the PIR units when the movement of vehicles and pedestrians in the car park is sensed.

Site vehicles

- 8.8.10 Vehicles used for excavation works and in transporting materials to and forth between the development site and the proposed bypass site would only operate during daylight hours.

Night time visual impact

- 8.8.11 Lighting needs within the proposed development site would be confined to the site compound area. Properties overlooking the compound area such as Bodfan, Eryri Hospital and some dwellings on Tyddyn Llwydyn would experience views of new light sources over a minor part of the view and for a medium term duration. The lighting would be removed after the Operation phase is complete. The significance of visual effect is judged as negligible adverse.
- 8.8.12 Lighting within the site compound may also be noticeable from Bryn-eglwys and Penrhos on the ridge between Caethro and Bontnewydd. As these properties face the town of Caernarfon the view of lights experienced may be indistinguishable from existing street lighting around the Eryri Hospital and Bodfan complex. The significance of visual effect is judged as no change.
- 8.8.13 The light from vehicles accessing and egressing the site compound between dusk and dawn may disturb receptors within properties on Seiont Mill Road. There would be high usage for a short period before and after working hours. Disturbance from lighting would be during winter months (between Autumn and Spring equinoxes). The light sources would be noticeable over a moderate part of the available view, but

would last for a short term duration. The disturbance would occur during the Operation phase. The significance of visual effect is judged as negligible adverse.

8.9 Caernarfon and Bontnewydd Bypass

8.9.1 The proposed scheme at the brickworks quarry is dependent on the development of the proposed Bypass. The proposed bypass would pass through land within and adjacent to the quarry. A large area of level concrete yard lies to the north west of the quarry. If the bypass is to be constructed the contractor plans to use the concrete yard as a site compound.

8.9.2 Analysis of ground conditions along the preferred route predicts that there would be a shortfall of material excavated within the Bypass site that is considered suitable for use in the construction of the road and its embankments. To resolve this problem suitable material would need to be 'borrowed' from another location, which at the same time could accommodate the unsuitable soils excavated.

8.9.3 Due to its proximity to the Bypass scheme, soils suitable for the manufacture of bricks could be used for civil engineering purposes and at the same time the inactive quarry could be restored far quicker than under the current planning permission. Because of the difference in ground levels between the proposed Bypass and the clay pit extraction area, a new network of haul roads is required.

8.9.4 The Environmental Statement submitted in support of the Key Stage 3 design includes an assessment of the predicted impacts on the landscape and visual resource. As the Bypass scheme and proposed development would involve similar civil engineering earth works, an assessment of cumulative effects is required by the EIA Directives.

Cumulative Landscape Impact

8.9.5 The process of filtering strategic LCAs and LANDMAP Aspect Layers for the Bypass scheme has determined 21 LCAs. There are two LCAs in the vicinity of the proposed development, namely Pen-y-Bryn (Bypass LCA12), and Fields southwest of Caeathro (Bypass LCA13). The predicted landscape impact significance of the Bypass on these LCAs ranges from a major to substantial detrimental impact during construction and at year of opening. By design year the significance is predicted to have reduced slightly to moderate and major detrimental impact.

8.9.6 The landscape character areas are limited to the area in which the Bypass would have a visual influence. As the road passes to the east of Caernarfon its visual influence is predicted to be limited westward by the Cibyn to Llanbeblig ridge and woodland within the Seiont valley. Eastward the Bypass's visual influence is predicted to be limited by the Caeathro to Bontnewydd ridge. This creates LCAs that are small in relation to

others where the Bypass would have a wider visual influence. This gives the impression that the Bypass would directly affect a larger proportion of a small LCA.

- 8.9.7 The significance of landscape effect brought about by the proposed Bypass to LCA 5.11 *Caeathro Rolling Lowland* would be a significant detrimental one. The predicted significance of landscape effect of the proposed development is a negligible detrimental one. Cumulatively, the proposed development would not contribute additional deterioration or improvement to the landscape.

Cumulative Visual Impact

- 8.9.8 Near and direct views of the Bypass in the vicinity of the proposed development would be available to dwellings and footpaths in the eastern outskirts of Caernarfon and on the western slopes of the Caeathro to Bontnewydd ridge. No dwelling is predicted to suffer a significant detrimental impact as a consequence of the proposed development, but it is clear that the proposed Bypass would significantly impact on receptors.
- 8.9.9 From VIS Ref 2LX.5 Tyddyn Llwydyn (50 to 62 evens) and 2DX.7 Glan Seiont (58 to 62), a view of the Bypass would be available where it crosses the fields to the north-east of the quarry on embankment. Views from ground floor would be interrupted by vegetation within Seiont valley and Seiont brickworks site, but there may be views available from first floor rooms. The predicted significance of visual effect of the proposed development is a negligible one. Cumulatively, the proposed development would not contribute additional deterioration or improvement to views.
- 8.9.10 From VIS Ref 2DX.8 Glan Seiont (63 to 70) and 2RX.2 Bryn Eilian (5 to 10), a view of the Bypass would be available where it crosses the fields to the north-east of the quarry on embankment. The impacts would be cumulative to views of works being carried out as part of the proposed development. The predicted significance of visual effect of the proposed development is a slightly detrimental during the Construction phase. Cumulatively, the proposed development would contribute a slight deterioration to views for a short term as changes within the fields to the north-east of the quarry may be visible.
- 8.9.11 From VIS Ref 2TD.2 Glyn, Lynn Lea and Cae Phillip, the proposed Bypass would be constructed on land adjacent to property boundaries. Some vegetation that currently filters views of the quarry would be lost. This would increase the magnitude of view of the existing quarry and activities during Construction and Operation would be visible. The Bypass would be constructed on a low embankment, which would form a barrier to views of the quarry. Once proposed woodland and hedgerows planted to screen the Bypass have become established, views of the quarry would be interrupted.

- 8.9.12 From VIS Ref 2SE.4 Plas Treflan, the proposed Bypass would dominate eastward views where it would be constructed on embankment up to 8 m in height. The proposed development would contribute a slight deterioration to southward views for a medium term, until the slopes of the haul road are restored. Traffic on the proposed Bypass would eventually be screened by woodland.
- 8.9.13 VIS Ref 2TA.1 Bryn-eglwys and 2TA.3 Penrhos overlook the part of the existing quarry and fields through which the Bypass would run. Existing vegetation contributes a screen to views of the existing quarry, and would also contribute a screen to views of the Bypass. From first floor rooms some of this vegetation can be seen over. The Bypass would be constructed on a low embankment, and in cut near to these properties. Once proposed woodland and hedgerows planted to screen the Bypass have become established, views of the quarry would be interrupted.
- 8.9.14 From VIS Ref 2SG.1 Bryn Eden, the Bypass would become the main detractor in westward views until mitigation measures become established. Where the Bypass is on a high embankment (Ch.5000-5300), it's likely that views of permanent haul roads associated proposed development would be interrupted. The hill at the clay pit's north-eastern edge would interrupt views towards the clay pit.
- 8.9.15 2SG.5 Fron Deg and 2TA.6 Bryn Gof (5 to 10), are located on a ridge on the outskirts of Caeathro. Properties overlook the rolling farmland between Caeathro and the Seiont. Views of the Bypass would be available where it runs in cutting and on embankment, most probably from first floor rooms. The Bypass would interrupt views of parts of the proposed development visible to these properties. Cumulatively, the proposed development would not contribute additional deterioration or improvement to views.

8.10 Summary and Conclusions

- 8.10.1 The proposed development does not directly impact on designated landscapes. Indirect landscape impacts, where views of the proposed development are predicted, but would cause no significant adverse impact to designated landscapes.
- 8.10.2 LCA 5.10 *Afon Seiont Lowland Valley* and LCA 5.11 *Caeathro Rolling Lowland* are directly impacted by the proposed development. Both are considered of medium landscape sensitivity. It is predicted that they would suffer a negligible detrimental impact.
- 8.10.3 LCA 5.6 *Caernarfon 19th Century Settlement* and LCA 5.8 *Caernarfon Modern Settlement* would be indirectly affected by proposed development. Views of the proposals would be available from the eastern edges of these LCAs. These areas already experience views of the existing quarry. LCA 5.6 is considered of high

landscape sensitivity and LCA 5.8 is considered of low landscape sensitivity. It is predicted that LCA 5.6 would suffer a significant adverse impact.

- 8.10.4 The proposed development would not be noticeable in views from Snowdonia National Park. From *North-Western Fringes of Snowdonia* SLA it is possible that views of the proposal could be available if looked for, but the impact on views of a complicated landscape would be negligible and not significant.
- 8.10.5 No significant visual impacts are predicted for residential properties. Many properties experience views of the existing quarry. Properties overlooking the fields to the north-east of the quarry are predicted to suffer a slight adverse impact during the Construction phase of the proposed development. The view of developed land would increase and that of farmland would decrease. The land would be restored to something similar to the original, this would alleviate detrimental impacts slightly.
- 8.10.6 No significant visual impact is predicted as a consequence of lighting. Lighting within the site compound would be designed to include measures to avoid or minimise the disturbance of nocturnal mammals. The duration of effect on people would be short to medium term and the magnitude confined to a small part of the development site.
- 8.10.7 The proposed Bypass would contribute a significant direct detrimental landscape impact to LCA 5.11 *Caethro Rolling Lowland*. The proposed development would not contribute significant cumulative detriment to the LCA.
- 8.10.8 The proposed Bypass would contribute a significant detrimental visual impact to scattered dwellings in the Caethro area. Mitigation works proposed to screen and integrate the Bypass in views from Caethro would also screen views of the proposed development.
- 8.10.9 Dwellings in the Llanbeblig area on the eastern fringes of Caernarfon would suffer a detrimental visual impact due to the Bypass. Views of parts of the proposed development would be in addition to those of the Bypass. The effects of changes to views would lessen when the proposed development has been restored and the measures to mitigate the Bypass are complete.

9 ECOLOGY AND NATURE CONSERVATION

9.1 Terms of Reference

9.1.1 The purpose of this chapter is to assess the potential effects of the development on the nature conservation interest of the application site and the surrounding area. The assessment has been prepared by Ecologists and it presents the results of an ecological assessment of the proposed development at the former Seiont Quarry Brickworks and Quarry.

9.1.2 The proposed planning application site boundary, hereafter referred to as the 'Seiont Quarry Site', corresponds to the application boundary presented in Figure 2.2. Where appropriate ecological survey data from a larger 'Survey Area' relevant to the development is included that extended beyond the Site boundary to include adjacent habitats.

9.1.3 This chapter is supported by two Technical Appendices, which contain the supporting information on the key features of nature conservation interest on which this assessment is based:

Appendix 9.1: Extended Phase 1 Habitat Survey Baseline Report.

Appendix 9.2: Otter and Badger Survey Baseline Report.

Appendix 9.3: Breeding Bird Survey Results.

9.2 Objectives of this Chapter

9.2.1 The principal objectives of this EclA are:

- to establish the baseline ecological conditions within the Site and determine its nature conservation value;
- to predict the character and significance of potential impacts arising from the proposed scheme on features of ecological interest valued as being of local importance or higher;
- to propose mitigation measures in order to minimise the level of any adverse impacts where significant ecological impacts are identified;
- to assess the significance of any cumulative and residual impacts.

9.2.2 Mitigation and enhancement measures are proposed in accordance with good practice, where appropriate, to avoid or minimise any potential impacts on ecological features of value. Any significant residual impacts on ecological features are identified.

9.2.3 Following a Pre-Application Consultation (PAC) in autumn 2016 some revisions have been made to the chapter to address aspects raised by the statutory consultees.

9.3 Legislative and planning policy context: national

Planning policy

9.3.1 Technical Advice Note 5: ‘Nature Conservation and Planning’ (TAN 5) (WAG, 2009), which supplements the land use policy document Planning Policy Wales (PPW) (WAG, 2002). TAN 5 provides advice about how the land use planning system should contribute to protecting and enhancing statutory and non-statutory sites of biodiversity and/or geological conservation value, as well as species protection and biodiversity conservation in the wider environment. To achieve this, it demonstrates how local planning authorities, developers and key stakeholders in conservation can work together to deliver more sustainable development that does not result in losses from the natural heritage but instead takes every opportunity to enhance it.

9.3.2 In considering biodiversity issues, TAN 5 highlights the requirement for public authorities to pay due regard to the conservation and enhancement of habitats and species through section 40 of the Natural Environment and Rural Communities Act 2006 (NERC), which states, “*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*”. To this end, section 42 of the NERC Act provides for the establishment of a list of habitat and species that are considered to be of “*principal importance for the conservation of biodiversity in Wales*”. The Assembly Government sets out its commitment to the Biodiversity Action Planning process in section 5.2 of PPW. The list of *Species of Principal Importance (SPIs) and Habitats of Principal Importance (HPIs) in Wales* can be viewed on the Biodiversity Wales website.

9.3.3 TAN 5 also states that the presence of a protected species is “... *a material consideration when a planning authority is considering a development proposal which, if carried out, would be likely to result in harm to the species or its habitat*”. If there is likely to be an effect on a protected species, adequate mitigation must be proposed prior to planning permission being granted.

9.3.4 In Wales, legislation for nature conservation is provided in the Environment (Wales) Act 2016 Sections 6 and 7 which supersede Natural Environment and Rural Communities Act 2006 Sections 40 and 42:

Section 6 of the Environment Act places a duty on public authorities to ‘*seek to maintain and enhance biodiversity*’ so far as it is consistent with the proper exercise of

those functions. In so doing, public authorities must also seek to ‘*promote the resilience of ecosystems*’. The duty replaces the section 40 duty in the Natural Environment and Rural Communities Act 2006 (NERC Act 2006), in relation to Wales, and applies to those authorities that fell within the previous duty. Public authorities will be required to report on the actions they are taking to improve biodiversity and promote ecosystem resilience.

Section 7 of the Environment Act provides lists of biodiversity resources and sets out the duty to take steps to maintain and enhance biodiversity. This section replaces the duty in section 42 of the NERC Act 2006. The Welsh Ministers will publish, review and revise lists of living organisms and types of habitat in Wales, which they consider are of key significance to sustain and improve biodiversity in relation to Wales. The Welsh Ministers must also take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section, and encourage others to take such steps.

- 9.3.5 National legislation for the special protection of selected species is provided in the Wildlife and Countryside Act 1981, as amended. Other than in exceptional circumstances, all British breeding birds, their nests and eggs, are protected under the Wildlife and Countryside Act 1981 (as amended). It is an offence to intentionally or recklessly kill, injure, or damage species protected under this Act. Further protection is given to Schedule 1 species included in sections 1(4) and 1(5). Some birds are also listed in Annex 1 of EC Directive 2009/147/EC on the conservation of wild birds (the ‘Birds Directive’) which imposes stricter protection on those species within Europe. Schedule 5 of the Wildlife and Countryside Act provides special protection to selected animal species other than birds, through paragraph 9(4) of the Act, against damage to “*any structure or place which any wild animal [included in the schedule] uses for shelter and protection*” and against disturbance whilst in such places.
- 9.3.6 The Protection of Badgers Act 1992, as amended, provides protection to badgers and their setts.
- 9.3.7 A number of animals, known as European protected species, are provided full protection through inclusion in Schedule 2 of The Conservation of Habitats and Species Regulations 2010, as amended. The Regulations, commonly referred to as the ‘Habitats Regulations’, include protection against deliberate disturbance for all European protected species wherever they are present, and provides tests against which the application for a development that may have an effect on a Schedule 2 protected species must be assessed before permission can be given. Amongst others, all bat

- species in the UK, great crested newts *Triturus cristatus*, otters *Lutra lutra* and hazel dormice *Muscardinus avellanarius* have European protected species (EPS) status.
- 9.3.8 In addition to species protection, the Wildlife and Countryside Act and Habitats Regulations also set out requirements/procedures for the notification, designation and protection of a range of statutory site designations in order to preserve important nature conservation resources.
- 9.3.9 Sites of Special Scientific Interest (SSSIs) are sites of national importance designated for their nature or geodiversity conservation interest. It should be noted that sites with the similar designation National Nature Reserve (NNR) are in Wales subject to legal protection as SSSIs, and NNRs are therefore not treated separately in this chapter.
- 9.3.10 In addition to species protection, the Habitats Regulations also make provision for the statutory designation of some sites as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), which are sites that are recognised as being of international importance to nature conservation. SACs and SPAs are also known as ‘European sites’, as they contribute to the European-wide network of sites, known as ‘Natura 2000’. They typically overlap with the SSSI designation.
- 9.3.11 SACs are designated in accordance with Regulations 7 and 8, to protect sites supporting examples of natural habitats in Annex 1 to EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the ‘Habitats Directive’) and populations of animal species in Annex 2 to the Directive (which excludes birds). Annex 1 habitats and Annex 2 species at a site may represent either a “primary reason for [its] selection” as a SAC, or being, “*present as a qualifying feature, but not a primary reason for site selection*”.
- 9.3.12 SPAs are classified in accordance with Article 4 of EC Directive 2009/147/EC on the conservation of wild birds (the ‘Birds Directive’).
- 9.3.13 For each SAC and SPA, Natural Resources Wales (NRW) publishes site-specific conservation objectives that relate to the features for which it has been designated as a European site. Under Regulation 61, if a significant effect on a European site is predicted as a result of a project, either alone or in combination with other projects or plans; it is against the conservation objectives that potential implications of development proposals must be assessed by a Competent Authority before the granting of planning consent, permission or other authorisation. In making an appropriate assessment the Competent Authority must take into consideration whether, subject to the impact avoidance and mitigation measures proposed, the scheme will adversely affect the integrity of the European site. The term integrity is

defined as the, “coherence of the site’s ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is ... classified”.

9.4 Legislative and planning policy context: UK Post-2010 Biodiversity Framework

9.4.1 The UK Post-2010 Biodiversity Framework (Joint Nature Conservation Committee and Department for Environment, Food and Rural Affairs, 2012), sets out a framework of priorities for UK-level work for the Convention on Biological Diversity, to which the UK is a signatory. Covering the period 2011-2020, this framework replaces the original UK Biodiversity Action Plan (UK BAP, 2004) system and now the work is focussed on the separate countries (Wales, England, Scotland and Northern Ireland).

9.4.2 The overall aim remains to protect a number of rare species and habitats, and reverse the declines of more widespread but declining species and habitats, and so currently many of the species and habitats in the UK BAP still form the basis of the biodiversity work carried out in the devolved countries.

9.4.3 In addition to the species in the UK BAP, BAPs have been devolved to local levels (LBAPs). Under the NERC Act, the government and public bodies, including planning authorities, have a duty to have due regard to the purpose of conserving biodiversity, so it remains good practice for BAP and LBAP species and habitats to be taken into consideration in the planning of a development scheme. Many UK and local BAP species are also listed on the NERC s.42 list of “species of principal importance” (SPIs) in Wales. The LBAP of relevance to this chapter is the Gwynedd BAP. The habitats and species which have action plans on the Gwynedd BAP are listed in Table 9.1.

Table 9.1: Gwynedd LBAP Habitat and Species Action Plans

Habitat Action Plans	Species Action Plans
Arable field margins	Adder <i>Vipera berus</i>
Cloddiau	Arctic charr <i>Salvelinus alpinus</i>
Gardens	Barn owl <i>Tyto alba</i>
Lowland dry acid grassland	Bluebell <i>Hyacinthoides non-scripta</i>
Lowland heathland	Brown hare <i>Lepus europaeus</i>
Lowland meadows and pasture	Chough <i>Pyrrhocorax pyrrhocorax</i>
Lowland wetlands	Floating water plantain <i>Luronium natans</i>
Maritime cliff and slopes	Hazel dormouse <i>Muscardinus avellanarius</i>
Mudflats	Hornet robberfly <i>Asilus crabroniformis</i>

Rhos pastures	Lampreys <i>Lampetra</i> spp
River corridors	Lapwing <i>Vanellus vanellus</i>
Strandlines	Lesser horseshoe bat <i>Rhinolophus hipposideros</i>
Upland heathland	Marsh fritillary <i>Euphydryas aurinia</i>
Upland oakwoods	Otter <i>Lutra lutra</i>
Wet woodland	Pine marten <i>Martes martes</i>
	Polecat <i>Mustela putorius</i>
	Salmonids <i>Salmo</i> spp
	Water vole <i>Arvicola amphibius</i>
	Waxcaps <i>Hygrocybe</i> spp

9.5 Legislative and planning policy context: local planning policy

9.5.1 The Biodiversity and Geodiversity section of the Gwynedd Unitary Development Plan (2001 – 2016) relates to nature conservation policies with the general aim to ‘provide land use planning guidance in respect of development that affects statutorily protected and locally or nationally valued habitats and species’. Relevant specific nature conservation policies included in the plan include:

- Policy B15: Protection of international nature conservation sites.
- Policy B16: Protecting nationally important conservation sites.
- Policy B17: Protecting sites of regional or local significance.
- Policy B19: Protected trees, woodlands and hedgerows.
- Policy B20: Species and their habitats that are internationally and nationally important.
- Policy B21: Wildlife corridors, habitat linkages and stepping stones.
- Policy b35 - Avoiding the spread of invasive species
 - Where the development involves the disturbance of soil contaminated by invasive species, developers will be requested to state what measures will be taken to deal with the invasive species and/or move it to a certified site.
 - When a development is approved, planning conditions or agreements will be used to ensure that the necessary measures to deal with and/or move the species are implemented, in accordance with details submitted with the planning application.

- Also, where a development involves disposal of soil or infill material on site, the Local Planning Authority will include a planning condition to ensure that the material did not originate from a pollution.
- Policy AMG3: Coastal Protection.
- Policy AMG4: Local Biodiversity Conservation.
- Policy AMG5: Protecting Sites of Regional or Local Significance.

9.6 Assessment Methodology

9.6.1 The Ecological Impact Assessment (EclA) presented in this chapter follows an adapted version of the Chartered Institute of Ecology and Environmental Management (CIEEM) methodology described in Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2016)⁸ (which in this chapter are referred to as the CIEEM guidelines).

Evaluation of Ecological Features

9.6.2 Following consultations, desk study and field surveys, criteria are applied to assess the nature conservation value of the ecological ‘features’, i.e. the sites, habitats, ecosystems, species, populations, communities or assemblages (both on and off-site) that could be impacted by the proposed development. As there is rarely comprehensive quantitative data on the wider habitat or species population resource, particularly below the international and national level, the nature conservation evaluation of ecological features necessarily also involves a qualitative component. This requires a suitably trained and experienced ecologist to make a professional judgement based upon a combination of published sources, consultation responses and knowledge of the Site and the wider area.

9.6.3 The categories of ecological value used in this chapter are described in Table 9.2.

Table 9.2: Criteria for Evaluation of Identified Ecological Features

Value	Criteria	Examples
Inter-national	Nature conservation resource (site, habitat or populations of species) of international importance. Includes designated sites, but may also include off-site ecological	European sites: SPAs and SACs, sites which are candidates for SPA or SAC designation, and other International sites such as Ramsar Wetlands. Habitats and populations/assemblages of species (including birds) that

⁸ CIEEM (2016). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.

Value	Criteria	Examples
	features on which the qualifying population(s) or habitat(s) of designated sites are considered, from the best available evidence, to depend.	represent the qualifying interests of internationally designated sites.
National (Wales)	Nature conservation resource (site, habitat or populations of species) of national importance. Includes designated sites, but may also include off-site ecological features on which the qualifying population(s) or habitat(s) of designated sites are considered, from the best available evidence, to depend.	SSSIs designated for biological features. All populations of W&CA Schedule 8 plants. All viable populations of species listed as Critically Endangered, Endangered, Vulnerable or Threatened in Red Data Books. Nationally important population/ assemblage of an EPS, Schedule 1 and/or 5 species.
County (Gwynedd)	Nature conservation resource (site, habitat or species) of importance in the context of old County scale areas.	Local Nature Reserves. County important population/area of a species / habitat of Principal Importance, UK BAP priority species / habitats, European Protected Species, Schedule 1 and/or 5 species.
Local (Caernarfon)	Nature conservation resource (site, habitat or species) of importance in the context of the local, district or borough Council or Unitary Authority administrative area.	Non-statutory designated sites. A breeding population of a species or a viable area of a habitat that is a Species of Principal Importance or is listed in a Local BAP because of its rarity in the locality. All breeding populations of an EPS, Schedule 1 and/or 5 species that have not been captured in higher categories above.
Less than Local	Unremarkable habitat/common species that may be of some value in the context of the site, but not more widely. A resource that is of little/no intrinsic nature conservation value.	Common, widespread, modified and/or impoverished habitats. Species of Least Concern that are widespread and/or common locally.

Impact Magnitude

- 9.6.4 Having classified the identified ecological features in terms of their value, this assessment then proceeds to an impact assessment for those features which have been assessed as being of local or greater value.

- 9.6.5 The magnitude of an impact depends upon the nature and sensitivity of an ecological feature and the range of potential effects arising from the implementation and operation of a proposed development.
- 9.6.6 In assessing the likely magnitude of an effect, it is necessary to have as great an understanding as possible of its timing, intensity, frequency, duration and reversibility. For the purposes of this assessment, the nature of the effects on specific ecological features is described in the Impacts section, and then the magnitude of these effects is summarised as being in one of the categories ‘**no impact**’, ‘**barely perceptible**’, ‘**low**’, ‘**medium**’ or ‘**high**’, depending upon the extent of the area or population deemed likely to be affected by the development. These categories are shown in Table 9.3 below.

Table 9.3 Levels of Impact Magnitude

Magnitude	Impact
No Impact	No detectable effects on the ecological resource, even in the immediate term.
Barely perceptible	Detectable effect but reversible within 12 months. Not expected to affect the conservation status of the site, habitat or species under consideration.
Low	Detectable effects, and may be irreversible, but either of sufficiently small scale (or short duration, if reversible) to have no material effect on the conservation status of the site, habitat or species population.
Medium	Noticeable effect on the nature conservation status of the site, habitat or species population, but would not threaten the long-term integrity of the system. Replaceable or reversible given time. Effect on nature conservation status likely to be detectable in short- and medium-term.
High	Significant effect on the nature conservation status of the site, habitat or species, likely to threaten the long-term integrity of the ecosystem. Not replaceable or reversible. Will be detectable in short-medium- and long-term.

Impact Significance

- 9.6.7 The determination of impact significance involves the interaction of both the nature conservation value of the site, habitat, or species population or assemblage concerned, together with the magnitudes of the various impacts upon it. The more ecologically valuable a site and the greater the magnitude of a given impact, the higher the significance of that impact is likely to be.

- 9.6.8 An EclA is undertaken in relation to the baseline conditions that would be expected to occur if the proposed development were not to take place, and in the case of this Site, the baseline is a dynamic system of change associated with existing permissions for mineral extraction.
- 9.6.9 Whilst the use of an impact significance matrix is a departure from the CIEEM guidelines, Table 9.4 shows in general terms the way in which the significance of ecological impacts is considered in this chapter. It is important to appreciate that this does not represent a rigid framework for assessment - there are gradations between different categories of site and impact, and on occasion the significance of a particular impact may not accord precisely with the categories shown below. Impacts identified as minor are considered not to be significant for the purposes of this EclA.

Table 9.4: Generalised Impact Significance Matrix

Nature Conservation Value of Feature	Magnitude of Potential Impact (+ve and -ve)			
	High	Medium	Low	Barely Perceptible
International	Exceptional	Major	Moderate	Minor
National - GB & Wales	Exceptional	Major	Moderate	Minor
Regional – North Wales	Major	Moderate	Minor	Minor / No significant impact
County – Gwynedd	Moderate	Moderate	Minor	No significant impact
Local – Caernarfon	Minor	Minor	Minor	No significant impact
Low - less than Local	Minor / No significant impact	Minor / No significant impact	No significant impact	No significant impact
Negligible	No significant impact	No significant impact	No significant impact	No significant impact

9.7 Baseline conditions and ecological feature evaluation

Desk Study

- 9.7.1 The local records centre 'Cofnod' was consulted in order to establish whether there were any pre-existing records of nature conservation sites or plant and animal species/assemblages of nature conservation significance for the Seiont Quarry Site and its surroundings. Review of existing biological records can be of assistance in

establishing the extent to which species or sites that could represent a material consideration in planning terms are likely to be present in suitable habitats locally.

- 9.7.2 Ecological records were requested from Cofnod for a buffer of 1km from the Seiont Quarry Site boundary for protected species and for designated statutory and non-statutory nature conservation sites (such as Local Wildlife Sites).
- 9.7.3 As part of a wider consultation exercise, the Gwynedd Senior Biodiversity Officer was consulted regarding the proposed works, and a response received on the 5th November 2015.
- 9.7.4 Information on statutory sites was obtained from the government interactive GIS website (<http://magic.defra.gov.uk>). The sites included in this assessment were limited to those designated for biological features (habitats or species) within 5km of the Quarry Site. Sites designated for geological features were not included, but are considered in Chapter 9: Geology and Soils.

Existing Ecological Survey Data: A487 Caernarfon and Bontnewydd Bypass scheme

- 9.7.5 Extensive ecological surveys were recently carried out by Parsons Brinkerhoff (PB) for the A487 Caernarfon and Bontnewydd Bypass (Caernarfon Bypass), and have been used to inform this EclA. Most of this survey data was provided through the Jones Brothers -Balfour Beatty Joint Venture, who are the contractor awarded the Caernarfon Bypass contract. Additional survey work was completed by Atmos Consulting.
- 9.7.6 A summary of the Caernarfon Bypass survey data collected is detailed in Table 9.5.

Table 9.5: Ecological Surveys Covering the Seiont Quarry Site

Survey Type	Dates Completed	Coverage
Phase 1 habitat survey	May 2015	Entire Site
Breeding Bird Survey	1 st May & 16 th June 2015	Eastern ¼ of the Site and 500m buffer
Bat Roost Assessment	May 2015	Southern, eastern and northern boundaries of the Site
Bat Activity Survey	June/July & Sept./October 2009 September 2014 May, July, Sept.2015 May & June 2016 M<	Eastern boundary of the Site and woodland area to the south of the Site

Dormouse Habitat Assessment	May 2015	Eastern edge of the Site (within 50m of the proposed bypass route)
Great Crested Newt	May 2015	Quarry sump on Site

9.7.7 The Phase 1 habitat survey was carried out as a general walkover and update of the 2009 phase 1 habitat survey and covered all areas within 500m of the proposed Caernarfon Bypass, including the Seiont Quarry site. The survey methods followed the Handbook for Phase 1 Habitat Survey guidelines produced by the Joint Nature Conservation Committee (JNCC,2010)⁹ and Volume 10, Section 4, Part 1 of the Design Manual for Roads and Bridges (The Highways Agency et al., 2001)¹⁰ and were undertaken by experienced ecologists.

9.7.8 Surveys for breeding birds were conducted in line with the methods used in the British Trust for Ornithology's Breeding Bird Survey. Visits were timed so that the first was in the early part of the breeding season (April to mid-May) and the second at least four weeks later (mid-May to the end of June).

9.7.9 Bat activity surveys were undertaken in June/July and September/October 2009, September 2014, May, July and September 2015, and finally May and June 2016. Multiple transect routes were surveyed along the proposed bypass route, four of which were in close proximity to the Seiont Quarry Site. The transects covered are shown in the figure 'Bat Survey Strategy Pre-Construction' provided in Appendix E.6 of the Caernarfon Bypass ES, which is reproduced in Appendix 9.4 and 9.5 of this ES. The transects of relevance to this ES were:

- transect R6: located to the south of the quarry area, running immediately adjacent to the construction compound scheme planning boundary;
- transects R7 and R7a: located to the south of the woodland which lies south of the scheme planning boundary;
- transect NRW3: located adjacent to the eastern point of the scheme planning boundary, surveyed in 2016 only for the purpose of informing the location of a proposed bat underpass culvert.

9.7.10 Dormouse habitat assessments and hedgerow surveys were carried out within 50m of the proposed Caernarfon Bypass in May 2015. These surveys recorded the likely

⁹ JNCC, (2010), Handbook for Phase 1 habitat survey - a technique for environmental audit, revised re-print. Joint Nature Conservation Committee.

¹⁰ The Highways Agency, The Scottish Executive Development Department, The National Assembly for Wales and The Department for Regional Development (2001) Design Manual for Roads and Bridges, Volume 10, Section 4, Part 1.

suitability of features, taking into account their connectivity, diversity of food-plants, structure and management. From this the dormouse potential of the habitats present was determined in accordance with five categories: optimal habitat (A), suitable habitat (B), sub-optimal habitat (C), suitable only for dispersal by dormice (D) and unsuitable for dormice (E). Following the completion of these surveys, Parsons Brinkerhoff determined that all of the woodland, scrub and hedgerow habitats across the survey area were at best of sub-optimal value for dormice, so nest tube surveys were not considered necessary.

9.7.11 All ponds within 500m of the proposed Caernarfon Bypass (twelve in total) were subject to a Habitats Suitability Index (HSI) assessment for great crested newts in accordance with the system devised by Oldham et al. (2000)¹¹. Only two of the ponds had a HSI score of average or above, and Parsons Brinkerhoff concluded that no further survey of the sump on the quarry was necessary.

Seiont Quarry Bat Licence Application

9.7.12 Bat surveys of the buildings previously present on the Quarry Site were undertaken by SLR Consulting in 2010 and 2012 prior to building demolition. As roosting bats were present, licence applications had to be made to NRW to allow the demolition work to take place. Surveys included a dusk emergence and a dawn re-entry of buildings in the main quarry yard in September 2012.

Additional Surveys: update Phase 1 Habitat Survey

9.7.13 An 'extended' Phase 1 Habitat survey covering the Seiont Quarry Site was undertaken by Atmos Consulting Ltd on 25th November 2015 in order to update and verify the results of the Phase 1 habitat survey data provided by the ecology surveyors for the Caernarfon Bypass scheme.

9.7.14 Phase 1 Habitat survey is a standardised method of recording habitat types and characteristic vegetation¹². This survey method is extended through the additional recording of specific features indicating the presence, or likely presence, of protected species or other species of nature conservation significance. Target notes were made to describe characteristic habitats, features of ecological interest, or any other features which require ecologically sensitive design or mitigation. Whilst not a full protected species or botanical survey, the Extended Phase 1 method enables a suitably

¹¹ Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000). Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*). Herpetological Journal 10(4), 143-155.

¹² JNCC, (2010), Handbook for Phase 1 habitat survey - a technique for environmental audit, revised re-print.

experienced ecologist to obtain sufficient understanding of the ecology of a site that it is possible either:

- to confirm the conservation significance of the site and assess the potential for impacts on habitats/species likely to represent a material consideration in planning terms; or
- to ascertain that further surveys of some aspect(s) of the site's ecology will be required before such confirmation can be made.

Badger Walkover Survey

9.7.15 A badger *Meles meles* walkover survey of the Quarry Site was undertaken on 25th November 2015. The badger survey was carried out as a thorough walkover of the Site, with visual checks for any signs of badger presence made by two suitably experienced ecologists. In accordance with standard survey methodology (Harris et al., 1989)¹³, the survey recorded any signs of badger activity (e.g. latrines, badger runs) as well as searching for setts which would represent a statutory constraint, if present.

Otter Survey

9.7.16 An otter survey of the Site was also undertaken on 25th November 2015. The survey followed standard methodology (RSPB, NRA & RSNC, 1994)¹⁴ and aimed to identify any sensitive features and establishing the presence or absence of otter activity. The survey comprised walking along the whole length of the River Seiont (where possible and safe to do so) that flows adjacent to the Site. The boundaries of the onsite quarry sump were also surveyed (where safe access was possible) along with the small ditch running between the river and the quarry sump. Signs of otter were searched for through close visual inspection of features near the waterline where otter spraints are likely to be found (e.g. larger rocks or fallen trees), and banksides were examined for otter holts.

Statutory Designated Sites

9.7.17 The Seiont Quarry Site does not overlap with any statutory nature conservation designation. All internationally and nationally designated sites within 5km of the Site are listed in Table 9.6.

9.7.18 There are three international sites within 5km of the Seiont Quarry Site, with a further one just over 5km (Glynllifon SAC) from the Site, which was considered due to its populations of highly mobile species, specifically lesser horseshoe bats.

¹³ Harris S, Cresswell P and Jefferies D (1989) Surveying Badgers, Mammal Society.

¹⁴ RSPB, NRA & RSNC (1994). The New Rivers and Wildlife Handbook. Sandy: Royal Society for the Protection of Birds.

Table 9.6 International Statutory Designations

Designation	Distance from the Site	Qualifying criteria
Menai Strait and Conwy Bay SAC	~ 1.5km to the north-west (at the nearest point)	Annex I habitats: including 'sandbanks which are slightly covered by sea water all the time', 'mudflats and sandflats not covered by seawater at low tide' and 'reefs'.
Abermenai to Aberffraw Dunes SAC	~ 4.5km to the west	Annex I habitats: including several types of shifting and fixed sand dunes, natural eutrophic lakes. Annex II species: petalwort <i>Petalophyllum ralfsii</i> and shore dock <i>Rumex rupestris</i> .
Glannau Mon: Cors heli / Anglesey Coast Saltmarsh SAC	~ 4.5km to the west	Annex I habitats: Atlantic salt meadows, estuaries, mudflats and sandflats not covered by seawater at low tide.
Glynllifon SAC	~ 5.1km to the south	Annex II species: significant lesser horseshoe bat populations (approximately 6% of the total UK population), including breeding and hibernating colonies.

9.7.19 There are five SSSIs within 5km of the Seiont Quarry Site, with a further one, Glynllifon, present just over 5km from the Site and these are listed in Table 9.7.

Table 9.7 National Statutory Designations

Designation	Distance from Site	Qualifying criteria
Afon Gwyrfai Llyn Cwellyn SSSI	~ 1.36km south-west	Running and standing water, aquatic plant assemblage, floating water-plantain, Arctic charr, Atlantic salmon and Otter.
Pant Cae Haidd SSSI	~ 2.2km south-east	Fen meadow vegetation and associated habitats.
Y Foryd SSSI	~ 3.45km west	Ornithological and marine biological features comprising dwarf eelgrass beds and their associated intertidal species and a nationally important over-wintering population of Wigeon.
Newborough Warren – Ynyslanddwyn SSSI	~ 4.5km west	The largest sand dune system in West Gwynedd, including dune ridges, wet and dry slacks to dune grassland and scrub development along with a dune-dammed lake, freshwater fen, saltmarsh and mudflats.

Designation	Distance from Site	Qualifying criteria
Glynllifon SSSI	~ 5.1km south	Significant population of lesser horseshoe bats, as well as whiskered bat <i>Myotis mystacinus</i> , Natterer's bat <i>M. nattererii</i> , Daubenton's bat <i>M. daubentonii</i> , common pipistrelle <i>Pipistrellus pipistrellus</i> , soprano <i>P. pygmaeus</i> , noctule bat <i>Nyctalus noctula</i> and the brown long-eared bat <i>Plecotus auritus</i> .

Non-statutory Designated Sites

9.7.20 No current non-statutory designations (excluding geological sites) exist within 1km of the Quarry Site, however, details for a total of 18 candidate Local Wildlife Sites were provided by Cofnod, as summarised in 9.8 below.

Table 9.8 Non-Statutory Designated Sites

Candidate Local Wildlife Site	Distance from Site	Qualifying criteria
Rhyddallt-bach	Adjacent to the western boundary	13.6ha of broadleaved woodland, largely offsite but including the tree lined banks of the River Seiont directly adjacent to the Site boundary
Tyddyn-llwydyn	10m north	2.6ha of semi-improved neutral grassland on the opposite bank of the River Seiont
Waenfawr Road	220m north	7ha of semi-improved neutral grassland
Afon Beuno	200m north	11.1ha of semi-improved neutral grassland
Afon Seiont	220m north	3.2ha of running water
Gallt-y-sil Farm	220m north	3.8ha of semi-improved neutral grassland and woodland
Afon Seiont Mosaic	300m north	5.2ha of broadleaved woodland
Afon Bueno	350m south-east	12.7ha of broadleaved woodland, semi-improved neutral grassland and marshy grassland
Pebblig Graveyard	450m north-west	1.6ha of scrub and open mosaic habitat, with slow-worm <i>Anguilla anguilla</i> , common lizard <i>Lacerta vivipara</i> and grasshopper warbler <i>Locustella naevia</i> present
Gwynedd 889: Maes-merddin	500m north-west	3.2ha of marshy grassland and semi-improved neutral grassland

Candidate Local Wildlife Site	Distance from Site	Qualifying criteria
Afon Seiont and Glan Gwna	500m north-east	4.2ha of broadleaved woodland
Tyddyn-bach	500m south-east	11.7ha of broadleaved woodland and semi-improved neutral grassland
Caeathro	550m north-east	3.2ha of broadleaved woodland, semi-improved neutral grassland and marshy grassland
Ty'n-y-coed	600m south	15.7ha of broadleaved woodland and marshy grassland
Afon Seiont	600m west	14.5ha of upland oak woodland, river and mudflats
Cae-rhydau	800m north-east	18.2ha of broadleaved woodland, marshy grassland, acid grassland and acid flush
Coed Mawr	900m north	8ha of broadleaved woodland and neutral grassland
Lletty	950m south	11.8ha of marshy and semi-improved neutral grassland

Habitats on Site

9.7.21 The Phase 1 Habitat types present within the Quarry Site have all been mapped (see Figure 9.1) and are described below in Table 9.9. Full results are provided in Appendix 9.1.

Table 9.9: Habitats Recorded on the Seiont Quarry Site

Habitat	Area (m ²)	Area (ha)	% of Site area
Broadleaved woodland - plantation	128.44	0.01	0.08%
Broadleaved woodland - semi-natural	895.96	0.09	0.56%
Cultivated/disturbed land - ephemeral/short perennial	28598.40	2.86	17.96%
Disturbed ground	14210.50	1.42	8.92%
Improved grassland	15882.84	1.59	9.97%
Neutral grassland - semi-improved	11928.58	1.19	7.49%
Poor semi-improved grassland	3676.42	0.37	2.31%
Quarry	42165.96	4.22	26.48%

Habitat	Area (m ²)	Area (ha)	% of Site area
Wet ditch	10.44	0.00	0.01%
Scrub - dense/continuous	16888.36	1.69	10.61%
Standing water	24340.48	2.43	15.29%
Track	506.51	0.05	0.32%
Total	159232.89	15.92	100.00%

Improved grassland

9.7.22 The fields to the north-west of the quarry were improved grassland, used for animal grazing. Dominant species included annual meadow grass *Poa annua*, perennial rye grass *Lolium perenne*, common bent *Agrostis capillaris*, crested dog's tail *Cynosurus cristatus* and white clover *Trifolium repens*.

Quarry

9.7.23 Large areas of the quarry remained as un-vegetated (or very sparsely vegetated) spoil heaps. The eastern side of the quarry slope had most recently been excavated to form a series of berms or terraces largely bare of vegetation, although some grasses, mosses and willow *Salix* sp. scrub had begun to colonise.

Standing water

9.7.24 A large, deep area of standing water was present in the centre of the steep-sided quarry sump. No aquatic vegetation was observed, and marginal vegetation included submerged willow scrub, soft-rush, hard rush *Juncus inflexus* and jointed / sharp-flowered rush *Juncus articulatus / acutiflorus*. The steeply shelving shoreline means that there is only a very narrow margin of shallows. No fish were observed moving near the surface and around the edges of the pool and very little, or no cover for aquatic species is available in the form of aquatic vegetation.

Hardstanding

9.7.25 The largest area of hardstanding was on the western side of the Site where the brickworks buildings were previously located. Several large brick piles were present, along with long bunds of quarry spoil which had vegetated over to varying degrees. The areas of broken hardstanding had been densely colonised with butterfly-bush (buddleia) *Buddleja davidii* scrub, and cracks between sections of hardstanding colonised by grasses, mosses and wildflowers.

Ephemeral / short perennial vegetation

9.7.26 Short perennial vegetation had developed on many of the large areas of quarry spoil and broken hardstanding. In the former brick yard, the ground was a mosaic of broken hardstanding, large piles of bricks, short perennial vegetation and patches of tree scrub. Many species were recorded (see Technical Appendix 9.1), including grasses, wildflowers and mosses. Silver birch *Betula pendula*, willow and alder *Alnus glutinosa* scrub was developing in some areas, as well as patches of bramble *Rubus fruticosus* Agg., buddleia and rushes. A short wall on the northern boundary supported ferns such as hart's-tongue fern *Asplenium scolopendrium*. The consultation response provided by the Gwynedd Biodiversity Officer noted that cat's ear *Hypochaeris radicata* and vervain *Verbena officinalis* were present.

9.7.27 There were also large areas of short perennial vegetation growing on stony ground on the quarry sides, with colt's-foot *Tussilago farfara* very locally dominant in some places and scattered willow scrub and bramble patches encroaching.

Scrub

9.7.28 Dense scrub was present at several locations on the Site. The steep northern and western sides of the quarry were covered by dense willow, silver birch, gorse *Ulex europaeus* and bramble scrub. Smaller patches of dense scrub were present in other locations, along with areas of scattered scrub.

Semi-natural broadleaved woodland

9.7.29 A very small area of semi-natural broadleaved woodland was present on the Site: the edge of a woodland strip along the northern boundary of the quarry. Species there included silver birch, hawthorn *Crataegus monogyna*, rowan *Sorbus aucuparia*, pedunculate oak *Quercus robur* and beech *Fagus sylvatica*.

Poor semi-improved grassland

9.7.30 An area of poor semi-improved grassland was present to the south-east of the quarry. Species included Yorkshire fog, cock's foot, annual meadow grass, perennial rye-grass, creeping thistle, broadleaved willowherb *Epilobium montanum* and silverweed *Potentilla anserina*.

Semi-improved neutral grassland

9.7.31 An area of semi-improved neutral grassland was present to the north of quarry pit. Dominant species included Yorkshire fog, crested dog's tail, common bent, false oat grass and white clover, with small patches of soft-rush and gorse scrub.

Wet ditch

9.7.32 A wet ditch ran from the quarry sump to the River Seiont, with a water channel containing approximately 10cm of water at the time of survey. Marginal / emergent vegetation was dominated by soft-rush, hard rush, bulrush *Typha latifolia* and broad-leaved willowherb, and aquatic vegetation included water starwort *Callitriche* sp. and round-leaved crowfoot *Ranunculus omiophyllus*.

Offsite habitats of note: Running water

9.7.33 The River Seiont flows along the northern boundary of the Site and around the former brickyard. The river was approximately 8m wide and 0.5m - 1.5m in depth. The river banks varied from vertical brick or stone walls to more natural, sloping, wooded banks dominated by bramble and ivy. Large rocks were present along the river edge, and both banks were lined with mature and semi-mature trees often supporting mosses and ferns.

Offsite habitats of note: Buildings

9.7.34 One derelict building was present near to the Site boundary, in the woodland north of the former brickyard. The derelict house on the northern edge of the brickyard was a brick built structure with a pitched roof and a basement known to be used as a hibernation roost by lesser horseshoe bats.

Offsite habitats of note: Broadleaved woodland and trees

9.7.35 Semi-natural broadleaved woodland was present in several locations adjacent to the Site: a woodland strip along the northern boundary of the quarry, a wet woodland to the north of the former brick yard, a large area of mature broadleaved woodland to the west of the Site covered by a Tree Preservation Order (TPO) and also the tree-lined banks of the River Seiont. An area of more recently planted broadleaved woodland was present adjacent to the Site boundary, part of which is covered by the TPO. A large mature pedunculate oak (TPO 611) stands next to a stone wall in the improved grassland to the north of the quarry.

9.7.36 Several of the boundaries to the east of the quarry were species-poor hedgerows with mature trees including oak, ash, sycamore, hawthorn and silver birch.

Limitations on Survey Results

9.7.37 As the updated Phase 1 survey was carried out in November, it may not have recorded many of the plant species which would be more obvious at other times of the year. For example, the species list provided for the areas of ephemeral / short perennial vegetation will not be as comprehensive as if the survey had been carried out in spring or summer when annuals would be evident. However, it is considered that the survey provided sufficient information to assess the value of the habitats present.

Invasive Plant Species

9.7.38 The Cofnod data search did not provide any records of invasive non-native plant species listed under Schedule 9 of the Wildlife and Countryside Act 1981. However, there is widespread buddleia present on the Site.

Bats

9.7.39 All British bats are European protected species. This section provides a summary of the results of bat surveys covering the Site and an evaluation of the nature conservation value for each of the bat features identified.

9.7.40 Bat surveys were undertaken in association with the Caernarfon Bypass scheme in 2009, 2014, 2015 and 2016. The four activity transects in proximity to the scheme planning boundary recorded common pipistrelle, soprano pipistrelle, noctule, brown long-eared, lesser horseshoe and *Myotis* bats to be present. In relation to lesser horseshoe bats, the ES Appendix E.5¹⁵ stated that “*Lesser horseshoes are widespread throughout the area but have been recorded in relatively low numbers*”. The ES¹⁶ reports that “*no obvious commuting routes were identified during the surveys... however it is suspected that the hedgerows to the south of the quarry are frequently used for foraging and potentially commuting given the level of activity noted in survey area 7 and 7A*”. The level of activity on transect R7 ranged from 1-11 lesser horseshoe bat (LHB) passes per survey night. By contrast, transect R6, which followed a route along the boundary of the quarry void area recorded only 1 LHB pass on a hedgerow approximately 90m from the scheme boundary.

9.7.41 Bat surveys undertaken by SLR Consulting in 2010 and 2012 prior to quarry building demolition work recorded common pipistrelle, soprano pipistrelle, brown long-eared bat and lesser horseshoe bats foraging within the wooded habitats along the River Seiont.

9.7.42 Prior to the 2010, it was known that a lesser horseshoe bat hibernation roost was present within the basement of the abandoned old building north of the main brickyard, approximately 30m from the site boundary. The Cofnod data provides four records relating to this roost, dated between 2001 and 2004, and describing between seven and 23 bats using the structure. An SLR survey in March 2010 recorded a single bat present. Cofnod provided records of several other lesser horseshoe bat roosts within 1km of the Site: a 2012 record of a maternity roost (31 bats) and two 1985 records of 25 and 50 roosting lesser horseshoe bats to the north-east.

¹⁵ Taken from the A487 Caernarfon and Bontnewydd Bypass Environmental Statement Appendix E.5 Bat Survey Report, Section 4, p32

¹⁶ Taken from the A487 Caernarfon and Bontnewydd Bypass Environmental Statement - Volume 1 Technical Assessment Report, Section 8.3.4, p299

- 9.7.43 The walkover survey carried out by Atmos Consulting in November 2015 observed at least six bat boxes present on trees along the river Seiont by the quarry entrance. Whilst no data is available on their use, it is assumed that these boxes are likely to be intermittently used by individuals of all crevice-dwelling species known to be present on the site. Other features on the Site with noted potential to support roosting bats include the small section of broadleaved woodland within the Site boundary north of the quarry, and the trees along the banks of the River Seiont. In addition to the above mentioned records, the Cofnod data search provided records for a brown long-eared bat maternity roost, four Pipistrelle species maternity roosts and two small natterer's bat roosts.
- 9.7.44 In summary, based on the above data, it is known that lesser horseshoe, brown long-eared, common pipstrelle, soprano pipistrelle, *Myotis* and noctule bats are present within the vicinity of the Quarry Site. Based on known habitat preferences for each of these species (or groups of species in the case of *Myotis* bats), a description of the known use of the Quarry site and surrounding area is given for each species in Table 9.10. In summary, whilst common and generalist species such as noctule, common and soprano pipistrelles are likely to forage across most of the site area, there is little habitat suitable for use by the rarer species known to be present, which have more specific habitat requirements. The only feature on the site which lesser horseshoe or brown long-eared bats might use is a vegetated ditch shown as Target Note 21 on Figure 8.1. On-site habitats which may be used by *Myotis* bats include the water-filled quarry sump and the areas of semi-improved grassland. In general, the habitats present around the site provide far greater quality foraging and commuting habitat.

Table 9.10: Bat species and habitats in the area

Species	Habitat preferences ¹⁷	Use of habitat on site?	Use of habitat off site?
Lesser horseshoe	Preferred foraging habitats include broadleaved woodland well connected by commuting routes such as hedges, woodland edge and riparian trees. Reluctant to cross open space.	No broadleaved woodland or hedgerow habitat on the site suitable for use by foraging or commuting lesser horseshoe bats.	Broadleaved woodland, riparian treeline and hedgerows are present in the areas around the Quarry site. Bypass survey data shows these features to be used by foraging lesser horseshoes, although no commuting routes were identified.

¹⁷ Foraging habitat preferences and foraging strategies of different UK species as given in Table 3.4 of the Bat Conservation Trust "Bat Surveys for Professional Ecologists: Good Practice Guidelines".

Species	Habitat preferences ¹⁷	Use of habitat on site?	Use of habitat off site?
Brown long-eared	Strongly associated with tree cover, preferring woodland with cluttered understory. Also foraging along woodland edge and hedgerows.	No broadleaved woodland or hedgerow habitat on the site suitable for use by foraging or commuting brown long-eared bats.	Broadleaved woodland and hedgerows are present in the areas around the Quarry site.
Common and soprano pipistrelle	Show a preference for deciduous woodland and riparian habitats, but are generalists using a wide range of habitats.	As a generalist species, most habitats on site may be used for foraging, although woodland edges and water features are most likely to be used.	Off-site habitat is of a much greater quality for foraging, comprising the broadleaved woodland and riparian habitats favoured by these species.
<i>Myotis</i>	Daubenton's bats favour aquatic habitats; other species tend to prefer broadleaved woodland, riparian corridors rough grassland habitats with hedgerows.	The water-filled quarry sump provides suitable foraging habitat suitable for Daubenton's bats, with areas of semi-improved grassland providing some foraging habitat which may be used by other <i>Myotis</i> species.	Off-site habitat is of a much greater quality for foraging, comprising the broadleaved woodland and riparian habitats favoured by these species.
Noctule	Found in a range of habitats, foraging out in the open, often over trees and water.	Open and water habitats are present across the site, and provide suitable foraging habitat.	Offsite habitat provides large areas of broadleaved woodland and open arable/pasture fields suitable for foraging.

Limitations on the Bat Survey Data

9.7.45 Whilst limited bat survey data is available for the Seiont Quarry Site itself, the 2009-16 Bypass surveys provide useful local context regarding bat foraging activity. The SLR bat surveys carried out on the main Quarry Site in 2012 provide valuable information about the species foraging and roosting on the Site itself, although that data is temporally limited (carried out in late September). Given the lack of specific bat survey data for the Quarry Site itself, the assessment of the value of bat features on the site incorporates the existing survey data and also a habitat-based assessment of the suitability of the site for use by bats, and the assessment is intentionally precautionary.

Otter and water vole

9.7.46 The otter survey carried out along the River Seiont adjacent to the Quarry Site in November 2015 recorded evidence of otter presence (spraints) in four locations along the river, but no holt was identified. Signs of otter were found on rocks along the banks of the river, some indicating very recent activity and others much older. Otter activity

along the river is therefore likely to be frequent. The quarry sump and the wet ditch which connects the sump to the River Seiont do provide corridors suitable for otter movement, however, survey of these did not record any signs of otter activity away from the river corridor and no potential for the presence of otter holts. Full details of results are provided in Technical Appendix 9.2.

9.7.47 No signs of water vole presence were recorded on the River Seiont or on the quarry site. The Cofnod search did not provide any records of water vole within 1km of the Site. The nearest evidence of water vole recorded by the 2015 bypass surveys recorded water vole signs approximately 2.1km to the south-west and 3km to the north-east of the Site. On this basis, it is assumed that water vole are not present on the Site.

Amphibians

9.7.48 A single waterbody is present on the Site, the quarry sump. Following the Atmos walkover survey in November 2015, a habitat suitability index (HSI) assessment was made. A HSI value of 0.61 was calculated meaning that this feature was assessed as having 'average' suitability for use by great crested newts.

9.7.49 The Stage 2 Bypass survey identified 54 ponds within the Bypass survey area, of which only seven were considered to require further newt surveys. These surveys did not find any evidence of great crested newts. Smooth newt *Lissotriton vulgaris* and common frog *Rana temporaria* were recorded in some ponds. The 2015 Caernarfon Bypass surveys identified twelve ponds within the survey area, of which only two were considered to require further survey. These surveys also did not find any evidence of great crested newts, although smooth newt and palmate newt *Lissotriton helveticus* were confirmed in one pond. These results are supported by the lack of great crested newt records in the Cofnod data search. During a survey in March 2000¹⁸ a surveyor searched for newts and common frog in shallow water bodies and under debris in rutted clay areas on the fringe of the brickyard and in the then active quarry sump. None were found.

9.7.50 On this basis, it is assumed that great crested newts are not present on the Site and this species is therefore scoped out of further assessment. It is assumed that there is the potential for the waterbodies on the Site to support other amphibian species (such as smooth newt, palmate newt, common frog or common toad).

Fish

9.7.51 The Pre-Application Consultation drew comments from the NRW that fish could be present in the quarry sump and that eels could be using the habitat. The Cofnod data search did not provide any records of fish in the sump. The steeply shelving shoreline

¹⁸ John Guest, Ecologist, on behalf of Richards Moorehead & Laing Ltd for Hanson, Survey report 2217/2, March 2000.

means that there is a very narrow margin of shallow water. A number of visits to the pool have been made through the range of seasons, between September 2015 and November 2016, and no fish have been observed moving near the surface and around the edges of the pool. Due to the site conditions, it is considered very unlikely that fish are present. The body of water has filled since 2008 with the current depth only being reached in 2011. In the few years since the sump water has substantially cleared of silt, there has virtually no colonisation by aquatic vegetation and the depth of the water would restrict aquatic plants to a very narrow margin around the shoreline.

9.7.52 Public access to the quarry is controlled by locked security gates at the Seiont bridge and so opportunities to introduce fish to the water artificially are considered very unlikely. Natural colonisation by river species is also very unlikely because the outfall of the overflow ditch is located well above the water level of the River Seiont so that there is no route for fish to arrive along the overflow ditch.

9.7.53 Since early 2016 the Applicant has maintained a daily presence on the site. While there is an unofficial path worn close to the eastern boundary of the quarry which is in regular use, there has been no observations of people descending into the quarry bowl and attempting to fish in the lake.

Badgers

9.7.54 The Cofnod data search did not provide any records of badger within 1km of the Site. A badger walkover survey of the Quarry Site was carried out in November 2015. No signs of badger activity were observed on the Site, and no badger setts were located. Whilst the occasional presence of badger on the Site cannot be ruled out, there were no setts identified and therefore badgers do not present a constraint on the proposed development activities. Although protected under the Protection of Badgers Act 1992, this protection is afforded the badger for animal welfare reasons rather than the species' conservation status. Badgers are common throughout rural Wales.

Reptiles

9.7.55 The Cofnod data search provided recent records of the reptiles common lizard and slow worm approximately 500m to the north of the Site. Lizards are found within habitats including heathlands, particularly in association with linear features such as dry stone walls that offer shelter. Slow worms are found in a range of habitats. The open mosaic habitats and brick piles present on the Quarry Site provide suitable cover, basking habitat and hibernation habitat for common lizard and slow worm.

Hazel Dormouse

9.7.56 Dormouse habitat assessments and hedgerow surveys were carried out within 50m of the proposed Caernarfon Bypass in May 2015. All of the woodlands and hedgerows on the Seiont Quarry Site were covered by this assessment.

9.7.57 All of the woodland areas and hedgerows on and adjacent to the Site were assessed as 'Category D' – sub-optimal for dormice, suitable only for dispersal.

9.7.58 On this basis, it is assumed that dormice are not present on the Site and this species is therefore scoped out of further assessment.

Wild Birds

9.7.59 A full list of all species recorded during ornithological surveys can be found in Appendix 9.3. Figure 9.3 presents the results of the breeding bird surveys.

9.7.60 Breeding bird walkover surveys were undertaken for the proposed Caernarfon Bypass scheme between April and June 2015, and covered a large part of the Site.

9.7.61 These surveys recorded a total of 17 bird species on the Site. Two Welsh Species of Principal Importance¹⁹ were recorded as being present on the Site: herring gull *Larus argentatus* (recorded present on the water-filled quarry sump) and song thrush *Turdus philomelos* (recorded as present in two locations on Site). Several other Birds of Conservation Concern (BoCC) (Eaton et al., 2015)²⁰ were also present on the Site. Amber listed species recorded included: lesser black-backed gull *Larus fuscus*, mallard *Anas platyrhynchos*, swallow *Hirundo rustica* and tufted duck *Aythya fuligula*.

9.7.62 In addition, a total of 35 species were present within the 500m buffer of the Site boundary. These included the Welsh Species of Principal Importance bullfinch *Pyrrhula pyrrhulam*, dunnock *Prunella modularis* and house sparrow *Passer domesticus*, the BoCC red listed grey wagtail *Motacilla cinerea* (present on the River Seiont 1.7km upstream from the Site) and mistle thrush *Turdus viscivorus*, and the BoCC amber listed common whitethroat *Sylvia communis*, dipper *Cinclus cinclus* (present on the River Seiont 1.7km upstream from the Site) and willow warbler *Phylloscopus trochilus*.

9.7.63 In addition to the above results, the consultation response received from the Gwynedd Senior Biodiversity Officer referenced sightings of the Welsh SPI species skylark *Alauda arvensis* and bullfinch on the Site and also previous records of the SPI marsh tit *Poecile palustris* on the Site. The Cofnod data search also provided a recent record of the Schedule 1 protected species barn owl *Tyto alba* approximately 800m east of the site, a 2005 record of kingfisher *Alcedo atthis* 800m downstream of the Site on the River Seiont, and recent records of the SPI starling *Sturnus vulgaris*.

¹⁹ Through inclusion in the list generated in accordance with Section 42 of the Natural Environment and Rural Communities (NERC) Act, 2006.

²⁰ Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015). Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746.

9.8 Evaluation of Ecological Features

Designated Sites

- 9.8.1 Designated sites are assigned a value which corresponds with their designation. The internationally designated sites (SACs) are assessed as being of **international** conservation value. The nationally designated sites (SSSIs) are assessed as being of **national** conservation value. The non-statutory locally designated sites (LWSs) are assessed as being of **local** conservation value.

Habitats

- 9.8.2 One habitat recorded on the Site represents a Welsh Habitats of Principal Importance²¹ (HPI): open mosaic habitats on previously developed land. Two other habitats near to the Site boundary are also HPI: hedgerows to the north of the quarry, and the River Seiont which runs adjacent to large sections of the Site boundary. River corridors are also covered by a Habitat Action Plan in the Gwynedd Local Biodiversity Action Plan.
- 9.8.3 The river corridor habitat of the River Seiont adjacent to the Site is Welsh HPI, connecting the habitats upstream and downstream. River corridors are also covered by a Habitat Action Plan in the Gwynedd Local Biodiversity Action Plan. On this basis it is assessed as being of county conservation value.
- 9.8.4 The ‘open mosaic habitat on previously developed land’ is a Habitat of Principal Importance which comprises of a number of the above described Phase 1 habitat types, being by nature a mosaic of different habitats. It therefore includes the above described quarry and ephemeral / short perennial vegetation, the edges of the quarry sump, the wet ditch, the hardstanding, quarry habitat and scrub. These habitats in isolation may not necessarily have any intrinsic nature conservation value. However, when linked as a mosaic of habitats they have greater value. ‘Open mosaic habitat on previously developed land’ is not a common habitat within the wider area. One candidate Local Wildlife Site within 1km of the Quarry Site, Peblig Graveyard, comprises 1.6ha of scrub and open mosaic habitat of previously developed land. As the open mosaic habitat present on the Quarry Site has not been listed as a candidate LWS, this habitat is assessed as being a feature of local conservation value.
- 9.8.5 The sump in the centre of the Site is assessed as being a feature of local conservation value.

²¹ Through inclusion in the list generated in accordance with Section 42 of the Natural Environment and Rural Communities (NERC) Act, 2006.

- 9.8.6 The areas of semi-improved neutral grassland on the Site are assessed as being of **local** conservation value. Nine of the 18 candidate Local Wildlife Sites within 1km of the Site comprise areas of semi-improved neutral grassland, so it is obviously a valued but common habitat within the local area.
- 9.8.7 The dry ditch present to the north of the quarry and the wet ditch connected to the quarry sump were considered to be of some value in the context of the Site but not more widely. They were therefore assessed as being features of less than local conservation value.
- 9.8.8 The very small areas of semi-natural broadleaved woodland and plantation woodland present within the Site boundary are of value within the context of the Site, however, given the large areas of mature broadleaved woodland adjacent to the Site and within the wider area, these onsite habitats have been assessed as being a feature of less than local conservation value, being of some value in the context of the Site but not more widely.
- 9.8.9 The areas of improved grassland and poor semi-improved grassland have been assessed as being a feature of less than local conservation value, being common within the wider area.
- 9.8.10 The remaining habitats recorded within the Site were common or widespread habitats and have therefore been assessed as being of less than local nature conservation value.

Bats

- 9.8.11 Surveys have recorded several features in proximity to the Site providing roosting potential for bats. These are assessed below, with the assessment process based on the framework for valuing bat roosts developed by Wray et al. (2010)²².
- 9.8.12 There is one known bat roost in proximity to the Site (approximately 30m from the site boundary), a lesser horseshoe hibernation roost with a maximum known count of 23 bats, within the basement of an abandoned old building north of the brickyard. Lesser horseshoes are categorised by Wray et al. (2010) as a 'rarer' species, and small numbers of hibernating bats of common or rarer species are evaluated as being features of county ecological value.
- 9.8.13 It is assumed that the bat boxes present on trees along the river Seiont adjacent to the site are likely to be intermittently used by individuals of all crevice-dwelling species known to be present on the site. Common and soprano pipistrelles are categorised as 'common species', and brown long-eared bat as a 'rarer' species. Roost of individual bats of rarer or rarest species are evaluated by Wray et al. (2010)

²² Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. (2010) 'Valuing Bats in Ecological Impact Assessment'. *In Practice*, December 2010, p23. Institute of Ecology and Environmental Management.

as being features of county ecological value. However, given the context of the Site, in a rural setting with numerous buildings likely to provide suitable roosting spaces for brown long-eared bats (Cofnod records show three roosts present within 1km of the Site), it is considered that an assessment of local ecological value is more appropriate for these bat boxes.

- 9.8.14 Other features on the Site with noted potential to support roosting bats include the small section of broadleaved woodland within the Site boundary north of the quarry, and the trees along the banks of the River Seiont. Given the large areas of broadleaved woodland present adjacent to the Site and within the local area generally, these woodland features are evaluated as being features of local ecological value.
- 9.8.15 The foraging habitat and commuting routes available on the Site have been assessed as being of local value for the 'rarer' species foraging on the Site (lesser horseshoe and brown long-eared bat) and of local value for the 'common' species foraging on the Site (common and soprano pipistrelles). By comparison, the foraging habitat and commuting routes available in the wider area surrounding the Site (the river corridor and large woodland blocks) are of much greater value than those on the Site.

Otter and Water Vole

- 9.8.16 The otter population along the offsite River Seiont corridor is considered to be a feature of local conservation value. However, there is little habitat with potential to support otter within the Site itself. The quarry sump and the wet ditch which connects the sump to the river Seiont do provide corridors suitable for otter movement, however, survey of these did not record any signs of otter activity away from the river corridor and no potential for the presence of otter holts. However, precautionary mitigation will be implemented during construction, in order to ensure compliance with protected species legislation.
- 9.8.17 With no evidence of water vole observed during the walkover survey and with no Cofnod records for the species within 1km of the Site, it is assumed that water vole are not present on the Site and this species is therefore scoped out of further assessment. Any mitigation provided for otter would also protect water vole.

Amphibians

- 9.8.18 As neither the Cofnod data nor the Caernarfon bypass surveys provided records of great crested newts within the vicinity of the Site, it is assumed that this species is not present on the Site and it is therefore scoped out of further assessment. However, it is assumed that there is the potential for some waterbodies on the Site to support other amphibian species. Assuming that this amphibian assemblage, of smooth newt, palmate newt, common frog or common toad, is assessed as being of less than local conservation value, important within the context of the Site but

comprising common and widespread species. Good practice mitigation measures will therefore be employed during works to the sump.

Fish

- 9.8.20 With no record of fish being present in the quarry sump the site is considered to have less than local conservation value and so are scoped out of further assessment. If fish are found to be present before or during works at the quarry appropriate measures will be taken, in accordance with the NRW Fisheries Officer. The NRW response to consultation suggested that the site could be used by eels as a refuge, or as a route for crossing between catchments and so there is further consideration of eels in this assessment with regard to permanent loss of the quarry sump. The European eel is listed on the Environment (Wales) Act 2016 Section 7 list of the living organisms of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales.

Badgers

- 9.8.19 With no records of badger within 1km of the Site and no evidence of badger activity on the Site, the badger population within the Site is considered to have a less than local conservation value. However, it should be noted that if badgers establish any setts prior to construction, appropriate mitigation measures would be required to ensure compliance with the relevant legislation.

Reptiles

- 9.8.20 The Cofnod data search provided recent records of the reptiles common lizard and slow worm within 1km of the Site. The open mosaic habitats and brick piles present on the Quarry Site provide suitable cover, basking habitat and hibernation habitat for common lizard and slow worm. As specific reptile surveys have not been carried out, a precautionary assessment of the reptile population value must be made. Therefore the reptile populations on the Site have been assessed as being of local conservation value. A Reasonable Avoidance Method Statement will be required to implement mitigation measures than prevent any harm to reptiles during the proposed works.

Hazel dormice

- 9.8.21 As surveys found all the woodland areas and hedgerows adjacent to the Site to be sub-optimal for dormice, it is assumed that dormice are not present on the Site and this species is therefore scoped out of further assessment.

Breeding Birds

- 9.8.22 The Welsh Species of Principal Importance herring gull and song thrush were present on the Site. As these records were of presence only, rather than breeding, the

populations of these species on the Site are assessed as being of less than local conservation value.

- 9.8.23 The Welsh Species of Principal Importance bullfinch, marsh tit and skylark are known to have been present on the Site, which may be used for breeding by these species, and so these populations are assessed as being of local conservation value.
- 9.8.24 The BoCC red listed species lesser black-backed gull, mallard, swallow and tufted duck were present on the Site. As these records were of presence only, rather than breeding, their populations on the Site are assessed as being of less than local conservation value.
- 9.8.25 Species known to be using the River Seiont corridor adjacent to the Site include the Schedule 1 protected species kingfisher, the BoCC red listed grey wagtail and the BoCC amber listed dipper. As the populations of these species are restricted to the river corridor, their populations are assessed as being of local conservation value.
- 9.8.26 The Schedule 1 protected species barn owl is known to be present in the local area, however, with no potential roost sites on the Site, the population on the Site is assessed as being of less than local conservation value.

9.9 Assessment of potential Impacts and mitigation

Proposed Development

- 9.9.1 The proposed development relates to the use of the Seiont Brickworks and Quarry as a temporary construction compound and offices to service the construction of the A487 Caernarfon and Bontnewydd Bypass.
- 9.9.2 However, simultaneous with this, activities will be carried out under the existing ROMP consent that are not part of the proposed development. These existing activities are part of the dynamic system of change associated with existing permissions for mineral extraction. This dynamic baseline is the background against which this new proposed development are considered. These activities include the following:
- Further mineral extraction from the existing slopes of the quarry and the large mound to the north. In addition, reserves of bricks and prepared raw brick clay remain on the Site in a number of locations.
 - The draining of the quarry sump is necessary for safe continued extraction of clay and so would take place in parallel with preparation of the bypass construction compound, with water pumped out over a period of time until the quarry sump was empty. Thus, the baseline conditions at the time that work on the bypass construction compound commences would be quite

different from current conditions, as the sump would already have been drained.

- 9.9.3 The details of the proposed development are described in detail in Chapter 2: Description of the Project, but in summary; the site of the former brick factory and the surrounding brick storage yard will provide staff accommodation, welfare car parking, and a bunded fuel store and plant maintenance area. A secure boundary fence will be formed around critical areas using temporary fencing. Two haul routes will be constructed ascending the sides of the quarry to facilitate access to the bypass construction site. A haul road running north from the quarry will join the Bypass site to the north-east of the quarry site for the period of construction only.
- 9.9.4 The location at which the quarry haul road joins the Bypass construction site was changed in December 2016 following comments from Natural Resources Wales (NRW). In the Pre-Application Consultation, NRW noted that the location at which the access road joined the Bypass was a location at which a 'bat underpass culvert' had been proposed in the Bypass bat mitigation plan. In order to avoid any disturbance to bats using this commuting route and the proposed underpass during construction, the route of the quarry haul road has been modified to join the bypass site at least 20m south of the culvert location. This will ensure that the hedgerows around the culvert are not affected by the construction of the haul road. On completion of the bypass the haul road will be closed off and no access to the public road from the quarry will be possible
- 9.9.5 The brickyard built on the peninsular contained by a meander in the River Seiont will be excavated down to a level of 9m AOD to form a basin, leaving the river bank, revetment wall and riverside trees virtually unchanged. A shallow water body will also be created in the centre of the excavated area.
- 9.9.6 Following the completion of the bypass, restoration works would be carried out in the quarry. Some of the soils from the road construction, which would not be suitable for construction fill but are appropriate for establishing natural vegetation, would be brought from the bypass for use in the restoration works. Progressive rehabilitation and landscaping of the quarry will also continue for several years and includes seeding and planting of grassland, scrub and woodland areas for the purpose of visual screening and nature conservation. A wide ditch with larger waterbodies will be formed around the floor of the quarry to intercept water from the slopes and to provide shallow water habitat.

Generic Impacts

- 9.9.7 Some of the impacts predicted as a result of the proposed development can be considered generic impacts which are typically associated with a development of this nature. Some of the impacts will be associated with the existing minerals planning

permission. An ecological feature may be affected by several of these generic impacts or just one. A summary description of these impacts is presented in Table 9.10. In addition, the presence of these impacts in the construction and/or the operational phase of the project are indicated.

Table 9.10 Generic Impact on Habitats and Species

Generic Impacts	Effects on Habitat Features/Species on Site
Direct habitat loss	Direct habitat loss as a result of the land take of the development.
Fragmentation of habitat areas	Direct habitat loss may result in habitat fragmentation, due to the placement of barriers, e.g. access roads, bisecting habitat areas and potentially creating a barrier to the movement of species recorded as present and affecting the integrity of the habitat.
Damage and disturbance to habitats and species	Temporary damage and disturbance to nearby habitats and species for the duration of the works, as a direct result of activities such as earthworks and vehicle movements.
Displacement of species	Potential for the displacement of species through habitat loss and increased levels of disturbance.
Dust deposition on sensitive habitats or sedimentation	Construction, excavation and operational works may have the potential to cause additional dust deposition or sedimentation, which may affect sensitive habitats nearby (if any), depending in the direction of the prevailing winds and presence of watercourses/waterbodies.
Light pollution of habitats used by species	The proposed development may involve additional lighting such as around the site compound which could alter the behaviour of nocturnal species.

Key Ecological Features to be assessed

- 9.9.8 Table 9.11a summarises the conservation value of all the ecological features discussed in section 4, which were assessed as being of local conservation value or greater. For each feature, the decision to scope in or out of further assessment is explained.
- 9.9.9 Those features which were considered to be of less than local value are automatically scoped out of further consideration in this assessment and therefore not included below, however, good practice mitigation may still be recommended as appropriate.

Table 9.11a Summary of Ecological Features: Sites and habitats

Ecological Feature or Feature (Excluding Birds)	Nature Conservation Value	Scoped in / out of further assessment	Reason
Designated Sites			
Menai Strait and Conwy Bay SAC	International	Out	1.5km distant, designation for Annex I habitats only. Not within area of impact.
Abermenai to Aberffraw Dunes SAC	International	Out	4.5km distant, designation for Annex 1 habitats and Annex II plant species only. Not within area of impact.
Glannau Mon: Cors heli / Anglesey Coast Saltmarsh SAC	International	Out	4.5km distant, designation for Annex 1 habitats only. Not within area of impact.
Glynllifon SAC	International	Out	5.1km distant, not within area of impact.
Afon Gwyrfai Llyn Cwellyn SSSI	National	Out	1.4km distant, but designation relating to separate catchment not within area of impact.
Pant Cae Haidd SSSI	National	Out	2.2km distant, designation for habitat features only. Not within area of impact.
Y Foryd SSSI	National	Out	3.5km distant, listed for supporting a nationally important wintering population of wigeon but not within area of impact.
Newborough Warren: Ynyslanddwyn SSSI	National	Out	4.5km distant, designation for habitat features only. Not within area of impact.
Glynllifon SSSI	National	Out	5.1km distant, not within area of impact.
Rhyddallt-bach cLWS	Local	In	Partly within area of impact (brickyard and woodland edge).
17 other Gwynedd cLWS	Local	Out	Offsite and of interest for habitat value. Not within area of impact.
Habitats within the Site			
Open mosaic habitat	Local	In	Within area of impact.
River Seiont	County	In	Within area of impact.

Ecological Feature or Feature (Excluding Birds)	Nature Conservation Value	Scoped in / out of further assessment	Reason
Quarry sump	Local	In	Within area of impact.
Semi-improved neutral grassland	Local	In	Within area of impact.

Table 9.11b Summary of Ecological Features: Species

Ecological Feature or Feature (Excluding Birds)	Nature Conservation Value	Scoped in / out of further assessment	Reason
Fauna			
Lesser horseshoe bats (roosting)	County	In	Within area of impact.
Lesser horseshoe bats (foraging)	Local	In	Within area of impact.
Common and soprano pipistrelle bats (roosting)	Local	In	Within area of impact.
Common and soprano pipistrelle bats (foraging)	Local	In	Within area of impact.
Brown long eared bats (roosting)	Local	In	Within area of impact.
Brown long-eared bats (foraging)	Local	In	Within area of impact.
Otter	Local	In	Within area of impact.
Eel	Local	In	Potentially within area of impact
Reptile populations	Local	In	Within area of impact.
Bullfinch	Local	In	Within area of impact.
Dipper	Local	In	Within area of impact.
Grey wagtail	Local	In	Within area of impact.
Kingfisher	Local	In	Within area of impact.
Marsh tit	Local	In	Within area of impact.
Skylark	Local	In	Within area of impact.

9.9.10 Of the ecological features considered to be of local or higher nature conservation value listed in Table 9.11a and 9.11b, 19 were scoped in for further assessment. The character of the impacts on these features are assessed here with reference to the type of impacts detailed in Table 9.12. The impacts on each feature are assessed in terms of their magnitude and overall significance using the matrices set out in Table 9.3 and 9.4.

- 9.9.11 The remaining nine ecological features which were scoped out of further assessment were all statutory designated sites which are considered to be outside the area of impact of these proposed works. These sites primary designations are largely related to plants and habitats. As the Site is not hydraulically connected to these sites and too far away for impacts from dust deposition to affect sensitive plants and bryophytes, no further consideration is necessary. Those sites that are designated for mobile species (widgeon and lesser horseshoe bat) are sufficient distant from the site that they are unlikely to be significantly dependant on the Site or significantly impacted by the construction compound activities.

Impacts on Designated Sites

- 9.9.12 The Rhyddallt-bach candidate LWS is partly within the area of impact. Whilst most of the 13.6ha of the LWS is outside the Site boundary, the LWS does include the former brickyard, likely because of the treeline along the river bank around the brickyard. There is no proposed removal of trees here, however there are some potential impacts associated with construction activities in close proximity to the trees. Standard good practice mitigation measures, such as exclusion of plant from within the root protection zones, will therefore be implemented. As such, impacts of the development are not likely to significantly affect the integrity of the cLWS. It is therefore considered that there would be a barely perceptible impact on this feature of local value resulting in a no significant impact.

Impacts on Habitats

- 9.9.13 The main impact on the habitats within the Site is direct loss. Much of the habitat loss is consented under existing ROMP permissions, but the proposed development will cause the loss of further habitat areas within the Site.

Permanent habitat loss associated with the current proposals

- 9.9.14 Whilst the draining of the sump (temporary habitat loss) and the further extraction of minerals from within the existing quarry boundary fall under the existing ROMP consents and therefore are not part of the current proposal, the filling of the quarry sump and permanent loss of the quarry sump is not part of the existing permissions. The restoration plans previously agreed under the ROMP review included restoration of the quarry to provide a deep water pool with steep sides, to be used as a recreational lake. However, as this new restoration proposal includes the infilling of the quarry sump, there is no plan to replace the deep pool. There are plans to provide replacement shallow water habitat.
- 9.9.15 The loss of the quarry sump represents an impact of high magnitude as the complete loss of the habitat is a significant effect within the site context and the habitat is not replaceable on a like-for-like basis. Whilst these losses cannot be mitigated,

proposals are provided below for compensation of the loss through habitat creation in the restoration phase of the project. This habitat loss is an impact of high magnitude on a feature of local value resulting in a minor significant impact.

- 9.9.16 The restoration of some flood plain function on the peninsular of the River Seiont will result in the permanent loss of the 0.87 ha of open mosaic habitat, representing a circa 8.5% loss of this habitat across the whole Site. Whilst this loss may be compounded by the cumulative effects of the ROMP-permitted quarrying activities, those ROMP losses will be partial and temporary in nature, limited to the period of active work in the construction compound. In the restoration phase of the project, this habitat will be re-instated across much of the quarry Site. The loss is therefore assessed as being an impact of medium magnitude as the loss will produce a noticeable effect on the nature conservation status of the habitat, but will not threaten the long-term integrity of the system, being replaceable and / or reversible over time. An impact of medium magnitude on a feature of local value results in a minor significant impact.

Habitat loss associated with existing ROMP permissions

- 9.9.17 Other areas of permanent habitat loss associated with mineral extraction within the quarry boundary are not assessed here as those activities are covered by existing ROMP permissions. For example, the loss of an area of semi-improved neutral grassland, whilst being within the area of impact of these proposals, will be a direct result of the permitted mineral extraction activities. As such, there will be no impact on the semi-improved neutral grassland habitat as a result of the additional construction compound activities.

Indirect Impacts on Habitats

- 9.9.18 Proposed works which go beyond the activities covered by the existing ROMP permissions and have the potential to indirectly impact the habitats present on the site are limited to the proposed modifications to the brickyard. The excavation of the brickyard to restore floodplain function area has the potential to impact the River Seiont and the tree line along the river bank. Likely indirect impacts on the riverside trees would be associated with construction activities in close proximity to the trees, and therefore an Arboricultural Method Statement will be developed to ensure good practice mitigation measures, such as the protection of root protection zones, are followed. Likely indirect impacts on the river include increased sedimentation and water pollution. This could represent an impact of low magnitude on a feature of county value resulting in a minor significant impact. For this reason, standard good practice mitigation measures for pollution and sedimentation prevention will be incorporated into the construction method statement and implemented for all work in proximity to watercourses. Provided this mitigation is implemented, the residual

impact will be of barely perceptible magnitude on a feature of county value, resulting in no significant impact.

Impacts on Bats

- 9.9.19 The lesser horseshoe bat hibernation roost located adjacent to the site on the edge of the brickyard will not be modified by the proposals and all works to the brickyard will be more than 20m from the building. However, if works to the brickyard were carried out over the winter period, noise from the construction works could cause disturbance to the hibernating bats. It is considered that this could represent an impact of medium magnitude on a feature of county ecological value resulting in a moderate significant impact. As a result, mitigation measures will be required which will be incorporated into working method statements. These will include: clear marking of the 20m buffer of the roost location so as to ensure that no works are carried out close to the roost; limiting construction activities (specifically digging into the ground) in the brickyard to the period between April and September (inclusive) so as to avoid disturbance to hibernating bats. Provided this mitigation is implemented, the residual impact should be of barely perceptible magnitude on a feature of county value, resulting in no significant impact.
- 9.9.20 The associated lesser horseshoe foraging habitat and commuting routes available on the Site being of local value. The proposed works will not result in any modification to the river corridor, which will be a key foraging and commuting route. It is therefore considered that there will be no impact on a feature of local ecological value resulting in no significant impact.
- 9.9.21 The bat boxes present on trees along the river Seiont were evaluated as being of local ecological value. Other broadleaved woodland blocks and individual broadleaved trees with noted potential to support roosting bats on the Site were also evaluated as being features of local ecological value. The proposed work will not result in the loss of any trees in the brickyard, however, indirect impacts on these potential roosting habitats include disturbance due to noise and lighting associated with the proposed works. It is considered that these factors represent an impact of low magnitude on a feature of local ecological value resulting in a minor significant impact. As a result, some good practice mitigation measures will be implemented. If the site design identifies individual trees to be removed, a pre-works bat survey will be carried out of the individual trees to ensure that roosting bats will not be affected. A lighting strategy will be implemented in order to ensure that artificial lighting is kept to a minimum and directed away from habitat features such as hedgerows and woodland edges which may be used by bats. The lighting strategy will adopt the

following principles, as agreed in a previous planning application²³ for the small site compound currently in place:

- avoidance of the use of external lighting when and where possible;
- minimisation of the period for which external lighting is on; and
- directional control of lighting to minimise spillage beyond the site compound area.

Provided this mitigation is implemented, the residual impact should be of barely perceptible magnitude on a feature of local value, resulting in no significant impact.

9.9.22 The bat foraging habitat and commuting routes available on the Site have been assessed as being of local value. The only loss of foraging habitat will be in relation to the infilling of the quarry sump, which is likely to be frequently used by foraging bats. However, there are many other habitats nearby which provide suitable foraging for bats, including the River Seiont corridor. Potential indirect impacts on the foraging habitats of the Site include disturbance due to lighting associated with the proposed works. Provided the mitigation described in paragraph 5.6.3 above is implemented, it is considered that these factors represent an impact of barely perceptible magnitude on a feature of local ecological value resulting in a no significant impact.

Impacts on Otter

9.9.23 The otter population along the River Seiont corridor is considered to be a feature of local conservation value. The proposed works will not result in any permanent loss of habitat known to be used by otter (the River Seiont) or with the potential to be used by otter (the on-site wet ditch which connects the sump to the river). However, potential indirect impacts on these habitats include disturbance due to noise, lighting, pollution and sedimentation associated with the proposed works. These factors could represent an impact of low magnitude on a feature of local ecological value resulting in a minor significant impact, however, provided adequate mitigation measures are implemented to reduce the night time impacts of lighting and noise, the residual impact will be of barely perceptible magnitude, resulting in no significant impact.

Impacts on Reptiles

9.9.24 Works to modify areas of habitat suitable for use by reptiles have the potential to disturb or harm reptile populations. These habitats are present in areas, such as the brickyard, and include brick or stone walls features. It is considered that this

²³ Letter from I.G. Richard of Richards, Moorehead and Laing to Idwal Williams of Gwynedd Planning Services, dated 4th November 2015, in relation to planning application reference C15/0977/19/LL

represents an impact of low magnitude on a feature of local ecological value resulting in a minor significant impact. As a result, these such works will be subject to a mitigation method statement, with measures based around removing these habitat features during the active season for reptiles (approximately April to October) and placing the rock in suitable habitat nearby, so as to retain hibernation habitat of similar kind nearby on the Site. Provided this mitigation is implemented, the residual impact should be of barely perceptible magnitude on a feature of local value, resulting in no significant impact.

Impacts on Birds

- 9.9.25 The species bullfinch, dipper, grey wagtail, kingfisher, marsh tit and skylark were identified as ecological features of local value. The new proposals would not result in any direct habitat loss that would affect these species. Potential indirect impacts could include disturbance due to noise, vibration and lighting associated with the proposed works. It is considered that these factors represent an impact of barely perceptible magnitude on a feature of local ecological value resulting in a no significant impact.

Impact on European Eel

- 9.9.26 The permanent loss of the quarry sump could have an impact on European Eel if the species is present. The proposed mitigation scheme, in the form of shallow waterbodies will provide good replacement habitat. The loss of the quarry sump would have a potential effect of medium magnitude on a species of county value, which would be an impact of Moderate Significance.

Summary of potential impacts

- 9.9.26 For those ecological features for which an impact is predicted as a result of the new proposals, the impacts are summarised in Table 9.12.
- 9.9.27 All residual impacts have been assessed as being of minor or no significance. The two minor significant impacts are related to habitat loss for which no mitigation is possible. However, proposals are provided below for compensation of the loss through habitat creation in the restoration phase of the project.

9.10 Proposed mitigation, enhancement and restoration

Implementation of Mitigation Proposals

- 9.10.1 The above described mitigation measures will be written in to the Construction Method Statement for the works, the specifics of which would be agreed with Gwynedd LPA prior to commencement of works. In summary, this includes mitigation measures for the following features:

- **River corridor habitat:** standard good practice mitigation measures for pollution and sedimentation prevention will be implemented for all work in proximity to watercourses.
- **Trees:** an Arboricultural Method Statement will be developed to ensure good practice mitigation measures, such as the protection of root protection zones, are followed.
- **Lesser horseshoe bat hibernation roost:** mitigation measures will be incorporated into working method statements, including clear marking of a 20m buffer of the roost location and limiting construction activities (specifically digging into the ground) in the brickyard to the period between April and September (inclusive) so as to avoid disturbance to hibernating bats.
- **Bat foraging and roosting habitats:** mitigation measures will be incorporated into working method statements, including a pre-works bat survey of any trees which require removal, and a lighting strategy. The lighting strategy will ensure that artificial lighting is kept to a minimum and directed away from habitat features such as hedgerows and woodland edges which may be used by bats, and will adopt the following principles:
 - avoidance of the use of external lighting when and where possible;
 - minimisation of the period for which external lighting is on; and
 - directional control of lighting to minimise spillage beyond the Site.
- **Otter:** the mitigation measures detailed above regarding the lighting strategy and the prevention of pollution and sedimentation of the river, will also protect the otter population.
- **Reptiles:** mitigation measures will be incorporated into working method statements, with measures based around removing any habitat features likely to be used by reptiles during the reptile active season (approximately April to October) and placing the rock in suitable habitat nearby, so as to retain hibernation habitat of similar kind nearby on the Site.
- **Amphibians:** good practice mitigation measures will be incorporated into working method statements for works to the sump.
- **European eel:** replacement shallow water habitat to be provided as mitigation for the permanent loss of the sump.

9.10.2 In addition to the above, and due to the presence on the Site of an invasive species, *Buddleia*, a biosecurity risk assessment will be required as part of the method statement to ensure this species is not spread further.

Table 9.12 Summary of Ecological Impact Assessment

Ecological Feature or Feature	Feature Value	Nature of Impact	Impact Magnitude	Impact Significance	Residual Impact Significance
Designated Sites					
Rhyddallt-bach candidate LWS	Local	Indirect impacts from proximity of construction activities	Barely perceptible	None	None
Habitats					
Open mosaic habitat	Local	Loss of 8% of total habitat on site	Medium	Minor	Minor
Quarry sump	Local	Total habitat loss	High	Minor	Minor
River Seiont	County	Indirect impacts: sedimentation and pollution	Low	Minor	None
Fauna					
Lesser horseshoe bats (roosting)	County	Disturbance due to noise, and lighting associated with the proposed brickyard works	Medium	Moderate	None
Other bat species (roosting) All bat species (foraging)	Local	Loss of the sump (foraging habitat) and disturbance as above	Low	Minor	None
Otter	Local	Disturbance due to noise, lighting, pollution and sedimentation associated with works	Low	Minor	None
Reptile populations	Local	Disturbance / harm caused during removal of basking / hibernation habitat	Low	Minor	None
Ornithological IEFs	Local	Disturbance as above	Barely perceptible	None	None
Fish (European Eel)	County	Permanent loss of water body	Medium	Moderate	None

9.11 Restoration Proposals

9.11.1 Agreed restoration proposals which were part of the quarry ROMP review provided for restoration of the site through stabilising and re-planting the quarry slopes and maintaining the quarry sump.

- 9.11.2 As the current proposal includes the permanent loss of the sump, replacement water features will be created at the restoration stage. In particular, a ditch or linear water body with pools and weirs, providing shallow water habitats, will be created around the perimeter of the filled sump to catch surface water draining off the restored slopes. This will provide replacement standing water habitat for use by birds, invertebrates and amphibians, and will also benefit European Eels. It is also proposed to create a permanent shallow waterbody where the brickyard is currently located across the river. This will also create a valuable standing water habitat. More detail of the restoration scheme and the habitat it would provide is set out in Section 2.5.
- 9.11.3 Rather than re-plant the quarry slopes entirely with woodland, the proposal is to allow space for the habitat of 'open mosaic habitat' (OMH) to re-establish post-project completion by selected planting and natural regeneration. Whilst some tree planting is useful for visual screening on the upper slopes of the restored quarry, OMH is the rarer and more valuable habitat in the local context and will be incorporated into the restoration plan.
- 9.11.4 The definition and criterion for this habitat, as provided by the JNCC (2011)²⁴, lists the following characteristics:
- at least 0.25ha in size;
 - known history of disturbance at the site;
 - vegetation comprises early successional communities consisting of stress-tolerant species indicative of low nutrient status or drought;
 - areas of un-vegetated, loose bare substrate and pools; and
 - habitats showing spatial variation and a range of plant communities in transition with one another.
- 9.11.5 The value of this habitat is in the rare plants, mosses, lichens and invertebrates, especially bees, wasps and beetles, which the habitat supports. Between 12% and 15% of all nationally-rare and nationally-scarce insects are recorded from OMH sites including 30 UK Biodiversity Action Plan invertebrate species (Lush *et al.*, 2013)²⁵. Specific habitat features are incorporated into the proposed restoration plans including:
- early successional habitats and ruderal vegetation;

²⁴ Joint Nature Conservation Committee (2011) UK Biodiversity Action Plan Priority Habitat Descriptions UK. Available from http://jncc.defra.gov.uk/PDF/UKBAP_PriorityHabitatDesc-Rev2011.pdf

²⁵ Lush, M.J., Kirby, P. and Shepherd, P. (2013) Open Mosaic Habitat Survey Handbook

- more established habitats such as grassland and woodland;
- patches of dense scrub and patches of scattered scrub;
- ponds, ditches, ephemeral and permanent wet features; and
- bare ground and rock piles.

9.11.6 The above restoration proposals will be written into a Habitat Creation and Management Plan, the specifics of which will be agreed with Gwynedd LPA.

9.12 Cumulative impact assessment

9.12.1 There may be cumulative impacts on flora and fauna if a number of developments are occurring within an area. The greatest theoretical risk is of significant impacts arising on species and habitats of national or international importance. Current guidance suggests that the highest priority for cumulative impact assessment is for species and habitats that are declining and/or not in favourable conservation status and that species and habitats of very high conservation importance may be targeted for cumulative assessments (SNH, 2005).

9.12.2 Other local developments which are considered to have the potential to cause cumulative impacts include the A487 Caernarfon and Bontnewydd Bypass scheme this scheme is currently being designed. An ES and Draft Orders will be published shortly, in accordance with the Highways Act, and will then be considered at a Public Inquiry).

9.12.3 Only two significant residual impacts were identified in Table 8.11 above:

- permanent loss of the deep water habitat provided by the flooded quarry sump;
- 8% of the open mosaic habitat within the quarry were assessed as having a minor residual impact.

Therefore, only these two ecological features need to be considered in this cumulative impact assessment. However, on a precautionary basis the statutory protected species known to be present on or adjacent to the Site (bats and otter) are also considered.

9.12.4 As the Caernarfon Bypass Environmental Statement (ES) did not identify any impacts on either sump or open mosaic habitats as a result of the construction or operation of the development, no cumulative impacts on these habitats are predicted.

9.12.5 In relation to bats, the Caernarfon Bypass ES identified a 'slight adverse' residual impact on commuting and foraging bats in the short term during both the construction phase and the initial operational phase of the project. This was due to

the loss of commuting routes and foraging areas resulting from initial site clearance, and then “continued fragmentation of commuting routes and associated prevention of access to foraging areas through ‘barrier effect’ created by the operational Scheme”²⁶. In both cases, this impact was considered to decrease to neutral in the medium to long term (within 10 years) as replacement planting matured. The proposed use of the Seiont Quarry Site as a construction compound is not predicted to have a significant residual impact on commuting or foraging bats, and the proposal will not result in the loss of any treelines or woodland areas used by bats. Provided the mitigation measures are implemented as described in sections 5 and 6 above, the simultaneous operation of this Site alongside the proposed bypass scheme will not result in any cumulative impacts on bats.

- 9.12.6 The Caernarfon Bypass ES did not identify any significant residual impacts on otters as a result of the construction or operation of the development, and therefore no cumulative impacts on this species are predicted.

9.13 Summary and Conclusions

- 9.13.1 The application Site does not benefit from any form of statutory nature conservation designation, and no statutory designated areas for nature conservation value are close enough to be affected by the proposed development. One non-statutory site, Rhyddallt-bach candidate Local Wildlife Site, is partly within the Site boundary, however, no significant residual impact is predicted.
- 9.13.2 Field survey identified a range of habitats present on the Site. Two Welsh Habitats of Principal Importance were recorded within the area of impact: open mosaic habitats on previously developed land, and the river corridor habitat of the River Seiont. No residual impact is predicted on the river corridor habitat, and only a minor significant impact on the open mosaic habitat. Post-development restoration proposals include the re-establishment of open mosaic habitat through selected planting and natural regeneration. As this open mosaic habitat is one which is characteristic of land which has been previously disturbed through development, this temporary loss followed by later re-establishment is not a significant change from the initial conditions on which the habitat developed.
- 9.13.3 Four species of bat (common pipistrelle, soprano pipistrelle, brown long-eared bat and lesser horseshoe bat) have been recorded foraging within the Site area, with noctule and *Myotis* bats recorded within the wider area. A small lesser horseshoe bat

²⁶ Taken from p.117 of the draft version of Chapter 8 of the Environmental Statement Volume 1 prepared for the Welsh Government by Parsons Brinkerhoff (PB) in December 2015 (report reference 3513874-PB-RP-EN-00001).

hibernation roost is present in the basement of a building adjacent to the Site and several bat boxes are present on the Site boundary which provide roosting opportunities for crevice-dwelling bats. The table below summarises the potential impacts of the proposals on bats and the mitigation measures which will be implemented to ensure that works will not have an adverse impact on bats. Provided mitigation measures are implemented, no significant residual impacts are predicted on these species.

Table 9.13: Summary of potential impacts on bats

Feature	Potential Impact	Mitigation	Residual Impact
Lesser horseshoe bat hibernation roost (OFF SITE)	Disturbance to roosting bats resulting from noise and vibration from the construction works	Clear marking of the 20m buffer of the roost location to ensure no works are carried out close to the roost. Limiting construction activities (specifically digging into the ground) in the adjacent brickyard to the period between April and September (inclusive).	Impacts avoided. No significant impact.
Lesser horseshoe foraging habitat and commuting routes immediately associated with the hibernation roost (OFF SITE)	Disturbance due to noise, vibration and lighting associated with the proposed works	No modification to foraging and commuting habitat features. Lighting strategy implemented in order to ensure that artificial lighting is kept to a minimum and directed away from habitat features such as hedgerows and woodland edges which may be used by bats.	Impacts avoided. No significant impact.
Bat boxes on trees along the river Seiont (OFF SITE)	Disturbance due to noise, vibration and lighting associated with the proposed works	No modification to foraging and commuting habitat features. Lighting strategy implemented in order to ensure that artificial lighting is kept to a minimum and directed away from habitat features such as hedgerows and woodland edges which may be used by bats.	Impacts avoided. No significant impact.
Bat foraging habitats on the site: the water-filled quarry sump (ON SITE)	Loss of foraging habitat for common pipistrelle, soprano pipistrelle, noctule and Daubenton's bats	Provision of compensation habitats in the restoration phase of the project.	No significant impact.

Feature	Potential Impact	Mitigation	Residual Impact
Proposed bat 'culvert' underneath the proposed bypass (OFF SITE)	Loss of connecting hedgerow during quarry access track construction. Nocturnal disturbance from traffic using the access road.	The route of the access road was altered to avoid any loss of connecting hedgerows, and minimise any nocturnal disturbance. The access road is likely to have very low levels of traffic, and therefore there would not be any significant levels of nocturnal disturbance as a result of it's' operation.	No significant impact.

- 9.13.4 Otter are present on the River Seiont, adjacent to the Site, however, provided mitigation measures are implemented, no significant residual impacts are predicted on this otter population.
- 9.13.5 The Site does provide good habitat for reptiles however, provided reasonable avoidance measures are implemented, no significant residual impacts are predicted.
- 9.13.6 No badger setts were identified within the Site, but precautionary mitigation will be required during the construction stage of the development.
- 9.13.7 A total of 17 bird species were recorded on the Site, with a further 35 species within 500m of the Site. These included one Schedule 1 species, three Welsh Species of Principal Importance and two species listed on the 'Birds of Conservation Concern' list. There was no significant residual impact on these species.
- 9.13.8 In summary, habitats and species of conservation concern were noted on the Site, however no residual impacts of greater than minor significance are predicted as a result of the proposed development.
- 9.13.9 Cumulative impacts, combining potential impacts of this proposal and other local developments, are not predicted to result in an increase in the significance of impacts on any of the ecological features identified.

10 GEOLOGY AND SOILS

10.1 Introduction

10.1.1 This chapter identifies baseline conditions with reference to soils, geology and potential ground contamination from previous land uses and describes how they may be affected by the development. It sets out the impacts that the construction and operation of the quarry and its associated infrastructure may have and identifies mitigation measures to avoid, reduce or offset any adverse impacts. Specifically, this chapter considers impacts on:

- Site Designation;
- Geology and Geomorphology;
- Minerals;
- Soils;
- Contaminated Land.

10.1.2 The study area is the quarry and land within the same ownership which has been investigated for mineral extraction.

10.1.3 Hydrogeology has been assessed in Chapter 14 Road Drainage and the Water Environment.

10.2 Methodology

10.2.1 Part II A of the Environmental Protection Act (1990), as amended, provides a legislative context for the assessment of contaminated land. Contaminated land for the purpose of Part IIA is defined as '*land which appears to the Local Authority [acting on Statutory Guidance] to be by reasons of substances in, on or under the land that Significant harm is being caused or there is a significant possibility of such harm being caused*': or '*Pollution of Controlled Waters is being, or is likely to be caused*'.

10.2.2 In implementing the proposed development guidance detailed in the following Planning Policy documents will be taken into consideration:

- Planning Policy Wales – Chapter 14;
- Minerals Technical Advice Note (TAN) 1 February 2004; and accompanying Mineral Planning Guidance Notes.
- Biodiversity and Geological Conservation (for Geological RIGS);
- Gwynedd Unitary Development Plan 2001 - 2016

10.2.3 The following legislation has also been considered:

- The Dangerous Substances Directive (78/464/EEC);
- Pollution Prevention and Control Act 1999;
- Environmental Protection Act 1990;
- Wildlife and Countryside Act 1981 (amended 1985) (For Geological SSSI's);
- Control of Pollution Act 1974;
- Contaminated Land Regulations 2000; and
- Anti-Pollution Works Regulations 1999.

Gwynedd UDP

10.2.4 Gwynedd Unitary Development Plan (UDP) includes policies that address geological matters.

POLICY B18 - Protecting Regionally Important Geological/Geomorphological Sites (RIGS), Proposals that are likely to cause significant harm to a Regionally Important Geological/Geomorphological Site (RIGS) will be refused unless the need for the development is more important than the site's value to earth science or the landscape. In cases where a development proposal affects a RIGS, preference will be given to conserving the site in its present condition. However, the explanation also indicates that the views of CCW, now NRW, will be considered.

POLICY B28 - Unstable Land - Proposals on land, or adjacent to land, which is or is likely to be unstable will be refused unless it can be ensured to the satisfaction of the Local Planning Authority:

- that any instability can be overcome by means of an environmentally acceptable design or location, and
- that any instability of the site, or an adjacent site will not cause significant harm to the development, and that the development will not cause significant harm to the stability of the land or adjacent land.

When a development is approved, planning conditions and/or agreements will be used in order to ensure that measures to overcome the problem of instability are satisfactorily in place.

POLICY B30 - Contaminated land or buildings Proposals to develop or reclaim contaminated or potentially contaminated land or buildings in a manner that takes land or buildings from a negative value to a positive value to the environment will be refused unless all the following criteria can be met:

- a detailed report on research into the site (including a risk assessment) is submitted with the planning application in order to establish the nature and extent of any contamination;

- (where there is evidence of contamination) a strategy, consistent with good practice, for removing, reducing or treating the contamination is included with the planning application so that the threat of contamination will not continue following treatment of the site

POLICY C10 - Contribution to the supply of aggregates, in determining applications for the development of sites for aggregate minerals the Council will have regard to current national policy for maintaining a landbank and the guidance contained in Minerals Technical Advice Note MTAN (Wales) 1: Aggregates. The Council will take into account the Regional Technical Statement for Aggregates when it is published.

POLICY C12 - Buffer zones, planning applications for mineral extraction within the buffer zones identified on the Proposals Maps will be refused unless a new buffer zone can be provided to reflect the minimum distances referred to in MTAN 1: Aggregates. A notional buffer zone will be applied to all new planning applications for mineral working in accordance with the minimum distances referred to in MTAN1 : Aggregates, and in cases where the notional buffer zones can not achieve the minimum distances required, developments will be refused. Proposals for sensitive developments as defined by MTAN 1 : Aggregates, within the buffer zones identified on the Proposals Maps and within any notional buffer zones will be refused.

POLICY C13 Aftercare, applications for mineral working will be refused unless a scheme for restoration, aftercare and afteruse, including details of proposed funding is included. Restoration shall be progressive unless it can be demonstrated that this is not practical. The scheme should address the following matters: the existing use of the site, adjoining land uses, the surrounding landscape character, the proposed final landform, the in-situ soil resource, its conservation during site working, and its use in the restoration and afteruse of the site, the potential for natural decolonisation or for enhancing or providing wildlife habitats, amenity and/or recreational use, the potential for educational use based on the industrial heritage and geology/geomorphology of the site, the potential for community benefit and employment, other policies

POLICY C15 - Removal of material from mineral working deposits, proposals to remove material from a mineral-working deposit will be granted provided that all the criteria set out in Policies C9 and C10, and the following criteria, can be met: that the operations can be effectively completed within a defined timescale; that the removal of material will not cause significant harm to visual amenity; that the removal of material will not cause significant harm to the amenity of local residents; that the removal of the mineral-working deposit will not cause a significant harm to the historic environment or cultural heritage of the Welsh slate industry; the proposal represents the best sustainable option when compared with the supply of

equivalent products from primary hard rock quarries; that the proposal shall seek to avoid significant harm to nature conservation interests.

POLICY C17 - Review of old mineral planning permissions, minerals review site applications will be determined against all the following criteria: the duration of the permission is limited to a reasonable working life (applicable to sites reviewed under the Environment Act 1995); the application sets out measures to minimise the impact on visual amenity, biodiversity, sites of archaeological, architectural and historic importance, public health, water resources, rights of way and the amenity of local residents; the application sets out measures to minimise the impact of transportation and mineral waste disposal; the application sets out appropriate measures for restoration and aftercare and for the mitigation of the effects of mineral working

POLICY C19 - Borrow pits, Proposals for the development of borrow pits will be approved provided that: there are demonstrable environmental benefits to be gained they can be developed in accordance with mineral planning policies

Scope of Assessment

- 10.2.5 An assessment of the likely geological impacts of the proposed development in the quarry is necessary, because it would have an effect on geology, soils and potential mineral resources. The assessment has been undertaken in accordance with guidance provided in DMRB Volume 11, Section 3, Part 11 Geology and Soils, June 1993. The assessment of baseline conditions has been established for the area within the proposed road corridor by referring to various sources of information including a desk-based study report and ground investigation factual report, as listed below:
- 10.2.6 Sources of information reviewed include:
- Geological Survey Sheets;
 - Gwynedd and Mon RIGS Group Site Record for Pen-y-bryn (Seiont Brickworks) GM/Q/0006: *Refer to Appendix 10.3*
 - Groundsure Geoinsight Report : *Refer to Appendix 10.1.3*
 - Groundsure Enviroinsight Report: *Refer to Appendix 10.1.4*
 - Exploratory borehole logs from recent ground investigations (detailed below);
- 10.2.7 Desk-based Study and Ground Investigation reports relating to part or all of the scheme include:
- Site Condition Report and Ground Contamination Investigation and Risk Assessment (and appendices which include trial holes records and Sample Chemical Test report: *Refer to Appendix 10.1 and 10.1.5 and 10.1.6.*

- Geological Ground Investigation Report on the area of above the unstable slopes on the east side of the quarry: Refer to Appendix 10.2.

10.2.8 Information relating to the site has been reviewed in order to establish the current baseline conditions relating to geology and soils. The potential impacts on existing baseline conditions, as well as the impacts of the development on prevailing conditions are then assessed. Mitigation measures that may be required to avoid, prevent, minimise, reduce or offset impacts together with residual and cumulative impacts following mitigation are described. There is however no specific methodology detailed in DMRB Volume 11, Section 3, Part 11, Geology and Soils for assessment of risk receptors, and determination of impact, importance, magnitude and significance. For this assessment the method used is set out for pollution and for geological resources.

Assessment of pollution risk

10.2.9 In order to make an assessment of the construction, environmental and human health risks a conceptual model needs to be developed for the site. This requires an examination of the 'Source-Pathway-Receptor linkages' to define construction, environmental and human health risk associated with existing and future conditions:

- **A source** of contamination in the ground at concentrations which have the potential to cause harm or to cause pollution of controlled waters;
- **A pathway** by or through which a receptor is being exposed to or affected by a contaminant or, could be so exposed or affected by a contaminant;
- **A receptor** that could be harmed by exposure to a contaminant.

Table 10.1: Receptors and possible pathways that might be present

Receptors	Pathway
Humans: future users of the site	Exposure via ingestion, inhalation or dermal contact with identified solid contaminants in near-surface strata
Controlled Waters: rivers and sumps	Leaching and migration

10.2.10 The identification of each of these three elements is linked to the identification of the other two. A pathway can only be present if it is capable of exposing an identified receptor to an identified contaminant. That particular contaminant should likewise be capable of harming or, in the case of controlled waters, be capable of polluting that particular receptor. If a pollutant source, pathway and receptor are found to be present then there could be a risk to the identified receptor. If there is an absence

of any part of the source, pathway or receptor process, there is no risk. The risk associated with each source-pathway-receptor linkage the probability that a significant pathway exists and the severity of the potential impact. The risk assessment has been carried out using the *Model Procedures for the Management of Contaminated Land CLR 11* (CLR) and the *Investigation of Potentially Contaminated Sites, Code of Practice, BS: 10175. BSI 2001*.

- 10.2.11 The identification of each of these three elements is linked to the identification of the others. A pathway can only be present if it is capable of exposing an identified receptor to an identified contaminant. That particular contaminant should likewise be capable of harming or, in the case of controlled waters, be capable of polluting that particular receptor. If a pollutant source, pathway and receptor are found to be present then there could be a risk to the identified receptor. If there is an absence of any part of the source, pathway or receptor process, there is no risk.
- 10.2.2 The site risk assessment has been undertaken in light of recent ground investigations and the full report is included in the planning application documents as the Site Condition Report and Ground Contamination Investigation and Risk Assessment. The results of the risk assessment have been incorporated into this Chapter. There is no specific methodology detailed in DMRB Volume 11, Section 3, Part 11, Geology and Soils for assessment of risk of pollution or harm to receptors, and determination of impact significance. The qualitative assessment of risk in relation to potential contamination is set out in Table 10.2 and a classification of probability in Table 10.3. A comparison between consequence and probability is shown in Table 10.4.

Table 10.2: Classification of Consequence (Qualitative Risk Assessment)

Classification	Definition
Severe	Short term (acute) risks to human health, likely to result in significant harm. Short - term risk of pollution of sensitive water resource. A short - term risk to a particular ecosystem, or organism forming part of such ecosystem.
Medium	Chronic damage to human health (significant harm). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem
Mild	Pollution of non - sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings /structures /services or to the environment.
Minor	Harm, not necessarily significant, which may result in a financial loss, or expenditure to resolve. Non - permanent health effects to human health. Easily repairable effects of damage to buildings, structures and services

Table 10.3: Classification of Probability (Qualitative Risk Assessment)

Classification	Definition
High likelihood	A pollution linkage and an event that appears very likely in the short term, and /or almost inevitable over the long term, or there is evidence at the receptor of harm or pollution
Likely	It is probable that an event will occur. Whilst not inevitable, it is possible in the short term, and likely over the long term.
Low likelihood	Circumstances are possible under which an event could occur, but it is not certain that (even over a long time period) such an event would occur.
Unlikely	It is improbable that an event would occur, even in the very long term.

Table 10.4: Comparison of consequence against probability

		Severity			
		Minor	Mild	Medium	Severe
Probability	High likelihood	Moderate/low risk	Moderate risk	High risk	Very high risk
	Likely	Low risk	Moderate/low risk	Moderate risk	High risk
	Low likelihood	Very low risk	Low risk	Moderate/low risk	Moderate risk
	Unlikely	Very low risk	Very low risk	Low risk	Moderate/low risk

Assessment of impact on geological resources

10.2.13 The assessment of the **Importance** of a geological or soil attribute is provided in Table 10.4. The **Magnitude** of an attribute, is set out in Table 10.5. The **Significance** of impacts is set out in Table 10.6 and Significance criteria in Table 10.7.

Table 10.5: Criteria to Determine Receptor/attribute Importance

Importance	Criteria	Typical Examples
Very high	Attribute has high quality and rarity on regional or national scale.	Site protected by International or EU legislation (World Heritage Site, Geoparks), Human populations close to source.
High	Attribute has high quality and rarity on a local scale.	Site protected by UK legislation, e.g. Site of Special Scientific Interest. Human populations located at some distance from source.
Medium	Attribute has a medium quality and rarity on a local scale.	Site of local geological importance (Regionally Important Geological Site (RIGS)), areas of mineral resource, or areas of soils of best and most versatile agricultural value.
Low	Attribute has a low quality and rarity on a local scale.	Sites with little or no local geological/soils interest.
None	Attribute quality and rarity is irrelevant.	Sites where mineral extraction is permitted

Table 10.6: Criteria to determine Impact Magnitude

Magnitude	Criteria	Typical Example
Major Adverse	Results in loss of attribute and or its quality and integrity.	Loss or severe damage to key characteristics, features or elements, or permanent harm to human beings.
Moderate Adverse	Results in impact on and integrity of the attribute, or loss of part attribute and or quality.	The integrity will not be adversely affected, the scheme may lead to a loss of or damage to key characteristics, features or elements, or temporary concerns about human health
Minor Adverse	Results in measurable change in attributes, quality or vulnerability.	Minor negative impact on key characteristics, features or elements.
Negligible	Results in impact on attribute, but of insufficient magnitude to affect the use and integrity.	Minor alteration to one or more features, characteristics or elements or no observable impact.
Minor beneficial	Results in beneficial impact on attribute or a reduced risk of negative impact occurring.	A measurable minor positive impact on key characteristics, features or attributes is evident.
Moderate beneficial	Results in moderate improvement of attribute quality.	A moderate positive impact on key characteristics, features or attributes is evident.
Major beneficial	Results in major improvement of attribute quality.	A major positive impact on key characteristics or attributes is evident.

Table 10.7 Significance Criteria (brown shaded boxes indicate a significant impact)

Importance of attribute	Magnitude of Impact (beneficial or adverse)			
	Negligible	Minor	Moderate	Major
Very High	Slight	Moderate/Large	Large	Very Large
High	Neutral	Slight/Moderate	Moderate/Large	Large
Medium	Neutral	Slight	Moderate	Moderate/Large
Low	Neutral	Neutral/Slight	Slight	Slight/Moderate
None	Neutral	Neutral	Neutral	Slight

10.3 Limitations and Assumptions

10.3.1 Data has been obtained from a number of statutory and non-statutory bodies, previous reports (by others) and external sources. These sources are considered reliable, but there is potential for errors to occur or for gaps in data to limit the accuracy of information.

10.4 Baseline conditions

10.4.1 The proposed scheme is mainly located within an established brick clay quarry which lies to the south of Caernarfon and east of the River Seiont. Extraction commenced in the early 20th Century and is permitted to continue until 2042. An area to the west of the river is outside the quarry, but was formerly used for brick manufacture. It is now used for brick storage. Pastureland to the east has not yet been quarried, but some mineral extraction is proposed.

Topography

10.4.2 The quarry was formerly a low rounded hill, known as Pen-y-Bryn, lying at about 50 metres AOD that formed part of the Arfon coastal platform to the northwest of the mountains of Snowdonia. The winding River Seiont, as it descends to the Menai Straits passes along the north and west side of Pen-y-Bryn and by cutting down into the underlying clays has created a winding incised valley. The quarry has been excavated into Pen-y-Bryn, starting by the riverside in the west, and gradually working eastwards and south. Until the late 20th Century the quarry floor was just above river level, but excavation downwards, following the clay reserve downwards has deepened the void to approximately 13 metres below river level. Large volumes of overburden were encountered during quarrying and by 2000 had become a constraint on clay extraction. The material was placed in a 20 to 25 metre high

mound along the river on the north side of the quarry void thus creating a bowl-shaped landform. The north side of the mound was planted with native woodland approximately 10 to 15 years ago. The remainder of the quarry void remains with exposed clay benches, although some of these on the east and south west sides are progressively deteriorating due to ground instability. An area on the south east edge of the void is designated as a Regionally Important Geodiversity Site (RIGS).

Geological context

- 10.4.3 Published British Geological Survey (BGS) maps indicate the site is underlain by glacial till of varying thickness which in turn overlies Silurian clays. The superficial deposits are Glacial Till formed up to 3 million years ago in the Quaternary Period with the local environment previously dominated by ice age conditions. These rocks were formed in cold periods with Ice Age glaciers scouring the landscape and depositing moraines of till with outwash sand and gravel deposits from seasonal and post glacial meltwaters.
- 10.4.4 Bedrock is lower Silurian Llanvirn Rocks (undifferentiated) - Mudstone, Siltstone and Sandstone. Sedimentary Bedrock formed approximately 464 to 467 million years ago in the Ordovician Period. These rocks were formed in a local environment previously dominated by shallow seas with mainly siliciclastic sediments (comprising of fragments or clasts of silicate minerals) deposited as mud, silt, sand and gravel.

Geology within the site

- 10.4.5 The overburden is made of the glacial sediments. Sections cut through these sediments in the 1980s and 1990s revealed organic sediments of great significance to the understanding of Quaternary events in western Britain. These have included peat and fragments of coniferous wood cones and needles, seeds, pollen and insect remains which help to date the material and provide environmental information. The data is evidence of wetland margin habitats with two episodes, one of open tundra-like conditions and the other of coniferous forest. Radio-carbon dating suggest an age of around 60,000 years BP for the latter and 40,000 years BP for the former. The Quaternary sediments have been found to be in the best condition in the south west corner of the quarry and these have been designated as a RIGSⁱⁱⁱ.
- 10.4.6 Beneath the overburden lie deep reserves of Ordovician clays which made up a hill, called Pen-y-Bryn. The hill has been quarried to a depth of around 50 metres, but investigations for the current minerals permission suggested that the reserves of clay go considerable deeper. The current permission would allow excavation down a further 40 metres.
- 10.4.7 Ordnance Survey mapping has provided a site history for the last 126 years. This shows that the original Seiont Brickworks stood on a low-lying peninsula in a loop of

the River Seiont immediately to the south west of the quarry. Demand for clay required quarrying to commence into Pen-y-Bryn Hill on the north east side of the river sometime before 1900. The brickworks continued to function on the peninsula with the quarry growing substantially. In the 1960s the brickworks was relocated across the river onto the floor of the quarry. The railway sidings on the peninsula remained for some years and then ceased working and were removed in the 1970s. The peninsula was then used for brick storage.

- 10.4.8 The fields to the north east of the quarry have remained in agricultural use until the present. A brick well house dating to before 1889 (marked as 'Tank' on OS maps) sits close the quarry edge in the northern most field, suggesting that there was a spring at this point, fed by water from Pen-y-Bryn Hill. This gathering of water may be linked to the instability and seepages of water on the adjacent quarry slope. A ground investigation of the field and observations of the adjacent quarry slope was commissioned in 2015. Figure 10.1 shows the location of these 4 boreholes (see also *Appendix 10.2, Figure 3 Borehole Location Plan* in the Geological Ground Investigation Report).
- 10.4.9 The boreholes, drilled up to 15 metres deep, show that a slightly gravelly sandy silt clay Glacial Till ranging in depth from 4 to 8 metres deep, overlies a weathered siltstone. Groundwater was encountered in the southerly two boreholes, BH3 and BH4, rising to 2 metres and 5.25 metres below ground level, respectively.
- 10.4.10 The Geotechnical specialist undertook a visual inspection of the land and quarry slope to the south west of the boreholes and observed signs of instability. These included significant evidence of recent and ongoing slope instability with slumped soils, tension cracks, slips and scarp faces extending down the slope. A photographic record was made and is included in the Geological Ground Investigation Report, Section 3.4 which is within *Appendix 10.2*). The area of instability appears to extend across a face of approximately 160 metres on the north east side of the quarry bowl. Anecdotal evidence is available that instability was recognised during the 2000 'Review of Old Planning Permissions' (ROMP) submission for the site²⁷. This geological study of the quarry, carried out by Geoplan Ltd, raised concerns about groundwater and ground conditions on the same slope. Further anecdotal evidence of the instability was provided to RML by Dr Ken Addison in February 2016 when he reported being on site and seeing a landslide occur. He explained that these events seemed to be as a result of lenses of liquefying clay exposed in the excavated face. Figure 10.2 shows the visible extent of the instability in the slope.

²⁷ Richards, Moorehead & Laing Ltd landscape and ecological advisors to Hanson 2000.

10.4.11 As a result of the Geoplan study proposals were built into the quarrying plans, and subsequently into the current planning permission²⁸, to remove a substantial volume of overburden and brick clay from the steep eastern slopes. This was described on the Interim Restoration Proposals (April 2000) as *'berms to be regraded during later quarrying phases as they become available'*, and included:

- Removal of part of the remaining high point of Pen-y-Bryn.
- Removal of a short section of the existing 260 metre hedgebank that extends northeast.
- Regularising of the broken slope to form contoured berms in line with the area to the south.

The new proposals for stabilising the slope will retain the full length of the hedge and the top of Pen-y-bryn and provide a shallower natural-looking final slope with a which can be restored to a more stable, accessible gradient with more naturalistic qualities than the existing berms.

Site geological designations

10.4.12 The quarry is designated a Regionally Important Geodiversity Site (RIGS) under the title of Pen-y-bryn. RIGS sites are considered to be analogous to a non-statutory wildlife site. The description of the RIGS is provided in *Appendix 10.3*. The Geo-conservation interest centres on the discovery in 1985 of a range of organic sediments underlying late-Quaternary glacial sediments of local (Snowdonia) and Irish Sea basin origin. This association is rare in the UK and of such importance in the evidence for and reconstruction and dating of environments and environmental processes during the past 100,000 years. The rarity of the site made it a strong contender for statutory designation as a Site of Specific Scientific Interest (SSSI). However, the location within a working quarry pre-empted such a high level of designation and it was agreed instead to notify the site as a RIGS and that the quarry owners at the time (Hanson), the scientific investigators and the Countryside Council for Wales (CCW), would work in collaboration to facilitate scientific investigations during active quarrying.

10.4.13 The RIGS Group for Gwynedd and Mon were invited to comment and they made a visit to the site in December 2015 and provided a report on their visit. The purpose of the visit was firstly, to examine the current condition of the quarry with particular reference to the exposed working faces and overburden of Quaternary glacial and other sediments. Secondly, to make a preliminary assessment of the likely impact of

²⁸ Planning Application Ref. N°. C00A/0441/14/MW, awarded 2007.

bypass construction on the RIGS, to consider the opportunities for further scientific investigations during the construction phase and, if relevant, any opportunities for future access to the Quaternary stratigraphy.

- 10.4.14 The exposed quarrying and overburden faces have inevitably degraded and become partially overgrown since Hanson ceased quarrying in 2007/8. The RIGS group representatives noted that the principal character of the upper section of the Quaternary overburden is still evident in 2015, as is the intermittent contact zone with the underlying bedrock (Ordovician clay). The quarry working faces and benches have been advanced some tens of metres further to the south-east since the last scientific investigations were conducted in 2000. The advice from the RIGS group was that *'that as a result of an exploratory drilling project funded by CCW in the early 1990s behind the main working face and towards the Pen-y-bryn lane, our analysis at that time was that the organic sediments (the chief interest) had been worked out and so too, possibly, the lowest gravels and lower grey till. We are not confident that they will reappear in any new excavations'*. Consequently, it is proposed that the RIGs group is offered the opportunity to observe and record any excavation works in the area of the RIGS site and to take samples, as required. It is understood that this proposal for a watching brief is matched by a similar one for the bypass construction project. On restoration of the quarry, any remaining organic deposits in the RIGS site will be retained as exposures for continuing study. Any proposed tree planting and revegetation of the quarry will be excluded from the areas of chief interest in the RIGS site.

Soils

- 10.4.15 Soil information from the Soil Survey of England and Wales show the unquarried areas of the site to be underlain by soils of the Nercwys and East Keswick Series of the Brickfields Association. These soils are described as slowly permeable seasonally waterlogged fine loamy soils that are used for dairy and stock rearing on permanent or short term grassland. These soils are derived from the underlying glacial till and whilst they are slowly permeable, the clays that underlie the glacial till can impede drainage.
- 10.4.16 The Agricultural Land Classification for England and Wales shows the area of the site to lie within Grade 4. Grade 4 is defined as *'land with severe limitations due to adverse soil, relief or climate, or a combination of these. Adverse soil characteristics include unsuitable texture and structure, wetness, shallow depth, stoniness or low water holding capacity. Relief and climate restrictions may include steep slopes, short growing season, high rainfall or exposure. Land in this grade is generally only suitable for low output enterprises. A high proportion will be under grass, but there may be occasional fields of oats, barley or forage crops'*.

Contaminated Land

- 10.4.17 The risks associated with contamination from previous uses are addressed in the Site Condition Report and Ground Contamination Investigation and Risk Assessment and the Consequences. Historical maps show potentially contaminating activities associated with the brickworks on both sides of the river. Ground levels were artificially raised to lift the activities on the land above flood level, but until trial pits were excavated in November 2015 very little was known about the nature of the fill used under the brickworks and railway sidings. The former brickworks to the east of the river is located partly within an early phase of the quarry and partly on made ground in what was once low-lying riverside land.
- 10.4.18 Ground investigation works in the quarry and former brickworks sites comprised 11 trial pits (*Appendix 10.1*, Site Condition Report and Ground Contamination Investigation and Risk Assessment report, Figure 5). Four boreholes (see Figure 3 Borehole Location Plan in the Ground Investigation Report on an area of overburden removal to facilitate slope stability) were dug in the area of the proposed excavations to the north east of the existing quarry.
- 10.4.19 The trial pits were dug with an excavator to depths ranging from 1.5 metres to 3.2 metres deep and each revealed made ground. The fill to the east of the river was found to include brick rubble, slate, clay, sand gravel, boulders, while to the west of the river wooden railway sleepers, ash and broken tarmacadam were also found.
- 10.4.20 Contamination testing has been undertaken on selected samples of soil and water collected from trial pits. The sampling strategy and analytical suites were proposed in order to evaluate environmental risks and meet any regulatory requirements under waste regulation. Chemical tests were scheduled for a broad range of metals and hydrocarbons which are listed in the Site Condition Report and Ground Contamination Investigation and Risk Assessment Report Section 3.3 and the results detailed in that report, which is included as *Appendix 10.1*.
- 10.4.21 Representative samples of made ground have been tested to assess the risk of soil contamination by substances that are toxic to humans or harmful to controlled waters. The assessment undertaken is a 'Tier 1 Generic Risk Assessment' which requires the comparison of contaminant concentrations to a set of generic Tier 1 Screening Values (TSV) risk-based screening concentrations. Contaminants found to be below the TVS concentrations are considered not to warrant further risk assessment. TSVs for soil, derived to be protective of human health, are defined for standard end uses in accordance with UK CLR framework. However, it should be noted that concentrations that exceed the TSVs do not necessarily mean there is a risk and the site should be remediated.

- 10.4.22 Chemical tests (*refer to Appendix 10.1.6*) have shown that concentrations of cadmium, chromium, arsenic, lead, copper, zinc and selenium were significantly below guideline concentrations. Mercury, Phenol, cyanide and polyaromatic hydrocarbons were below the detection limits and no elevated concentrations of sulphur and sulphide were found in the ground. A small fraction of Chrysolite asbestos fibres were detected in four out of the 11 samples tested, although analysis indicated that in the trial pits TP5, TP8 and TP11 the mass of asbestos fibres was only 0.006%. In TP6 the mass was 0.033%.
- 10.4.23 Samples of surface water that accumulated in two of the trial pits were taken for analysis (*refer to Appendix 10.1.7*). The analysis compared the samples to the EQS values for freshwater and drinking water. Samples were also taken from the River Seiont upstream and downstream of the quarry. There was no noticeable difference between the upstream and downstream river water samples indicating that there is no impact from the site on water quality. There were no elevated concentrations of any of the chemical parameters analysed for (with the exception of sulphate and the drinking water standards).
10. 4.24 Water samples have been taken from the flooded quarry sump and the subsequent laboratory analysis has shown
- 10.4.25 The results of sampling and analysis have not identified any contamination within the ground strata at the site that could be a risk to human health other than very low quantities of asbestos. However, the majority of the site is already covered with a concrete slab, which will remain, and other areas of the site not surfaced will be capped with a sealed surface or aggregate to allow vehicle movement in the site compound. The risk of human exposure to the ground strata is therefore negligible.
- 10.4.26 The baseline situation with regard to contamination is that no elevated concentrations of contaminants were identified and therefore there is no source to leach. In the absence of any leached contaminants there can be no risk to controlled waters. In the absence of any contamination source there is no risk to humans through the use of the site for commercial purposes, or to the wider environment.
- 10.4.27 The Applicant will seek advice from the NRW Waste Regulation team in the event of further asbestos is found. The only asbestos of any significance that was found during the investigation was within easily identified demolition rubble contained within a small tank base. If the tank is excavated or the surroundings ground disturbed, the asbestos would be removed off-site, in accordance with best practice, by a licence carrier. It is extremely unlikely that any asbestos will be found elsewhere on the site, but if found (and identified) it would also be removed by a licenced carrier. A plan

for the removal and disposal of asbestos will be developed by the Applicant before any excavation is the area of the asbestos deposits commences.

10.5 Identification of impacts

10.5.1 This section of the chapter identifies the potential soils and geology impacts that may occur as a consequence of the proposed development. The potential impacts are first assessed assuming no mitigation. The significance of the potential impacts has been undertaken in accordance with the criteria detailed in Section 10.3 and are detailed along with possible mitigation measures in Tables 10.2 to 10.7.

Contamination (mobilised in made ground)

10.5.2 **Potentially contaminated soils** have development implications which may include transport and disposal costs, regulatory implications, re-use of site won materials, importation of clean soils, planning restrictions and onerous construction procedures. Earthworks will need to be undertaken in accordance with BS6031:2009, Code of Practice for Earthworks. The assessment of impacts relating to pollution or harm from already contaminated soils within the site have been considered in the light of the Site Condition Report and Ground Contamination Investigation and Risk Assessment, as follows:

Classification of Consequences Table 10.2: **Minor**;

Classification of Probability Table 10.3: **Low likelihood**;

Comparison of Consequence against Probability Table 10.4: **Very Low Risk**

Impact with mitigation (described below) will pose a **Very Low Risk**.

10.5.3 **Mitigation of risk** will include avoidance of excavation below current ground level in areas where the ground investigation has identified an increased risk of exposing contamination material that could cause harm to human health or pollute the River Seiont. The ground investigation has only identified very small deposits of asbestos fibres. If these are excavated, then reburial of the material will ensure the impact on human health is minimised.

10.5.4 **Potential to pollute soils** during construction activity, for example fuel spillage: the assessment of pollution impacts arising from soils as a result of construction activity have been considered.

Classification of Consequences Table 10.2: **Severe**;

Classification of Probability Table 10.3: **Likely**;

Comparison of Consequence against Probability Table 10.4: **High Risk**

Impact with mitigation (described below) will pose a **Low Risk**.

10.5.5 **Mitigation**: construction good practice includes working to guidance detailed in the Pollution Prevention Guidelines (PPG), as detailed in PPG01, General Guide to the

Prevention of Pollution. Chemicals, fuels, oils and materials will be stored in secured compounds, be appropriately banded and in accordance with appropriate regulations as detailed in the Control of Regulations 2001 and relevant Control of Hazardous Substances to Health (COSHH) Regulations 1994. Areas outside banded fuel stores will be formed to drain towards the quarry sump with interception measures in place to capture hydrocarbons and silt.

Excavation and earthmoving of mineral in the existing quarry

- 10.5.6 The excavation of mineral within the quarry will be required to form working areas, to provide mineral for use as fill in the bypass scheme, or for reprocessing for other construction purposes. The extraction would steepen the side slopes. Because mineral extraction is already permitted under an existing planning permission an assessment of the impact is not required. However, by extracting within the quarry, the need for extraction from existing commercial quarries, or from new borrow pits would not be required and this beneficial impact that should be taken into account. An assessment of use of the clay in the quarry would be:

Receptor/Attribute Importance Table 10.5: **Low**;

Impact Magnitude: Table 10.6: **Minor beneficial Magnitude**;

Impact Significance Table 10.4: **Neutral/Slight beneficial**

Impact with mitigation (described below) will pose a **Moderate Beneficial Impact**.

Mitigation to include the restoration of the final landform to naturalistic revegetated slope.

Works to stabilise the unstable eastern side of the existing quarry

- 10.5.7 A geotechnical study has already shown that the slope is unstable. Two measures are proposed:

1. Removal of clay and overburden from the area of instability to form a cutting for the proposed haul road. The excavated fill will be used in bypass construction and the topsoil will be retained for restoration.
2. Engineering 'Unsuitable' fill will be brought from the bypass construction site to provide material to assist in quarry restoration. The quarry sump will be filled and the side slopes of the quarry buttressed with the imported material to form slopes between 1:3 and 1:4.

The change to the landform would be of **Minor Adverse Magnitude**, while improved slope stability would be **Moderately Beneficial Magnitude**. Overall these are considered to be of **Minor Beneficial Magnitude**. This overall magnitude is shown below.

Receptor/Attribute Importance Table 10.5: **Low**;
 Impact Magnitude: Table 10.6: **Minor Beneficial Magnitude**;
 Impact Significance Table 10.4: **Neutral**;
Impact with mitigation (described below) will pose a **Slight Beneficial Impact**.
Mitigation to include the restoration of the final landform to naturalistic revegetated slope.

Restoration of the quarry and infilling the sump

- 10.5.8 The quarry sump will be pumped dry and following extraction of mineral it will be filled to the current water level with excavated materials from the bypass that are not suitable for use in road construction. The material used in this way will be treated as inert waste and handled in accordance with good practice. A Bespoke Permit for this scheme is currently in preparation. Once the sump is filled the imported material will be placed around the side slopes of the void to form shallow gradients of 1:3 to 1:4, which is considerably shallower than the existing berms or the restoration scheme proposed under the existing planning permission. Topsoil will be used to prepare some of the finished surface of the quarry and other disturbed areas within the site. Restoration will be completed several years in advance of the 2042 deadline for the existing permission.

Receptor/Attribute Importance Table 10.5: **None**;
 Impact Magnitude: Table 10.6: **Major beneficial**;
 Impact Significance Table 10.4: **Slight beneficial Impact**
Impact with mitigation (no mitigation proposed) will pose a **Slight to Moderate Beneficial Impact**.

Excavation of made ground within the former brickyard west of the river

- 10.5.9 The brickyard west of the river will be cleared of stored bricks and the yard area excavated to a depth of around 2 metres in the centre with sloping sides and the existing river bank and riverside trees retained. This will remove fill material consisting of brick rubble, sand, gravel and clay, which was originally placed to raise the ground to prevent flooding of the yard and railway sidings. A small depth of the underlying clay will also be excavated. The void will be provide floodplain function with a shallow permanent waterbody for nature conservation.

Receptor/Attribute Importance Table 10.5: **Low**;
 Impact Magnitude: Table 10.6: **Minor Beneficial Magnitude**;
 Impact Significance Table 10.4: **Neutral/Slight**;
Impact with mitigation (described below) will be **Slight Beneficial Impact**.
Mitigation to include the restoration of the final landform for floodplain function, amenity and nature conservation.

Import, processing and export of excavated materials for construction

10.5.10 Materials extracted within the site and from the bypass will be brought to a dedicated area and processed to enhance the quality and value of materials for construction. This will allow materials to be used in the most effective and economical manner and will minimise the import from other sites. Processing can create dust which can be carried by wind to human receptors or it can be carried into watercourses. In either case there are impacts to be considered.

Receptor/Attribute Importance Table 10.5: **Low**;

Impact Magnitude: Table 10.6: **Moderate Beneficial Magnitude**;

Impact Significance Table 10.4: **Slight Beneficial Impact**

Impact with mitigation (dust control) will be **Slight Beneficial Impact**.

Protection of the RIGS site

10.5.11 The geological interest at Pen-y-bryn RIGS site lies in the Quaternary overburden, not the underlying clay. It is understood that any exposure of the overburden cross-section for examination by geologists is considered of value as part of the RIGS site. Previous quarrying activity has pushed the overburden back to expose the clay along a wide front on the south east lip of the quarry. Some damage would be caused by excavation for the proposed bypass which will be in cutting to the east but rises to grade as it continues west. No further stripping of the overburden is planned in this south east side of the quarry, but during bypass construction one of the proposed quarry haul roads will pass over the existing overburden face on a temporary embankment. The embankment will be removed on completion. Note that stripping of overburden to the north east side of the quarry is described in paragraph 10.6.7.

Receptor/Attribute Importance Table 10.5: **Very High**;

Impact Magnitude: Table 10.6: temporary short term **Minor Adverse** moving to permanent **Slight Beneficial**;

Impact Significance Table 10.4: **Temporary Moderate / Large Adverse Impact**

Impact Significance with mitigation: **Large Beneficial**

Mitigation to include minimising earthmoving in the area of the RIGS interest. Consult RIGS specialists to agree mitigation and recording. Remove of temporary haul road embankment and retention of the existing cut face. A fresh face would be cut if appropriate, to provide the optimum exposure of the cross-section with access to the location along permissive paths to allow interpretation post works.

10.5.12 Table 14.8 summarises the residual impacts on Geology and Soils.

Table 10.8: Summary of potential impacts and their significance

Potential Impact (<i>Risk of impact</i>)	Receptor	Risk based assessment				
		Classification of Consequences	Probability	Consequence over Probability	Mitigation	Residual risk of Impact
Mobilisation of existing contaminants in made ground during earthworks	Soil and human health	Minor	Low likelihood	Very Low Risk	Good construction practice will reduce significance	Very Low Risk
	Surface Water (Afon Seiont)	Medium	Low likelihood	Moderate/Low	Good construction practice, effective containment and appropriate treatment of contamination will reduce significance	Very Low Risk
Pollution of soils following accidental spillage or leakages	Soil and water	Severe	Likely	High Risk	Good construction practice and effective containment will reduce significance	Low Risk
Potential Impact (<i>Significance of Impact</i>)	Receptor/ attribute	Significance based assessment				
		Receptor attribute	Magnitude of impact	Significance	Mitigation	Residual significance of Impact
Excavation of mineral in area of existing planning permission	Mineral reserves	Low	Minor Beneficial	Neutral/Slight Beneficial	Restoration of the finished quarry	Neutral
Works to stabilise the eastern slopes	Mineral reserves	Low	Minor Adverse	Neutral	Restoration of the final, stabilised slopes	Slight Beneficial
	Landform stability	Low	Moderate Beneficial			
Excavation of made ground in former brickyard west of river	Mineral reserves	low	Minor Beneficial	Neutral/Slight beneficial	Restoration of floodplain function, amenity and nature conservation	Slight Beneficial
Restoration of the quarry and infilling of the sump with inert fill	Landform	Low	Moderate Beneficial	Slight Beneficial	Normal good construction and waste management practice	Slight Beneficial

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

Potential Impact (Significance of Impact)	Significance based assessment					
		Receptor attribute	Magnitude of impact	Significance	Mitigation	Residual significance of Impact
Import, processing and export for reuse of excavated material for construction purposes	Soils and mineral reserves	Medium	Major Beneficial	Slight/Moderate Beneficial	Excavated material brought to the site will be reused and the value of each component maximised through separating, crushing and screening for export as sand and aggregates for concrete making and embankment fill. Works will be carried out using good practice mitigation techniques to limit dust and silt spread	Large beneficial
	Surface water	High	Moderate adverse	Moderate Large		Neutral
	Human beings	Very High	Moderate adverse	Large Adverse		Neutral
Import to site, of inert waste for restoration and revegetation of the quarry surfaces.	Soils and mineral reserve	Low	Negligible	Neutral	Restoration and revegetation of surfaces carried out to good industry practice to objectives of nature conservation and amenity	Moderate Beneficial
Damage to designated Pen-y-bryn Regionally Important Geodiversity Site (RIGS)	Designated site	Very high	(Short term) Minor Adverse	Moderate to Large Adverse	Minimise excavation and earth moving in the area of the RIGS site, consult specialists to agree mitigation scheme and any recording required, allow RIGS features to remain visible for interpretation during and post works. RIGS representatives invited to provide a watching brief to record excavation and take samples.	Large Beneficial

10.6 Mitigation

- 10.6.1 All construction/ working phase risks are reduced by the adoption of good working practices and implementation of a construction management plan during construction. The Contractor would be required to provide method statements for the works for input into the Construction Environmental Management Plan (CEMP). These would include visual inspection of the works, routine sampling of excavated materials and surface water in the quarry sump to check for potential contamination as a consequence of ground disturbance. A monitoring regime of discharges to the river from the sump will be agreed with NRW before works commence. This is also forms part of the cscheme of mitigation set out in the Water Quality Chapter of the ES, .
- 10.6.2 All excavation and breaking out of existing surfaces within the former brickworks yard will be carried out in accordance with PPG6: 'Working at construction and demolition sites: PPG6'.
- 10.6.3 The restoration scheme for the site has to be completed in a phased manner as material becomes available to complete the filling of the sump and the buttressing and soiling of bare clay quarry benches. A scheme of restoration has already been agreed with the Minerals Planning Authority for the previous planning permission in 2008. The intention is to implement a similar scheme that differs mainly in the infilling of the quarry sump. The restoration scheme is shown in Figure 2.5.
- 10.6.4 Use of the quarry as a source of fill materials for the bypass, and then using inert 'Unsuitable' material from the bypass scheme for engineering purposes to fill the sump and buttress the slopes should be regarded as beneficial to the environment because if a more remote quarry and landfill were used instead the costs and negative impacts of road transport and use of finite mineral reserves would be substantially greater.
- 10.6.5 The RIGS group will be offered the opportunity to maintain a watching brief during extraction of the layers of interest.

10.7 Residual impacts

- 10.7.1 The scheme has the potential to have overall a **Neutral impact** during the working phase, if good industry practice to control environmental impacts is followed. The Impacts improve substantially to **Moderately Beneficial** impact once the quarry is restored and the Regionally Important Geodiversity Site is available for access for educational purposes. In terms of risk to soils, water and human health the risks are

low if good practice to control dust, silt and pollution during the working phase of the site is followed.

10.8 Cumulative Impacts

10.8.1 The proposed activity in the quarry would be closely linked to bypass construction. Construction related activities in both sites will affect the environment over much the same timeframe. Some cumulative geological and soils effects are likely to occur. Both schemes will involve the excavation and deposition of minerals with potential impacts on geological and soil resources. The following potential cumulative impacts could arise and these are based upon known information for the quarry and previously published information for the bypass.

Potential impact	Seiont Quarry site	A487 Caernarfon bypass	Cumulative impact assuming effective mitigation
Changes to natural landforms	A small area of landform changed, but restoration achieved early. Slight to Moderate Beneficial impact.	Permanently change the landform surface. The effect is likely to be Slight or Neutral adverse.	Neutral to Slightly Beneficial Cumulative impact.
Geological and geomorphological features	Neutral impact.	Widely affected by excavation and filling using soft and hard rock along the bypass route. Neutral Impact.	Neutral Cumulative Impact
Designated sites (RIGS)	Pen-y-bryn RIGS site temporarily Adverse, but permanent Large Beneficial Impact.	Potential to create RIGS site at the northern end of the bypass scheme in the deep rock cutting where graben and fault formations will be exposed and could be retained for education purposes. Probably a Moderate Beneficial impact.	Moderate Beneficial Cumulative Impact
Groundwater	Neutral Impact	Neutral Impact	Neutral Cumulative Impact
Surface water	Neutral	Neutral	Neutral Cumulative Impact
contamination	Very Low Risk	Potentially Very Low Risk	Very Low Cumulative Risk

10.90 Summary and conclusion

10.9.1 Residual significance following mitigation for construction phase risks is defined as **Neutral** (i.e. neither adverse nor beneficial). Residual significance following mitigation for operational phase risks is defined as **Neutral** or **Minor Adverse**, which is defined as a **Minor Negative Impact** that although measurable, is not considered as 'Significant'.

11 NOISE EFFECTS

11.1 Introduction

- 11.1.1 The purpose of this chapter is to assess the proposed development in terms of the potential noise impact and to satisfy the requirements for mitigation of noise. The assessment undertakes predictions of noise levels at the closest Noise Sensitive Receptors (NSRs) and assesses the predicted noise levels with reference to national guidelines and criteria. This assessment is necessarily technical in nature and a glossary of terms is provided to assist the reader, along with a table of example noise levels commonly found in the environment.
- 11.1.2 The proposed development can be defined in a number of distinct 'phases' with respect to the assessment of potential noise impacts. Aspects of the development with the potential to affect the noise climate in the vicinity of the site include the extraction, processing and transportation of materials within and beyond the site, and ultimately during a period of restoration. A period of construction will also take place to initially prepare the site for the subsequent extraction of materials, including the establishment of two haul routes.
- 11.1.3 The exact programme and working method for each phase is currently unknown. However, it is possible to estimate noise levels associated with the operation of the anticipated plant and activities using a desk-based assessment, based on conservative assumptions on the use and locations of plant. Predicted noise immission levels are presented and compared to the relevant guidance on noise level criteria for construction sites and mineral workings.

11.2 Consultation

- 11.2.1 Consultation is an essential step in the assessment process. The formal scoping process is detailed in full within Chapter 1 and Table 11.1 summarises the consultation which has been undertaken with the Environmental Health Department of Gwynedd Council with respect to noise. Within the table, text in italics represents direct quotes from responses received.

Table 11.1: Consultation with Gwynedd Council

Issues Raised / Discussed	Response / Comment
<i>Noise and vibration impacts on sensitive receptors, including proposed working hours used and the duration of particularly noisy activities. The equipment/machinery being used, loading/unloading activities, excavation, construction of the alternative access route, mobile plant in use and restoration activities.</i>	All proposed phases assessed, to include excavation, construction of haul routes, mobile plant and restoration.
<i>Impacts of vibration caused by the scheme and mineral extraction and other heavy engineering activities.</i>	No requirement to assess the impact of vibration, as no blasting is proposed and all plant will be located at sufficient distances from residential properties.
<i>Where the scheme generates significant operational traffic (HGV within the quarry and using the access roads) during the development, a road traffic noise and vibration assessment to predict impacts on sensitive receptors.</i>	Traffic movements on the quarry access road and proposed haul routes have been included in the predicted and assessed as part of the appropriate phase.

11.3 Policy and Guidance

11.3.1 The following policy documents have been taken into account for the assessment of noise impact associated with the development:

- European Parliament and the Council of the European Union. (2002). *Directive 2002/49/EC*;
- *Planning Policy Wales* (Edition 9);
- *Technical Advice Note 11: Noise*; and
- *Minerals Technical Advice Note (MTAN) 1 – Aggregates*.

11.3.2 Furthermore, the following good practice and guidance documents have been referred to:

- BSI. (2014). BS 5228-1:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites. Noise*;
- World Health Organisation. (1999). *Guidelines for Community Noise*;
- Institute of Environmental Management and Assessment. (2014). *Guidelines for Environmental Noise Impact Assessment*.

Overall Approach

- 11.3.3 A number of standards and guidelines may be referred to in relation to acceptable noise levels. The overarching European legislation in relation to noise is set out in Directive 2002/49/EC, which is commonly known as the Environmental Noise Directive (END). The END aims to limit people's exposure to environmental noise and requires each member state to provide data on noise exposure, to adopt action plans to prevent or reduce noise exposure and to preserve environmental noise quality where it is currently good.
- 11.3.4 The national policy for planning is *Planning Policy Wales*. Chapter 13 of this document, *'Minimising and Managing Environmental Risks and Pollution'* references *Technical Advice Note (Wales) 11: Noise (TAN 11)* for further guidance on noise-related planning issues. Whilst TAN 11 does not specifically deal with noise associated with mineral extraction, the general principles of noise assessment and measurement are relevant for the assessment of noise from construction and open sites.

TAN 11

- 11.3.5 TAN 11 is the key technical planning guidance on noise issues and is of assistance to developers in the identification of noise issues relevant to both noise-generating and noise-sensitive development. Advice on assessing noise and on factors to consider in relation to a number of different noise sources is given in Annex B of TAN 11.
- 11.3.6 TAN 11 states the following: *'This note 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 administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications which will either generate noise or be exposed to existing noise sources'*.

BS 5228:2009+A1:2014

- 11.3.7 With regards to the assessment of construction noise, TAN 11 refers to the 1984 version of BS 5228, *'Code of Practice for Noise and Vibration Control on Construction and Open Sites: Noise'*. This standard provides a methodology for predicting noise levels attributable to a wide variety of construction and related activities which are shared with mineral extraction sites. The assessment is therefore undertaken in accordance with BS 5228 (where applicable), but makes reference to the most recent version which was published in 2014.

- 11.3.8 In the absence of specific national guidance on noise limits during construction activities, the guidelines detailed in Annex E of BS 5228 are used to assess the potential impacts associated with predicted noise levels. The most simplistic of these guidelines are based upon fixed noise level limits and this regard BS 5228 states in Annex E.2: *'Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut.'*
- 11.3.9 BS 5228 goes on to state: *'Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*
- *70dB in rural, suburban areas away from main road traffic and industrial noise; and*
 - *75dB in urban areas near main roads in heavy industrial areas.*
- These limits are for daytime working outside living rooms and offices.'*
- 11.3.10 As such, for all NSRs during proposed construction activities, a noise limit of 70dB L_{Aeq} has been adopted. This is applicable for the assessment of noise levels associated with site preparation activities and the construction of the haul routes.
- MTAN.
- 11.3.11 The Welsh Government's planning policies for minerals development are detailed in the recent (2016) revisions of *Planning Policy Wales* and supported by a series of *Minerals Technical Advice Notes (Wales)* (MTAN). The MTAN documents set out detailed advice on the mechanisms for delivering the policy for aggregates extraction by mineral planning authorities and the aggregates industry.
- 11.3.12 With reference to noise from aggregate extraction, *MTAN 1 – Aggregates* is used. It states at paragraph 85: *'Where aggregates extraction and related operations occur close to areas that are sensitive to noise, particularly residential areas, noise impact must be minimised to acceptable levels'*.
- 11.3.13 MTAN 1 goes on to state, at paragraph 87: *'The aggregate industry should aim to keep noise emissions at a level that reflects the highest possible environmental standards, taking all reasonable steps to achieve quieter working while having regard to the principles of BATNEEC – the best available techniques not entailing excessive cost. MPAs should have regard to the background noise levels and the threshold at which significant effects are likely at noise sensitive areas and properties when considering the acceptability of proposals or setting noise limits in a planning condition. Conditions on planning permissions should identify the noise sensitive properties at which noise limits are set and establish a scheme of monitoring that*

identifies how, where and when noise is to be measured and how the results will be used and assessed.'

11.3.14 With reference to acceptable noise level limits, MTAN 1 goes on to state at paragraph 88: *'Noise limits should relate to the background noise levels subject to a maximum daytime noise limit of 55dB(A) where background noise levels exceed 45dB(A). 55dB(A) is the lower limit of daytime noise levels where serious annoyance is caused. Where background noise is less than 45dB(A), noise limits should be defined as background noise levels plus 10dB(A).'*

11.3.15 In accordance with MTAN, daytime working is defined as 07.00 to 19.00 with noise level limits set in terms of the L_{Aeq} parameter over a one hour measurement period.

Existing Noise Level Limits

11.3.16 Noise level limits are currently in place for existing operations within the quarry, as per Conditions 17 to 19 of the site's planning consent.

11.3.17 Condition 17 states: *'Between the hours of 07.00 and 19.00 Monday – Friday and between the hours of 07.00 and 13.00 on Saturdays, the noise level arising from the development shall not exceed the $L_{Aeq,1hour}$ free field levels shown in 'Schedule 1' below'.*

Schedule 1

Location	Criterion $L_{Aeq,1hour}$ Free field, dB
Ysbyty Eryri Hospital	54.0
Seiont Cottage	57.0

11.3.18 Condition 18 of the consent goes on to state: *'At all times, the noise level arising from the development's residual activities (e.g. water pumping, servicing, environmental monitoring or maintenance and testing of plant) shall not exceed 39dB $L_{Aeq,1hour}$ free field at any residential or any other noise sensitive property'.*

11.3.19 Condition 19 relates to periods of temporary working and states, *'Temporary operations which may exceed the criterion levels set out in Condition 17 and 18 shall be notified in advance to the mineral planning authority and shall not exceed 70dB $L_{Aeq,1hour}$, free field, expressed in the same manner as in Conditions 17 and 18 at any residential or any other noise sensitive property'.*

11.3.20 It is understood that these noise level limits are based on the recommendations within MTAN 1 (i.e. relative to background noise levels) and are applicable to current

operations within the site at the closest NSRs. These noise level limits would also be applicable for the proposed phases – specifically, during excavation, processing and further restoration of the quarry.

11.3.21 In order to provide a conservative assessment, the lower criterion of 54dB L_{Aeq} has been adopted for all identified NSRs, except Seiont Cottage, with respect to the assessment of noise during the proposed extraction, processing and restoration phases. For Seiont Cottage, a noise limit of 57dB L_{Aeq} has been used for these phases as per the existing planning consent.

11.3.22 These limits are comparable with the guidelines of the World Health Organisation (WHO) and their 1999 document ‘*Guidelines for Community Noise*’.

WHO Guidelines for Community Noise

11.3.23 The ‘*Guidelines for Community Noise*’ document recommends suitable noise levels for both outdoor and indoor living areas during daytime periods, and these levels are set regardless of the noise type or source. It advises on the minimum levels of noise before critical health effects occur. For the daytime period, the WHO guidelines focus on the protection of residential amenity (specifically annoyance and speech interference) in “*outdoor living areas*”. In this regard, the WHO guidelines state: “*To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55dB for a steady, continuous noise*”.

11.3.24 Whilst the WHO guidelines are not directly applicable to noise from mineral workings, the existing planning condition and adopted noise limits (in line with MTAN 1) are shown to be comparable to their recommended daytime noise limits. The assessment is therefore undertaken to demonstrate that noise levels associated with longer-term activities of extraction and restoration at the site will be no greater than the existing permissions in place and not exceeding 55dB L_{Aeq} as far as reasonably practicable.

11.4 Significance Criteria

Guidelines for Environmental Noise Impact Assessment

11.4.1 The *Guidelines for Environmental Noise Impact Assessment*, produced by the Institute of Environmental Management and Assessment (IEMA), were published in October 2014. The guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The key terms used within this assessment and which are relevant to the IEMA guidelines are: Sensitivity, Magnitude, and Significance.

Sensitivity

- 11.4.2 The effect will be described with reference to the receptor type and its sensitivity to the noise impact, as detailed in Table 10.2.

Table 11.2: Sensitivity Criteria for Noise Receptors

Sensitivity	Definition
Very High	Residential properties (night-time) Schools and healthcare buildings (daytime)
High	Residential properties (daytime) SAC, SPA, SSSI (or similar areas of special interest)
Medium	Offices and other non-noise producing employment areas
Low	Industrial areas

Magnitude

- 11.4.3 Magnitude is based on the measure of how loud a noise might be.

Table 11.3: Magnitude Criteria for Noise Receptors

Magnitude	Definition
Major	Greater than 10dB above the relevant limit value
Substantial	Between 5 to 9.9dB above the relevant limit value
Moderate	Between 3 to 4.9dB above the relevant limit value
Minor	Between 0.1 to 2.9dB above the relevant limit value
Negligible	Less than or equal to the relevant limit value

Significance

- 11.4.4 The sensitivity of the receptors, together with the magnitude of impact, defines the significance of the noise effects as shown in Table 11.4.

Table 11.4: Significance of Noise Effect

Magnitude	Sensitivity Very High	Sensitivity High	Sensitivity Medium	Sensitivity Low
Major	Major	Major	Major	Moderate
Substantial	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Moderate	Minor
Minor	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

11.4.5 It is considered that the above criteria reflect the key benchmarks that relate to human perception of sound. Generally, 3dB(A) is considered to be the smallest change in environmental noise that is perceptible to the human ear and a 10dB(A) change in noise represents a doubling or halving of the noise level.

11.5 Noise Prediction Methodology

11.5.1 Throughout all phases noise will be generated during the haulage of plant and materials within the site, and through the operation of both fixed and mobile plant. The main activities and items of plant associated with each phase are detailed in Table 11.5; however, the exact programme and working method associated with each phase is not absolute.

Table 11.5: Description of Phases, with associate plant / equipment

Phase	Description / Activities	Plant / Equipment / Traffic
Establishment Phase		
Extension of existing temporary site compound to provide the contractor's site offices, yards and related facilities.	Temporary change of use of former brick factory site and hard standing to provide staff accommodation, welfare facilities, staff and visitor parking, and parking for plant. Includes HGVs delivering security fencing and site cabins, via existing quarry access road.	HGVs and small delivery vehicles Tracked mobile crane
Construction of haul routes	Provision of two haul routes ascending the sides of the quarry, to facilitate access to the bypass construction site by reforming	CAT D6T truck-type tractor Komatsu D65PX dozer

Phase	Description / Activities	Plant / Equipment / Traffic
Establishment Phase		
	existing slopes to provide stable surface. Excavation of a haul road cutting on the east side of the quarry to link with the bypass construction site.	Komatsu PC450 hydraulic excavator Hitachi ZX670 excavator
Site preparation	Preparation of quarry prior to further extraction and restoration. Including creation of a platform for mobile mineral processing plant.	Dozer Tracked excavator Wheeled backhoe loader

Phase	Description / Activities	Plant / Equipment / Traffic
Post-establishment Phase, with Extraction areas		
Operation of compound	Operation of the construction compound.	Delivery vehicles, HGVs, Low loaders and Diesel generator
Material Processing	Reprocessing of clay, brick and gravel/pebble reserves, to be used for bypass construction, utilising a mobile mineral processing platform located below the north-west lip of the quarry. Including crushing and washing.	Crushing – Tracked excavator, tracked semi-mobile crusher, screen stockpiler & wheeled loader Washing – Screen stockpiler, wheeled loader, electric water pump & diesel generator
Concrete Production	Mobile concrete batching plant.	Diesel generator Wheeled loader Cement mixer trucks Concrete mixer truck
Excavation, Extraction & Earthworks	Extraction of clay within existing permitted area. Importation of materials via haul routes to infill the quarry sump and stabilise the quarry slopes.	A40 mixer truck Hitachi ZX670 excavator Komatsu PC450 excavator Volvo EC480 excavator Komatsu D65PX crawler dozer CAT D6T truck-type tractor
Traffic	Traffic on the haul routes to facilitate access from the compound to the bypass construction site.	Hitachi ZX670 excavator Volvo EC480 excavator Volvo A40 dumper

Phase	Description / Activities	Plant / Equipment / Traffic
	Private cars and road deliveries by small van on site access road.	Volvo A40 mixer truck Private cars and small delivery vehicles
Restoration and Post-restoration		
Restoration	Restoration of the quarry slopes and infilling of sump, including spreading of surface soils, seeding and planting as necessary.	Volvo A40 articulated dump truck Volvo EC480 excavator Komatsu PC450 hydraulic excavator Komatsu D65PX crawler dozer

11.5.2 Noise levels within and around the site, as a result of each of the identified phases, are likely to change due to the combinations and locations of plant and equipment. The key variables influencing the noise immission levels associated with the proposed development are:

- The sound power level (SWL) of the plant and the equipment being operated;
- The number of noise sources operating at any one time;
- The duration of operations;
- The distance between the noise sources and the receptors;
- The presence of screening mounds, buildings and/or barriers;
- The potential reflection of sound; and
- Ground attenuation.

11.5.3 In order to predict the noise immission levels attributable to the development at each NSR during each phase, noise propagation models are constructed within the proprietary modelling software package CadnaA®. Within the CadnaA® software, complex noise models can be produced in order to simulate the propagation of noise sources according to a wide range of national calculation standards, including BS 5228. BS 5228 also provides measured noise level data for a variety of plant and activities for use within noise propagation calculations. The predictions are based on worst case noise levels at each NSR, e.g. concurrent and consecutive use of plant, and are made in accordance with Annex F.2.2 of BS 5228 ('Method for Activity L_{Aeq} ').

11.5.4 Throughout all identified phases, traffic will be accessing and moving within the site. The impact of noise levels associated with traffic is therefore considered in combination with the plant assumed for each of the phases listed in Table 11.2.

Within CadnaA[®], it is assumed that traffic will move from the construction compound and along the haul routes ten times in any given hour, i.e. a 'moving point source', with a speed of 10mph.

- 11.5.5 For each phase, barrier attenuation within the model is considered through the incorporation of OS 'Terrain50' and site-specific topography (provided by the Applicant), which is determined by the working face of the quarry.
- 11.5.6 Due to the location of the site relative to the closest NSRs, the noise level predictions have been based on 90% soft ground between the sources and receivers under weather conditions considered favourable for propagation leading to a conservative result.
- 11.5.7 Noise predictions are based on the 10m sound pressure levels (SPLs) listed in Annex C of BS5228 for the anticipated plant items and these are detailed for each phase in the following tables, Table 11.6 to Table 11.8.
- 11.5.8 The SPL values in these tables have been used within the CadnaA[®] software in order to convert into the corresponding SWL values. The software takes account of measurement distance (10m) and sphere partition (Q), which corrects for the influence of reflective surfaces close to the noise source, i.e. the ground.
- 11.5.9 The noise predictions represent a worst-case scenario in terms of plant and equipment locations, where mobile equipment is operating at its closest approach to nearby NSRs or in locations where attenuation provided by the quarry face is at a minimum. In addition, all predictions are based on plant operating at full power and 100% on-time. No allowance has been made for breaks or temporary shutdowns of the plant or equipment.

Table 11.6: Establishment Phase – SPL values at 10m, dB

BS5228 Ref., (Annex C, Table C.1 to C.12)	Plant	Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
Construction of Compound Facilities									
C.4, 50	Tracked mobile crane	68	71	68	62	66	66	55	46
Total		68	71	68	62	66	66	55	46
Construction of Haul Routes									
C.4, 74	CAT D6T truck-type tractor	79	71	78	75	78	70	61	55

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

BS5228 Ref., (Annex C, Table C.1 to C.12)	Plant	Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
C.5, 12	Komatsu D65PX crawler dozer	80	78	71	70	74	68	65	61
C.9, 6	Komatsu PC450 hydraulic excavator	95	93	89	89	86	82	76	74
C.5, 18	Hitachi ZX670 excavator	76	79	75	75	76	73	70	65
Total		95	93	90	89	87	83	77	75
Site Preparation									
C.2, 1	Dozer	79	77	76	74	68	67	60	59
C.2, 3	Tracked excavator	80	83	76	73	72	70	69	66
C.2, 8	Wheeled backhoe loader	74	66	64	64	63	60	59	50
Total		83	84	79	77	74	72	70	67

Table 11.7: Post-Establishment Phase and Extraction – SPL values at 10m, dB

BS 5228 Ref., (Annex C)	Plant	Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
Excavation, Extraction & Earthworks									
C.9, 22	Volvo A40 articulated dump truck	100	97	88	84	82	80	77	68
C.4, 20	Volvo A40 mixer truck	83	74	66	69	70	78	60	55
C.5, 18	Volvo EC480 excavator	76	79	75	75	76	73	70	65
C.9, 6	Komatsu PC450 hydraulic excavator	95	93	89	89	86	82	76	74
C.5, 12	Komatsu D65PX crawler dozer	80	78	71	70	74	68	65	61
C.4, 74	CAT D6T truck-type tractor	79	71	78	75	78	70	61	55

Engineering works and use of land relating to the construction of the proposed Caernarfon and Bontnewydd bypass and existing minerals permission

BS 5228 Ref., (Annex C)	Plant	Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
Total		101	99	92	91	88	86	80	76
Material Processing – Extraction									
C.10, 1	Tracked hydraulic excavator	82	87	82	77	72	70	66	59
C.9, 22	Articulated dump truck	100	97	88	84	82	80	77	68
Total		100	97	89	85	82	80	77	69
Material Processing – Crushing									
C.2, 15	Tracked excavator	77	85	70	73	70	68	63	57
C.9, 14	Tracked semi-mobile crusher	91	91	88	87	85	83	78	68
C.10, 15	Screen stockpiler	84	82	79	79	74	74	71	64
C.9, 26	Wheeled loader	89	90	86	82	83	77	75	64
Total		94	94	90	89	87	84	80	71
Material Processing – Washing									
C.10, 15	Screen stockpiler	84	82	79	79	74	74	71	64
C.9, 26	Wheeled loader	89	90	86	82	83	77	75	64
C.11, 3	Electric water pump	67	65	65	64	63	63	60	54
C.6,39	Diesel generator	79	74	67	64	55	51	45	40
Total		91	91	87	84	84	79	77	67
Material Processing – Concrete Production									
n/a*	Mobile concrete batching plant	86	81	76	78	75	78	67	60
Total		86	81	76	78	75	78	67	60
*from measured data.									

Table 11.8: Restoration and Post-Restoration Phase – SPL values at 10m, dB

BS5228 Ref., (Annex C, Table C.1 to C.12)	Plant	Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
Restoration									
C.9, 22	Volvo A40 articulated dump truck	100	97	88	84	82	80	77	68
C.5, 18	Volvo EC480 excavator	76	79	75	75	76	73	70	65
C.9, 6	Komatsu PC450 hydraulic excavator	95	93	89	89	86	82	76	74
C.5, 12	Komatsu D65PX crawler dozer	80	78	71	70	74	68	65	61
Total		101	99	92	90	88	85	80	76

11.6 Baseline Conditions

- 11.6.1 The site is adjacent to the River Seiont, to the south of Caernarfon, and is approximately 24 hectares in size. It consists of the quarry void, agricultural land to the north-east, east and south, an access road, the former brickworks and brickyards.
- 11.6.2 An interim restoration scheme in 2008 created a large earth mound on the western side of the quarry. Visually, this screens the quarry void from the residential properties beyond. The sides of the quarry void and an area to the east are cut into well-defined terraces, ready for further excavation.
- 11.6.3 As stated previously, noise level limits are currently in place for existing operations within the quarry, as per Conditions 17 to 19 of the site's planning consent. It is understood that these noise level limits are based on the recommendations within MTAN 1 (i.e. relative to measured background noise levels) and are applicable to current operations within the site at the closest NSRs.
- 11.6.4 The majority of NSRs identified within this assessment are private residential properties, except for the Ysbyty Eryri hospital (and adjacent care home) which is located to the west of the site. The identified NSRs are detailed in Table 11.9, and the location of each NSR and their position relative to the development is shown on Figure 11.1.

Table 11.9: Noise Sensitive Receptors

NSR ID	NSR Name	Approximate OS Grid Coordinates
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		X	Y
NSR01	Plas Treflan	249380	361920
NSR02	Bryn Eden	249620	361760
NSR03	Mur Mathew	249770	361790
NSR04	Fron deg	249900	361690
NSR05	Bryn-y-gof	249900	361590
NSR06	Cefn-y-gof	249890	361530
NSR07	Penrhos	249660	361440
NSR08	Cae Philip	249240	361220
NSR09	Seiont Cottage (Ffordd Felin Seiont)	248740	361430
NSR10	Ysbyty Eryri Hospital (and care home)	248750	361620
NSR11	Tyddyn Llwydyn	248850	361750

11.7 Assessment of Impacts

11.7.1 The predicted noise immission levels at each NSR due to the phases identified in Table 11.5 are presented in the following section. The predictions represent the maximum noise level expected from the simultaneous operation of all anticipated activities during each phase; however, in practice, this will not happen as plant will move around and will not always operate at the same time. Therefore, the predicted noise levels are likely to be much higher than in reality.

11.7.2 In addition, noise contour plots detailing the predicted noise immission levels from plant operating simultaneously during each phase are provided as Figure 11.2 to Figure 11.4.

Establishment Phase

11.7.3 The establishment (or construction) phase of the proposed development has been assessed in accordance with the noise limits set out in BS5228 using the *fixed noise limits* methodology. For the purposes of this assessment, the lower noise limit of 70dB L_{Aeq} has been adopted.

Table 11.10: Establishment Phase – Predicted Noise Immission Levels, dB

NSR ID	NSR Name	Predicted Noise Immission Level, dB L _{Aeq}
NSR01	Plas Treflan	53
NSR02	Bryn Eden	54
NSR03	Mur Mathew	39
NSR04	Fron deg	41
NSR05	Bryn-y-gof	45
NSR06	Cefn-y-gof	44
NSR07	Penrhos	49
NSR08	Cae Philip	49
NSR09	Seiont Cottage	62
NSR10	Ysbyty Eryri Hospital	59
NSR11	Tyddyn Llwydyn	55

11.7.4 Table 11.10 shows that the worst-case predicted noise levels during the establishment phase would remain below the 70dB L_{Aeq} noise limit adopted for the assessment of these activities at all receptors.

11.7.5 Therefore, in terms of significance, it is determined that noise associated with the establishment phase of the development would have a negligible effect. Mitigation measures to reduce potential impacts, other than those included within the design of the site, are considered unnecessary; however, good site management practices would be followed at all times.

Post-establishment Phase, with Extraction

11.7.6 The post-establishment phase of the proposed development has been assessed in accordance with the noise limits set out within the existing planning consent, which have been derived in accordance with the MTAN 1 guidance.

Table 11.11: Post-establishment Phase with Extraction – Predicted Noise Immission Levels, dB

NSR ID	NSR Name	Predicted Noise Immission Level, dB L _{Aeq}
NSR01	Plas Treflan	50
NSR02	Bryn Eden	50
NSR03	Mur Mathew	41
NSR04	Fron deg	40
NSR05	Bryn-y-gof	42
NSR06	Cefn-y-gof	41
NSR07	Penrhos	50
NSR08	Cae Philip	50
NSR09	Seiont Cottage	57
NSR10	Ysbyty Eryri Hospital	54
NSR11	Tyddyn Llwydyn	53

11.7.7 Table 11.11 shows that the worst-case predicted noise levels during the post-establishment phase would meet the fixed noise limit of 54dB L_{Aeq} adopted for the majority of receptors in relation to the assessment of these activities. For NSR09, Seiont Cottage, the adopted noise limit of 57dB L_{Aeq} (for this receptor only) is also shown to be met.

11.7.8 It should be noted that these results are based on a temporary position for the mobile minerals processing plant (249050, 361600). This location would be used for up to three months, during which time the use of the processing plant will be used intermittently due to a limited demand for concrete during the initial stages and limited storage capacity for processed rock. It will then be repositioned into a deeper cut bay within the landform for future use.

11.7.9 Table 11.12 shows the predicted noise levels during the post-establishment phase, assuming the processing plant is repositioned to 249015, 361625.

Table 11.12: Post-establishment phase with repositioning of processing plant – predicted noise immissions, dB

NSR ID	NSR Name	Predicted Noise Immission Level, dB L _{Aeq}
NSR01	Plas Treflan	50
NSR02	Bryn Eden	52
NSR03	Mur Mathew	42
NSR04	Fron deg	42
NSR05	Bryn-y-gof	42
NSR06	Cefn-y-gof	41
NSR07	Penrhos	50
NSR08	Cae Philip	49
NSR09	Seiont Cottage	55
NSR10	Ysbyty Eryri Hospital	54
NSR11	Tyddyn Llwydyn	53

11.7.10 Table 11.12 shows that the predicted noise levels during the post-establishment phase, with the repositioned processing plant, would meet the fixed noise limit of 54dB L_{Aeq} adopted for the majority of receptors. For NSR09, Seiont Cottage, the adopted noise limit of 57dB L_{Aeq} (for this receptor only) is also shown to be met. In addition, noise levels are predicted to be lower in some cases due to the repositioning of the processing plant, as it will benefit from screening when located within a deeper cut platform to the north-west of the northern haul road.

11.7.11 In summary, the predicted noise levels for the post-establishment phase (with the repositioned processing plant) are shown to be no greater than the existing permissions in place and do not exceed 55dB L_{Aeq} for all receptors.

11.7.12 Therefore, in terms of significance, it is determined that noise associated with the post-establishment phase of the development would have a negligible effect. Mitigation measures to reduce potential impacts, other than those included within the design of the site, are considered unnecessary; however, good site management practices would be followed at all times.

Restoration and Post-restoration Phase

11.7.13 The restoration phase of the proposed development has been assessed in accordance with the noise limits set out within the existing planning consent, which have been derived in accordance with the MTAN 1 guidance.

Table 11.13: Restoration and Post-Restoration Phase – Predicted Noise Immission Levels, dB

NSR ID	NSR Name	Predicted Noise Immission Level, dB L _{Aeq}
NSR01	Plas Treflan	49
NSR02	Bryn Eden	46
NSR03	Mur Mathew	38
NSR04	Fron deg	39
NSR05	Bryn-y-gof	40
NSR06	Cefn-y-gof	42
NSR07	Penrhos	48
NSR08	Cae Philip	54
NSR09	Seiont Cottage	53
NSR10	Ysbyty Eryri Hospital	54
NSR11	Tyddyn Llwydyn	50

11.7.14 Table 11.13 shows that the worst-case predicted noise levels during the restoration phase would meet the fixed noise limit of 54dB L_{Aeq} adopted for the majority of receptors. For NSR09, Seiont Cottage, the adopted noise limit of 57dB L_{Aeq} (for this receptor only) is also shown to be met.

11.7.15 The predicted noise levels for the restoration phase are therefore shown to be no greater than the existing permissions in place and do not exceed 55dB L_{Aeq} for all receptors.

11.7.16 Therefore, in terms of significance, it is determined that noise associated with the restoration phase of the development would have a negligible effect. Mitigation measures to reduce potential impacts, other than those included within the design

of the site, are considered unnecessary; however, good site management practices would be followed at all times.

11.8 Mitigation

11.8.1 A number of measures exist to control and minimise the impact of noise from construction sites. These include:

- European Commission Directives and UK Statutory Instruments in place to control noise emissions from construction plant;
- The guidance within BS5228 on the control of noise from construction sites; and
- Section 60 of the Control of Pollution Act (COPA) 1974, which gives Local Authorities the power to control noise from construction sites.

11.8.2 Although it is not anticipated that noise levels will exceed the adopted noise level limits for each identified phase, site design and the general principles of site noise control (as described in BS5228) will be implemented throughout.

Site Design

11.8.3 The extraction of surface minerals generates noise due to the use of heavy machinery. During the extraction and restoration phases, the potential risk of noise impacting on the closest NSRs would vary depending on the type of activities being undertaken at the time and the effectiveness of noise control measures.

11.8.4 The site incorporates several existing features that will aid in the mitigation against potential noise impacts. These features include, but are not limited to:

- A large earth mound on the western side of the quarry, which screens the quarry void from residential properties north of the river;
- The sides of the quarry void and an area to the east which are cut into well-defined terraces;
- Steeper quarry sides through proposed further excavation.

Good Site Practice

11.8.5 In addition to the noise mitigation measures incorporated into the site design, good site management practices and other specific measures would also provide additional noise mitigation. These measures include, but are not limited to:

- Activities to be undertaken in locations where noise attenuation from existing landforms would maximise the benefit to NSRs;

- Haul roads to be kept clean and maintained in a good state of repair to avoid unwanted rattle from vehicles;
- Noise emission levels to be compliant with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments;
- Mobile plant and HGVs entering the site to minimise, as far as is practical and safe, noise from reversing alarms;
- Plant operated in a proper manner to minimise noise emissions, for example, minimisation of drop heights and avoidance of revving of engines;
- Plant to be fitted with effective exhaust silencers and maintained in good working order to meet manufacturers' noise rating levels, with defective silencers replaced immediately;
- Plant which is used intermittently to be shut down when not in use; and
- Pumps and generators to be located behind existing mounds or landforms, to be electrically powered and fitted with acoustic covers where necessary.

11.9 Conclusions

- 11.9.1 The noise assessment has considered the potential for noise generated by the proposed development to give rise to noise impacts at the closest NSRs. The assessment has been made against noise level limits derived in accordance with relevant policy and guidance.
- 11.9.2 The assessment has shown that worst-case noise levels generated by operations during all anticipated phases of the development are predicted to be at or below the adopted noise level limits at all identified receptor locations.
- 11.9.3 Based on the results of the assessment, it is considered that features incorporated into the design of the site will aid in the mitigation of noise and a number of good site practices have been suggested to reduce the risk of potential noise impacts.
- 11.9.4 It is therefore concluded that noise should not pose a material constraint for the proposed development.

12 EFFECT ON COMMUNITY ASSETS

12.1 Introduction

12.1.1 This chapter considers the potential impacts on the local community and community facilities that could be affected by the construction, operation and restoration of the site. The following will be considered:

- The effects brought about by physical disruption to the use of public rights of way, cycleways, public roads and other community and recreational links;
- The potential effects on the enjoyment of community facilities and public open space that may arise from changes brought about;
- Cumulative effects that might arise with other developments in the area.

12.1.2 The key matters of concern are:

- The consequences of increased vehicular activity;
- The consequences of direct temporary or permanent physical disruption;
- Proposed means to avoid, minimise or mitigate any impacts.

12.2 Policy context

Local Planning Policies

STRATEGIC POLICY 1: Taking a precautionary approach, development proposals that would have an adverse or uncertain impact on the environment, economy or cultural character (including the Welsh language) of the Plan area will be refused unless it can be conclusively shown by an appropriate impact assessment that this can be negated or mitigated in a manner acceptable to the Planning Authority.

POLICY A2 - Protecting the social, linguistic and cultural fabric of communities, proposals that would, because of their size, scale or location cause significant harm to the social, linguistic or cultural cohesion of communities will be refused.

POLICY A3 - Precautionary principle, proposals will be refused if there is any possibility of serious or irreversible damage to the environment or the community unless it can be shown conclusively at the end of an appropriate Impact Assessment that the impact can be negated or mitigated.

POLICY B23 – Amenities, proposals that cause significant harm to the amenities of local communities will be refused. Developers will be required to demonstrate clearly that they will respond positively to the following factors, as appropriate:

- that the development ensures the reasonable privacy of its users and nearby properties;
- that the development will not lead to the over-development of the site;
- that the development does not increase traffic nor the noise associated with traffic in a way that causes significant harm to local amenities;
- that the design of the site reduces opportunities for anti-social behaviour and creates an atmosphere where people feel safe to walk, cycle and play;
- that the design of the external layout of the development takes into account the needs of all its potential users including disabled persons.

POLICY CH22 - Cycling network, paths and rights of way, all parts of the cycling network, paths and public rights of way (including footpaths, public footpaths, bridle paths and byways) will be safeguarded and promoted by:

- assessing any proposal that would infringe upon a cycle route, path or public right of way with the aim of ensuring that the cycle route, path or public right of way is satisfactorily incorporated within the development and if this cannot be achieved that:
 - appropriate provision is made to divert the route, or
 - an alternative new route is provided which safely and attractively maintains or improves the local network
 - refusing any proposal which is likely to prohibit plans to extend the existing cycling network, paths and public rights of way unless an alternative path can be provided which is just as safe, attractive and accessible.

12.3 Method of assessment

12.3.1 This assessment method is based on the approach set out in Design Manual for Roads and Bridges Volume 11 Environmental Assessment Section 3, Environmental Assessment Techniques, Part 6 Pedestrians, Cyclists, Equestrians and Community Effects. The title of Community Effects has been adopted to reflect the changing requirements of DMRB Vol 11 and so this section addresses community facilities and local routes for non-motorised travellers.

12.3.2 The Volume 11 method is intended for use in the assessment of impacts of road projects. The proposal scheme will affect or indirectly affect some community routes and facilities. The method separates out the following effects for assessment:

- Changes to routes and duration of local journeys for non-vehicular travellers to community facilities: quantified by measured distances and increases in journey time;

- Changes in amenity: descriptive assessment of changes brought about by the scheme;
- Severance of local residents from community facilities and services: due to disruption brought about by increased traffic, or other activity, the extent to which a normal journey might be hindered by distance or complete blockage of the normal route.

12.3.3 The scale of severance is assessed on the scale set out in Table 12.1.

Table 12.1: Magnitude of severance and relief of severance

Magnitude	Definitions of severance	
Slight	In general, the current journey pattern is likely to be maintained, but there will probably be some hindrance to movement; (e.g. journey increased by up to 250 metres)	
Moderate	Some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Other trips will be made longer or less attractive (e.g. journey increased by more than 250 to 500 metres)	
Severe	People are likely to be deterred from making trips to an extent that is sufficient to induce a re-organisation of their habits. This would lead to a change in the location of centres of activity or in some cases to a permanent loss to the community. (e.g. journey increased by more than 500 metres)	
Magnitude of relief	Relief from severance by reduced traffic flow (as a percentage)	
	Built up area	Rural area
Slight	Up to 30%	60 to 75%
Moderate	30% to 60%	75% to 90%
Substantial	More than 60%	More than 90%

12.4 Potential impacts

12.4.1 Figure 12.1 shows the main community facilities, non-vehicular routes and public open spaces surrounding the site. A preliminary assessment has identified that many

of these will remain unaffected by the proposed development. The findings of the preliminary assessment are shown in Table 12.2. Traffic impacts are addressed in Chapter 13.

- 12.4.2 Table 12.2 identifies if the effects on a receptor are direct or indirect, whether the effect is predicted to be insignificant, and if it is sufficiently remote from the site for an indirect effect to be irrelevant to the assessment. If there is no effect, then no further assessment is required.
- 12.4.3 Because the proposed development will take place within an established site with existing consents for quarrying, brick manufacture and storage, with access along a private road, any new impacts will be slight. The following potential effects have been identified as a comparison with the existing circumstances. The potential effects with proposed mitigation are summarised in Table 12.3.

Table 12.2 Summary of preliminary assessment of potential receptors

Aspect	Directly affected	Indirectly affected	Minimal effect	Geographically remote	Assessment taken
Footpath 13	N	Y			Yes
Footpath 26, 31 and 32	Y	Y			Yes
Footpath 26	N	Y	✓		
Glan Gwna Holiday Park	N	Y	✓	✓	
Chapel and cemetery Caethro	N	N		✓	
Service Station and Shop, Caethro	N	N		✓	
Footpaths 44,45 and 48	N	N		✓	
Byways south west of Caethro	N	Y	✓	✓	
Footpath 24 and 25	N	N			
Cycleway along Pen y Bryn	N	N			
Footpath 14 and 15	N	N			
National Cycleway Route 8	N	N			
Bryn Seiont Hospital	N	N		✓	
Ysbwty Eryri / Care Home	N	Y			Yes
The Park public open space	N	Y			Yes

Aspect	Directly affected	Indirectly affected	Minimal effect	Geographically remote	Assessment taken
Rugby Club	N	N		✓	N
Shops on Ffordd Eryri	N	N		✓	N
Ysgol Yr Hendre	N	N		✓	N
Caernarfon Cemetery	N	N		✓	N
St Peblig's Church and graveyard, Constantine Road	N	N		✓	N

12.5 Significance of impacts

12.5.1 This section describes significance of the potential impacts, using the criteria set out in Table 12.1. Table 12.3 summarises these impacts and describes mitigation.

Establishment of the bypass construction compound and storage area (Month 1 - 3)

12.5.2 The **existing quarry access road (via Ffordd Felin Seiont)** will be used by the private vehicles of site-based construction personnel and small delivery vehicles. Some heavy goods vehicles (HGV) will also require access to deliver and remove plant, temporary buildings and certain high-value materials. This existing road has been used by the quarry operators since the railway was removed in the 1960s and use is still permitted under the current planning permission for quarrying which will run until 2042. The increase in traffic over the period of 3 months will be similar to what would be required for quarrying and brickmaking if this activity had continued since 2007.

During the operational period of the compound (Approximately months 4 – 24)

12.5.3 During this period there will be the greatest amount of activity within the site and on the adjacent bypass construction site:

- The site offices, car park and staff welfare facilities will be provided on the former brickworks site;
- areas of the quarry will be cleared and two haul roads created to link with the proposed bypass haul road;
- a working platform for the processing of excavated material will be formed within the quarry void;
- Mineral extraction under the existing minerals permission will recommence;

- The brickyard to the west of the river will be excavated to form a basin.
- Fill material will be imported to the quarry to restore the quarry by infilling the quarry void and form shallow side slopes.

- 12.5.4 During the first year of construction the existing quarry access from Ffordd Felin Seiont will be used for private cars, small delivery vehicles and some selected HVGs. The predicted numbers of vehicles and the impact on traffic is addressed in Chapter 13. All other traffic required to enter the quarry or bypass site will enter from the bypass construction haul road, outside the quarry boundary. During this period the impacts would be the similar (Slight) to those set out in paragraph 12.4.2.
- 12.5.5 Once the quarry restoration is completed use of the current access via Ffordd Felin Seiont will no longer be used of a frequent basis. The impact of this reduction would have a corresponding beneficial effect on the users of The Park, of footpath 13 and residents on Ffordd Felin Seiont. They would experience a **Substantial Beneficial** reduction in journey times, severance and amenity.
- 12.5.5 The residents and staff of Ysbyty Eryri and the adjacent Care Home might also experience a **Beneficial improvement** in amenity, although there would be a slight loss of amenity due to a slight increase in visual impact brought about by the proximity of the activities within the former brickworks yard. Visual Impact is addressed in Chapter 8.
- 12.5.6 **Users of Footpath 31 and 32** will experience loss of amenity where the existing public right of way crosses the line of the earthworks for the proposed new quarry access road. The loss of amenity will result from the temporary disruption of the direct route, the presence of construction traffic and the permanent presence of the access road. Overall the loss of amenity will initially be **Moderate impact** declining to **Slight** once the excavation is completed.

Following completion of the bypass construction (Approximately Month 25 - 85)

- 12.5.7 During the period following the construction of the bypass there will be a short period during which time the site compound will be dismantled and plant and equipment removed from the brickyards. Then, the remaining activity will continue within the quarry void to complete the restoration of the land. The import of fill and export of recovered aggregates will continue, as required, to complete restoration; although the amount of traffic generated by the site restoration will not be significant. Restored areas of the quarry will be prepared, seeded and planted in accordance with the agreed restoration scheme.
- 12.5.8 The permanent reduction in use of the original quarry access road will benefit the users of The Park, of Footpath 13, and residents whose properties lie along Ffordd

Felin Seiont. The impact would be an overall **Moderate Beneficial** in terms of amenity and severance.

- 12.5.9 The residents and staff of Ysbyty Eryri and the adjacent Care Home would experience an overall **Moderate Beneficial improvement** in amenity with the removal of the construction compound on the former factory site and the phased revegetating of the quarry slopes.
- 12.5.10 **Users of Footpath 31 and 32** will experience an overall **Moderate beneficial** improvement in amenity as the excavated area northwest of the quarry is restored and revegetated.

Following completion of the quarry restoration (Months 86 onwards)

- 12.5.11 Completion of the restoration of the quarry will include the removal of all remaining plant and equipment and the revegetating of the quarry slopes.
- 12.5.12 The impacts of this stage in the project will be beneficial to local communities with an overall improvement in amenity and reduction in disruption. By comparison with the starting point of the project as the site stands now, the overall change will be **Moderate to Substantial Beneficial**. The residents along Ffordd Felin Seiont, in the hospital and using public footpaths will no longer be adversely affected by quarrying or construction traffic and activity within the quarry, while the users of local footpaths, and others within the community will have the benefit of the improved amenity of the restored quarry.

Impacts on the wider community

- 12.5.13 There would be a slight increase in traffic in the establishment phase, this would be an insignificant adverse impact to local journeys to community facilities. The wider community will not be affected by the scheme during the periods of bypass construction and restoration because the quarry is already adequately separated and excluded from normal community activity and local journeys. In the period following restoration there will be a beneficial impact from the provision of access for informal recreation within areas of the site.

12.6 Cumulative impacts

Residents on Ffordd Felin Seiont

- 12.6.1 The bypass is sufficiently separated by topography, distance and intervening woodland for the effects of working within the quarry to be irrelevant to the residents living on Ffordd Felin Seiont. So the cumulative impacts of the quarry and the bypass during construction and after will be the same as for the quarry alone.

Ysbyty Eryri and the Care Home

- 12.6.2 The bypass is sufficiently separated by distance and intervening trees for the bypass to have only minor effects on the amenity of staff and residents living in the Care Home, or staff and patients in the hospital. So the impacts of the quarry and the bypass during construction will be only a slightly increased adverse effect which would not raise the cumulative impact above the **Slight Adverse** Impact cause by the quarry alone. In the period after construction is completed the overall beneficial effects of quarry restoration will improve amenity in accordance with the assessment of significance for the quarry.

The Park

- 12.6.3 The bypass is sufficiently separated by topography, distance and intervening woodland for the effects of this scheme to be irrelevant to the users of The Park. So the cumulative impacts of the quarry and the bypass during construction and after will be the same as for the quarry alone.

Footpaths, bridleways and cycleways

- 12.6.4 The combined effects of the scheme with those of the proposed bypass include impacts on Public Footpaths in the vicinity of the quarry, namely 19, 24, 26, 31, 32, and on the Pen y Bryn Cycleway and closure of the Pen y Bryn unclassified road. In all of these routes bypass construction will require temporary crossings or permanent diversions/closures which will generally cause Moderate or Major impacts on the use of footpaths. During the post construction stage those routes that are to be re-opened will be restored to use with a road crossing and possibly with a diversion. The overall significance of would be **Moderate to Slight Adverse**.
- 12.6.5 Cumulative impacts on footpaths from the bypass and quarry are considered to be **Moderate Adverse** in significance during construction and because some will be permanently closed the long-term impact will be similar. The future of these public footpaths will be decided by the outcome of any Public Local Inquiry for the bypass project.
- 12.6.6 A summary of Cumulative impacts at each phase of the scheme are included in Table 12.3.

Table 12.3: Summary of Impacts and proposed mitigation

Stage <i>and duration</i>	Impacts by comparison with existing permitted quarry					Overall cumulative impacts, including bypass on wider community	Mitigation	
	Residents on Ffordd Felin Seiont	Ysbwty Eryri and Care Home	The Park	Public footpaths	Wider community/ overall impact			
A. Establishment of the bypass construction compound and storage area (<i>3 months</i>)	Slight adverse impact of short duration , through disruption, due to increased traffic on access road during working hours and loss of amenity due to disturbance from activity within the site and on the access road.					Slight adverse	Slight adverse	Plan site personnel commuting and deliveries to avoid peak traffic. Keep visible areas of site tidy. Manage disturbance of footpath to minimise impact
B. Operational period of the compound <i>21 months</i>	Slight adverse impact declining as use of the quarry access road reduces.	Slight adverse impact resulting from loss of amenity.	Slight adverse impact resulting from loss of amenity.	Moderate adverse impact declining to Slight adverse once excavation around footpaths completed.	Slight adverse	Moderately adverse	Plan site activity to comply with noise, dust and visual impact mitigation.	
C. Following completion of the bypass construction <i>60 Months</i>	Moderate beneficial as activity on site gradually reduces to almost nothing.	Slightly beneficial as activity on site gradually reduces to almost nothing.	Slightly beneficial as activity on site gradually reduces to almost nothing	Slight adverse impact declining as restoration of quarry progresses. Cumulative impact will be greater due to permanent closures of footpaths.	Slight beneficial	Moderately adverse	Manage disturbance of footpath to minimise impact Plan site activity to comply with noise, dust and visual impact mitigation.	
D. Following completion of the quarry restoration	Moderate to Substantial beneficial impact as restoration makes public access to quarry possible.	Moderately beneficial as restoration completed.	Moderately beneficial as restoration completed.	Neutral as restored areas establish and the quarry is revegetated	No change	Slight adverse	No additional mitigation proposed	

13 TRAFFIC GENERATION AND EFFECTS

13.1 Introduction

13.1.1 This chapter considers the potential access and traffic impacts associated with the construction, operation and restoration of the site. The following will be considered:

- The type and volume of traffic generation related to the proposed scheme within the quarry;
- The potential environmental effects that may arise from traffic associated with the scheme.
- An assessment of the significance of the projected traffic in light of thresholds of significance.

13.1.2 The key matters of concern are:

- Access routes to the site;
- Impacts on the local highway network;
- Proposed means to avoid, minimise or mitigate the impacts, if required.

13.1.3 Plans to construct a new route for the A487 to form a Caernarfon and Bontnewydd Bypass will also have an effect on traffic flow on roads around Caernarfon Brick Quarry. If the bypass is to be constructed the works would most likely occur sometime between 2017 to 2019. Once the road is operational then the traffic will use that in preference to the old roads that pass through Caernarfon and Bontnewydd. This assessment addresses the potential impact of traffic when the quarry extraction and restoration works are combined with bypass construction.

13.2 Methodology

Legislation and guidance

13.2.1 The transport and traffic matters described in the following planning advice and documents have been taken into account in this assessment:

Local Planning Policies.

POLICY B23 – Amenities, proposals that cause significant harm to the amenities of local communities will be refused. Developers will be required to demonstrate clearly that they will respond positively to various factors, of which the most relevant to this assessment are: that the development does not increase traffic nor the noise associated with traffic in a way that causes significant harm to local amenities; that the

design of the external layout of the development takes into account the needs of all its potential users including disabled persons.

POLICY CH28 - Impact of development on journeys, proposals for large scale developments that substantially increase the number of journeys made by private vehicles will be refused unless they include measures to reduce the environmental impact as part of a Transport Assessment and/or a Travel Plan. The Local Planning Authority will favour developments that are planned and designed in a manner that promotes the most sustainable and environmentally acceptable modes of transport.

POLICY CH30 - Access for all, proposals for residential units, business/industrial units, or buildings/ facilities for public use, will be refused unless it can be shown that thorough consideration has been given to the need to provide appropriate access for the widest possible range of individuals.

POLICY CH31 - Providing for cyclists, development proposals will be refused unless they provide the following, wherever there are clear opportunities to do so:

- clear and safe access into the site for cyclists
- attractive, direct and safe cycle routes across the site
- clear and safe links to the existing or proposed cycle network
- safe and convenient parking facilities for bicycles
- facilities for showering and changing (if more than 20 people are employed on the site)

POLICY CH33 - Safety on roads and streets, development proposals will be approved only if they conform with all the following criteria:

- that provision will be made for vehicular access to the site, which is safe and in keeping with the local surroundings;
- that the existing road network is of sufficient standard to deal with the flow of traffic that is likely to result from the new development or that adequate improvements can be made which are consistent with the function of the road within the defined roads hierarchy and that the improvements are in keeping with the local area;
- that appropriate traffic calming measures are provided in connection with any development that is likely to lead to a substantial increase in traffic.

POLICY CH36 - Private car parking facilities, proposals for new development, extensions to existing development or change of use will be refused unless off-street parking is provided, either on the development site or adjacent to it, in accordance with the Council's existing parking guidance. The following factors will also be taken into consideration:

- the accessibility to the public transport service from the proposed development site;
- the ease with which travel to and from the proposed development site can be made on foot or bicycle;
- the proximity of the proposed development site to a public car park.

Assessment method

13.2.3 Guidelines for the Environmental Assessment of Road Traffic²⁹, are referred to in this assessment. The guidelines are intended for the assessment of the environmental effects of road traffic associated with major new development. The guidelines suggest two rules can be used as a screening process to identify the appropriate extent of the assessment area. These are:

Rule 1: Include road links where traffic flows would increase by more than 30% (or the number of HGVs would increase by more than 30%;

Rule 2: Include any other specifically sensitive areas where traffic flows would increase by 10% or more.

13.2.4 Whilst the brick factory has been demolished and the site has been unused for quarrying and brick manufacturing since 2008, the existing planning permissions for the brickworks, quarry and brickyard require traffic to use the existing access road until 2042. However, this new application is concerned with traffic that will use the site specifically in connection with construction of the proposed bypass. Initially the current access route from the existing A487 would be used, but as soon as feasible the use would be restricted and then it would be closed to most traffic. Whilst there would be short-term impact on the existing road network there would be only a negligible long term impact accompanied by a reduction in traffic using existing access road. The development sequence for access to the proposed scheme would be:

Mobilisation phase:

During establishment of the site compound and construction of haul roads.

Operational phase:

During quarry works and construction of the adjacent bypass.

Restoration phase:

Following completion of the bypass there will be a period of continued quarry restoration works.

²⁹ Institute of Environmental Management and Assessment -Guidelines for the Environmental Assessment of Road Traffic, 1993

Consultations

- 13.2.5 The EIA Scoping exercise included consultations with Gwynedd Council and Welsh Government. The latter were contacted because of the direct relationship between the proposed development and the adjacent Welsh Government scheme to construct the bypass. They did not have any comments because the volume of traffic generated by the proposed development in the quarry would not be sufficient to have an effect on the trunk road network.
- 13.2.6 Gwynedd Council Environmental Health Officer identified that potential road traffic impacts were a concern. In particular, the following was indicated in a formal reply to the Request for a Scoping Opinion:

Issues to be considered with regards to traffic and transport include:

- *Environmental impacts as set out in the IEMA Guidelines for Environmental Assessment of Road Traffic which include residential disturbance, severance, pedestrian and vehicle delay, noise and vibration, dust and dirt and air pollution.*
- *These issues should be addressed by collecting baseline data and forecast trip generations should be collected and/or estimated in line with best practice guidance. The assessment should cover all stages of the development.*

Predicted Impacts

- 13.2.7 This assessment has assigned predicted vehicle trips expected over the various phases of the project. This information was derived from the expected duration of the associated proposed bypass construction and knowledge of the required work on site. Vehicle trips were assigned to the road network and assessments of the impacts were made, based on the appropriate traffic assessment guidance.
- 13.2.8 The quarry has been selected as a source of fill material for construction and as a site to permanently place excavated fill from the bypass that is unsuitable for use in construction. By selecting this site the contractor will be able to substantially reduce impacts of road haulage on local road traffic. To demonstrate the benefit a comparison is made between hauling to and from remote quarries on the one hand and using the Seiont Brickworks quarry on the other. Alternative sources of construction fill that have been considered are set out in Chapter 4.
- 13.2.9 There would be an initial establishment period when plant, equipment and temporary buildings would be delivered to the former factory site, but once the site offices are in

place the number and size of vehicles using the existing access road would reduce. The quarry and former factory site will be divided into:

'Clean' side with direct access from the public road network;

'Working' side accessible only from the bypass construction site.

Entry to the 'clean' side would be allowed for private vehicles, daily small delivery vehicles such as Royal Mail vans and occasional deliveries by HGVs which would need to gain access to the 'clean' side of the site and so could not use the bypass construction haul road.

- 13.2.10 Entry to the 'working' side would be from the bypass construction site. In order to reduce congestion and delays on the road network around Caernarfon the intention is for as much of the construction traffic, in particular HGVs, abnormal loads and plant, to arrive and leave the bypass construction corridor using entry points away from the centre of Caernarfon and without using the access road to the quarry. These access points along the bypass route are outside the scope of this planning application. Access to the bypass construction site is covered within the Environmental Statement for that scheme which means that this assessment only addresses traffic impacts on the access to the quarry site using the existing access road.

Assessment of Significance

- 13.2.11 As mentioned above, the IEMA Guidelines for the Environmental Assessment of Road Traffic (1993) state that two broad rules of thumb can be used as a screening process to delimit the scale and extent of the assessment.
- 13.2.12 The guidelines identify general thresholds for traffic flow increases of 10% and 30%. Where the predicted increase in traffic flows is lower than the thresholds, the guidelines suggest the significance of the effects can be stated to be low or insignificant and further detailed assessments are not warranted. However, to ensure a relative assessment of the increase or decrease in road traffic in environmental terms the following criteria outlined in Table 13.1 and 13.2 are used to determine magnitude of impact and receptor sensitivity respectively.

Table 13.1 Magnitude of impact Criteria

Change in Traffic Flow	Magnitude of Impact
Change in total traffic or HGV flows over 90%	Major
Change in total traffic or HGV flows of 60 - 90%	Moderate
Change in total traffic or HGV flows of 30 – 60%	Minor
Change in total traffic or HGV flows of less than 30%	Negligible

Table 13.2 Receptor sensitivity

Receptor Sensitivity	Receptor Type
Major	Receptors of greatest sensitivity to traffic flow: schools, colleges, playgrounds, accident blackspots, retirement homes, urban/residential roads without footways that are used by pedestrians. (Paragraph 2.5 IEMA Guidelines, 1993)
Moderate	Traffic flow sensitive receptors including: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, unsegregated cycleways, community centres, parks, recreation facilities.
Minor	Receptors with some sensitivity to traffic flow: places of worship, public open space, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision.
Negligible	Receptors with low sensitivity to traffic flows and those sufficiently distant from affected roads and junctions.

13.2.13 The magnitude of change and the sensitivity of the receptor are then compared to determine overall significance.

Table 13.3 Determination of Significance of Effects

Sensitivity of Receptor	Magnitude of Impact			
	Major	Moderate	Minor	Negligible
Major	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Negligible
Minor	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

13.2.14 Potential effects are therefore concluded to be of major, moderate, minor or negligible significance. Major and moderate significance represent effects considered to be significant in terms of the EIA guidance.

Potential effects of increased traffic

13.2.15 An increases in traffic, has the potential to result in environmental impacts, which are considered to be greater if the number of HGV increases. The potential effects of increased traffic are:

- A Traffic noise** - the potential traffic noise impact on residential receptors would be temporary in nature and using the brickworks quarry would be comparable to the existing permitted use of the site for clay quarrying and brick manufacture. A formal assessment of noise is reported in Chapter 11.
- B Disruption and driver delay** - the effects of delay to other road users would mainly be apparent during the movement of abnormal loads as a result of their large size and low speed rather than their numbers. Whilst on the A487, for example, these movements will have less of an impact on driver delay with overtaking lanes provided to the east of Griffiths Crossing. The abnormal loads movements would be undertaken outside of peak traffic hours to reduce the overall disruption. If required, the abnormal load vehicles could pull over to the side of the road at a suitably safe location to allow other road users to overtake, thereby minimising driver delay.
- C Increased risk of accidents** - any increase in traffic numbers has the theoretical potential to increase the risk of accidents. Ordinarily, marginal increases in vehicle numbers would be considered to have a negligible effect on safety since the increases are within average day to day variation in traffic levels. However, there is a potential for impacts on safety as a consequence of driver frustration related to the movement of abnormal loads.
- D Severance, Intimidation and Pedestrian Delay** - an increase in vehicle numbers, particularly HGVs through towns and villages, could result in additional delays to pedestrians wishing to cross i.e. severance. HGV traffic, particularly abnormal loads, can reduce the amenity of pedestrian routes in towns and villages to the extent that pedestrians feel intimidated by the traffic. The HGV and abnormal load routes to and from the quarry will be carefully selected, where possible, to avoid towns and villages. The small number of additional movements is expected to have a negligible effect on severance, intimidation and pedestrian delay on these routes.
- E Dust and dirt** - HGVs have the potential to distribute dust and dirt from the construction site onto the local road network. These effects would be most pronounced in the immediate vicinity of the site entrance. Dirty construction vehicles and plant will be kept within segregated working areas of the construction

compound. The potential for road soiling to occur would be controlled by appropriate measures such as wheel cleaning and road sweeping, when required.

13.3 Baseline

Baseline study

13.3.1 This section considers the proposed access routes to the site and existing road conditions. A route access study, including a visual inspection, was undertaken to assess existing road layout and the existing access road to the quarry.

Routes and access: site access and internal haul roads

13.3.2 The means of vehicular access to the quarry could change over the lifetime of the restoration project and bypass construction. The existing means of access (Seiont Mill Road) has been used by HGVs bound for the quarry and brickworks for a considerable time. The review of this existing access route confirms that Seiont Mill Road remains adequate for use by HGV's. If the bypass scheme does not progress to construction, access to and from the quarry to the bypass construction corridor would not be required. The existing access road will therefore remain as the only vehicular access route to the quarry.

Sensitive Receptors

13.3.3 In order to establish the sensitive receptors along the routes to the existing quarry access road, a desktop study was undertaken, examining Ordnance Survey 1:50,000 maps.

Table 13.4 Receptor sensitivity

Receptor Sensitivity	Potential receptor
Major	Ysgol Yr Hendre Ysbwty Eryri Former Workhouse (Care Home)
Moderate	Pont Seiont Roundabout on the existing A487 Pen y bryn Road (residential properties without footway) A4085 Waen Fawr Road (without footway)
Minor	The Park (Recreational space and public gardens) Eryri residential estate (north east of quarry) Caethro Chapel Residential streets in Caethro

Study Area

13.3.4 The setting and road network is shown in Figure 13.1. The roads that will potentially be most affected by traffic entering and leaving the quarry during bypass construction and quarry restoration are:

- A487 between Bontnewydd and Caernarfon;
- A4085 Caernarfon to Beddgelert (the proposed route for HGVs arriving and leaving the quarry during the bypass construction period crosses this road at Caeathro roundabout);
- The unnamed roads from Bontnewydd on the A487 and Caeathro. This route is part of a series of rural roads that currently serve as an alternative route to driving through Caernarfon on the A487.
- Private road to the quarry from Pont Seiont.

13.3.5 The A487 and other roads through Caernarfon are considered as busy, constrained and prone to congestion. To avoid increasing congestion several routes are considered to be the better for HGVs and load-loaders delivering construction plant to the quarry. Local rural roads will be considered out of bounds for large construction vehicles, for example Pen-y Bryn Road and associated rural lane network south and south west of the quarry.

Mobilisation phase

13.3.6 During the early phases of work at the quarry, when the site is being prepared as a construction base and project offices, access to the quarry will be required using existing public roads. A route has been planned for HGVs arriving from the east and south:

1. **From the east of Caernarfon:** from the A55 junction 11 (Llandegai), the A4244 to Cwm y Glo and Brynrefail, then onto the A4086 to Pontrug towards Caeathro, crossing the A4085 and continuing to Bontnewydd, then north on the A487 to Pont Seiont and onto Seiont Mill Road and into the quarry along the existing access road.
2. **From the south of Caernarfon:** using the A487 from the south passing through Bontnewydd to Pont Seiont and onto Ffordd Felin Seiont and into the quarry along the existing access road.

After the bypass haul road is constructed:

13.3.7 Once construction begins and the construction haul road from Plas Menai roundabout and the Goat roundabout will be the preferred route for all bypass construction traffic with access points from the public road network at both ends and at some intermediate locations:

3. **Bypass construction HGVs** access the bypass from the fixed entry points. Only a very small number will need to enter the quarry directly from public roads. Those that do will follow the following routes:
 4. **From the north and east of Caernarfon:** from the A55 Junction 12, the A487 to Griffiths Crossing roundabout (Plas Menai) and onto the bypass haul road. Private vehicles for the 'clean' area of the site will continue to use Route 1 above;
 5. **From the south and west:** using the A487 from the south to the Goat roundabout and onto the bypass haul road. Private vehicles for the 'clean' area of the site will continue to use Route 2 above;
- 13.3.8 The amount of traffic generated by the scheme in the quarry will be relatively modest on the wider road network and so study area was not expanded any further than the roads listed above, as it is expected that traffic flows would be integrated within the wider road network without any significant effect. This chapter therefore considers the likely increases in traffic along these routes at several stages during the development and considers the benefit of using the Seiont Brickworks Quarry as opposed to more remote quarries.

Baseline Traffic Counts

- 13.3.9 Recent surveys of the local network have been used to predict the baseline traffic flows for the year 2018, to support the design for the proposed bypass. These traffic flows are the basis for this assessment. Figure 13.1 shows the roads for which predicted figures have been provided. To assess the impact of additional traffic generated by the quarry, as part of bypass construction two types of journey have been assumed:
- The arrival of private vehicles and light delivery vehicles from the surrounding area and from the east having approached along the A55 and A470 from the east or the A487 from the south;
 - The arrival of HGVs and abnormal loads from the A55 to the east, using the route described in paragraph 13.3.7, Point 1, to arrive at the north or south end of the bypass construction haul route;
- 13.3.10 The period when work in quarry is likely to affect the local road network is during bypass construction and so the traffic figures used in this assessment are based on predictions calculated by the bypass design team for the road network for 2018. The traffic flows are shown in Table 13.5.

Table 13.5 Baseline traffic based on predicted traffic flow for 2018

Ref	Road link	Annual Average Daily Traffic (AADT) 12 hour					
		Direction:				Total flow	
		N	S	E	W	Light	HGVs
1	A487 North of Caernarfon	8,160	8,300	-	-	15,180	1,280
2	A487 fly-over in Caernarfon	6,940	6,310	-	-	12,470	780
3	B4366 Bethel Road	2,090	2,120	-	-	4,020	190
4	A4086 Llanberis Road	-	-	3,890	3,910	7,080	720
5	A4085 Waenfawr Road	-	-	2,480	2,390	4,830	40
6	A487 South of Caernarfon	9,200	8,920	-	-	16,550	1,570
7	Caethro to Bontnewydd link	2,280	2,150	-	-	4,190	240
8	Caethro to Pont Rug link	2,440	2,420	-	-	4,480	380
9	A4086 (Afon Seiont Crossing link)	-	-	5020	5390	9600	790
10	A4086 to B4366 link	4,050	4,180	-	-	7,190	1,040
11	B4366 to A487 (Plas Menai roundabout) link	2,420	2,800	-	-	4,770	850
12	B4366 at Bethel	2,510	2,680	-	-	4,620	570
13	Pen y bryn Lane	-	-	60	60	120	0

13.4 Potential impacts of the proposals

13.4.1 Access to the site during the three phases of activity would be:

<p>Mobilisation phase:</p> <p>During establishment of the site compound and construction of haul roads.</p>	<p>Access via the existing site access from the existing A487 at Pont Seiont. To be used for private vehicles, delivery of materials and temporary buildings for the site compound and some construction plant.</p>
<p>Operational phase:</p> <p>During quarry works and construction of the adjacent bypass.</p>	<p>Access for private road vehicles and small delivery vehicles to the site compound car park and reception will use the existing quarry access road via the existing A487.</p> <p>Construction related traffic requiring access to the bypass construction corridor will not use the quarry access road. However, access directly to the quarry from the bypass construction corridor will avoid use of public roads.</p>
<p>Restoration phase:</p> <p>Following completion of the bypass there will be a period of continued quarry restoration works.</p>	<p>Access for all vehicles required for quarry restoration will be along Seiont Mill Road.</p> <p>On completion of the restoration Seiont Mill Road would be retained.</p>

Construction Traffic Generation

- 13.4.2 During the period when the Seiont Brickworks Quarry site is actively used during bypass construction, the types of vehicle and the estimated numbers that would require access directly to the construction compound from the road network (not including those requiring access from the bypass construction haul road) are set out in Table 13.6. Note that these are shown as daily, weekly or monthly totals as appropriate. The basis for these figures is explained in the following paragraphs.

Abnormal Loads Trip Generation

- 13.4.3 An abnormal load movement is defined as a vehicle in excess of 18.65 metres in length or 2.9 metres in width or 44 tonnes in weight. Any abnormal loads during the Mobilisation phase would require access via the existing quarry road.

Heavy Goods Vehicles Trip Generation

- 13.4.4 HGV trip generation is based on the estimated demand of the bypass in line with the proposed construction programme. Following completion of the bypass some HGV movements would be required to complete quarry restoration. The volume of mineral to be extracted and to be brought to the site for quarry restoration has been estimated

between 300,000 m³ and 400,000 m³. The final quantity will depend on unknown ground conditions and unpredictable weather. For the sake of this assessment the worst case of 400,000 m³ has been taken. The predicted 400,000m³ of fill imported to the site will be enough to complete restoration of the quarry. If the required quantity is not imported from this source it is likely that the restoration plans will require the remaining volume of fill, with associated vehicle movements, to be made up from alternative sources.

- 13.4.5 Concrete pouring operations require a continuous and steady supply. To reduce road traffic the contractor plans to mix concrete from raw materials within the quarry, where possible using site generated aggregates, so that the need for deliveries of ready mixed concrete or aggregate from remote suppliers is minimised or eliminated. During this period, the cement powder would be delivered from manufacturers on a regular basis. These deliveries will be brought to site by road, using the existing quarry access road. It is estimated that there could be around as 800 cement deliveries during the main construction period of 22 months.

Table 13.6: Types and average numbers of vehicles requiring access to the construction compound

Vehicle type	Estimated numbers of movements in and out of quarry during bypass construction		
	Working Day	Weekly	Overall
Private vehicles of construction personnel and visitors	76		
Small delivery vehicles such as couriers	5		
Low loaders and abnormal loads to deliver equipment and plant			60
Flat-bed lorries and other HGVs, to deliver temporary project office units.		10	
Fuel tankers to supply diesel to construction plant			10
Deliveries of powdered cement			800

Haulage of fill to and from the quarry

- 13.4.6 Haulage vehicle movements in and out of the quarry with excavated materials would occur, where feasible, during the drier months with smaller quantities moved in wetter months. That means that much of the 400,000m³ worst case total volume would be

carried between April and October, with up to 80% of this during July, August and September. If sources of fill and disposal were selected away from the bypass these quantities would be carried on public roads. By choosing to use the quarry linked by haul roads to the immediately adjacent bypass, none of the haulage of excavated fill would be carried by HGVs on the public roads.

- 13.4.7 The quarry operator plans to use off-road haulage vehicles to carry material to and from the bypass construction site. These 40 tonne dumper trucks which, will not be used on public roads can carry twice the load of a conventional HGV, so the predicted number of vehicle movements will be halved. A comparison is shown in Table 13.7.

Table 13.7: comparison of numbers of vehicle movements

Type of vehicle used	Total number required to carry 400,000m ³ of excavated material	Sources and disposal sites remote from bypass with haulage on public roads	Sourcing and disposal in Seiont Brickworks Quarry. No haulage on public roads
Normal road vehicles	88,890	88,890	0
40 tonne dumper truck	44,440	0	44,440

Construction Worker Trip Generation

- 13.4.8 During the construction phase of the bypass, an average of 60 personnel are expected to be on site at once. These personnel will travel to car parking provided within the contractor's compound in the quarry on a daily basis. Some will work in the project offices, while others will be taken from the car park to the bypass construction site.
- 13.4.9 Statistics from the National Travel Survey 2006³⁰ show car occupancy levels for construction personnel average 1.6 persons / vehicle. The 60 personnel would require 38 vehicles. Each would arrive and leave the site daily making a total of 76 movements each day. These trips are likely to be made in private cars and light vans. This equates to 1,520 movements per month, and 33,440 over the 22 months of the contract.

³⁰ Department for Transport - Transport Statistics Bulletin: National Travel Survey 2006

Assumptions made for this assessment

- 13.4.10 Traffic flows for the years 2018 are based on surveys of traffic in 2015 onto which have been added a predicted increase for the intervening three years. The figures have been calculated and provided, for the purpose of this assessment, by the design team for the A487 Caernarfon and Bontnewydd bypass scheme. The duration of the temporary use of the quarry and the extraction of fill and placing of surplus is determined by the duration of the bypass construction contract. The duration of the restoration period cannot be pre-determined until any potential shortfall in the quantity of fill material from the bypass, if any, is known.
- 13.4.11 Table 13.6 sets out the daily, monthly and total traffic movements for different types of vehicles. The change over from existing quarry use to the proposed new quarry access is indicated by green cells for existing and, blue for proposed.



Table 13.8: Estimated vehicle movements in and out of the quarry

Table continues onto the next page

Traffic movement type		Phases 1 to 3: average numbers of vehicle movements (in & out)		
Vehicle type	Status Estimated average	Mobilisation (3 months) Compound and haul road establishment	Operational (19 months) During quarry works and construction of bypass.	Quarry restoration (Duration not fixed) Post completion of bypass
		Using existing quarry access from A487 at Pont Seiont.	2018/2019 Quarry access for cars and small delivery vehicles from A487 at Pont Seiont. Construction traffic will access via bypass construction corridor.	All vehicles for car park and offices using Seiont Mill Road. On completion of the bypass the direct haul road access to the quarry will be removed.
Private vehicles	Daily	40	76	4
	Monthly	800	1520	80
Small delivery vehicles	Daily	5	5	
	Monthly	100	100	6
Low loaders and abnormal loads	Daily			
	Monthly	< 6	< 6	< 1
Flat-bed lorries and other HGVs	Daily	6	1	
	Monthly	20	20	4

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Traffic movement type		Phases 1 to 3: average numbers of vehicle movements (in & out)		
Vehicle type	Status Estimated average	Mobilisation (3 months) Compound and haul road establishment	Construction (19 months) During quarry works and construction of bypass.	Quarry restoration (Duration not fixed) Post completion of bypass
		Using existing quarry access from A487 at Pont Seiont.	2018/2019 Quarry access for cars and small delivery vehicles from A487 at Pont Seiont. Construction traffic will access via bypass construction corridor.	All vehicles for car park and offices using Seiont Mill Road. On completion of the bypass the direct haul road access to the quarry will be removed.
Fuel tankers	Daily			0
	Monthly	1	1	0
Powdered cement	Daily			0
	Monthly	1	36	0
Daily total		48	84	< 5
Monthly total		968	1,683	91
Total vehicle movements using existing access road		(3 months) 2,900	(10 Months) 16,830	(Assume 60 months) 0
Total vehicle movements using proposed access		0	0	5,460
Total vehicle movements:		Temporary use duration of bypass construction 39,670		quarry restoration 19,380

13.5 Assessment of Effects

13.5.1 This section considers the possible impact of the likely vehicle movements associated with the proposed scheme in the quarry on the local road network. The typical average baseline vehicle movements on the local road network are set out in Table 13.5.

13.5.2 This assessment makes a comparison between the traffic flows that are expected as the 2018 baseline with:

- The situation where all extra construction fill is brought from remote quarries, and all surplus material taken, to remote landfills by public roads;
- None of these journeys are required because mineral extraction and disposal of surplus is accommodated within the quarry with no need for transport by road.

Route to the quarry

13.5.3 Road access to the quarry at different phases of the project is described in Section 13.3. The access routes have been proposed because vehicle should use well-maintained roads with adequate capacity to carry the vehicles. The construction traffic is not expected to have a detrimental effect on these roads. Many of the construction workers are expected to be employed locally and therefore travel from local towns and villages.

Ffordd Felin Seiont

13.5.4 Ffordd Felin Seiont which leads to the quarry is approximately 520 metres long, extending south east along the north bank of the River Seiont from a junction with the existing A487 at the Pont Seiont roundabout. There are 13 properties that have access from the lane. Approximately 300 metres southeast of Pont Seiont a private road branches to the north of Ffordd Felin Seiont and continues for a further 200 metres to the quarry only. Ffordd Felin Seiont is typically 4.5 metres wide, is relatively straight with good visibility. The northerly 100 metres from Pont Seiont is walled on both sides. Further south the wall there is a wall on the north side only with a narrow verge to the south with passing places, one of which have been formalised. There is good forward visibility in both directions. All quarry traffic will take the quarry entrance and none will continue along Ffordd Felin Seiont. The assessment addresses the impact of increased use on this road and local residents.

On site access and haul routes

13.5.5 Using the quarry as the site for the contractor's project offices, compound and as a source of fill and disposal will significantly reduce the amount of traffic on public roads. Haul roads will be constructed directly between the quarry and the bypass

construction site and along the full length of the bypass so that construction traffic can be segregated from road traffic. The approach to managing bypass construction vehicles will be set out the Environmental Statement for that project.

Traffic Flows

13.5.6 Tables 13.9 and 13.10 show the estimated number of vehicle movements that would be required to enter and leave the quarry during the construction of the bypass:

Table 13.9 sets out the estimated total, monthly, daily, hourly average and peak hourly vehicle movements assuming that the sites of supply of fill material and disposal of excavated material unsuitable for engineering, is remote from the bypass site. In this scenario the materials would be carried by 20 tonne road heavy goods vehicles (HGV) which would leave the site using the A487 southbound and return northbound, but with no vehicles passing through the busy centre of Caernarfon.

Table 13.10 sets out the estimated total, monthly, daily, hourly average and peak hourly vehicle movements assuming that the sites of supply of fill material and disposal of excavated material, is the Seiont Brickworks Quarry.

13.6 Statement of Significance

13.6.1 Tables 13.9, 13.10, 13.11 and 13.12 summarise daily average and peak hour increases in traffic during construction of the bypass of the kinds shown in Table 13.7:

13.6.2 The figures used in the following tables (Tables 13.9 and 13.10) are based on estimated demand for import and export of fill as indicated in a draft indicative bypass construction programme prepared by the bypass design team in March 2016. Later revisions of the programme may vary, but the figures used are adequate for the purposes of this assessment by showing maximum and average figures and the duration. These figures are used as a base to calculating the effect on local roads:

- **Table 13.10** shows estimated traffic on public roads if all fill materials are brought to or taken to remote quarries and landfills.
- **Table 13.11** show estimated traffic if the option to use Seiont Brickworks Quarry is used to supply and receive fill material, but.

13.6.3 The two tables describe the effects in terms of the percentage increase in traffic volumes assuming HGV site traffic is leaving and returning, in comparison to the projected base traffic flows.

13.6.4 The optimum construction programme requires that the maximum volume of fill is moved when required for efficient construction and to avoid the wettest months of the year. Calculations show that while the monthly average over the construction programme would require 9,640 return journeys on public roads, the peak month of July 2018 would require 28,000 vehicles, including 26,400 HGVs, to make return journeys. The latter figure equates with 1,257 HGV return journeys to quarries and landfills each day, or around 150 to 160 each hour. Such a high frequency of vehicle movements at junctions onto the public road network would be result in heavy congestion and substantial delays. The other options are delays to the construction programme; or a plan to avoid use of public roads.



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Table 13.9 Total construction stage estimated monthly vehicle movements: USING A REMOTE QUARRY AND LANDFILL

Type of round trip	2017	2018												2019											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep		
Export from bypass all excavated surplus materials to remote disposal site using public roads (20 t. HGVs)	0	50	50	200	4000	5,400	6,000	8,000	8,000	5,000	3,400	1,600	1000	1000	4000	6000	9000	9,000	9,000	4700	2,000	1450	0		
Import of fill from remote quarry using public roads (20 tonne HGVs)	0	40	50	100	1600	2000	2000	4,160	18,400	18600	18,600	10200	200	200	200	200	3000	2000	2000	2000	2000	1300	0		
HGVs and abnormal deliveries to quarry by public road	28	22	22	63	55	59	60	67	68	63	70	71	72	45	45	73	73	73	73	73	73	73	73		
Private cars and small delivery vehicles arriving at site compound using public roads	900	900	900	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620		
Total above	928	562	1022	1983	6855	8659	9680	13847	28088	25283	23690	13491	2892	2065	5865	7893	13693	12693	12693	8,393	5,693	4,443	1,693		
Total numbers of the site-based vehicles above using public roads for these movements																									
Total monthly vehicle movements on public roads	Average	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	
	9,641	928	562	1,022	1,983	6,855	8,659	9,680	13,847	28,088	25,283	23,690	13,491	2,892	2,065	5,865	7,893	13,693	12,693	12,693	8,393	5,693	4,443	1,693	
Daily average	175	42	33	51	99	326	412	509	659	1,338	1,264	1,128	642	131	121	293	395	685	604	668	400	271	222	81	
Hourly average	15	5	4	6	12	41	52	64	82	167	158	141	80	16	15	37	49	86	76	84	50	34	28	10	
Estimated site peak hour (quarry) (7-8am & 6-7pm)	71	46	46	47	85	93	91	100	100	170	133	94	84	83	83	46	46	46	46	46	46	46	46	46	
Estimated peak hour (network) (8-9am & 4-5pm)	15	4	4	7	9	16	15	24	93	57	18	7	7	7	7	7	7	7	7	7	7	7	7	7	

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Table 13.10 Total construction stage estimated monthly vehicle movements: USING SEIONT BRICKWORKS QUARRY

Type of round trip	2016		2017										2018											
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	
Import of excavated restoration materials from bypass not using public roads (40 tonne dumpers)	0	20	50	100	1500	2,280	1,934	5,000	5,000	5,000	2,466	1,800	800	100	200	3000	3000	3,000	4,500	3500	700	500	0	
Export of fill to bypass not using public roads (40 tonne dumpers)	0	20	20	50	800	1000	1000	2,060	9,200	9,300	9,300	5,100	100	100	100	100	1500	1000	1000	1000	1000	700	0	
HGV deliveries to quarry by public road	28	22	22	63	55	59	60	67	68	63	70	71	72	45	45	73	73	73	73	73	73	73	73	
Private vehicles arriving at site compound	900	450	900	1,620	1,200	1,200	1,620	1,620	1,620	1,620	1,620	1,620	1,620	820	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	1,620	
Total above	928	512	992	1,833	3,555	4,539	4,614	8,747	15,888	15,983	13,456	8,591	2,592	1,065	1,965	4,793	6,193	5,693	7,193	6,193	3,393	2,893	1,693	
Total numbers of vehicles above using public roads																								
	Average	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct
Total monthly vehicle movements on public roads	1,819	928	470	922	1833	1,255	1,259	1,680	1,687	1,688	1,683	1,690	1,691	1,692	865	1,665	1,693	1,693	1,693	1,693	1,693	1,693	1,693	1693
Daily average	175	42	28	46	92	60	60	88	80	80	84	80	80	77	100	43	83	85	81	89	81	81	85	81
Hourly average	15	5	3	6	11	7	7	11	10	10	11	10	10	10	12	5	10	11	10	11	10	10	11	10
Estimated site peak hour *1 (7-8am & 6-7pm)	71	46	46	46	47	85	93	91	100	170	133	94	84	83	83	46	46	46	46	46	46	46	46	46
Estimated network peak hour *2 (8-9am & 4-5pm)	15	4	4	4	7	9	16	15	24	93	57	18	7	7	7	7	7	7	7	7	7	7	7	7

Notes: *1: Estimated site peak hour is the busiest time for the site with personnel arriving for work or leaving. *2: Estimated network peak hour is the busiest hour on the road network

13.6.5 Tables 13.11 and 13.12 are based on the following assumptions, which have been made based on the best information when this assessment was carried out:

1. Routes to be used by HGVs from the scheme are planned to avoid using streets and roads in Caernarfon.
2. No quarry traffic will use Pen-y-Bryn Lane or the directly linked unclassified lanes.
3. All private vehicles, light delivery vehicles and road HGVs arriving or leaving the contractor's compound, but not entering the bypass construction corridor or quarry, would arrive or leave only using the existing quarry access road until this route is replaced.
4. All road HGVs and abnormal loads leaving or arriving would be required to use the 'unofficial' Caernarfon bypass via Caeathro, Pont Rug and the A4086 and A4244 to get to the A55 so that they avoid using the centre and streets of Caernarfon and other settlements.
5. All HGV traffic carrying construction materials into or out of the bypass scheme will enter the public road network by leaving the bypass haul road at the access points at either the Goat roundabout or the Plas Menai roundabout on the A487 to avoid causing congestion around Caernarfon.
6. All HGVs carrying fill, if required, would most likely travel north-south on public roads to the concentration of readily accessible inert waste sites and quarries to the south. Whilst there are some sites to the north and east, these are at a greater distance.
7. If the Caernarfon quarry is used to supply construction fill and accommodate surplus 'unsuitable' fill, 40 tonne dumpers will work entirely within the bypass construction corridor and the adjacent quarry. None of these vehicles would drive on public roads.

Table 13.11 Percentage increase on 2018 baseline traffic using remote quarry and landfill during bypass construction

Ref	Road link	Predicted 2018 Baseline traffic						Expected traffic generated by the quarry						Combined total traffic					
		Annual Average Daily Traffic (AADT) 12 hour						AADT						AADT					
		Direction and number:				Total flow		Direction and number:				Total flow		Direction, number and <i>increase of x %</i>				Total flow	
	N	S	E	W	Light	HGVs	N	S	E	W	Light	HGVs	N	S	E	W	Light	HGVs	
1	A487 North, between Caernarfon and the A55 Junction	8,160	8,300	-	-	15,180	1,280	27	27	-	-	54	0	8,187	8,327	-	-	16,514	1,280
													<1%	<1%	-	-	<1%	0%	
2	A487 fly-over in Caernarfon	6,940	6,310	-	-	12,470	780	0	0	-	-	0	0	6,940	6,310	-	-	12,470	780
													0%	0%	-	-	0%	0%	
3	B4366 Bethel Road	2,090	2,120	-	-	4,020	190	0	0	-	-	0	0	2,090	2,120	-	-	4,020	190
													0%	0%	-	-	0%	0%	
4	A4086 east of Pont Rug	-	-	3,890	3,910	7,080	720			0	0	0		-	-	3,890	3,910	7,080	720
																0%	0%	0%	0%
5	A4086 west of Pont Rug			3,136	3,127	6,263	671			26	26	52	8	-	-	3,162	3,153	6,315	679
																<1%	<1%	<1%	<1%
6	A4085 Waenfawr Road	-	-	2,480	2,390	4,830	40			0	0	0		-	-	2,480	2,390	4,830	40
																0%	0%	0%	0%
7	A487 South of Caernarfon	9,200	8,920	-	-	18,550	1,570	Av. 420 Max 2,746	Av. 420 Max 2,746	-	-	116	Av. 366 Max 2,692	Av. 9,620 4.6% Max 12,062 31%	Av. 9,340 4.7% Max 11,782 37%	-	-	Av. 18,960 <2.2% Max 19,582 5.6%	Av. 1,936 23% Max 4,262 172%
8	Caeathro to Bontnewydd link	2,280	2,150	-	-	4,190	240	27	27			54	16	2,307	2,177	-	-	4,244	256
														1.2%	1.3%	-	-	1.3%	6.7%
9	Caeathro to Pont Rug link	2,440	2,420	-	-	4,480	380	26	26			52	16	2,466	2,446	-	-	4,532	396
														1%	1%	-	-	1.2%	4.2%
10	A4086 (Afon Seiont Crossing link)	-	-	5,020	5,390	9,600	790			26	26	52	8	-	-	5,046	5,416	9,652	798
																<1%	<1%	<1%	<1%
11	A4086 to B4366 link	4,050	4,180	-	-	7,190	1,040	26	26			52	8	4,076	4,206	-	-	7,242	1,048
														<1%	<1%	-	-	<1%	<1%
12	B4366 to A487 (Plas Menai roundabout) link	2,420	2,800	-	-	4,770	850	26	26			52	8	2,446	2,826	-	-	4,822	858
														1%	<1%	-	-	1%	<1%
13	B4366 at Bethel	2,510	2,680	-	-	4,620	570	0	0			0	0	2,510	2,680	-	-	4,620	570
														0%	0%	-	-	0%	0%
14	Pen y bryn Lane	-	-	60	60	120	0			0	0	0	0	-	-	60	60	120	0
																0%	0%	0%	0%
15	Ffordd Felin Seiont			104	104	206	2			84	84	162	6	-	-	188	188	368	8

Table 13.12 Percentage increase on 2018 baseline traffic using Seiont quarry during bypass construction (using existing quarry access for some traffic)

Ref	Road link	Predicted 2018 Baseline traffic						Expected traffic generated by the quarry						Combined total traffic					
		Annual Average Daily Traffic (AADT) 12 hour						AADT						AADT					
		Direction and number:				Total flow		Direction and number:				Total flow		Direction, number and % increase				Total flow	
N	S	E	W	Light	HGVs	N	S	E	W	Light	HGVs	N	S	E	W	Light	HGVs		
1	A487 North, between Caernarfon and the A55 Junction	8,160	8,300	-	-	15,180	1,280	27	27	-	-	54	0	8,187	8,327	-	-	16,514	1,280
													<1%	<1%	-	-	<1%	0%	
2	A487 fly-over in Caernarfon	6,940	6,310	-	-	12,470	780	0	0	-	-	0	0	6,940	6,310	-	-	12,470	780
														0%	0%	-	-	0%	0%
3	B4366 Bethel Road	2,090	2,120	-	-	4,020	190	0	0	-	-	0	0	2,090	2,120	-	-	4,020	190
														0%	0%	-	-	0%	0%
4	A4086 east of Pont Rug	-	-	3,890	3,910	7,080	720			0	0	0	0	-	-	3,890	3,910	7,080	720
																0%	0%	0%	0%
5	A4086 west of Pont Rug			3,136	3,127	6,263	671			26	26	52	8	-	-	3,162	3,153	6,315	679
																<1%	<1%	<1%	<1%
6	A4085 Waenfawr Road	-	-	2,480	2,390	4,830	40			0	0	0	0	-	-	2,480	2,390	4,830	40
																0%	0%	0%	0%
7	A487 South of Caernarfon	9,200	8,920	-	-	18,550	1,570	0	0	-	-	0	0	9,200	8,920	-	-	18,550	1,570
														0%	0%	-	-	0%	0%
8	Caeathro to Bontnewydd link	2,280	2,150	-	-	4,190	240	27	27			54	16	2,307	2,177	-	-	4,244	256
														1.2%	1.3%	-	-	1.3%	6.7%
9	Caeathro to Pont Rug link	2,440	2,420	-	-	4,480	380	26	26			52	16	2,466	2,446	-	-	4,532	396
														1%	1%	-	-	1.2%	4.2%
10	A4086 (Afon Seiont Crossing link)	-	-	5,020	5,390	9,600	790			26	26	52	8	-	-	5,046	5,416	9,652	798
																<1%	<1%	<1%	<1%
11	A4086 to B4366 link	4,050	4,180	-	-	7,190	1,040	26	26			52	8	4,076	4,206	-	-	7,242	1,048
														<1%	<1%	-	-	<1%	<1%
12	B4366 to A487 (Plas Menai roundabout) link	2,420	2,800	-	-	4,770	850	26	26			52	8	2,446	2,826	-	-	4,822	858
														1%	<1%	-	-	1%	<1%
13	B4366 at Bethel	2,510	2,680	-	-	4,620	570	0	0			0	0	2,510	2,680	-	-	4,620	570
														0%	0%	-	-	0%	0%
14	Pen y bryn Lane	-	-	60	60	120	0			0	0	0	0	-	-	60	60	120	0
																0%	0%	0%	0%
15	Ffordd Felin Seiont			104	104	206	2			84	84	162	6	-	-	188	188	368	8

Potential Effects on roads with 0% to less than 10% increase

13.6.6 In terms of the thresholds outlined by the IEMA Guidelines, Tables 13.11 and 13.12 illustrate the degree of increase in numbers of vehicles using the local road network on an average day. On most roads illustrated the increases in vehicles on the background flow would be between 0% and 4%. For the majority of the network the traffic generated by the use of the quarry would be a small percentage of the baseline daily traffic flows and so the impact in each case is '**Negligible**' (refer to Tables 13.1, 13.2 and 13.3 for the assessment criteria). Receptor sensitivity varies along the various roads that would be affected, but are considered to be **Minor or Negligible**. The Significance of Effect would be **Negligible**.

Potential Effects on A487 south of Caernarfon

13.6.7 Because of the commercial sensitivities of a construction contract the contractor cannot commit to material from a particular quarry at this early stage of the scheme development. However, if fill is to be imported from a remote quarry or taken to a remote landfill then road transport will be required. For this assessment the scenario used for the traffic figures in Table 13.10 is set out in Paragraph 13.5.6 Item 6 and would require HGVs to use the A487 south of Caernarfon (see Table 13.10 Row 7). A discussion about alternative sources of fill and disposal are set out in Chapter 4.

13.6.8 The A487 south of Caernarfon is the most likely road for HGVs to use to get to and from remote quarries and landfills to the south with the least impact on the wider road network. In these circumstances all HGV traffic carrying excavated fill to and from the bypass would use the A487 and so enter the construction site at the Goat Roundabout entrance.

13.6.9 The increase in traffic south of Caernarfon would be substantial, but variable from month to month. To illustrate the range the average and maximum figures and percentage increases are shown. The maximum would occur during weekdays in summer 2018 (see Table 13.8 – highlighted in orange). The summer months in 2018 and 2019 would see substantially elevated numbers of HGVs using the A487 to the south of Caernarfon (see Table 13.8 – highlighted in yellow). The increased HGV traffic would be elevated for the full construction period of 22 months. The impact assessment for this road is set out in Table 13.13.

Table 13.13: Traffic on the A487 south of Caernarfon

Scenario on the A487 south of Caernarfon/Goat roundabout	Magnitude of Impact	Receptor sensitivity	Significance of impact	Combined significance
Using remote quarries and landfills	All vehicles: increase of 5.6% = Negligible	Major (high significance of HGVs)	Negligible	Moderate (high significance of HGVs on flow)
	HGVs: increase of 172% = Major		Moderate	
Using the quarry for both fill and landfill	All vehicles: increase of 0% = Negligible	Minor	Negligible	Negligible
	HGVs: increase of 0% = Negligible		Negligible	

Potential Effects on local roads if using quarries and landfills to the east or north

13.6.10 Another scenario is that quarries to the north or east are used (see Figure 5.1 for the locations of quarries and landfills). In this circumstance the route taken would be either:

- A. from the north end of the bypass scheme at Plas Menai roundabout and onto the A487 east bound to the A55, or;
- B. out of the quarry, via Ffordd Felin Seiont, south on the A487 to Bontnewydd and then north east along the 'unofficial' bypass to Caethro, then Pont Rug and then east along the A4086.

For both routes, the increases in numbers would be the same, but the percentage increase would be greater. The Magnitude of Impact would be in the order of **Minor to Moderate**, while the receptors would vary from **Negligible to Moderate** with an overall Significance of Impact on the routes ranging between **Negligible to Moderate**.

Potential effect on Ffordd Felin Seiont

13.6.11 Option B which uses the Ffordd Felin Seiont is not the preferred option, although some traffic will have to use this road to enter the quarry. The existing planning permission for extraction of clay and brick manufacturing already means this road would be used by private vehicles and HGVs.

13.6.12 Recognising the potential scale of adverse impacts that over 888,890 HGV return journeys on the existing quarry access road (affecting on local residents, causing

damage to the carriageway and increased congestion at Pont Seiont Roundabout), the contractors would prefer to minimise use of that route by HGVs. The current plans are that only private vehicles, light goods vehicles and a small number of HGVs will use the Ffordd Felin Seiont to enter the quarry daily. The impact of traffic on Ffordd Felin Seiont is set out in Table 13.14.

Table 13.14: Traffic on Ffordd Felin Seiont

Baseline daily traffic (AADT) in 2018* (assumes no increase on 2016)		Increase in 2017/2018 with quarry traffic (comparable with existing quarry planning permission)				
		Increase		Total existing and increase		
daily	Peak hours	Daily	Peak Hour	Daily	Peak hour	Hourly average
208*	20	84	30	294 41%	50 150%	24.5 45%

* Estimated based on 16 traffic movements per day per dwelling, with 13 dwellings taking access through the private road.

- 13.6.13 On that basis this road would see daily and peak hour traffic flows that exceed the 'Rule 1' threshold of 30% for both peaks hours and the daily average. The daily increase of 41% would be a **Minor Magnitude Impact**, while the Peak Hour impact would be a **Major Magnitude Impact**. Overall the Magnitude in **Moderate**.
- 13.6.14 The exceedance would be during Peak Hours on the local road network when local residents, whose properties are accessed from Ffordd Felin Seiont, are likely to be leaving for work in the morning, or returning home in the afternoon. To mitigate this problem the Contractor plans the working day so that the majority of commuting construction personnel will occur before the morning Peak Hour and after the afternoon Peak Hours. With the peak traffic for the quarry occurring before most local residents are on the road, the worst impacts would be reduced to around the daily average of 45%. This would have a **Minor Magnitude Impact**. However, because this road serves residential properties and there is no footway, the Receptor Sensitivity would be '**Major**' (see Table 13.2). The Significance of Effect is therefore determined as '**Moderate**' (see Table 13.3).

Extraction of fill and disposal of surplus

- 13.6.15 Tables 13.11 and 13.12 demonstrate the benefit of sourcing construction fill and disposing of surplus fill in close proximity to the bypass scheme without using public roads. The comparison is between on the one hand the estimated requirement for

HGVs to make many return road trips to import fill material from remote quarries and a similar number to export surplus material for disposal in landfill; and on the other hand, the use of much larger 40 tonne off-road dumper trucks to carry fill in and out of the quarry directly from the bypass construction site without using public roads.

- 13.6.16 Avoiding substantial numbers of HGVs using public roads means that the increase in traffic will be limited to HGV requiring access to the 'clean' zone of the construction compound during the working day. These have been estimated as 68 HGVs per month during the three-month mobilisation period (between 3 and 4 a day), then 28 a month for the duration of construction (between 1 and 2 a day). This number of vehicle movements is comparable to what might be expected for the brickworks under existing planning permissions.
- 13.6.17 The working hours for the quarry site mean that the majority of commuting construction personnel will arrive by private car before the morning Peak Hour and after the afternoon Peak Hour on the public road network. This number of vehicle movements is similar to what might be expected for the brickworks under the existing planning permission.
- 13.6.19 The planning of routes for the traffic generated by the quarry has avoided the Major Sensitive receptors listed in Table 13.2. Pont Seiont roundabout, a Moderate Sensitive receptor, would have a slightly increased volume of HGV and light vehicle traffic entering and leaving the site via Ffordd Felin Seiont.

Table 13.15 Summary of impacts if remote quarries and landfill used

Receptor road	Sensitivity	Magnitude	Significance
Roads with only a small increase in traffic flows (less than 10%)	Minor or Negligible	Negligible	Negligible
A487 south of Caernarfon	Negligible	Negligible	Negligible
A487 south of 'The Goat' roundabout	Major	Major	Moderate
Ffordd Felin Seiont	Moderate	Moderate	Moderate

Table 13.16 Summary of impacts if Caernarfon brick quarry is used

Receptor road	Sensitivity	Magnitude	Significance
Roads with only a small increase in traffic flows (less than 10%)	Minor or Negligible	Negligible	Negligible
A487 south of Caernarfon	Negligible	Negligible	Negligible
A487 south of 'The Goat' roundabout	Negligible	Negligible	Negligible
Ffordd Felin Seiont	Moderate	Moderate	Moderate

13.7 Cumulative Effects

13.7.1 This chapter has so far addressed the impacts of traffic moving in and out of the quarry only. Whilst this will include a large part of the bypass construction traffic, there will be traffic effects as a result of:

- **Entry points** to the bypass construction site at either end (Griffiths Crossing roundabout and the Goat roundabout) and possibly at defined points along the route. Vehicles using these entries will include HGVs and abnormal loads delivering large pre-fabricated items, large construction plant, carriageway construction materials;
- **Road crossings**, where the bypass construction corridor crosses existing public roads. Normal practice is for these crossings to be manned or to have traffic controls to separate construction plant and HGVs from road traffic and to maintain the flow of traffic on the public road.

13.7.2 The cumulative effects will be felt on those roads, particularly the A487 where traffic will increase due to both the quarry and the bypass construction corridor. HGVs leaving and entering the two sites will combine at the A487 Plas Menai and The Goat Roundabouts. Whilst traffic congestion could increase at these two junctions the worst consequences of congestion will occur when the existing roundabouts are subject to temporary traffic controls. The figures calculated for the quarry and site compound represent a large proportion of traffic entering and leaving both schemes and so the cumulative impact of both would be only slightly larger than the impact of the quarry alone. A very small impact could occur at peak periods.

13.8 Mitigation

- 13.8.1 This section considers the likely mitigation measures that would be implemented in order to minimise the traffic and transport impacts of mobilisation, construction and decommissioning.
- 13.8.2 The potential effects associated with the proposed traffic will be reduced by prioritising the use of the construction haul roads rather than public roads for moving plant and large vehicles, as described in Chapter 3 (Project Description).
- 13.8.3 Prior to construction, a draft traffic management plan would be prepared for consideration following consultation with Gwynedd Council, the Trunk Road Authority and other stakeholders. The joint venture contractor will finalise this traffic management plan with Welsh Government and adhere to its details during the project. The traffic management plan will typically include consideration of the following:
- Careful selection of suitable routes for large vehicles avoiding settlements, minor roads, poor junctions and where possible by avoiding locations suffering from congestion. Specific routing of abnormal loads to avoid peak seasonal traffic.
 - Appropriate Police or contractor escort to accompany movement of abnormal loads at times to be agreed with the local authorities and police where appropriate;
 - Informative road signage;
 - Arrangements for regular road maintenance and cleaning, e.g. road sweeping in the vicinity of the site access points as necessary;
 - Specific timing of deliveries outside of local peak traffic hours, where possible;
 - Wheel cleaning / dirt control arrangements at key stages of construction;
 - • Provision of temporary signs and traffic control where necessary.
- 13.8.4 The implementation of a traffic management plan and routing strategy will aim to reduce the movement of construction vehicles during the morning and evening peak traffic hours when the road network is typically at its busiest.
- 13.8.5 Statistics from the Department for Transport's National Travel Survey 2006 show typical car occupancy levels for construction personnel averages around 1.6 persons per vehicle, which reduces the number of light vehicles by half. In order to reduce traffic impacts associated with the construction of the proposed scheme,

construction personnel will be encouraged to car-share or utilise company shuttles where practicable.

- 13.8.6 A traffic management plan would be prepared and agreed with the local authorities to ensure traffic impacts at this time are minimised.

Residual Effects

- 13.8.7 The mitigation measures described above, and the temporary nature of the increase in traffic, would result in minimal residual environmental effects in terms of traffic and transport. This is justified by:

- use of a traffic management plan and routing agreements to minimise any impacts during both construction and decommissioning; and
- the effects associated with traffic in the operational phase being insignificant

Significance

- 13.8.8 This Traffic and Transport chapter has assessed the likely significance of effects of the traffic associated with the use of the quarry during bypass construction. With the implementation of mitigation measures such as an appropriate traffic management plan and suitable liaison with Gwynedd Council, the residual traffic and transport effects are temporary and have been assessed as having an overall impact of either minor or negligible significance.

- 13.8.9 Under the current, minerals planning permission for the brickworks and clay extraction quarry an operator has the right to bring HGVs and quarry plant to the site using the local road network, including Ffordd Felin Seiont, until 2042. The current proposal would shorten the period of extraction and traffic on this road by up to 27 years. Whilst filling and restoring the site might extend for a few years after completion of the bypass (late 2018) the overall shortening of the active use of the quarry from a further 27 years to as few as 7 years, is considered to be a significant further reduction in traffic impacts which would be an improvement on the current situation.

Significance of cumulative impacts

- 13.8.10 During bypass construction, when the quarry will be in use, there will be cumulative impacts of both schemes together. The cumulative effect will be a negligible increase in traffic over and above the bypass construction activity.

13.9 Conclusions

13.9.1 This assessment of traffic has provided the opportunity to compare different circumstances which could arise from construction of the bypass and from use of the quarry. The baseline for any comparisons is the existing permitted quarry which an operator could continue to be used to extract of mineral until 2042 and there are no limits on the number of vehicles that could use the existing Ffordd Felin Seiont to enter and leave the quarry. The following conclusions can be drawn:

- A. If the source of fill for the bypass and the location for depositing surplus materials is remote from the bypass site, probably to the south of Caernarfon, the average daily movement of HGV traffic on the A487 would increase significantly (172%) with some months seeing much higher increases in HGVs during 2017 and 2018.
- B. If the source of fill for the bypass and the location for depositing surplus materials is in Seiont Quarry, the average daily movement of HGV traffic onto the A487 would be a negligible increase (0%) during 2017 and 2018.
- C. The number of vehicles (private vehicles and HGVS using Ffordd Felin Seiont to leave and enter the contractors compound from the A487 at Pont Seiont roundabout would increase, but the total for the duration of the bypass construction would be comparable with the numbers that might be expected in the quarry was brought back into use for brick manufacture or other mineral extraction. Due to the short duration of the use and restoration of the quarry as part of the bypass construction is that quarry traffic using Ffordd Felin Seiont will cease on completion of the road.

14 DRAINAGE AND THE WATER ENVIRONMENT

14.1 Introduction

- 14.1.1 This chapter describes the existing flood risk at the site and assesses the potential impacts of the development during both the construction phase and restoration phase on flood risk elsewhere and groundwater. The chapter also describes the existing and proposed surface water drainage arrangements.
- 14.1.2 This chapter should be read in conjunction with the chapters relating to water quality and ground conditions.
- 14.1.3 The impacts of flood risk to the site have been assessed from a range of sources including fluvial, tidal, surface water, sewer, groundwater and flooding from artificial sources. The potential impacts on flood risk elsewhere as a result of the development have also been assessed.
- 14.1.4 The site is partially located within Flood Zone C2 on the Welsh Government Development Advice Map – an area considered to be at risk of flooding from fluvial or tidal sources, without significant defence infrastructure, with a 0.1% (1in1000) chance or greater of occurrence in any given year. The remainder of the site is located within Flood Zone A – an area considered to be at little or no risk of fluvial or coastal / tidal flooding.
- 14.1.5 The north-western extent of the site is shown within Flood Zone 3 on the Natural Resources Wales (NRW) Flood Risk (including defences) map – an area at flood risk with a 1% (1 in 100) chance or greater of fluvial flooding in any given year. The north-western extent of the site is also shown within Flood Zone 2 – an area at risk with between a 1% and 0.1% chance of fluvial flooding in any given year. The remainder of the site is located outside of the extreme extent of flooding, with a less than 0.1% chance of fluvial flooding in any given year.
- 14.1.6 Mitigation measures have been identified where applicable.

14.2 Methodology

- 14.2.1 The existing flood risk to the site has been assessed using a range of information sources including:
- Hydraulic modelling results from a 2-Dimensional (2D) model of the Afon Seiont Waterco Consultants, January 2016 (updated April 2016)
 - NRW Surface Water, Reservoir Flood and Groundwater Vulnerability Mapping
 - Envirocheck Flood Report obtained from Landmark

- Anglesey & Gwynedd Joint Strategic Flood Consequences Assessment (May 2013)
- Site Condition Report, Ground Contamination Investigation and Risk Assessment, e-geo Solutions Ltd, January 2016.
- Geological Ground Investigation Report, e-geo Solutions Ltd, February 2016.

14.2.2 Technical Advice Note (TAN15) of Planning Policy Wales (PPW) sets out a range of assessment criteria for development sites within Flood Zone C2. The development is classified as 'less vulnerable' in accordance with TAN15. For less vulnerable development within Flood Zone C2 the following acceptability criteria need to be addressed:

- Acceptable consequences for nature of use
- Flood defences adequate
- Agreement for construction and maintenance costs secured
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Effective flood warning provided
- Flood emergency plans and procedures
- Flood resistant design
- No increase in flooding elsewhere

14.2.3 The existing surface water drainage arrangements have been assessed by reviewing Dwr Cymru Welsh Water (DCWW) sewer records and through client correspondence.

14.3 Assessment criteria

Planning Policy Wales (PPW)

14.3.1 PPW was published in March 2002 and updated in July 2014. It sets out the land use planning policies of the Welsh Assembly Government. It is supplemented by a series of Technical Advice Notes (TANs). PPW, the TANs and circulars together comprise national planning policy which should be taken into account by local planning authorities in Wales in the preparation of the unitary development plans.

Technical Advice Note 15: Development and Flood Risk (TAN15)

14.3.2 TAN 15 was originally published in July 2004. TAN15 provides technical guidance which supplements the policy set out in PPW in relation to development and flooding. It advises on development and flood risk as this is related to sustainability principles (section 2.2 PPW), and provides a framework within which risks arising from both river and coastal flooding, and from additional runoff from development in any location, can be assessed.

14.3.3 TAN15 states that less vulnerable development can be considered in Flood Zone C2, subject to the application of the justification test and acceptability of consequences.

Justification

14.3.4 Development will be justified if it can be demonstrated that:

- i. Its location in Zone C is necessary to assist, or be a part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; **or**,
- ii. Its location in Zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and,

- iii. It concurs with the aims of PPW and meets the definition of previously developed land; **and**,
- iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 (of TAN15) found to be acceptable.

Acceptability of consequences

14.3.5 In accordance with section A1.14 of TAN15 there is a frequency threshold of flooding below which flooding of development should not be allowed. TAN15 states that commercial and industrial development should be flood free during the 1 in 100 (1%) Annual Exceedance Probability (AEP) fluvial flood event for the lifetime of the development.

14.3.6 In accordance with A1.15 of TAN15, beyond the threshold frequency (beyond the 1% AEP fluvial event), the proposed development would be expected to flood under extreme conditions. Section A1.15 provides indicative guidance on what is considered tolerable conditions for different types of developments. For commercial development maximum flood depths to property and the sites access should not exceed 600mm during extreme events i.e. the 0.1% AEP event. For industrial development, depths should not exceed 1000mm. The maximum velocities of floodwaters should not exceed 0.15 m/s at commercial properties and 0.3 m/s on access routes. The maximum velocities of floodwaters should not exceed 0.3 m/s at industrial properties and 0.45 m/s on access route.

Significance criteria

14.3.7 To determine if an impact is significant, the importance of a water feature and the magnitude of the impact are assessed together. For this assessment, the following

criteria (in Table 1) have been used to determine the importance of a water feature. Table 2 outlines the magnitude of any potential impacts on a water feature and Table 3 defines the significance of the impacts on the water feature from a comparison of the importance (Table 1) and magnitude of any impact (Table 2) on a water feature.

Table 14.1 – Importance of a Water Feature

Importance	Description
High	A watercourse / feature with national hydrological importance to biodiversity and ecosystems, flooding of property and land, flood alleviation and economic / social use. A Principal Aquifer.
Medium	A watercourse / feature with regional hydrological importance to biodiversity and ecosystems, flooding of property and land, flood alleviation and economic / social use. A Secondary Aquifer
Low	A watercourse / feature with local / minimal hydrological importance to biodiversity and ecosystems, flooding of property and land, flood alleviation and economic / social use. Unproductive strata.

Table 14.2 – Magnitude of the Potential Impacts on Water Features

Magnitude	Description
Major	<p>Long term / permanent changes to the hydrology, significant change in the physical state of the water feature and / or serious pollution resulting in substantial degradation of the water quality.</p> <p>Significant damage to land and property, resulting in long term displacement of property occupiers</p> <p>Major change from the baseline conditions.</p> <p>Increase in flood risk offsite by 5mm or greater during all flood events.</p>
Moderate	<p>Short to medium term changes to the hydrology, minor change in the physical state of the water feature and / or minor degradation of the water quality. Damage to land and property, resulting in moderate economic loss.</p> <p>A reduction of the economic value provided by the water feature.</p> <p>Less than 5mm increase in flood risk offsite.</p> <p>Moderate change from the baseline conditions.</p>
Minor	<p>Small measurable changes to the hydrology but no overall change in flood risk elsewhere.</p> <p>Minimal changes in water quality which are unlikely to affect sensitive receptors.</p> <p>Minor change from the baseline conditions.</p>

Negligible	Little to no change when compared with the baseline conditions.
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Table 14.3 – Significance Matrix of the Impacts on Water Features

		Importance		
		High	Medium	Low
Magnitude	Major	High	High	Moderate
	Moderate	High	Moderate	Low
	Minor	Moderate	Low	Low
	Negligible	Low	Low	Negligible

14.4 Baseline Conditions – Flood Risk

Risk from Fluvial and Tidal Sources

14.4.1 The Welsh Government Development Advice Map is based on the best available information considered sufficient to determine when flood risk issues need to be taken into account in planning future development. The maps are based on the Environment Agency's (EA) extreme flood outlines (Zone C) and the British Geological Survey (BGS) drift data (Zone B). Table 4 below describes the flood zone classifications.

Table 14.4 – Development Advice Map Flood Zones

Flood Zone	Description of Zone
A	Considered to be at little or no risk of fluvial or tidal/coastal flooding.
B	Areas known to have been flooded in the past evidenced by sedimentary deposits.
C	Based on EA extreme flood outline, equal to or greater than 1 in 1000 (0.1%) annual probability event (river, tidal or coastal).
C1	Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
C2	Areas of the floodplain without significant flood defence infrastructure.

14.4.2 The Welsh Government Development Advice Map (Appendix 13A) shows that the north-western extent of the site and the quarry void are located within Flood Zone C2. The remainder of the site is located within Flood Zone A.

14.4.3 The NRW Flood Risk (including defences) map (Appendix 13A) shows that the north-western extent of the site is located within Flood Zone 3. The north-western extent

of the site is also shown to be located within Flood Zone 2. The remainder of the site is located outside of the extreme extent of flooding. Table 5 below describes the NRW Flood Zone classifications.

Table 5 – NRW Flood Zone Descriptions

Flood Zone	Description of Zone
1	Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%).
2	Land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%), or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.
3	Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Fluvial

- 14.4.4 The nearest major watercourse is the Afon Seiont, located immediately north and west of the site. The site is not located in an area which benefits from flood defences. NRW were consulted to determine the availability of flood level data for the site. NRW advised that there was no detailed flood level data available, therefore 2-Dimensional (2D) hydraulic modelling of the Afon Seiont has been undertaken by Waterco Consultants in January 2016 (updated April 2016) to estimate flood levels, extents, depths and velocities for the site. The modelling results are included in Appendix 13B with map extracts provided overleaf. The temporary planning permission is for 5 years. NRW have confirmed that there is no need to consider climate change due to the temporary nature of the development proposals.
- 14.4.5 As shown in Figure 14.1, the developable site area including its access off Seiont Mill Road Bridge is flood free.
- 14.4.6 The topographical survey shows the water level within the quarry void as 12.9 metres Above Ordnance Datum (m AOD). The water level in the quarry void is not impacted during the 1% AEP event.
- 14.4.7 As shown in Figure 14.2, a 66% blockage of the Seiont Mill Road Bridge during the 1% AEP event does not significantly impact flood depths or extents on site. Seiont Mill Road is shown to flood, with depths of up to 0.6m and velocities of up to 2.4 m/s estimated.
- 14.4.8 As shown in Figure 14.3, a 66% blockage of the Brickyard access bridge does not impact on flood depths or extent in the developable area of the site.

- 14.4.9 As shown in Figure 14.4, flooding is estimated during the 0.1% AEP event. Flood depths up to 1.2m are experienced in a localised low point in the north-western extent of the site. The developable area of the site is shown to be flood free. The sites access at Seiont Mill Road is also shown to be flood free.
- 14.4.10 During all modelled events a former brickyard in the south-western extent of the site (west of the Afon Seiont) is shown to flood with depths up to 1.2m.

Fluvial

- 14.4.11 The site is located approximately 1.7km south-east of the Menai Strait. The site (excluding the quarry void) is situated at or above 13m AOD and is above sea level. There are no records of tidal flooding at the site and it can therefore be concluded that the site is not at risk of tidal flooding.

Risk from Surface Water

- 14.4.12 The NRW 'Risk of flooding from surface water' map (Appendix 13A) identifies a flow route from an unnamed land drain to the south of the site, to the quarry void. The risk associated with this flow route is low, meaning it has between a 0.1% and 1% chance of flooding in any given year. An isolated area of the site, south-east of the former brickworks factory, is identified at low risk. The remainder of the site is not at risk. There are no records of surface water flooding at the site. It can therefore be concluded that the risk of surface water flooding is low.

Risk from Groundwater

- 14.4.13 The Envirocheck flood report has identified that the site is at negligible risk of groundwater flooding. The SFCA states that 'in general groundwater flooding is not considered to be a significant source of flooding across the joint local development plan area (Anglesey and Gwynedd).'
- 14.4.14 The detailed ground contamination investigation carried out by e-geo Solutions Ltd (January 2016) comprised 11No. trial pits, excavated to depths of between 1.5m and 3.2m below ground level (bgl). A clayey Made Ground was recorded at depths of between 0.4m and 3.0m bgl and the underlying natural ground is recorded as Clay or Silty Gravel. Groundwater was not recorded in any of the excavations.
- 14.4.15 A detailed geological ground investigation was carried out by e-geo Solutions Ltd (ref: E0756.GGI.R1) in February 2016 for the borrow pit area located north-east of the existing quarry pond. Groundwater was encountered within two of the four boreholes at depths of 6m below ground level (m bgl) rising to 5.25m bgl (BH3) and 2m bgl (BH04). In both boreholes the groundwater strikes were recorded in the Siltstone. The other two boreholes (BH01 & BH02) were also drilled into the Siltstone,

however these remained dry, indicating that the groundwater is not continuous across the site, but more likely present in discrete lenses of more permeable material. Based on the information provided it can be concluded that the risk of groundwater flooding is likely to be low.

Risk from Sewers

- 14.4.16 There are no public sewers crossing the site. Correspondence with the client has determined that there is a private sewer which used to serve the former brickworks. The private sewer crosses the Seiont Mill Road Bridge and along Seiont Mill Road to the sewage works. There are no records of sewer flooding at the site. There are no distinct flow routes which would direct any potential sewer flooding towards the site. The former brickworks have been demolished, therefore there is no flow going into the private sewer which has the potential to cause a flood risk. It can therefore be concluded that the risk of sewer flooding is low.

Risk from artificial sources

- 14.4.17 There are no canals in this area. The NRW 'Risk of Flooding from Reservoirs' map (Appendix 13A) shows that the site is not at risk of flooding from reservoirs. Therefore, the risk of flooding from artificial sources is low.

14.5 Baseline conditions: surface water drainage

- 14.5.1 The Dwr Cymru Welsh Water (DCWW) sewer records show that there are no public sewers crossing the site. The nearest public sewer is a 150mm public combined sewer located to the west of the site, on the western side of the Afon Seiont. Surface water runoff from the existing site either infiltrates into the ground, flows into the quarry void or flows into the Afon Seiont.
- 14.5.2 Analysis of surface water samples recovered from Afon Seiont up and down stream of the site as part of the e-Geo Solutions assessment (January 2016), did not record any elevated contaminant levels when compared to the selected screening values. This indicates that currently the impact of the site on surface water is negligible.

14.6 Baseline Conditions – Surface Water Quality

- 14.6.1 Analysis of surface water samples recovered from Afon Seiont up and down stream of the site as part of the e-Geo Solutions assessment (January 2016), did not record any elevated contaminant levels when compared to the selected screening values. This indicates that currently the impact of the site on surface water is negligible.

14.7 Baseline Conditions – Groundwater Status

- 14.7.1 NRW 'Groundwater Vulnerability' mapping indicates the importance of an aquifer for drinking water and the vulnerability of the aquifer to pollution. The mapping, included in Appendix 13A shows that the site is not underlain by superficial deposits. The bedrock mapping shows that the site is underlain by a Secondary Undifferentiated aquifer – defined by the Environment Agency as an aquifer designation '*assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.*'
- 14.7.2 Visual and olfactory evidence of contamination was not recorded during the ground investigation undertaken by e-Geo (January 2016). Recovered soil samples were compared to selected screening values protective of human health in a commercial end use setting. Whilst the contaminant concentrations are recorded below the selected screening values, they were recorded above the laboratory limits of detection (LOD); leachate analysis of soil samples was not included as part of the assessment. The absence of leachate testing means that the risk to groundwater from potential contamination at the site cannot be ascertained. Trial pit logs indicate that clay underlies the Made Ground across part of the site. Where clay is present it will minimise the leaching of potential contaminants from the Made Ground into the underlying aquifer. No groundwater was encountered in any of the trial pits. Groundwater was recorded at relatively shallow depths in two boreholes located in land to the north-east of the site. These groundwater strikes are at levels significantly above the level of the site. Anecdotal information suggests that a minor spring is present on the southern face of the quarry following some slope instability /movement; no further information has been provided. On this basis the baseline conditions at the site are considered to be Moderate to Low.

14.8 Assessment of Effect

Impacts of Flood Risk during the Construction Phase: Short to Medium Term

- 14.8.1 Areas within the site boundary, including the brickyard in the south-west, the quarry void and an isolated low point in the north-west of the site are shown to flood with depths exceeding the TAN15 guidelines. No development is proposed within the brickyard or isolated low point in the north-west. Hydraulic modelling, undertaken in April 2016 has determined that the quarry void is not connected to the Afon Seiont during the 0.1% AEP flood event and does not provide flood storage, therefore any development in this area will not impact on flood risk elsewhere.

- 14.8.2 The proposed development is not considered to be within the functional floodplain. Therefore, the proposed development will not deprive flood storage space from the floodplain. The proposed development will therefore not increase the risk of fluvial flooding elsewhere.
- 14.8.3 The proposed development is located outside of the 0.1% AEP flood extent and is therefore compliant with Tables A1.14 and A1.15 of TAN15.
- 14.8.4 The water from the quarry void will be pumped into the Afon Seiont to allow materials to be removed from the void for the construction of the proposed bypass. This will have a moderate impact on this water feature (quarry void), as the water level will be significantly lower than the baseline level of 12.9m AOD.
- 14.8.5 The proposed development will have a moderate impact on the Afon Seiont. The removal of bricks from the brick storage yard will allow for a greater flood storage capacity, however there will be no impact upon the hydrology and flow of the watercourse. The addition of water from the quarry void into the Afon Seiont has the potential to cause an increase in flood risk downstream.

Impacts of Flood Risk during the Restoration Phase: Long Term

- 14.8.6 The brick storage yard in the south-western extent of the site, and the northern extent of the site will continue to be at risk of flooding.
- 14.8.7 The quarry void will be backfilled to a minimum level of 15m AOD once restored. This will have a moderate impact on the quarry void, as this will remove the water feature.

Impacts of Surface Water Runoff during the Construction Phase: Short to Medium

Term

- 14.8.8 The proposed development will not increase the impermeable area on site and will therefore not increase surface water runoff rates or volumes. This will have a low impact on the Afon Seiont.
- 14.8.9 There is potential for contaminants to enter the Afon Seiont from substances such as hydrocarbons, oil, silt and chemicals associated with the construction compound. The impact of such activities is further discussed in Chapter 14: Water Quality.

Impacts on Groundwater during the Construction Phase: Short to Medium Term

- 14.8.10 The proposed development has the potential to introduce contaminants from activities such as transportation, vehicle refuelling, importing construction materials and maintenance and storage of plant equipment. The impact of contamination of groundwater is considered to be low.

14.8.11 The groundwater level is not known at this stage. The removal of material from the quarry void below the water table has the potential to cause groundwater to inflow into the quarry void. This could have a low adverse impact on the base flow to the Afon Seiont and any abstraction boreholes in the locality.

Impacts on Groundwater during the Restoration Phase: Long Term

14.8.12 There is potential for groundwater contamination from the introduced material used to infill the quarry void. This could have a low risk on groundwater quality.

14.8.13 The introduction of material could also change the groundwater regime. Introduced material could affect the groundwater flow, causing saturation within the imported materials and reducing the base flow into the Afon Seiont and private abstraction boreholes. The impact on groundwater flow is considered to be low.

14.9 Mitigation during Construction Phase

14.9.1 A Construction Environmental Management Plan (CEMP) will be produced at the implementation stage in order to ensure that good practice guidance is adhered to and that potential effects are mitigated as far as reasonably possible. The CEMP will identify controls to protect the water environment which will include, but not be limited to, the following:

- Installing wheel-washing facilities at the exit from the construction site / compounds
- Providing covers for lorries transporting materials to / from site to prevent releases of dust / sediment to watercourses / drains
- Ensuring that storage areas are secured and provided with secondary containment (in accordance with the Oil Storage Regulations and best practice)
- Ensuring that storage of oils and chemicals is sited away from drainage infrastructure
- Ensuring that concrete is stored and handled appropriately to prevent release to drains
- Ensuring that any run-off water that gathers in trenches is pumped via settling tanks or ponds to remove any sediment. Temporary works consent will be sought from the relevant authorities detailing the methods for removal of run-off water
- Ensuring that any water which comes into contact with any contaminated material during construction is disposed of in accordance with the Water Resources Act (1991) [Ref. 11.2]

- Documenting a spill procedure and ensuring that spill kits are kept in the vicinity of chemical / oil storage
- Implementing a procedure to notify the Environment Agency / Local Authority (as necessary) in the event of the release of suspended solids to surface water sewers during construction
- Ensuring that storage of stockpiled materials is on an impermeable surface to prevent leaching of contaminants and is covered when not in use to prevent material being dispersed and to protect from rain, and
- Ensuring that stockpiles are kept to a minimum possible size (stockpiles are likely to be limited due to the small nature of the Site).

Flood Risk

- 14.9.2 All development including machinery and material stores will be located outside of the 0.1% AEP flood extent.
- 14.9.3 Stockpiles of bricks within the brickyard will be removed, increasing the flood storage capacity in the area
- 14.9.4 Pumping of the quarry void has the potential to increase flood risk downstream. In order to ensure flood risk offsite is not increased, discharge rates should be restricted to equivalent greenfield runoff rates. The specific rates will be determined as part of the discharge consent. This will ensure the impact to the Afon Seiont is low.

Surface Water Runoff

- 14.9.5 Surface water will be managed separately for 'clean' and 'dirty' activities associated with the construction compound.

Clean Surface Water Management

- 14.9.6 Surface water runoff from the 'clean' car park and temporary site buildings will drain onto the surrounding hard-standing as per the existing situation, with runoff draining into the ground through voids or into the Afon Seiont during an extreme rainfall event. The existing drainage system will be maintained

Dirty Surface Water Management

- 14.9.7 Surface water runoff from the 'dirty' car park and 'dirty' haulage routes will be directed into the quarry void or an existing attenuation basin in the south-eastern extent of the site. The quarry void will be pumped during the construction of the bypass to accommodate runoff from the disturbed quarry slopes and haulage routes. The drainage ditch connecting the quarry void to the Afon Seiont will be closed off to ensure no discharge directly to the watercourse. The refuelling area and plant servicing area will drain into the quarry void via oil interceptors. Silt traps will be

placed within the quarry void to provide treatment to the runoff. Once passed through the silt traps, water will be pumped to the attenuation basin in the south-western extent of the site, where water will discharge into the Afon Seiont via an existing outfall.

Groundwater

- 14.9.8 The surface water treatment methods outlined above will ensure that surface water receives an appropriate level of treatment so that any potential pollutants will not enter the underlying aquifer. The groundwater levels below the site have not been confirmed. It is possible that groundwater may be encountered during the excavation of material in the existing quarry void. De-watering activities may be necessary to allow dry working during material extraction. Controlled pumping and discharging of surface water will be agreed with NRW. Alternatively, disposal will be off site to a suitably licensed receiving facility.

14.10 Mitigation during Restoration Phase

Flood Risk

- 14.10.1 The removed materials from the brick storage yard in the south-western extent of the site should not be replaced, as the storage yard will provide flood attenuation which will benefit properties downstream

Surface Water Runoff

- 14.10.2 The proposed bypass will have a surface water management system which will ensure that surface water from the road will receive a sufficient level of treatment and will not increase flood risk elsewhere. The impact of surface water runoff will therefore be considered as low.

Groundwater

- 14.10.3 The imported material used to infill the quarry void should be suitable for the intended use to avoid contaminating groundwater. This will ensure that the impact of imported material is negligible on groundwater quality.

14.11 Residual Effects

- 14.11.1 The western brick yard will continue to be at risk of fluvial flooding from the Afon Seiont during the 1% AEP event. The risk during this event will be mitigated by ensuring no development within this area, other than the removal of material, which will increase the flood storage capacity of the area. The north-western extent of the

site will continue to be at risk during the 0.1% AEP event. The risk is mitigated by ensuring no development within this area.

14.12 Conclusion

14.12.1 It is considered that the proposed mitigation measures will ensure that the proposed development does not increase flood risk offsite, and will improve the flood storage capacity of the brickyard in the south-western extent of the site. Discharge consent will be required where water is pumped out of the quarry void. Surface water runoff will be managed effectively during the construction phase to ensure no increased flood risk or pollution risk. The impact of the proposed development on groundwater is considered to be low. However, it is recommended that the groundwater level on site is determined.

15 WATER QUALITY

15.1 Introduction

15.1.1 This chapter identifies the potential effects of the scheme on water quality. It sets out the impacts that the construction and operation of the quarry and its associated infrastructure may have on water quality and identifies mitigation measures to avoid, reduce or offset any adverse impacts.

15.1.2 A Flood Consequences Assessment (FCA) has been prepared and is referred to in Chapter 14 which has been prepared to addressing flood and drainage.

15.2 Legislation and policy

15.2.1 The policies relevant to this subject are the same, or similar to those for in Chapter 14 Drainage and the Flood Environment. To avoid duplication these have not been included her, but are cross-referenced to Chapter 14 by paragraph number:

Policy	Paragraph
Water Framework Directive	14.2.2
Groundwater Directive	14.2.4
Planning Policy Wales	14.2.5
Gwynedd Unitary Development Plan Policy B33 – Development that creates pollution or nuisance	14.2.10
Gwynedd Local Development Plan Policy PCYFF1: ‘Development Criteria’ Policy PCYFF2: ‘Design & Place shaping’ Policy PS5: ‘Sustainable Development’ Policy PS16: ‘Conserving and enhancing the natural environment’	14.2.13
Pollution Prevention Guidelines	14.2.15

LDP specific policy:

15.2.2 **POLICY C29 - Safeguarding water resources**, proposals that will cause significant harm, which cannot be mitigated or managed effectively, on surface water, ground water sources or freshwater ecosystems will be refused.

15.3 Methodology

15.3.1 In relation to the water environment, this assessment comprises the following:

- A list of receptors that have are sensitive to possible impacts arising from the development as well as the key risks to those receptors;
- An assessment, against the baseline, of the likely magnitude and significance of possible impacts arising without mitigation;
- Proposed mitigation measures;
- An assessment of the likely revised impacts with mitigation measures;
- A summary of the residual risks associated with the Scheme;
- An assessment of cumulative impacts arising during the proposed activities.

15.3.2 The assessment identifies water environment features (receptors) with potential to be impacted by the scheme. These water features have, or are considered likely to have connectivity with the quarry. Impacts on water quality are assessed against whether they are permanent or temporary in relation to the duration of the impact.

15.3.3 Receptors are assessed against criteria to establish their relative importance and sensitivity to the effects of pollution, as set out in Table 15.1. The Magnitude of an impact is determined using the criteria set out in Table 15.2. Estimating the Significance of potential impacts are made using the assessment matrix shown in Table 15.3.

Table 15.1: Estimating the importance / sensitivity of receptor water features

Importance	Criteria	Example
Very High	High quality and rarity on a regional or national scale	'Very Good' chemical or biological quality and Water Framework Directive (WFD) Class 'High'. Designated under EU or UK legislation, Salmonid fishery, Source Protection Zone, high amenity value.
High	High quality and rarity on a local scale	'Good' chemical or biological quality and WFD Class 'Good'. Used by species Designated under EU or UK legislation, Cyprinid fishery, moderate amenity value.
Medium	Medium quality and rarity on a local scale	'Fair' chemical or biological quality and WFD Class 'Moderate'. Some local amenity value.
Low	Low quality and rarity on a local scale	'Poor' chemical or biological quality and WFD Class 'Poor'. No local amenity value.

Table 15.2: Estimating the magnitude of impacts

Magnitude	Criteria
Major adverse	Results in loss of attribute and / or quality and integrity of the attribute
Moderate adverse	Results in loss of effect on integrity of receptor attribute or loss of part of attribute.
Minor adverse	Results in some measurable loss of quality.
Negligible	Results in loss of quality, but not enough to affect use or integrity
Minor beneficial	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity
Moderate beneficial	Beneficial Results in moderate improvement of attribute quality
Major beneficial	Results in major improvement of attribute quality

Table 15.3: Assessing the Significance of potential impacts

		Magnitude of impact			
		Negligible	Minor	Moderate	Major
Importance of attribute/ water feature	Very High	Neutral	Moderate	Large	Very Large
	High	Neutral	Slight to Moderate	Moderate to large	Large to Very Large
	Medium	Neutral	Slight	Moderate	Large
	Low	Neutral	Neutral	Slight	Moderate

15.4 Consultation

15.4.1 Consultation has been undertaken with NRW. Formal Screening and Scoping for the scheme has also been undertaken with all relevant statutory consultees. A summary of the responses is included below and the full Scoping Response is included in *Appendix 1.1*.

15.4.2 Gwynedd Council: Environmental Health identified the following matters:

- Capacity of the sewer system to convey and treat the predicted wastewater flows and loads arising from the proposed development.

- Impacts on surface and groundwater from construction and operation, including pollution and contamination
- Appropriate attenuation and discharge arrangements for surface and foul water during both construction and operation to avoid adverse impacts on sensitive receptors,

15.4.3 Natural Resources Wales listed the following points:

- Storage of fuel, oils and chemicals with bunding, spill plans and spill kits;
- Containment of silt laden drainage from haul roads;
- A new discharge permit for the existing silt treatment facility will be required;
- Discharges from the site will need to be monitored.

15.4.4 Welsh Water Dwr Cymru responded to a request for information about sewer capacity by confirming that the sewer has sufficient capacity for the proposed uses and numbers of personnel.

15.5 Baseline (receptors)

15.5.1 Water resources within the study area have been studied and data gathered from published sources and from field observation. These are shown in Figure 15.1.

Nearby surface water resources: Afon Seiont

15.5.2 The site is located within the catchment of the Afon Seiont, which flows past the north-western and south-western boundaries of the site before discharging into the Menai Strait approximately 1.8km north of the site. The Afon Seiont in 'Main River', assessed as having a Water Framework Directive classification of 'Moderate' and is identified as a Salmonid water. Licensed water abstractions are held by Hanson Brick and by Cyngor Gwynedd (23/65/16/0019 at NGR SH 4877 6151).

Afon Seiont
Steady flow, good current, high amenity value
Water quality status objective: Good by 2027. Supports protected species Salmonid Stream
Notes: R. Seiont is Main River and flows into Y Fenai a Bae Conwy / Menai Strait & Conwy Bay SAC

- 15.5.3 The Seiont is a fast flowing flashy stream. The site topographical survey shows that the river falls around 4 metres in its passage from the northern boundary of the site to the meander to the south, a distance of around 750 metres. There are two historical abstractions serving mill streams, which remain visible, within the site.

Baseline water quality

- 15.5.4 Analysis of surface water samples recovered from Afon Seiont up and down stream of the site as part of the e-Geo Solutions assessment (January 2016), did not record any elevated contaminant levels when compared to the selected screening values. This indicates that currently the impact of the site on surface water is negligible.

Nearby surface water resources: un-named watercourse

- 15.5.5 Immediately south of the quarry are the marshy floor and southern slopes of a shallow valley which form part of the Gwyrfaï catchment. The northern slopes of the valley have been removed by quarrying. An un-named minor watercourse flows in a south-westerly direction along the valley floor (across the south side of the quarry) to discharge into the Afon Beluno about 1.5 km to the south west (also known as Afon Rhosdican – Main River) and then into the Afon Gwyrfaï over 3km to the south west. The valley floor through which the channel passes is dominated by marsh and mire vegetation. In the past the watercourse maintained a steady flow, but this has dwindled in recent decades to become a more seasonal stream, possibly as a result of quarrying. OS mapping suggests that this watercourse first becomes visible beside Penrhos, a property to the south east of the quarry on Penybryn Road.

Afon Beluno (tributary of Rhosdican)
Intermittent flow and low amenity value.
Water quality and ecological quality: Low (observation)
Notes: Rhosdican is Main River and is a tributary of the Afon Gwyrfaï (SAC)

Springs and wells

- 15.5.6 A number of springs are noted on historical OS mapping and recorded in Figure 15.1. Some of these springs are still visible on the ground as seepages, none was observed to be flowing freely. A spring was found within the quarry in early February 2016 and was noted to be flowing generously from deep within the clay approximately 20 metres below the lip of the quarry. This spring had formed a large basin in the clay and was overflowing into a quarry ditch. The channel traversed the slope descending slowly towards a discharge point into the Seiont to the west. The point

at which the water emerges lies within an area of saturated and unstable ground that was excavated sometime between 1997 and 2007.

- 15.5.7 A second spring, recorded as a 'tank' on OS maps, lies close to the edge of the quarry on the east side. The brick built tank is heavily silted and there are no signs of flowing water. On the shallow slope to the north there is an area of slumped ground with indications of seasonal saturation. This has been interpreted as evidence of an historical flow of water.

The quarry sump and other pollution control measures

- 15.5.8 Since clay extraction was last carried out in 2007 the quarry sump has filled to form a waterbody of around 15 metres depth. Water level is controlled with an overflow ditch with an invert of 13.5metres AOD. The sump is filled with water arising from within the quarry void which is formed of heavy clay and whilst this could include ground water seeping from the upper slopes, it is thought to be mainly surface water. The overflow ditch flows northwest to discharge into the Seiont. The flow varies with weather conditions. In periods of dry weather, the ditch is observed to contain shallow standing water with no visible flow.

- 15.5.9 When the quarry was operating the sump received all water draining from within the excavated area and any seepages within the slopes, and functioned as a silt trap and settling lagoon. Periodically the quarry operator would pump water from the sump into a secondary settling lagoon on the south west corner of the brickworks yard. This settling lagoon discharged into the Afon Seiont at Grid Ref. SH 4880 6160. This discharge was regulated by discharge consent, reference CG0092101, to discharge a maximum daily volume of 4,320 cubic metres per day of trade effluent—site drainage water from Seiont Works, Caernarfon, Gwynedd. (Hanson Brick Ltd 2001). A new discharge consent is currently being applied for.

- 15.5.10 The brickworks yard, located close to the river bank on the west side of the quarry, is surfaced with concrete. This area was used for the parking and loading of vehicles and for stacking bricks. Surface drainage from this area discharged into surrounding vegetation. Immediately to the west of the concrete paved yard is a large flat area surfaced with crushed brick or raw clay. This area drains east and south into the sump.

Groundwater resources

- 15.5.11 An Envirocheck report provided in May 2009 for the A487 Caernarfon to Bontnewydd study records that the majority of the site is underlain by negligibly permeable strata ('Non Aquifer'). To the west variably permeable strata with soils

of intermediate class are present beneath the former brickworks and brick stocking yard. No Source Protection Zones are shown in the vicinity of the site.

- 15.5.12 Visual and olfactory evidence of contamination was not recorded during the ground investigation undertaken by e-Geo (January). Recovered soil samples were compared to selected screening values protective of human health in a commercial end use setting. Whilst the contaminant concentrations are recorded below the selected screening values, they were recorded above the laboratory limits of detection (LOD); leachate analysis of soil samples was not included as part of the assessment. The absence of leachate testing means that the risk to groundwater from potential contamination at the site cannot be ascertained. Trial pit logs indicate that clay underlies the Made Ground across part of the site. Where clay is present it will minimise the leaching of potential contaminants from the Made Ground into the underlying aquifer. On this basis the baseline conditions at the site are considered to be Moderate to Low.

Foul water disposal

- 15.5.13 The brickworks and quarry is served by an existing connection to public sewers which leave the site by crossing the main access road bridge and then north to the sewage works. Surface water drainage will not be directed into the foul sewer.

15.6 Identification of potential impacts

- 15.6.1 The proposed activities will include extraction of clay and overburden within the existing permitted quarry, export of the material for use in construction of the bypass and import of surplus fill from the bypass site to use in restoring the quarry. The quarry will also be used as a construction compound, with offices, personnel welfare facilities, plant maintenance and storage, fuel storage and various construction and mineral extraction works.
- 15.6.2 For the purposes of this impact assessment it is necessary to identify the likely means that water resources could be adversely affected by the proposals if no avoidance or mitigation measures are employed. These potential impacts are described in Table 15.4.

Assessment of pollution risk

- 15.6.3 In order to make an assessment of potential impacts on water quality an examination of the 'Source-Pathway-Receptor linkages' is useful:

A source of contamination in the ground at concentrations which have the potential to cause harm or to cause pollution of controlled waters;

A pathway by or through which a receptor is being exposed to or affected by a contaminant or, could be so exposed or affected by a contaminant;

A receptor that could be harmed by exposure to a contaminant.

Table 15.4: Source-pathway-receptor linkages and potential impacts

Source of water pollution	Pathway	Phase	Receptor and risk
A Quarry sump to be emptied of water to provide safe working conditions during mineral extraction and restoration. If ground is disturbed suspended solids could be carried in the water	Water extracted from the sump by pumping.	Establishment	Fresh water carrying suspended silt or other pollution is discharged into the River Seiont and into the marine SAC.
B Formation of the southern haul road and future use by large vehicles and plant could disturb the spring and watercourse channel and so contaminate water with suspended solids.	Spring water flowing into existing channel carried suspended silt.	Establishment and Operation	Discharge of suspended silt into the River Seiont An adverse impact on water quality in the River Seiont and on the Marine SAC downstream
C Trial pits in the brickworks yard have shown that there is some made ground. There is potential for contaminants to be present which could be a source of pollution if it is disturbed or excavated.	After the sump is pumped dry it will still receive surface water from the quarry slopes, the former brickworks yard and potentially from a spring in the south west side of the quarry.	Operation and Restoration	An indirect adverse impact on water quality in the River Seiont and on the Marine SAC downstream.
D Spillage from the fuel store, cement hoppers and cement 'wash-out' could be spilt. Other chemicals, for example hydraulic oils, could spread as a result of accidental spills or following inappropriate storage or disposal of containers.	Potential contaminants carried by surface or ground water into the quarry sump and then into the river.	Operation & restoration	Contaminants could adversely affect water quality in the River Seiont and the marine SAC by changing the pH, or polluting with toxic chemicals or hydrocarbons. With indirect impacts in the Marine SAC.
E Excavation, tipping and processing of material, and moving vehicles in the quarry could generate dust in dry conditions and a slurry of suspended solids in wet conditions.	Dust lifted and carried by prevailing winds (Refer to Chapter 6 Air Quality).	Operation	Particles could be carried into the River Seiont to adversely affect water quality. Contaminants could penetrate the clay floor of the quarry and

Source of water pollution	Pathway	Phase	Receptor and risk
F Contaminants in fill brought to the quarry from the bypass construction site and used in restoration.	Wash-off from surfaces such as haul roads and yards flowing into the sump.	Restoration	pollute ground water in the permeable strata on the west side of the quarry.

Ref A: emptying of sump by pumping into the River Seiont

15.6.4 Suspended solids entering the River Seiont would be the result of disturbance events rather than a permanent change. Once the silt generating activity ceases water quality will return to the previous situation. Suspended solids at visible concentrations can have an adverse impact on the amenity value of the river which currently has a high amenity value. High turbidity can result in adverse impacts on the relatively good quality of the Seiont. Turbidity will reduce sunlight reaching aquatic, estuarine and marine vegetation, it can result in a loss of dissolved oxygen in water which, in turn, harms fish and other aquatic animals such as Salmonid species and indirect impacts upon other protected species. The Water Quality Objective for 2027 is Good.

Receptor Importance Table 15.1: **High**;

Impact Magnitude: Table 10.2: **Negligible Adverse Magnitude**;

Impact Significance Table 10.3: **Neutral**.

Impact with mitigation (described in Section 15.7) will result in no suspended solids reaching the river and so would pose a **Neutral Impact**.

Impact on the Water Quality Objective: **Neutral Impact**

Ref B the spring and watercourse

15.6.5 The spring and excavated narrow channel which carries away the water are a recent addition to the quarry slopes (since 2000) and so a temporary loss of water quality would have a negligible direct impact on the resource. However, the disturbance of silts in the spring and the associated channel would have a similar temporary effect on the River Seiont as suspended solids carried from the quarry sump.

Receptor Importance Table 15.1: **High**;

Impact Magnitude: Table 15.2: **Negligible Adverse Magnitude**;

Impact Significance Table 15.3: **Neutral**.

Impact with mitigation (described in Section 15.7) will result in no suspended solids reaching the river and so would pose a **Neutral Impact**.

Impact on the Water Quality Objective: **Neutral Impact**

15.7 Mitigation

15.7.1 The scheme has been designed with embedded mitigation using the existing quarry drainage and silt removal measures to manage surface water. Drainage and Water Environment are described in Chapter 14.

15.7.2 The approach to preparing the site, to extraction of mineral and restoration of the quarry has been developed to separate known point sources of clean surface water from the working site and to contain potential pollution. The working areas of the quarry will also be separated from the temporary offices, welfare facilities and vehicle parking. Foul drainage will also be separated. The proposed measures are set out in the following paragraphs. Surface water drainage measures for the establishment and operational phase of the quarry are shown in Figure 15.2.

Preparation works: pumping out the quarry sump and existing silt lagoons

15.7.3 The working floor of the quarry will be pumped dry to allow safe access for quarrying plant and personnel. The waterbody, which is mainly fed by surface water, will be pumped directly into the River Seiont. Pumping will cease when the river is in spate and there is potential to increase flood risk downstream. In the final stages of pumping the discharge will be diverted to the riverside silt lagoon if suspended solids are causing turbidity.

15.7.4 The existing silt lagoons (Numbers 1, 2 and 3 on Figure 15.2) on the floor of the quarry will be brought back into use to allow settlement of suspended solids at all stages of construction, operation and restoration. The outfall ditch which currently takes overflow water from the sump into the Afon Seiont will be blocked off. A submersible pump located in the silt lagoons will periodically pump water out of the sump and into the existing lagoon (Number 4) which allows water to infiltrate through underlying soils into the river.

15.7.5 All construction/ working phase risks to water quality are reduced by the adoption of good working practices and implementation of a construction management plan during construction. The Contractor would be required to provide method statements for the works for input into the Construction Environmental Management Plan (CEMP). These would include visual inspection of the works, routine sampling of excavated materials and surface water in the quarry sump to check for potential contamination as a consequence of ground disturbance. A monitoring regime of discharges to the river from the sump will be agreed with NRW before works commence.

- 15.7.6 All excavation and breaking out of existing surfaces within the former brickworks yard will be carried out in accordance with PPG6: 'Working at construction and demolition sites: PPG6'.

'Clean Zone': temporary offices and car parking

- 15.7.7 Planning permission for temporary use of part of the site as staff offices and car parking was granted under Code C15/0977/19/LL in October 2015. These facilities use existing utility provision including foul drainage which previously served the brickworks. The current proposal would extend the temporary offices and parking on the concrete-paved brickyard and former factory floor. There would be secure access from public roads. Surface water drainage from this area will conform to the existing arrangements. The existing road bridge over the Seiont will continue to be used for road vehicles only.

Wheel wash

- 15.7.8 Barriers will segregate the 'Clean Zone' from the 'Working Zone' and a wheel-wash will be installed to ensure that vehicles leaving the working zone are clean before using public roads. Surface drainage from the working zone will be directed into the silt lagoon or into the quarry sump.

'Working Zone': Fuel storage, plant refuelling, maintenance, waste storage

- 15.7.9 Fuel for site vehicles and plant will be stored in approved double-skinned tanks sited within bunded containment holding a minimum 110% of the capacity of the largest tank, all in accordance with NRW guidelines. A temporary plant maintenance shed will be placed with direct access from the haul roads and the former brickyard. The facility will receive construction vehicles and plant within the working area of the site. During fuelling and maintenance, vehicles and plant will stand over drip trays or within a bunded containment so that any drips and spills are captured. Routine maintenance such as greasing, topping up oils and hydraulic fluids will also be carried out over drip trays. Approved spill kits will be maintained in these areas and the staff will be trained in their use.

- 15.7.10 Surface drainage from the fuelling and maintenance facility will include a petrol interceptor discharging water into the quarry sump. Secure containers will be used for stores and segregated waste. The operator will manage waste to maximise recycling and recovery.

'Working Zone': Silt and erosion management in the quarry

- 15.7.11 The strategy for managing silt within the quarry and filling areas combines:
- Steps to minimise the amount of silt arising;

- Steps to prevent silt being transported from site;
- Steps to protect sensitive receptors from silt.

15.7.12 To minimise the generation of silt, all existing surface vegetation will be left undisturbed until an area is to be worked. Temporary stockpiles of material will be 'sealed' by surface compaction to control erosion if they are to remain for long periods. Haul roads would be surfaced with unbound aggregate won from site operations, to maximise their usability and minimise both silt in wet conditions and dust in dry conditions.

15.7.13 The topography of the current quarry and surrounding parts of the site is such that all surface water drainage from operating areas flows towards the sump in the base of the quarry void. The system of silt settling lagoons used during previous quarrying operations would be adapted to suit the proposed earthworks and filling. Initially the water level in the void would be reduced by pumping clean water via the existing ditch. One or more temporary sumps would then be re-formed so that drainage water can be directed to a collection point and pumped out when settled. The capacity would be sufficient that no pumping need be carried out when the water was silty or disturbed. As filling of the void progresses, new lagoons and directing bunds will be formed in sequence at progressively higher level so that each can be drained and filled.

15.7.14 Drainage from the quarry site would be confined to a single discharge point. The quantity and nature of the discharge would remain within the consent limits and so there would be no change of effects on the receiving watercourse (the Afon Seiont).

'Working Zone': South haul road

15.7.15 The existing haul road which ascends the west side of the quarry will be widened and improved. The terracing required for this road will include a surface water drainage channel, formed to capture clean surface water from the spring and divert it towards a dedicated outfall into the Afon Seiont. A low bank will separate the road surface from the channel, while gentle cross falls on the road will direct silt laden surface water towards the quarry sump.

'Working Zone': East haul road

15.7.16 A new 10 metre wide haul road will be constructed to ascend the north and east sides and then to cross a field to the east to allow access into the proposed bypass construction corridor. This road will be retained to provide long term access into the quarry. The road terrace will be constructed with drainage ditches at the

bottom of cutting slopes to capture silt laden surface water and direct it into the quarry sump.

Extraction and processing of mineral from the existing quarry

- 15.7.17 Under the existing minerals planning permission clay and overburden will be excavated and transported to the bypass construction site as engineering fill. Selected stony or sandy material will be crushed and screened to produce aggregate of higher value for construction. Processing will be carried out on a purpose formed terrace on the north side of the quarry void. The processing plant will be operated under a mobile plant licence. Surface water drainage from the plant will be directed into the quarry sump. Water required for washing will be drawn from the sump and returned when used.

Concrete batching

- 15.7.18 A mobile concrete batching plant would be operated in the eastern section of the former brickworks yard, taking advantage of the existing hard surfacing and the screen mound. Run-off from this part of the site would be directed to a catch pit which would also take wash water from the concrete wagons. This water would then be recycled into the concrete-making process and not discharged. Cement for concrete making would be delivered in sealed tankers which would be connected directly to the batching plant and would remain as temporary silos until emptied and replaced. This system avoids the need to transfer cement from vehicles to static silos, minimising the potential for spillage or leakage and consequent water pollution. The layout of the batching facility would maintain separation between 'clean' routes for road vehicles and material delivery, and 'site' routes for the haulage of prepared concrete and other earthworks materials.

Asphalt Batching Plant

- 15.7.19 This temporary plant will be placed close to the concrete batching plant and will be served by the same drainage and environmental protection measures.

Extraction of mineral west of the river

- 15.7.20 Extraction works in the existing brick stocking yard to the west of the river would be separated from the Afon Seiont by the existing retaining wall which extends along the river frontage of this peninsula. A marginal strip of ground inside the retaining walls will be left to protect existing riverside trees and provide access along the riverbank. The excavation of the made ground, formed of brick debris, railway ballast and quarry overburden from early phases of quarrying, as well as some underlying soils would be contained within the retaining wall and a margin of

undisturbed ground, so that rainwater during the operation would be held to percolate into the ground and not carry silt into the river. Excavated material from the brickyard will be carried to the quarry over the existing concrete bridge, or over a temporary bridge if required, for processing and onward delivery to the construction site.

Site 'housekeeping'

- 15.7.21 The site operator will prepare method statements setting out the details of day to day housekeeping activity that would be required to provide operational mitigation of the working site. These would include operational measures applied as and when required to minimise pollution. These will include the use of spill kits by site personnel, regular monitoring of the settling lagoons and drainage network, tool-box talks for site operatives, regular maintenance and inspection of plant and fuel stores and regular pumping out of oil interceptors. Site vehicles will be restricted to well-defined areas and routes. Water courses and sensitive vegetation will be protected with exclusion zones. All these measures will be implemented in accordance with the NRW guidelines and any other constraints imposed by permits and licences.

Filling operations

- 15.7.22 Fill materials imported to the site for the work will be controlled in accordance with the Environmental Permit for the site, but at this pre-permit stage the classes are anticipated to be as shown in Table 15.5. Material will arise mostly from the A487 Caernarfon to Bontnewydd improvement scheme, ie within 3 miles of the site. Some material is expected to be derived from site operations such as crushing and screening of aggregates. If there is a restoration shortfall then other local sources of fill and restoration materials may be found. An application for a Bespoke Environmental Permit is currently in preparation and a draft Waste Recovery Plan has been submitted to Natural Resources Wales.
- 15.7.23 The materials to be imported for the purpose of site engineering and restoration would come from some of the categories shown in the EA guidance publication RGN 13: 'Defining Waste Recovery: Permanent Deposit of Waste on Land' Appendix 2, reproduced in Table 15.5. This publication lists materials suitable for this purpose.

Table 15.5: Waste categories (RGN13 Appendix 2)

Waste Code	Description
01	WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS
01 01	Wastes from mineral excavation
01 01 02	Wastes from non-metalliferous excavation
01 04	Wastes from physical and chemical processing of non-metalliferous minerals
01 04 08	Waste gravel and crushed rocks other than those containing dangerous substances
01 04 09	Waste sand and clays
17	CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)
17 05	Soil (including excavated soil from contaminated sites) stones and dredging spoil
17 05 04	Soil and stones other than those mentioned in 17 05 03
19	WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE
19 12	Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 12	Soil substitutes other than that containing dangerous substances only
20	MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS
20 02	Garden and park wastes (including cemetery waste)
20 02 02	Soil and stones

15.7.22 Only materials which are inert or free from contamination that could present a risk to surface waters, groundwater and the local environment would be permissible under the Environmental Permit.

Biosecurity

15.7.23 Biosecurity concerns raised by NRW will be addressed through the Environmental Permit. Measures will be in place to segregate soils that include propagules of

invasive non-native species or plant diseases. These will either be buried deep within the volume of fill, or will be taken to a suitable tip for disposal in the appropriate manner under the regulations. Wherever possible the most sustainable and affordable solution will be used.

- Soils known to be identified with areas or vegetation with disease problems, or containing rhizomes or viable seeds of non-native invasive species will be buried deep within the restoration scheme if this is a requirement of control; (for example Rhododendron, Buddleia, Himalayan Balsam and Japanese Knotweed).
- *Phytophthora ramorum*, for example, is spread by spores from affected plants. Soils where the disease has been reported will be buried well below the ground surface.
- Only native Locally indigenous species will be specified in the planting proposals. Plants will be obtained from certified disease free sources and grown from seed from the appropriate Regions of Provenance (Seed Zone 30 - 303 or 304);
- Ash (*Fraxinus excelsior*) will not be specified. The same will apply to any other species about which the NRW raise concerns;

15.7.24 Imported restoration material would be placed no less than 60m from the Afon Seiont, against the inner face of the existing north-west facing screen mound. Any run-off would drain towards the quarry sump and away from the river. Any sub-surface drainage towards the river would have to pass through at least 60m thickness of the existing mound.

15.7.25 The base of the current clay pit excavation is underlain by considerable depth of Ordovician clay as described in section 10.5. These clays provide a further buffer to protect any groundwater from material that should leach from the imported materials.

Permanent restoration scheme for surface water.

15.7.26 Surface water drainage measures for the post-restoration phase of the scheme are shown in Figure 15.3. Surface water from precipitation will flow down the restored slopes until intercepted by cut-off drains. These drains will be located on the permanent access road and around the perimeter of the restored quarry floor and discharge into the River Seiont via a new southern ditch. The existing outfall ditch which flows northwest to the river will be closed off, but allowed to discharge into the southern discharge point. A spring on the south side of the quarry will continue

to flow along an excavated channel and into the River Seiont. The ring ditch around the floor of the bowl will provide a silt trap until the restored slopes are stabilised by vegetation cover.

15.8 Residual impacts

- 15.8.1 The residual impacts of each aspect are set out in Section 15.6. In summary, these indicate that whilst there could be potentially significant harm caused to the River Seiont, the proposed mitigation scheme would reduce these effects by intercepting spilt fuel, hydraulic oil and other hydrocarbon pollutants in fuel interceptors, with silts carried into and intercepted the existing quarry drainage and silt lagoon system. The result there will be Neutral impacts (see Table 15.3). To ensure that the mitigation measures remain effective a programme of regular and frequent monitoring of interceptors, lagoons and outfalls will be implemented. An individual within the contracting site team will be made responsible for this activity and for ensuring that interventions to maintain effectiveness of mitigation rare completed quickly.
- 15.8.2 Once the construction of the bypass and restoration of the quarry are finished the final surfaces within the quarry will become well-vegetated and any silt run-off from the restored slopes will cease.

15.9 Cumulative impacts

- 15.9.1 Extraction and restoration of the quarry will occur at the same time as the proposed bypass is being constructed. Cumulative impacts of both schemes on water quality would affect the River Seiont. This river receives water from tributaries that will be indirectly or directly affected by construction of much of the eastern end of the bypass. There is a small watercourse known as the Afon Beluno immediately to the south of the quarry that discharges into the Gwyrfaï via the Rhoscidan. The Gwyrfaï is a SAC and could be directly and indirectly affected by the western length of the bypass. The impacts could arise from the construction activity of the bypass and at the quarry, but also by the operational phase of the road.
- 15.9.2 Environmental management of construction activity will be carried out in accordance with best practice to contain and manage silt laden run-off and to avoid pollution incidents. These measures will be implemented with full awareness of the importance and sensitivity of the two rivers and their tributaries. The same environmental management team will be monitoring both sites to ensure that mitigation is effective and that construction activity is carried out with adequate

environmental protection and the risk of damaging incidents is kept to a minimum. The cumulative impacts during construction would be Neutral Impact.

- 15.9.3 The cumulative impact of the operational phase of the bypass and the post restoration phase of the quarry will be better than the current situation, before construction starts, for several reasons. Firstly, the new bypass with new drainage and environmental protection will receive traffic that would otherwise have used the old A487 through Caernarfon. The old road does benefit from the same environmental protection measures such as silt traps and fuel interceptors. Secondly, the quarry sump will have been filled and any silt or potential pollution that was contained within that waterbody would be remediated or contained by the restoration scheme. In summary, the cumulative impact of both schemes would be slightly beneficial compared with the pre-construction situation.

16 CONCLUSION

- 16.1 Using the former brickworks quarry site in the manner proposed (Chapter 2) will provide substantial economic and environmental benefits. A large proportion of the materials required for construction can be obtained from the quarry with minimal transport costs, reduced fuel use and much reduced carbon emissions. Similarly, any fill material excavated from the bypass that cannot be used for engineering works can be brought to the quarry. Both these operations will avoid the need to use local roads for access to more distant quarries in Gwynedd, or elsewhere in North Wales, will ensure that a very large numbers of journeys by heavy goods vehicles will not be required, with the result that traffic congestion on the road network will not be worsened by the mass haulage of fill material and vehicle emissions will not be increased on the roads that might otherwise be used.
- 16.2 A benefit to local residents is that restoration of the quarry and the cessation of mineral extraction will be completed well before the current planning permission for clay extract expires.
- 16.3 Overall environmental impacts will be limited and temporary due to the short term nature of the proposed activity. In the medium to long term the impacts would become positive with the restored quarry contributing to the quality of amenity and to nature conservation.
- 16.4 Cumulative impacts with other developments would be greatest during the period of construction of the bypass, but declining once the bypass construction and quarry restoration are completed. The close proximity of the proposed bypass and the quarry is shown in Figure 16.1.

REFERENCES

i Expert Panel on Air Quality Standards. Airborne Particles: What is the most appropriate measurement on which to base a standard? April 2001. The Stationery Office Ltd.

ii K Addison, Pen-y Bryn – the Ice Age, bricks and conservation, pub Earth Heritage Issue 1 January 1994.

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