

**Final Agreed
Revised Dates
22.5.07**

FFOS-Y-FRAN LAND RECLAMATION SCHEME

**Incorporating Extraction of Coal by Opencast Methods
Being the Final Phase of the East Merthyr Reclamation Scheme**

MERTHYR TYDFIL

Planning Application Number: P/03/0225

RESTORATION STRATEGY

Prepared in accordance with Planning Condition 50

by RPS Planning, Transport and Environment

in association with Leek and Weston Limited, Peter Brett Associates, White Young Green Planning, and International Heritage and Conservation Management

May 2007

**Miller Argent (South Wales) Limited
Cwmbargoed Disposal Point
Fochriw Road
Merthyr Tydfil
Mid Glamorgan
CF48 4AE**

Contents

- 1.0 Introduction**
- 2.0 The Existing Site**
- 3.0 Working and Restoration**
- 4.0 Soils, Seeding and Planting**
- 5.0 Waste Management of former Landfills**
- 6.0 Ecology**
- 7.0 Archaeology and the Historic Landscape**
- 8.0 Public Access**
- 9.0 Conclusions**

Figures

- Figure 1 Planning Application Site Area**
- Figure 2 East Merthyr Reclamation Scheme Phases and Related Proposals**
- Figure 3 Site Features and Landscape**
- Figure 4 Restoration Plan**
- Figure 5 Management Compartments**
- Figure 6 Soil Mapping Units (Topsoil & Subsoil)**
- Figure 7 Soil Forming Materials**
- Figure 8 Soil Reinstatement Strategy**
- Figure 9 Waste Tip Assessment**
- Figure 10 Ecology
Phase I Habitat Survey**

- Figure 11 Ecology
Breeding Bird Survey 2001**
- Figure 12 Ecology
Breeding Bird Survey 2003**
- Figure 13 Ecology
Mammal & Herpetile Survey
(Excluding Badgers)**
- Figure 14 Footpaths**

Appendices

- Appendix A Progressive restoration**
- Appendix B Restoration of opencast coal sites: photographic record**
- Appendix C Provision of lapwing habitat during the works**

1.0 Introduction

1.1 The Ffos-y-fran Land Reclamation Scheme at Ffos-y-fran, Merthyr Tydfil, incorporates extraction of coal by opencast methods and is the final phase of the East Merthyr Reclamation Scheme. The site area is shown on Figure 1.

1.2 This report has been prepared to satisfy the requirements of Planning Condition 50 which states:

“No development shall commence until a Restoration Strategy for the restoration and management of the site has been approved by the Planning Authority. Such a scheme shall detail the sequence and phasing of backfilling and reclamation showing clearly their relationship to the working scheme and shall include appropriate landscape mitigation and restoration, taking into account the historic landscape character, features of ecological interest and intended after-use of the land.”

1.3 Section 2.0 of this report describes the Ffos-y-fran Land Reclamation Scheme site. Section 3.0 describes the working and restoration of the site, including the sequence and phasing of backfilling and reclamation in relation to the working scheme, landscape mitigation and restoration. Section 4.0 describes the strategy for stripping, storage and respreading of soils and soil forming materials, and establishment of vegetation. Section 5.0 explains how existing landfills within the site boundary will be managed as part of the site operations. Section 6.0 describes the existing ecology of the site and the measures which will be taken in relation to nature conservation through the working and restoration of the site. In section 7.0 the strategy for archaeology and the historic landscape is explained, and in section 8.0 the provisions for public access during working and restoration. Conclusions with respect to the restoration strategy are drawn in section 9.0.

1.4 This strategy sets out the principles of restoration. The site will be reclaimed progressively in accordance with the strategy as required by Planning Condition 51. A detailed Restoration Plan for each phase of the restoration will be submitted to the Planning Authority at least 6 months prior to the cessation of replacement of overburden in that phase. This Restoration Plan will show the final landform; soil profile characteristics for establishment of wildlife habitats and common grazing; specifications for soil placement and sources of soil or soil forming material to be replaced; details of watercourse and pond locations and construction, for that phase. The phases of working are shown in the Progressive Restoration Plans at Appendix A. The phases are as follows:

Phase 1	Preliminary operations (excavation of box cut)
Phase 2	Excavation to maximum void
Phase 3	Excavation to end of coaling
Phase 4	Final void restoration

1.5 The Restoration Plan for the completed site is shown on Figure 4

1.6 As required by Condition 53, an Aftercare Scheme for each phase of the restoration will be submitted for the written approval of the Planning Authority not later than 6 months prior to the completion of restoration of each phase. The After Schemes will provide details of vegetation establishment (including the nature and timing of any cultivations and stone picking operations; content and origin of seed mixtures; proposed seed rates and timing of sowing; and any proposed fertilizer and lime rates based on the results of soil analysis), vegetation management (including the timing and frequency of cutting and proposed grazing regime), tree and hedge establishment (including ground preparation; planting details including species, type of stock, establishment methods, planting density and timing; and maintenance

including beating up, weed control, fertiliser application, protection from grazing animals and pruning/thinning) and monitoring which may be required..

The East Merthyr Reclamation Scheme

- 1.7 The East Merthyr Reclamation Scheme was the initiative of the former Merthyr Tydfil Borough Council and Mid Glamorgan County Council and has sought to reclaim the derelict land to the east of Merthyr Tydfil by way of opencast coal mining operations, restoring the land to beneficial use at no cost to the public purse. The scheme is included in the current local plan. Phases I and II of the scheme have been implemented and the 'Ffos-y-fran Land Reclamation Scheme' will complete the Scheme. The Application Area, together with the previous Phases of the East Merthyr Reclamation Scheme are shown on Figure 2.
- 1.8 Whilst planning consent for Phase III was granted in November 1988, the then permitted scheme would not have dealt with all the dereliction in the area and would have sterilised as large a reserve of coal as it would have won. It was therefore proposed in 1994 that the scheme be revised to recover the larger proven reserve in line with government guidance, whilst simultaneously addressing a number of environmental concerns not originally addressed in the Phase III proposals. The revised scheme was referred to as "Phase IIIA" and it is the area of this proposal that is reflected in the local plan. However, the planning application was withdrawn in May 1999 in the run up to a compulsory purchase inquiry.
- 1.9 The Ffos-y-fran Land Reclamation Scheme has been designed to replace the previous Phase IIIA proposal whilst fully addressing the more stringent environmental requirements of the present day.

The Ffos-y-fran Land Reclamation Scheme

- 1.10 The extent and setting of the Ffos-y-fran land Reclamation Scheme are shown on Figure 3. The site occupies high ground approximately 1.5 kilometres to the east of Merthyr Tydfil town centre and comprises mainly urban common land forming part of the Merthyr & Gelligaer Commons at levels between 280m and 450m above Ordnance Datum (AOD). It is bounded to the north-west by the recently re-aligned A4060 trunk road, to the north-east by the Trecatti refuse void, to the east by the Unitary Authority boundary between Merthyr Tydfil and Caerphilly, to the south-west by the Mountain Hare to Fochriw Common road (the 'Bogey Road'), extending approximately 1km to the south of the 'Bogey Road' and to the south west of the Cwmbargoed to Treharris mineral railway line.
- 1.11 The purpose of this document is to explain the progressive restoration strategy which has been developed for the Ffos-y-fran Land Reclamation Scheme, as required by Planning Condition 50. In doing so it draws on the relevant sections of the Environmental Statement which accompanied the Planning Application.
- 1.12 Restoration is an integral part of the working of the site and there is no distinct operational separation between the extraction of coal by opencast methods, which would finance the scheme, and the progressive restoration of the site. However, this document seeks to explain the measures which will be adopted to achieve the satisfactory restoration of the surface of the site. The proposed restoration seeks to achieve a balance between a number of sometimes conflicting interests, in particular agriculture, Rights of Common (including commoners' rights and the public right to walk the urban common for air and exercise), landscape, nature conservation, cultural heritage and recreation.
- 1.13 It is recognised that there can be conflicts between the interests of agriculture and nature conservation, and that this has been a problem of commons management in the past, both on the Gelligaer and Merthyr Commons, and on many other upland commons. However, it is important that a suitable grazing regime is achieved

across the site both in the short and long term. It is of course the case that the developer has control over the land which will revert to the Common for the operational and aftercare period only. The developer has limited control over the Common Land once handed back to the Commoners. However the operational period is for some 17 years, and over that time there is the opportunity to establish habitats of nature conservation value, whilst still addressing the needs of the commoners whose grazing rights will be reinstated on completion of the scheme.

- 1.14 It is also recognised that the recent Gelligaer & Merthyr Commons Management Plan has been written in line with DEFRA's recent consultation on The Agricultural Use and Management of Common Land, which is anticipated to influence legislation relating to Commons in the future. The Single Farm Payment, which was launched on 1st January 2005, and the enhanced suite of agri-environment schemes is expected to have an impact on grazing regimes, influencing the type and numbers of livestock grazing land.
- 1.15 Therefore, in the long term, it is anticipated that grazing regimes will become more beneficial for biodiversity and that the parts of the Ffos y Fran site, when returned to Common land, will be managed in a way which is more appropriate to conservation management for biodiversity than has been the case in the past.
- 1.16 An Environmental Management Plan will be prepared for each phase of the development and submitted for approval, as required by Planning Condition 42, and implemented for the Ffos-y-fran operations. This will include the requirements for mitigation of environmental impacts. The plan will form an integral part of the contract for the operations and will be prepared in sufficient time for its requirements to be taken into account by those tendering for the work. Environmental specialists will attend pre-works meetings to ensure that the contractor is familiar with site conditions and environmental compliance requirements. All site personnel will be made familiar with the environmental requirements of the works at induction courses and tool-box talks, as necessary.
- 1.17 Site works will be monitored by an Environmental Liaison Officer who will call on the project's environmental specialists, where necessary, to ensure that the environmental requirements are fulfilled.
- 1.18 A Technical Working Group will be established. Representation will be invited from Merthyr Tydfil County Borough Council, the Welsh Assembly Government Technical Services Division, the Environment Agency, the Countryside Council for Wales, CADW, and the Gelligaer and Merthyr Commoners Association, together with Miller Argent and the main contractor, to provide advice as and when required throughout the duration of the scheme and aftercare period.

Consultations

- 1.19 During preparation of this strategy, the following organisations have been consulted:
- Merthyr Tydfil County Borough Council
 - Countryside Council for Wales
 - Environment Agency
 - CADW
 - Glamorgan and Gwent Archaeological Trust
 - Welsh Assembly Government Department for Environment, Planning and Countryside (Agriculture Section)
 - Gelligaer and Merthyr Commoners Association
- 1.20 The Merthyr Tydfil Biodiversity Partnership was also consulted. The full Biodiversity Partnership membership was invited to comment on the strategy following a presentation to the partnership by Miller Argent (South Wales) Limited, and the comments received were collated by Merthyr Tydfil County Borough Council.

2.0 The Existing Site

Introduction

- 2.1 The site comprises three main areas:
- The Western Shoulder
 - The Open Moorland
 - Bryn Caerau Farm Area
- 2.2 The first two areas broadly represent the land which lies within the previously consented Phase III of the East Merthyr Reclamation Scheme.

The Western Shoulder

- 2.3 The area of the site to the north-west of the abandoned route of the former A4060(T) remains not fully restored following Phase II of the East Merthyr Reclamation Scheme in the expectation that Phase III would follow.
- 2.4 From the line of the former A4060(T) to the top of the shoulder of high ground to the west of the reclaimed Trecatti opencast site, the site is characterised by old re-vegetated colliery shale tips. Extensive areas of the old re-vegetated mine spoil tips to the west of the disused railway, which runs southwards from the former A4060(T), have been over-tipped with mine waste from former tip washing operations. The landform steps down in a series of irregular terraces towards the west. The new A4060(T) roundabout at Mountain Hare has cut into the base of the westernmost spoil tip. Whilst vegetation is present on the older spoil tips, the newer 'Ryan's' tips remain largely unvegetated and are being actively eroded at their margins.
- 2.5 To the east of the disused railway line are two areas of recent spoil tipping. The first is immediately to the south of the former A4060(T). This area was tipped with mine waste from the Merthyr Vale colliery spoil tips. It is a long terraced landform with a flat top, and whilst it has been grass seeded, the quality of the sward it supports is poor. A small valley has been left between this spoil tip and the natural ground that rises to form the ridgeline overlooking Merthyr. To the south-east of this valley there is another area of spoil resulting from tip washing. This spoil tip is also unvegetated and eroded. The other area of tipping to the east of the old mineral railway line is a former local authority landfill site close to the Bogey Road. This area does not rise above adjacent ground levels, but forms a somewhat unnatural terrace where the land would otherwise slope naturally towards the valley running to Cwm Blacks Farm.
- 2.6 From these tip areas and the disused railway line the natural ground rises to the ridgeline overlooking Merthyr. This landform is characterised by re-vegetated surface mine workings along the outcropping coal bearing strata. The area also has a number of old crown-holes resulting from former collapses into shallow underground working voids. This gives the hillside an irregular appearance, set above the prominent level terraces formed by the tips and railway embankments and tracks, although most of the workings are not readily visible from the settlements below. The top of the ridgeline is characterised by 17th-19th century shallow opencast ironstone workings and is now used by motorcycle scramblers. This area is well vegetated, except where scarred by the motorcyclists and by access tracks driven for coal prospecting operations.
- 2.7 There are three former refuse landfills in this area that are understood to contain both household and industrial waste. They are commonly referred to as 'Landfill Tip 13', 'Hoover Landfill' and 'Merthyr Landfill'. Landfill Tip 13 and the Hoover Landfill are to be completely excavated and dealt with during the proposed scheme. Part of the Merthyr Landfill which lies within the excavation area will also be removed. However, the south eastern part of this landfill will be capped and will remain.

The Open Moorland

- 2.8 The second area has been defined as the open moorland to the north and west of Cwmbargoed. To the north of the Bogey Road the landscape is typically bleak and exposed, consisting of unimproved acid grassland and areas of marshy flushed acid grassland in wetter parts. There are small ponds, small colliery spoil heaps, ditches, old fence lines and telegraph poles, together with a number of old building bases and foundations along the edge of the road. A haul route, built to link Phase II of the East Merthyr Reclamation Scheme to Cwmbargoed Disposal Point, runs parallel to the Bogey Road. To the north, man-made ponds have been formed behind earth dams. The water levels of the ponds vary throughout the year leaving bare and somewhat barren 'beach' areas at their upper edge. Some of the earth dams have been breached leaving a redundant landform that is typically incised by an eroded gully. This landscape is dominated by the National Grid 400kV overhead pylon line that crosses the area in a north-east/south-west direction.
- 2.9 The Bogey Road varies in width and condition, with sharp bends and steep changes of gradient. It passes between the tips at the western edge of the site and crosses over the disused mineral railway line on a very narrow single carriageway bridge, before entering a steep hairpin bend enclosed by recently formed earth bunding.
- 2.10 On the open higher ground the road is aligned in straight sections which follow the local irregularities in contour. The edge of the road is disturbed where vehicles have overrun its edge. A series of simply constructed passing places have been added. Extensive fly-tipping occurs along the length of this road.
- 2.11 Part of the former Trecatti opencast site, is included within the northern part of the site to the south of the landfill void. This reclaimed area, with its simple landform and gentle gradients, forms a discordant element within the overall mixed character of the open moorland area. It is a rather exposed area of land set to improved pasture with no shelter or enclosure.
- 2.12 To the south of the Bogey Road the land falls gently southwards to the disused railway. This corridor and the strip of land beyond it have a disturbed urban fringe character with a number of scattered buildings of varied styles, tips and man-made ponds. Much of this area is excluded from the scheme in recognition of the archaeological and nature conservation interests of the area.
- 2.13 To the south of this corridor there is a large area of tipping, which extends between Isaac Morgan Cottages and Tai Cwmbargoed. It occupies the spur of land between two small tributary streams of the Bargod Taf and extends close to the edge of the site boundary along the access road to Bryn Caerau Farm. The landform of this spoil tip is artificially elevated, irregular and unvegetated with a large pond on one of its upper terraces and smaller ponds at its edges, some of which are of ecological value.
- 2.14 To the south of Tai Cwmbargoed, extending between the northern part of this spoil tip and the northern limit of Cwm Golau to the east, is a flat-topped spoil tip with steep sides. At one time this formed part of the adjacent working, but has now been grassed and is used for grazing.
- 2.15 To the west of the spoil tip between Isaac Morgan Cottages and the Bryn Caerau Farm access road is an area of open moorland. This is crossed by an old incline which used to serve Pen-y-Darren pits in the valley bottom to the west of the track leading to Bryn Caerau farm. At the top of the incline is the now derelict Incline Top House together with its enclosures and access track.
- 2.16 There is also an almost square shaped man-made pond which formed part of the Dowlais Free Drainage System. The pond and some nearby associated leats and drainage channels have been designated a Scheduled Ancient Monument (SAM), the

Sarn Howell Pond and Watercourses, consisting of three separate areas of interest (see Figure 3). This has been excluded from the scheme.

- 2.17 There is a small spoil tip south of the Bogey Road at the western edge of the site area which forms part of the Ffos-y-fran spoil tips further west. Fly-tipping currently takes place at the highpoint of the track leading south from the Bogey Road near this boundary. The overhead power lines cross this area.
- 2.18 Further to the south-east and south of the Ryan's Tip, an Iron Age Settlement lies immediately adjacent to the Bryn Caerau access road. This was discovered during site investigations for the Ffos-y-fran Land Reclamation Scheme. The site, although within the planning application area, has been excluded from the working area.

Bryn Caerau Farm Area

- 2.19 The third landscape area includes the northernmost extension of the valley landscape of the Bargod Taf. Bryn Caerau Farm is located at the southern apex of Garth Fawr, the main spur of land which forms this part of the site. The farm is located at approximately 285m AOD at the confluence of the Bargod Taf and Nant Gyrawd, in a well wooded and little disturbed setting. The site boundary crosses this main spur at approximately 325m AOD before dropping into Cwm Golau and rising again to the railway line to the northeast. The site boundary is approximately 400 metres from Bryn Caerau Farm.
- 2.20 A pattern of fields extends from Cwm Golau to the north of Bryn Caerau Farm. The Nant Gyrawd, which flows south within Cwm Golau, enters a narrow gorge clothed with broad-leaved woodland that extends up to the 320m contour within the valley bottom. Broad-leaved trees and shrubs form field boundaries which radiate from this central core. Due to the nature conservation interest of this wooded valley, it has been excluded from the scheme and lies east of the site area.
- 2.21 The remnant hedgerows to the west of the valley are discontinuous and fragmented. The field boundary trees diminish in size and number with increased elevation and exposure. Improved upland grazing fields also extend from this central core and from the south, with pasture and rough grazing on the higher more exposed ground.
- 2.22 The main area of sheltered fields with wooded boundaries lies to the south of the site and the landscape becomes increasingly wooded further south within Cwmbargoed. Only the northern limits of the fields are within the site boundary where shelter is provided by broken sections of remnant hedgerow and occasional individual trees. Beyond the remnant hedgerows, the open fields on Garth Fawr have an exposed character. There is a low area at the head of Cwm Golau which is poorly drained rough grazing land.

3.0 Working and Restoration

- 3.1 The Ffos-y-fran Land Reclamation Scheme comprises the final phase of the East Merthyr Reclamation Scheme. 317ha of the 367ha of Derelict Land Sites DL14, DL15 and DL52 of the Priority Reclamation Programme identified in Policy GR2 of the adopted Merthyr Tydfil Borough Local Plan will be reclaimed at no cost to the public purse. The other 50ha (which was excluded from the application) consists mainly of the Scheduled Ancient Monument areas (shown on Figure 3), and the area to be retained as the Central Ecological Area area between the Bogey Road and the mineral railway. Whilst identified as derelict they are of archaeological and ecological interest and are to be preserved. The proven reserve of some 10.8 million tonnes of recoverable coal will be comprehensively worked by a programme of opencast mining operations followed by the progressive restoration and aftercare of the land.
- 3.2 In working the coal reserves, excavations will encounter and remove the derelict shafts and adits that occur on the western flank of the site. Within the excavation area, there are 52 known shafts and 39 known adits associated with previous iron ore and coal workings in this area. 3 of these recorded shafts and 3 adits have already been excavated during working of Phase 2 of the East Merthyr Reclamation Scheme. There are a further 9 shafts and 18 adits within the site, many of which will need to be stabilised as part of the works. These account for almost all the identified derelict mine workings remaining at East Merthyr, though other unrecorded shafts, adits and old workings are likely to be present within the working area.

Existing Land Use

- 3.3 Some 342.7ha of the site has been classified as being in agricultural use. This consists of enclosed permanent pasture in the south west, common rough grazing in the east and centre of the site, rough grazing on old tips in the west and an area of a restored opencast coal site (Trecatti) in the north.
- 3.4 The common land is grazed by stock belonging to the Gelligaer and Merthyr Commoners; the stock consists mostly of sheep with some cattle and horses. Stocking rates are generally high on both the common and the restored Trecatti land. Stock will be removed and common rights suspended for the duration of the reclamation scheme.
- 3.5 The enclosed permanent pasture in the south east, Bryn Caerau, is mostly grazed by sheep. The land has been generally improved.
- 3.6 The remaining land consists of non-agricultural land, urban land, open water and other unclassified land.
- 3.7 A further area of non-agricultural land comprises poorly restored refuse landfills constructed by the former Merthyr Tydfil Borough Council, now returned to the common for grazing.

Contaminated Land

- 3.8 Three former waste disposal landfills associated with the former Merthyr Tydfil Borough Council, the Hoover Factory and other unknown sources are known to lie within the western sector of the site. Apart from the eastern section of the Merthyr Landfill, which lies immediately north west of the Bogey Road bridge over the disused mineral railway line, these will be removed during opencast operations, sorted and treated. It is anticipated that most of the waste will be suitable for recycling to an engineering specification and will be used for engineering works (such as road construction) within the site. Residual waste (non-inert material) which cannot be so used will be removed from the site and disposed of to the nearby licensed landfill site.

Any hazardous material will be removed for disposal off site at suitably licensed facilities.

Land Use after Restoration

- 3.9 The primary land use proposed on the restored site will be to return it to its former use as urban common land for stock grazing, with public access for air and exercise. Bryn Caerau Farm will be returned to agricultural use, where disturbed, and nature conservation measures will be incorporated throughout the restoration scheme. The site will be predominantly restored to grassland and moorland vegetation associated with the open areas of the common, with particular attention being given to re-instating the acid grassland presently adjacent to the Tair Carreg Moor Site of Interest for Nature Conservation (cSINC) that is located outside the eastern boundary north of the Bogey Road. The final distribution of land uses across the site, however, will be dependent upon the soil and soil-forming resources available.
- 3.10 There is a limited amount of soils across the site, much having been destroyed by the old mining activities and/or buried beneath spoil tips. It has been estimated that, in order to satisfactorily restore the land, an additional 1.6 million tonnes of suitable soil or soil-forming material is required. Opencast operations will provide a unique opportunity to recover such volumes of suitable soil-forming material from below ground level, enabling the efficient and comprehensive restoration of the site. It is proposed that the majority of the restored land will be used for upland grazing as urban common land as illustrated on the restoration plan on Figure 4.

Phased Working and Restoration

- 3.11 The restoration scheme will work progressively from south to north across the site in accordance with this strategy as required by Planning Condition 51. The duration of the scheme will be determined by the annual rate of coal production, which in turn is determined by the sales contract with the end user for the coal. The optimum annual output for the safe and efficient operation of this Scheme is between 750,000 and 1 million tonnes of coal per year.
- 3.12 Detailed restoration plans for each phase of the scheme will be submitted for the approval of the Planning Authority at least six months prior to the cessation of the replacement of overburden in that phase. The plans will show the final landform details, soil profile characteristics for establishment of wildlife habitats (including woodland and wetland areas) and common grazing; details of soil placement and sources of soil or soil forming material to be replaced; details of watercourse and pond locations and construction; and all necessary agricultural facilities for that phase, and will include written specifications.
- 3.13 The proposed restoration profile for the site is shown on the Restoration Plan (Figure 4). Drawings numbered A1, A2, A3 and A4 in Appendix A show the progressive restoration of the site. As can be seen from these drawings, the site will be progressively restored after the completion of the initial Box Cut. Based on an extraction rate of 1 million tonne of coal per year, some 26 ha will have been restored at the end of Phase 2 (approximately 6 years after the start of excavation), 68 ha at the end of Phase 3 (after approximately 12 years), and 146 ha at the end of Phase 4 (after approximately 13 years). The remaining 255 ha will be restored within the following two years.
- 3.14 Plans A1-A4 in Appendix A illustrate the progressive implementation of the restoration during the four main phases of operation. In Phase 1 the preliminary works to prepare for coal extraction would be carried out, during which no restoration would be feasible.
- 3.15 Restoration would commence in Phase 2. The landform would be re-established in the western-most part of the site and along the edge of the site bordering the western

section of the Bogey Road. An initial area of woodland planting would be established along the boundary with the A4060. A baffle mound constructed to mitigate potential noise impacts on the nearby settlement would be retained in the west of the site, until the final phase of restoration. The direction of working and therefore of restoration, allows the area closest to the nearby settlements to be restored first, so that even the relatively limited area to be restored in Phase 2 would have an immediate effect and provide a foreground in views from the west of the continuing operations.

- 3.16 During Phase 3 backfilling after extraction will allow the areas of restored land in the west to extend eastwards. As haul roads between the extraction area and the southern overburden mounds were reduced to one route, an additional area between Bogey Road and the main east-west haul road may be restored, and a further area of woodland established in the west of the site. The eastward progression of restoration would continue through Phase 4, including extension of the woodland planting.
- 3.17 The major part of the site restoration would be carried out after coaling had ceased, with the return of the stored overburden to the final void, restoration of the lands occupied by the overburden mounds, the soil storage mounds, the water treatment areas, haul roads, and plant and offices. Water treatment areas, where appropriate, would be restored as ponds and wetland, and watercourses, new ponds and reservoirs formed. The footpath network would be laid out in this final phase also. The progress of habitat establishment and of conservation of heritage features is outlined in Sections 6 and 7 respectively.
- 3.18 The final profile, although based on the restoration plan at Figure 4, may have to be amended throughout the working of the site due to any fluctuation between the actual levels of bulkage and coal volumes extracted, and those anticipated. Regular surveys will be carried out to check the balance of the quantities excavated and the material available for restoration, to ensure that the final restoration scheme balances, i.e. to ensure that neither a void nor a dump is left at the end of working.
- 3.19 After the completion of coaling, overburden restoration will take approximately 24 months to complete. The southern overburden dump will be restored first, followed by the north eastern and north western dumps.

Soil Placement

- 3.20 On completion of overburden restoration, the remaining soil forming material, subsoil, and topsoil in store, will be restored to complete the restoration stage of the site. Soils can only be re-spread when weather conditions are suitable, generally between April and September, and because of this, if sufficient time is not available to complete the restoration of these soils in a particular season then the final restoration will be delayed until the following year. Soil resources on site are very limited and soil-forming material won from the excavation area will be utilised to make up any shortfall.
- 3.21 Soils stripped from areas of particular ecological interest will be stored separately and restored to specific locations identified for their re-instatement. In particular, the soils adjacent to the Tair Carreg Moor Site of Importance for Nature Conservation (SINC) will be re-spread over much the same location to provide the basis for creation of a similar wet acid grassland. In restoring this area, clay bunds and contour ditches will be constructed to retain water within the soil profile where required.
- 3.22 A number of the water treatment areas will be retained throughout the restoration and aftercare stages of the site. These areas will act as storm storage "buffer" zones, controlling water discharge off site until natural retention is established in the restored landform and vegetation cover over the period of the aftercare.
- 3.23 As shown on the restoration plan (Figure 4), some of the residual water treatment areas could be converted into permanent water features on completion of the

aftercare as part of the final restoration scheme. Prior to the removal, or otherwise, of the water treatment areas, all accumulated silt will be removed and disposed of on site (either buried, or spread and dried, and used as soil forming material if appropriate and suitable). The design of these features will be discussed with the Environment Agency.

- 3.24 Nature conservation interest and habitat creation will be incorporated as a feature of the reinstated landscape. Areas of conservation value that lie within adjoining land and within the site boundary, but which will not be affected by the working operations, will be protected and managed to retain and enhance their archaeological and nature conservational value.

Aftercare

- 3.25 An Aftercare Scheme for each phase of the restoration will be submitted for the approval of the Planning Authority not later than six months prior to the completion of restoration (including soil spreading) of each phase as required by Planning Condition 53.
- 3.26 The Aftercare Schemes will provide details of vegetation establishment (including the nature and timing of any cultivations and stone picking operations; content and origin of seed mixtures; proposed seed rates and timing of sowing; and any proposed fertilizer and lime rates based on the results of soil analysis), vegetation management (including the timing and frequency of cutting and proposed grazing regime), tree and hedge establishment (including ground preparation; planting details including species, type of stock, establishment methods, planting density and timing; and maintenance including beating up, weed control, fertiliser application, protection from grazing animals and pruning/thinning) and monitoring which may be required..
- 3.27 The programme of maintenance and aftercare will follow the restoration of the working areas; this will be carried out for a period of 5 years after the restoration works are satisfactorily completed as certified by the LPA. Particular attention will be paid to grazing control, appropriate fertiliser application, soil structure development and drainage necessary to achieve the range of wildlife habitats and the standards of agricultural land required by the local planning authority and the Agricultural & Rural Affairs Department of the National Assembly for Wales.
- 3.28 The Aftercare Schemes will recognise the need for careful control of vegetation establishment in areas where nature conservation is the priority. In these areas suitable habitat conditions will be achieved through sensitive reinstatement (including soil replacement, seed mixtures and grazing regimes). In these areas fertilizer will not be applied unless this is essential for the satisfactory establishment of vegetation, and only with the written approval of the Planning Authority. Across the wider site, the aim of aftercare will be to encourage the development of biodiversity in association with agricultural use, and aftercare management will reflect this objective. In particular use of fertilizers will be carefully controlled.
- 3.29 Weed control will be undertaken in accordance with the guidance provided in English Nature's *Herbicide Handbook – Guidance on the Use of Herbicides on Nature Conservation Sites*.
- 3.30 Since the Common Rights will be suspended during the working of the scheme, management, including any fencing which may be required, will be entirely in the control of the operator.
- 3.31 Monitoring of restored areas will be implemented during the aftercare period. The scope of monitoring will be agreed with the LPA. In addition to species specific monitoring of great crested newt (as required by the WAG Licence) and breeding lapwing, other monitoring may include assessment of vegetation establishment, surveys of breeding birds, terrestrial and aquatic invertebrates.

- 3.32 As explained at paras 6.6 and 6.11, management plans for retained areas of nature conservation interest at Cwm Golau and the central ecological area, between the Bogey Road and the railway line, will be prepared and implemented following commencement of the scheme. These management plans will specify requirements for monitoring of habitats and species. Monitoring of vegetation, hydrology and hydrogeology of the Tair Carreg Moor SINC to the east of the site has commenced, in accordance with a methodology agreed with Caerphilly County Borough Council, and will continue for the duration of operations.
- 3.33 Following implementation of the works, and at the same time as the management plans for the retained areas of nature conservation interest, a Biodiversity Map will be prepared for the completed scheme, identifying the biodiversity enhancements which are expected to arise as a result of the restoration. This will serve as a tool for monitoring habitat changes and species occurrence as the restoration proceeds, and for ensuring that the restoration scheme achieves its objectives. Species specific monitoring, and assessment of vegetation establishment, during the aftercare period will also be specified.
- 3.34 On completion of the 5 year aftercare period, and provided that the land has been restored to a standard acceptable to the local planning authority, fences will be removed and the site will be returned to Common, Agricultural Tenants, or other Landowners, as required to meet any legal constraints or agreements.

The Restoration Plan

- 3.35 The restoration plan has regard to Merthyr Tydfil County Borough Council's objectives and policies for the landscape. In particular the following objectives have been adopted:
- i. The restoration design aims to develop a range of landscape character appropriate to the different parts of the site, and to integrate it with the surrounding landscape
 - ii. The northern and north-western slopes are part of the landscape setting of Merthyr Tydfil, and their restoration treatment aims to enhance that setting.
 - iii. The project includes restoration of public access routes. Their enjoyment will be enhanced through improved signage and information, and indications of routes linking places or providing circular walks.
- 3.36 The Environmental Statement provided a broad scheme upon which the Restoration Plan has been based (Figure 4). The restoration design is described by reference to the proposed landform and drainage pattern, the vegetation to be established, features to be incorporated and access. A key aim of the proposals is to produce a varied surface giving areas of light and shadow, and texture and grain to the landscape. It includes "macro features", such as valleys and stream courses, and minor variations in terrain, soil depth, drainage and micro-climate. Such "micro" features are frequently absent from older reclamation sites, and will support the aim of developing variety, by providing suitable conditions for different habitats. Some of the larger features, such as main watercourses, will be designed-in and constructed during overburden placement. Smaller features, such as small ponds, scrapes and hedgebanks will be constructed during or after soil placement. The use of bio-engineering techniques, for example as an alternative to stone lining of drainage channels, will be considered.
- 3.37 The detailed restoration proposals for the phases of the Ffos-y-fran Restoration Scheme will provide full specifications for such features in the form of drawings and written specifications.

Previous Restoration Experience in South Wales

- 3.38 Appendix B contains a photographic record over the past 8 years of the restoration of opencast coal sites across South Wales. Several of the sites had already been restored for some years at the time of the earliest of the photographs, in 1997, and some are currently under restoration, demonstrating the latest restoration techniques. The sites illustrated represent both lowland and upland sites, with restoration to a range of after-uses comprising agriculture, nature conservation or amenity. These examples show how similar techniques and features to those proposed at Ffos-y-fran have been successfully implemented elsewhere.
- 3.39 At Parc Slip, to the west of Aberkenfig near Bridgend, restoration aftercare was completed in 1992. It is now a nature reserve, managed by, and the headquarters of, the Wildlife Trust of South and West Wales. The main features of the restoration were lakes and ponds with associated wetland, and rushy and wildflower meadows. There are also areas of woodland and hedgebanks. The area is accessible to the public, and provided with footpaths and seating areas.
- 3.40 At Llanilid West, where coaling ceased in 1997 and restoration aftercare is still in progress, the restoration is to agricultural fields with hedgerows. Early experience in restoring hedgebanks, which did not establish successfully, led to the adoption of alternative approaches as work progressed to trial different techniques.
- 3.41 At Banwen, an upland site to the north of Glyn-neath, aftercare ceased in 1998. Restoration included marshy grassland, ponds and water courses.
- 3.42 Coaling is still in progress at Nant Helen opencast site, further to the north of Banwen near Abercraf, but restoration of earlier phases is being carried out progressively. This is also an upland site, rising to 285m AOD. As well as extensive areas of open common upland grassland, as is proposed at at Ffos-y-Fran, ponds, streams, wetland and heather bog have also been successfully restored.
- 3.43 Coaling ceased at Brynhenllys in 2003, but restoration commenced on previous phases in 1996, mainly to enclosed agricultural land and woodland, with areas of marshy grassland.
- 3.44 The photographs show not only successful establishment of a range of restoration types, they also illustrate how manipulation of landform and ground conditions on a small scale within the overall strategy can produce variations of vegetation, such as rush colonised depressions, which add diversity and visual interest.

Landform

- 3.45 The landform of the restored site will reflect that of the surrounding hillsides, with an overall gently rounded form, with smaller-scale variations. The land will rise from a low point of about 286m AOD at Mountain Hare roundabout in the western-most point of the site to a rounded dome at about 400m AOD. The A4060 defines the north-western boundary, which rises to 352m AOD at the northern-most point of the site. A distinct valley feature will separate the dome from the land rising to the boundary with Trecatti and Tair Carreg Moor in the north and north-east of the site. To the east and south of these main landform features, the restored land will fall gently to the Bogey Road.
- 3.46 South of the Bogey Road, the restored landform is governed to the north by the retained and undisturbed areas in the central area. To the south of the mineral railway, it will rise to a low east west ridge to the east and form a north-south valley in the centre, similar to the current Bargod Taf valley. To the west the land will rise slowly from the valley to the Sarn Howell Pond, which is to be retained undisturbed. In the south of the site, the landform is to be restored to similar levels to the existing.

- 3.47 Within this broad landform structure, variations are introduced. As noted in the Environmental Statement, the north-western part of the site is characterised today by the line of the former railway that linked Cwmbargoed with Penydarren and Dowlais. In this north-western area, the lines of the former railway and A4060 are to be retraced by proposed public paths, and the overall landform will be modified to produce a terraced effect, to allow the line of the former railway to be “read” in views to the site. The landform is further modified in the north-eastern and north-western areas to accommodate small valleys for watercourses and ponds. As explained above, the larger features will be constructed during overburden placement, and smaller features during or following soil placement. Full detail of the proposed construction and materials to be used in such features will be provided in the detailed restoration plans.
- 3.48 Examples of the introduction of such features in a restored landscape are shown in Photographs 29, 31, and 32 of Appendix B.

Drainage pattern

- 3.49 The landscape restoration plan shows the main surface/storm water drainage proposed. The watercourses will be varied in detail to include cascades, which could be formed in block stone recovered during the operations, and used to line the new watercourses where necessary. Examples of such cascades are shown at Photographs 11 and 30 of Appendix B. Stone used in creation of watercourses will be locally sourced and of appropriate size to encourage habitat creation for aquatic invertebrates. Ponds will be introduced where feasible or necessary to slow water speeds in the watercourse and provide variations in aquatic habitat. Such a watercourse with ponds is shown in Photograph 32 of Appendix B.
- 3.50 Streams will drain the western and north-western areas, to ponds, before linking into the surrounding watercourses. In the north-eastern area and on the eastern flank of the domed hill in the west of the site, the drainage system proposed is in the form of leats and reservoirs similar to those of the Dowlais Free Drainage System, a large section of which survives on Tair Carreg Moor. The drainage channels, or leats, in the east of the site will be linked with those in Tair Carreg Moor or to those in the central area, restoring the existing pattern of drainage. Flows of watercourses draining the site would be ameliorated through ponds or cascades as necessary to prevent adverse impacts on the receiving watercourses.
- 3.51 A stream will follow the valley in the central area, connecting with the Bargod Taf on the south-western boundary, west of the iron Age Settlement, with a tributary draining the eastern ridge.
- 3.52 New ponds are proposed in the locations of the water treatment areas for the operational phase of the reclamation scheme by modifying the form of the water treatment areas. The pond margins, and water depths within these areas, will be designed to provide for the successful establishment of diverse habitats, including marsh and bog habitats. For ponds, established good practice is to form a shallow sloping margin, about 15m wide, with deeper water beyond, and an indented shoreline composed of irregular bays. This approach provides a variety of conditions to allow the establishment of a progression of marginal and aquatic vegetation which in turn provides food and cover for a variety of fauna. A range of suitable aquatic and marginal plant material will be sourced from other ponds within and adjacent to the site and introduced into the new ponds. The design of these features will be discussed with the Environment Agency. Examples of similar ponds are shown in Photographs 1, 3, 9, 10, 12, 28 and 33 of Appendix B.
- 3.53 The ponds in the north-eastern part of the site, will have retaining earthworks on their downhill sides.

Vegetation

- 3.54 The majority of the site is to be restored to upland grassland suitable for common grazing. The techniques for soil distribution and seeding are described in section 4. On the shallower slopes north of the Bogey Road, the soils and the after care will produce a substantial area of acid grassland, while on the eastern boundary with Tair Carreg Moor, an area of wet heath is to be established, as a continuation of the vegetation of the adjacent moor (which is a Site of Interest for Nature Conservation). As explained in section 4, soils originally stripped from this area will be replaced within areas confined by clay bunds which will serve to retain water in the same way as the existing contour ditches in this area. The area of acid grassland to the south of the wet heath will include features designed to retain water and provide a mosaic of wet and dry habitats. Seed of Welsh provenance will be used in re-establishment of vegetation in this area of wet heath, unless found to be not practicable and with the approval of the Planning Authority.. The practicability of using locally sourced seed is being investigated and the Planning Authority will be advised on the progress and outcome of these investigations.
- 3.55 Examples of restoration to grassland/moorland vegetation are shown in Photographs 13, 22, 23, 24, 26, 29, 31, 32, 33, 34, 35, 36, 39, 40, 41, and 43 of Appendix B.
- 3.56 In the enclosed fields in the south of the site, the restoration will be to improved grassland.
- 3.57 Blocks of woodland are proposed along the north-western boundary, which is not common land. It is designed to integrate with the existing and developing woodland along the slopes to the west of the A4060, with the aim of enhancing the road's setting and the view from the settlements towards the road and the site. Another block of woodland is proposed in the valley of the restored section of the Bargod Taf. Attention will be given to the design of the woodland edges so as to provide a varied structure using appropriate shrub species. No woodland is proposed on the higher land or the common land, whose character will be open upland moorland, similar to the surrounding hillsides.
- 3.58 Woodlands will be established using traditional methods of planting forestry transplants and root trainers. A minimum depth of 600mm of free draining and friable rootable soil or soil forming material will be required for planted areas. This will be provided from stored soils stripped from the site, overburden and suitable soil forming material as described in section 4. The potential for collection of seed from local woodlands, and raising transplants to be introduced to the site, will be investigated and implemented if practicable. This will potentially form part of the activities at the proposed visitor centre.
- 3.59 Hedgerows are proposed to the field boundaries in the south of the site. These will be established as hedgebanks consisting of earth banks constructed of sub-soil. The sides will seeded with a suitable seed mix into the sub-soil, which provides nutrient poor conditions suitable for the establishment of wild flowers. Should any access track be required for agricultural purposes, the potential for providing hedgerows along both sides of the track would be considered.

Other features

- 3.60 It is possible that a portion of the high wall of the excavation void may be retained in the north-eastern part of the site. If feasible, the backfilled landform will be modified to leave a 6-8m high exposure where the high wall is in visually and geologically interesting rock formation.
- 3.61 If suitable stone is recovered during the operations, field boundaries in the south of the site will include some in the dry stone construction found in the fields of Bryn Caerau Farm, reflecting the cultural heritage and providing landscape interest. If

sufficient stone is available, the boundary between the enclosed fields and the open moorland will be defined with stone walls.

- 3.62 Stone enclosures or shelters for sheep on the moorland are proposed, to be sited in the course of the works on site, selecting suitable locations.

Landscape character

- 3.63 The restored site falls into four broad areas:

The north-western area, overlooking Merthyr Tydfil

- 3.64 This area provides an important part of the setting of Merthyr Tydfil. After restoration, it will provide a backdrop of a rounded hill of upland grassland, with landform variations reflecting valley features of varying scale, and restoration of the lines of the former railway and trunk road. Water courses will have a natural stream character, with stony bottoms and cascades on steeper sections. On the lower slopes, it will be integrated with the A4060 and vegetation to its west by the introduction of woodland areas, with further variety provided in the wetlands developed from the former water treatment areas. The footpath network proposed offers routes over the high ground, along the retraced lines of former road and railway, and through open and wooded areas, with potential links to the settlement. From within the area, wide-ranging views will be available over the surrounding area, and except for the lower wooded area, there will be a sense of elevation and exposure.

The north-eastern area, north of the Bogey Road and extending to Trecatti and Tair Carreg Moor in the east

- 3.65 This area is separated from Merthyr Tydfil by the higher landform to the west. It slopes towards the central area of the site and the Bogey Road, with views concentrated within the site and southwards over the rising ground of Merthyr Common. This area will be characterised by the pattern of vegetation proposed, with upland grassland on the upper slopes (continuing from the north-western area), wet heath where it borders the Tair Carreg Moor SINC to the east, and acid grassland on the lower slopes bordering the Bogey Road. In this area, water features will have the character of reservoirs and leats, reflecting the former man-made features of the Dowlais Free Drainage System, and a section of the opencast high wall is proposed to be left exposed. These features will be linked by the footpath network, and in conjunction with the measures to interpret other heritage features (described in Section 7), interpretative signage is proposed.

The central southern area, extending to the enclosed fields and Iron Age settlement

- 3.66 This area includes the central ecological area and the major heritage features to be retained. In the southern part of the area, the landform will be restored to a gentle ridge of upland grassland in the east, and a wooded valley to the south, with a general sense of enclosure by the higher ground surrounding the area. The heritage and ecological features of interest will be linked by existing tracks or new footpaths, with interpretive signage. The footpaths here have been aligned to avoid the lapwing nesting area which would be created in the east of this area to avoid disturbance.

The southern enclosed fields

- 3.67 The areas between Garth Fawr and Cwm Golau and bordering Bryn Caerau will be laid out in a traditional pattern of irregular fields with hedgerow boundaries, and will be used for grazing. Located on the shallow valley sides above the steep slopes of Nant Gyrawd, it will have a sense of enclosure and intimacy. Heritage interest could be enhanced, if suitable material is recovered, by stone walls to mark the boundary between the enclosed fields and the open land of Garth Fawr. A footpath through the fields will link the area with the surrounding rights of way network.

Land Management

- 3.68 The division of the site into compartments for management during the aftercare period is shown on Figure 5. Grazing is an important component of management and stocking rates are likely to vary according to the use of the various management compartments. Stocking rates are normally stated as Livestock Units (LU) per ha. This is a method of describing different stock types and age groups based on their energy requirements. Standard ratios are used, commonly based on one livestock unit equalling one Friesian dairy cow. English Nature's Upland Management Handbook (English Nature 2001) includes a table of Livestock Units, based on the MAFF Farm Business Survey as follows:

Stock type	Livestock Units	Stock type	Livestock Units
Cattle		Sheep	
Dairy cow	1.00	Ewes:	
Dairy bull	0.65	Light	0.06
Beef cow	0.75	Medium	0.08
Beef bull	0.65	Heavy	0.11
Heifers in calf	0.80	Breeding ewe hoggos (¹ / ₂ -1 year)	0.06
Other cattle (not intensive beef):		Other sheep over 1 year	0.08
0-12 months	0.34	Rams	0.08
12-24 months	0.65	Lambs	0.04-0.08
Over 24 months	0.80	Store lambs under 1 year	0.04
Horses	0.80		

- 3.69 Not all schemes use the same values for Livestock Units. For example, Tir Gofal uses 0.15 LU for a sheep, 1.0 LU for a horse, 1.0 LU for a cow over 24 months and 0.6 LU for a cow under 24 months. Appropriate LU values for the stock to be grazed at the site would be agreed for the Aftercare Schemes with advice from the Technical Working Group. The following LU values have been assumed for the purposes of this strategy:

1 sheep = 0.15 LU
1 horse = 0.80 LU
1 cow = 0.65 LU

- 3.70 Preferred stocking rates on the enclosed fields at Bryn Caerau (Compartment 7b) once established, could be up to 2.25 LU/ha (equivalent to 15 sheep/ha, or 2.8 horses/ha, or 3.5 cows/ha), whilst on the wet grass heath adjacent to Tair Carreg Moor, the preferred stocking rate would be not more than 0.15 LU/ha (1 sheep/ha, or 0.19 horses/ha, or 0.23 cows/ha). 0.45-0.75 LU/ha (3-5 sheep/ha, or 0.6-0.9 horses/ha, or 0.7-1.2 cows/ha) would be likely to be appropriate across much of the site to allow for development of good wildlife habitat. Stocking rates during the aftercare period would be agreed with the WAG Agriculture Department and the LPA, with advice from the Technical Working Group, as part of the detailed aftercare schemes.

- 3.71 The number of registered rights for Gelligaer and Merthyr Commons (some 3091ha) is 54750 sheep. Some of the commoners can graze horses and cows as an alternative to sheep. These alternative rights total 329 horses or 10925 cattle.
- 3.72 Considering the sheep rights alone, this equates to 2.66 LU/ha if all the rights were exercised. It can be seen that this would be some 3 - 6 times the rates likely to be appropriate across much of the site.
- 3.73 It is recognised that the grazing patterns of cattle and ponies may be better suited to the development of diversity of both flora and fauna, particularly invertebrate fauna, and that the intensity of grazing should vary through the year. Spring, summer & autumn grazing is generally preferable, and winter grazing and supplementary feeding should be avoided. However, the practicalities of agricultural management, and the requirements of graziers, may not always allow ideal conditions to be achieved.
- 3.74 The future management of the common land beyond the aftercare period is discussed further below. It is recognised that through the Single Farm Payment, agri-environment schemes and future legislative changes, there is likely to be a new approach to the management of commons which will have a direct bearing on the numbers and type of livestock grazed by the commoners.
- 3.75 The proposed management of land within the compartments identified on the plan are as follows.
- Compartment 1 - Wet Grass Heath, Compartment 2 - Acid Grassland, and Compartment 3 - Upland Grassland*
- 3.76 Aftercare management will be through appropriate cutting and/or grazing at suitable stocking levels. These areas will revert to Common Land on completion of the restoration scheme and will be managed with the rest of the Common Land.
- Compartment 4 Grassland with Woodland Blocks*
- 3.77 Aftercare management will be through appropriate cutting and/or grazing at suitable stocking levels. Woodland blocks will be established using species mixtures, planting stock and techniques appropriate to the site. Appropriate beating up and other woodland management will be implemented during the aftercare period
- 3.78 This area will remain fenced from the Common Land at the end of the aftercare period. Thinning and other woodland management will be undertaken as required. The grassland will be grazed at appropriate stocking levels.
- Compartment 5 Central Ecological Area*
- 3.79 This area of nature conservation interest, between the Bogey Road and the railway line, contains ponds where great crested newts and other amphibians have been recorded. Most of this area has been excluded from the site and will be retained, enhanced and managed as an ecological area. A detailed management plan will be prepared and implemented for this area following commencement of the scheme.
- 3.80 Suitable areas for reptiles will be retained in this area including the line of the former railway itself. Given the small numbers of reptiles likely to be affected by the works, this will be suitable as a receptor area for translocation of reptiles from other parts of the site.

Compartment 6 Upland Grassland and Woodland (in 6b)

- 3.81 Aftercare management will be through appropriate cutting and/or grazing at suitable stocking levels. Compartment 6a will revert to Common Land on completion of the restoration scheme or will be managed with the adjoining Common Land. The applicants will seek to achieve appropriate stocking levels over the Common Land. Compartment 6b will remain under Miller Argent's control and they will control stocking levels over this land. The higher part of this parcel will be managed to provide suitable nesting habitat for lapwings.

Compartment 7 Cwm Golau and Bryn Caerau

- 3.82 The sheltered valley of Cwm Golau, with its woodland, (Compartment 7a) is excluded from the site. This land will be retained and managed in order to enhance its existing ecological interest and through appropriate habitat creation and improvement. A detailed management plan will be prepared and implemented to enhance the overall nature conservation value of this area following commencement of the scheme. This will include areas of tree and shrub planting, reinforcement of hedgerows, fencing, and control of stocking levels. Ponds to provide habitat for great crested newts have already been constructed in this area by Miller Argent largely through clearing out old infilled ponds and former settling lagoons..
- 3.83 Aftercare management of Compartment 7b will be through appropriate cutting and/or grazing at suitable stocking levels. Hedges will be established using suitable native species as explained in section 4 and managed so as to form stock-proof boundaries and to provide habitat features. This area will include two wetland areas based around restored water treatment areas comprising ponds with surrounding wet habitats.
- 3.84 Compartment 7b will remain under the applicants' control and will be managed together with the retained farmland in Cwm Golau (Compartment 7a). Miller Argent will control stocking levels over this land.

Future Management of the Common Land

- 3.85 The Gelligaer and Merthyr Commoners Association is responsible for the management of the common land. A Management Plan for the common has been prepared and a project plan developed to introduce a broad management and improvement programme. The association has been advised that an application for Objective 1 funding to improve management of the common has been approved.
- 3.86 The management plan refers to the existing flora and fauna of the common and sets out a number of overall objectives for management. These include:
- “(iv) To prevent the illegal grazing of the common by owners of stock who are not registered commoners and by registered commoners who do not comply with legally authorised stocking levels.*
 - “(vi) The maintenance and enhancement of all historical ecological and archaeological features on the common and to liaise with the other authorities and organisations with particular interest in these features and to help and assist such bodies in any of those initiatives.”*
- 3.87 In relation to the management of grassland, heath and wetlands, the objectives are:
- “(i) To keep an up to date register of all “Registered Commoners”.*
 - “(ii) To monitor stock numbers and the regulation thereof and the use of supplementary feeding.*

- (iii) *To consider the conservation of the natural indigenous grassland, heath and wetland, together with the natural fauna and flora, and to draw up detailed proposals for the use of lime and fertilizer with these considerations in mind.*
- (iii) *To control the spread of bracken, gorse, rush, thistle, ragwort and other such weeds and to do so in a manner which does not cause damage to the natural nature of the common or interfere to any practical extent with the enjoyment of the common by others. To liaise with and take the advice of other interested bodies and to cooperate with such bodies in the implementation of control action.*
- (v) *To return to the natural nature of the common, its landscape and herbage, all those areas despoiled by development, past and present, and not satisfactorily reinstated so as to provide acceptable visual amenities, grazing and habitat.*
- (vi) *To draw up proposals in conjunction with the landowner and other interested bodies, to increase the bio-diversity of the common and to seek aid to fully implement these proposals on areas approved.*
- (vii) *To investigate the possibility of the provision of shelterbelts by the planting of trees, and to provide for the maintenance of existing woodland.”*

3.88 With respect to general nature conservation requirements, the objectives of the plan are:

- “(i) To cooperate with those who are responsible for all ponds, feeders, reservoirs and the like, together with their ancillary water catchment and drainage facilities, to properly maintain these features so as to enhance the habitat of wild species that depend on them.*
- (ii) To ensure that wildlife habitat in general is properly preserved and that no actions are taken which would endanger any rare species.”*

3.89 The management proposals include measures for enhancement of biodiversity as well as a number of other key areas; historic landscape, agricultural impact, public recreation, and anti-social behaviour.

3.90 The Gelligaer and Merthyr Commoners Association would be invited to be represented on the Technical Working Group to ensure that, together with other interested parties, they were involved in discussions regarding the future management of the land.

Visitor Centre

3.91 Planning consent has been granted for a Visitor Centre at Cwmbargoed Disposal Point to be operated in association with the scheme. This will provide educational and interpretation facilities, both for the land reclamation process, and for the natural and historical environment in the vicinity of the site.

4.0 Soils, Seeding and Planting

Existing Soil Resource

- 4.1 A detailed assessment of soil resources was commissioned by British Coal Opencast and carried out by ADAS in 1992/3. Further supplementary work was carried out by ADAS in 1993, 1994 and 1995. Additional investigation was carried out by RJ Skinner consulting in 2003.
- 4.2 Four broad soil types have been identified on the agricultural parts of the site and are depicted on Figure 6. Soil forming materials were also identified over the areas depicted on Figure 7. The soils and soil forming materials depicted on the drawings have been described as follows:-

Soil Unit 1 - Mineral Soils

- 4.3 Soils of this type were found predominantly in the enclosed fields in the south-eastern part of the site, but also in small areas on the undisturbed common land. They consist of dark greyish brown, medium clay loam topsoils to 200mm depth, overlying yellowish brown medium clay loam subsoils to 500mm. Below this depth is yellowish brown weathered boulder clay.

Soil Unit 2 - Organic or Peaty Topped Mineral Soils

- 4.4 Almost all of the undisturbed common land consists of soils of this type together with some areas within the enclosed fields in the south-eastern block. This soil type is represented by two typical cross sections:
- (i) topsoil consisting of black or very dark grey peaty loam to approximately 150mm depth over a grey, medium clay loam subsoil down to 400mm.
 - (ii) dark grey brown organic clay loam topsoil to 200mm depth overlying light brownish grey medium clay loam subsoil to 450mm depth.
- 4.5 In the case of both variant soils the material below the subsoils was weathered boulder clay.

Soil Unit 3 - Restored Soils

- 4.6 Restored soils occur on the old Trecatti Opencast Site, part of which covers the north of the Ffos-y-fran area. A 'topsoil' layer of approximately 325mm depth incorporating some organic matter has developed during the period since its restoration. Overall, the material consists of 1000mm plus of dark or dark greyish brown medium clay loam. Intrusions of brown or yellowish brown heavy clay loam were found to be common. Stone content of the soil layers below 300mm is over 35% by volume up to 300mm in size and frequently up to 75% or more. However in the topsoil layers, stone removal at the time of restoration has reduced this content to around 10%.

Soils Units 4 & 5 – Spoil Tips and Disturbed Soils

- 4.7 Soil Unit 4 is found in the naturally vegetated coal and shale tips covering the central western part of the site. Soil Unit 5 lies primarily in the levelled and grassed spoil tips around the western edge of the site.
- 4.8 In both cases, a shallow rooting zone of 150 – 300 mm in depth has developed consisting of a medium clay loam incorporating some organic matter. This overlies shaly spoil material, relatively loose in Soil Unit 4 but compacted in Soil Unit 5, except on slopes. Where it contains enough fine material to determine soil texture, this was

found to be a medium clay loam. Stone content was assessed at over 75% by volume up to 200mm in size in the top 250mm increasing to over 90% with depth. The quantities of large stone vary across this unit, and as mapped in the soil forming materials map, areas within Soil Units 4 and 5 have been identified as sources of suitable soil forming materials for future restoration at the site.

Soil Forming Material

- 4.9 Soils over much of the site have been examined to greater depth using a mechanical excavator to 900mm depth to investigate whether there were any, deeper seated, soil forming materials suitable for use in the subsequent site restoration. Five types of Soil Forming Material have been identified; these are shown on Figure 7.
- 4.10 In areas to be used for overburden and Soil Forming Material storage, trial pits have been dug to approximately 1.5m. In the area of excavation trial pits were dug to 3.5 to 4m where possible. There will inevitably be more Soil Forming Material at greater depths than those examined, but this has not been identified or included in the volumes quoted.
- 4.11 Prospecting borehole logs have been checked to see if there was any likelihood of Soil Forming Material being present at greater depths than the trial pits. The geological descriptions and soil descriptions of a given horizon are not necessarily the same. Therefore, material found at depth cannot be assessed accurately for potential soil forming quality.

Soils Stripping and Storage

- 4.12 All available topsoil will be stripped from all areas to be used for excavation, overburden, subsoil and soil forming material storage, roads, hard standing areas, water treatment facilities and building construction.
- 4.13 All available suitable subsoil will be stripped from any area previously stripped of topsoil, except those areas required for the storage of subsoil.
- 4.14 Suitable soil forming material which has been identified will also be stripped. Wherever possible such material will be directly spread.

Soil Stripping

- 4.15 Before any major excavation is commenced in areas where soil resources are present, topsoil will be stripped to the average depths indicated for the various soil units indicated above and placed in the soil storage mounds shown on the Progressive Restoration plans in Appendix A. Sufficient areas will be stripped to provide for the uninterrupted working of the site until the next suitable season for topsoil stripping, including the excavation area and also areas to be used for buildings, plant yards, stockpiles of any material except topsoil, access roads, temporary haul roads and tracks, pipeline excavations and temporary or permanent diversions of watercourses.
- 4.16 As soon as practicable after topsoil stripping has been completed, subsoil will be stripped to the average depths indicated for the various soil units indicated above and similarly placed in storage mounds shown on the Progressive Restoration plans.
- 4.17 Every effort will be made to avoid compaction of soils. The stripping of soils will be confined to periods between April and September when conditions are dry enough to prevent damage through the passage of heavy plant. This will also help to prevent the intermixing of soil layers by the stripping process. Stocks of topsoil, subsoil and soil forming material will not be traversed by heavy plant except when absolutely necessary. Most potential archaeological resources will be encountered during soil stripping and the mitigation measures are explained in section 7.

4.18 Topsoil and subsoil from Area 2 (see Figure 8) will be stripped and stored separately for use in restoration. An area of wet grass heath in the east of the site is identified as being of conservation interest. The topsoils and subsoils over this area will be stripped and stored separately for subsequent reuse in the formation of similar wet grass heath in the same general area during restoration of the site (see area 2WH on Figure 8).

4.19 In Soil Unit 3 (the restored Trecatti overburden store site), there is an upper 325 mm layer of material which has agricultural value and will be stripped as "topsoil". As the area covered by this Soil Unit will be used for the storage of Soil Forming Material and overburden to an approximate height of 25m, there would be no benefit from stripping the underlying much poorer soil materials.

Soils Storage

4.20 Sufficient area has been allocated to store all soils and Soil Forming Material identified to the maximum heights set out below. Topsoil, subsoil and soil forming material and overburden will be stored separately and prevented from mixing. Two qualities of natural topsoil and subsoil have been identified and it is proposed to store these separately.

4.21 In addition, the maturing restored topsoil covering the former Trecatti site area, Soil Mapping Unit 3, will be stored separately.

4.22 As described above, soils from the wet grass heath area will be stored separately and replaced in approximately the same location from which they were stripped.

4.23 The soils from the remainder of Soil Unit 2 (as shown on Figure 6) are fairly similar in nature across the site and only after replacement will restoration create the two separate restoration types; "2" and "2AG" as shown on Figure 8. These represent semi-intensive agricultural grassland and acid grassland respectively. The differences will be introduced following soil placement by the appropriate differential use of lime, fertilisers, seed mixtures and grazing regimes.

4.24 Maximum storage mound heights will generally be as follows:

- Topsoil and Subsoil 4 m;
- Soil Forming Material 15 m.

4.25 Soil forming material will be segregated and stored within the northern overburden mound.

4.26 All mounds of soil will be seeded to grass, utilising native species where practicable, at the earliest opportunity. This will limit the potential for colonisation by aggressive weed species. Any localised infestation by such species will be dealt with by use of suitable herbicide treatments or other management techniques as appropriate. The vegetation on the soil and soil forming material stores will be managed by cutting and/or grazing.

4.27 A suitable seed mix for stores of mineral soils and soil forming materials to be used in the restoration of Areas 1, 3 and 4 would be:

<i>Agrostis capillaris</i>	Common bent	15%
<i>Festuca rubra rubra</i>	Creeping red fescue	30%
<i>Poa pratensis</i>	Smooth-stalked meadow grass	20%
<i>Lolium perenne</i>	Perennial ryegrass	25%
<i>Trifolium repens</i>	White clover	10%

4.28 The same mix would be suitable for overburden stores. As explained at para 4.33, any overburden from the surface of the stores containing vegetation and used in

restoration of Area 2 will be placed a minimum of 2m below the base of the restored soil profile.

4.29 A suitable seed mix for soils to be used in the restoration of Area 2 would be:

<i>Agrostis capillaris</i>	Common bent	15%
<i>Festuca rubra rubra</i>	Creeping red fescue	35%
<i>Festuca ovina</i>	Sheep's fescue `	30%
<i>Poa pratensis</i>	Smooth-stalked meadow grass	20%

4.30 The following grass seed mixture would be suitable for organic and peaty soils

<i>Agrostis capillaris</i>	Common bent	20%
<i>Agrostis vinealis</i>	Brown bent	15%
<i>Anthoxanthum odoratum</i>	Sweet vernal grass	15%
<i>Festuca ovina</i>	Sheep's fescue `	25%
<i>Festuca rubra rubra</i>	Creeping red fescue	25%

4.31 The practicability of use of seed of Welsh provenance for stores of soils to be used in restoration of Area 2 will be investigated and used if available on reasonable commercial terms.

4.32 All drainage from soil stores will pass through water treatment lagoons to protect downstream watercourses from pollution with fine particulate material.

Soils Utilisation and Restoration Method

4.33 In taking overburden from store for use in restoration, any overburden from the surface of the stores containing vegetation and used in restoration of Area 2 will be placed a minimum of 2m below the base of the restored soil profile.

4.34 There is a shortage of good quality topsoil and subsoil for use in the restoration on Ffos-y-fran. There is currently an estimated shortfall of some 2 million tonnes. This shortfall will be made up by using soil forming material which has been identified within the superficial deposits and spoil tips of historically worked materials.

4.35 The use of low compaction bulldozers, rather than scrapers or mechanical shovels only, would be employed for reinstating soils. This method of reinstatement has previously been employed and found to be successful in South Wales where site topography and high rainfall can cause problems. The main benefits of this method over the use of motorised scrapers and shovels are:-

- Reduced compaction of the reinstated soil profiles.
- Fewer problems with surface water run-off from freshly restored areas.
- The reinstated soil profile, being less compacted, provides a better drainage regime providing a degree of attenuation during periods of high rainfall.
- The less compacted nature of the soil profile, along with better drainage characteristics, result in improved tree and grass establishment due to quicker and deeper root development.

4.36 The method is more adaptable to steeper areas, leaving much smaller areas of micro-topography for soiling with mechanical shovels, which require some form of subsequent soil consolidation. Where the shovel technique has not been followed by some consolidation and soils are left very loose, following a wet period, they can become completely untrafficable and rut severely if run across by farm tractors etc.

4.37 Compared with mechanical shovel techniques, the low ground pressure bulldozer has been found to be very satisfactory. It imparts a degree of consolidation to the soil

layers which prevents them holding too much moisture (like a wet sponge) after rain. Routes for dump trucks would be defined and trafficking strictly controlled.

- 4.38 However, much of the soil on site will be subject to compaction, and may be impermeable following the long period of storage. The compaction will need to be relieved. All soils on site will be ripped prior to soil replacement with the exception of that to be replaced in area 2WH. Soils will be ripped to 500mm depth. Compaction of localised patches of the replaced soils in area 2AG and 2 will be employed after soil replacement to achieve habitat mosaics including localised patches of marshy grassland and wet flushes. Field drainage may be required in Area 1.
- 4.39 After laying the soil profiles, a range of agricultural activities will occur and these will vary according to the particular after-use. These works may include ripping, soil levelling, stone picking, cultivation, power forking, disking and stone picking prior to cultivation. Laid material would be sown as soon as practicable after placement.
- 4.40 The combination of these agricultural techniques, along with the advantages of the low compaction bulldozer, together with the use of shovel and truck during the reinstatement, would provide the basis for successful site restoration.
- 4.41 The proposed restoration plan for Ffos-y-fran is shown on Figure 4.
- 4.42 Those areas of the common (Soil Unit 2) that had previously been stripped of organic and peaty soils will receive the same topsoil and subsoil, which will have been stored separately during stripping operations.
- 4.43 Particular attention will be given to those soils stripped from the wet grass heath of nature conservation interest (Soil Unit 2WH), where 200mm of the same topsoil will be underlain by 200mm of the corresponding subsoil to reflect the original profile over this area. In order to ensure that water is retained in the soil profile in this area to maintain the high water table needed to support wet grass heath, a series of clay bunds will be constructed approximately along the contours of the restored area forming a series of cells into which the restoration soils will be placed.
- 4.44 The soils stripped from the remainder of Soil Unit 2 will for the most part be placed in two layers; 165mm of the organic-peaty topsoil over 165mm of subsoil within areas 2 and 2AG shown on the Soil Reinstatement Strategy (Figure 8). Whilst the soils are currently similar, the different after-care management will result in different grassland characteristics as described above.
- 4.45 Within area 2T shown on the Soil Reinstatement Strategy (Figure 8), topsoil and subsoil material from Soil Unit 2 would each be replaced at a thickness of 250mm. This is to give a greater total thickness of soil layers in order to help encourage and sustain good tree growth in this area.
- 4.46 The areas currently overlain by shale heaps, disturbed soils, buildings and disused haul roads and railways will be restored using the soil forming materials (SFMs) found on site. These are mainly shales with some inclusions of boulder clay in material "C". The restored soil thickness will in general be 500 mm (area 4M), but in areas where trees are to be planted the greater thickness of 650mm will be used (in areas 4N and 4S) as shown on Figure 8.
- 4.47 Most of the Soil Forming Materials found are somewhat acidic in nature although none appear to be pyritic and therefore they are not extremely acidic or potentially so. Soil Forming Materials "A" and "B" gave laboratory pH values in the range 4.5 to 5.6. For acid grassland end uses, liming may not be needed on soils formed on these materials and would be avoided, other than where light applications may be needed to aid establishment (e.g. 3 t/ha). Where semi-intensive grass double or treble this lime rate may be needed prior to seeding or planting. Material "C" had a pH range of

5.3 to 6.8 and material "E" pH values from 5.3 to 5.9 (only 2 samples tested). pH values in material D have only been carried out for pit 27 when a range of pH values from 5.1 to 5.9 was obtained. Materials C, D and E could be used for semi-intensive grassland with nil or only small lime additions. The actual rates will be confirmed by further soil testing after final placement on site. All specifications for soil amelioration, if required, will be agreed in advance with the LPA and WAG Agriculture Department.

- 4.48 Use of bulk organic materials will also be considered to improve soil forming materials if necessary. These may include farmyard manure, spent mushroom compost, digested sewage sludge, composted civic amenity 'green' waste, and other materials which may be locally available. The suitability of such materials will be assessed prior to any such use.

Seed Mixtures

- 4.49 Appropriate seed mixtures will be specified according to the soil types to be used in restoration and to the proposed afteruse of the various areas of the site. These will be discussed and agreed with the WAG Agriculture Dept and the Local Planning Authority. Indicative seed mixtures which may be used with reference to the reinstatement areas shown on Figure 8 are provided below. All seed mixes and provenances specified will be subject to availability on reasonable commercial rates and terms. In particular it is the intention to use seed of local or Welsh provenance in restoration of Areas 2AG and 2WH on Figure 8.

Areas 1, and 3 Upland grazing on mineral soils

Seed mixed for mineral soils and restored soils recovered from restored Trecatti site.

<i>Agrostis capillaris</i>	Common bent	5%
<i>Festuca rubra rubra</i>	Creeping red fescue	20%
<i>Festuca rubra commutata</i>	Chewings fescue	10%
<i>Festuca ovina</i>	Sheep's fescue	10%
<i>Festuca tenuifolia</i>	Fine-leaved sheep's fescue	10%
<i>Poa pratensis</i>	Smooth-stalked meadow grass	10%
<i>Lolium perenne</i>	Perennial ryegrass	25%
<i>Trifolium repens</i>	White clover	10%

Area 2 and 2AG Acid grassland on organic and peaty soils

Grass seed mixture for organic and peaty soils

<i>Agrostis capillaris</i>	Common bent	20%
<i>Agrostis vinealis</i>	Brown bent	10%
<i>Anthoxanthum odoratum</i>	Sweet vernal grass	10%
<i>Deschampsia flexuosa</i>	Wavy hair-grass	5%
<i>Festuca ovina</i>	Sheep's fescue	20%
<i>Festuca rubra rubra</i>	Creeping red fescue	20%
<i>Molinia caerulea</i>	Purple moor grass	10%
<i>Nardus stricta</i>	Mat grass	5%

Herb mixture for 2AG to form 20% of the overall mix (indicative - subject to availability - % of total grass + herb mix))

<i>Betonica officinalis</i>	Betony	1.5%
<i>Calluna vulgaris</i>	Heather	1.5%
<i>Carex spp</i>	Sedge (appropriate species)	4.5%
<i>Centaurea nigra</i>	Black knapweed	1.0%
<i>Conopodium majus</i>	Pignut	1.0%

<i>Galium saxatile</i>	Heath bedstraw	0.5%
<i>Hypochoeris radicata</i>	Common cat's ear	1.0%
<i>Leontodon autumnalis</i>	Autumnal hawkbit	1.0%
<i>Potentilla erecta</i>	Tormentil	1.0%
<i>Prunella vulgaris</i>	Self-heal	2.0%
<i>Ranunculus acris</i>	Meadow buttercup	2.0%
<i>Succisa pratensis</i>	Devil's-bit scabious	1.5%
<i>Vaccinium myrtillus</i>	Bilberry	1.5%

Area 2WH Wet heath adjacent to Tair Carreg Moor SINC

Seed for organic and peaty soils to be reinstated in the area adjacent to Tair Carreg Moor SINC.

Grass seed mix as 2AG with additional spreading of litter or seed harvested from Tair Carreg Moor SINC.

Herb mixture for 2WH to form 20% of the overall mix (indicative - subject to availability - % of total grass + herb mix)

<i>Achillea ptarmica</i>	Sneezewort	0.5%
<i>Angelica sylvestris</i>	Wild angelica	1.0%
<i>Calluna vulgaris</i>	Heather	2.0%
<i>Cardamine pratensis</i>	Cuckoo flower	2.0%
<i>Carex spp</i>	Sedge (appropriate species)	4.0%
<i>Erica tetralix</i>	Cross-leaved heath	2.0%
<i>Eriophorum angustifolium</i>	Common cottongrass	1.0%
<i>Galium palustre</i>	Marsh bedstraw	0.5%
<i>Lotus uliginosus</i>	Greater bird's-foot trefoil	1.0%
<i>Lychnis flos-cuculi</i>	Ragged robin	0.5%
<i>Potentilla erecta</i>	Tormentil	1.0%
<i>Succisa pratensis</i>	Devil's-bit scabious	1.0%
<i>Tricophorum cespitosum</i>	Deer grass	1.0%
<i>Vaccinium myrtillus</i>	Bilberry	2.0%

Area 4 Acid grassland on soil forming materials

Mix for recovered soil forming materials amended as necessary.

<i>Agrostis capillaris</i>	Common bent	10%
<i>Festuca rubra rubra</i>	Creeping red fescue	20%
<i>Festuca rubra commutata</i>	Chewings fescue	15%
<i>Festuca ovina</i>	Sheep's fescue	10%
<i>Poa pratensis</i>	Smooth-stalked meadow grass	10%
<i>Lolium perenne</i>	Perennial ryegrass	20%
<i>Trifolium repens</i>	White clover	5%
<i>Trifolium hybridum</i>	Alsike clover	5%
<i>Lotus corniculatus</i>	Bird's-foot trefoil	5%

- 4.50 Sources of seed will vary depending on the afteruse of the various areas of the site. Seed used in Area 1 on Figure 8 is likely to be normal agricultural cultivars. In Areas 3 and 4 seed will again be of commercial stock but less competitive cultivars will be used. The practicability of use of seed of Welsh provenance in these areas will be investigated. In Area 2 grass seed used will be of Welsh provenance if available on reasonable commercial terms.

Seed Harvesting

- 4.51 As an alternative to commercial seed, the potential for harvesting seed from the site, or adjoining land, for use in restoration will be investigated. In the first instance, seed has been harvested from land in the east of the site, between the electricity transmission line and the site boundary, in summer 2005 and put in store for use in restoration. This will enable the quantity and content of the seed harvested to be assessed and consideration given to further harvesting from similar habitats elsewhere in future years for storage.
- 4.52 Seed harvested from the site or adjoining land (or other suitable seed of Welsh provenance) will be used for seeding of soil stores to be used in restoration of acid grassland and wet heath areas, unless found to be not practicable and with the approval of the Planning Authority.
- 4.53 The views of Caerphilly County Borough Council will be sought regarding future harvesting of seed from the Tair Carreg Moor SINC either to put in store for future restoration, or for direct sowing
- 4.54 Harvested seed (or other suitable seed of Welsh provenance) will be used for the wet heath restoration, unless found to be not practicable and with the approval of the Planning Authority..
- 4.55 Harvested seed (or other suitable seed of Welsh provenance) will be used for the acid grassland restoration, unless found to be not practicable and with the approval of the Planning Authority.
- 4.56 The potential for use of harvested seed in progressive restoration of the western area of the site, and of using the early restoration phases, where such locally harvested seed had been used, as a seed source for use on the later phases, will be investigated and implemented if practicable.

Tree and shrub species

- 4.57 The principal areas of tree and shrub planting will be on the restored land in the west of the site adjacent to the A4060 road. There will also be an area of woodland planting in Area 6b in the southern part of the site. There will be planting of new hedgerows associated with the restored land north of Bryn Caerau Farm in the south of the site. Suitable species and specifications, including replacement requirements for failed stock, for these plantings will be discussed and agreed with the Local Planning Authority. The operator will collect seed of suitable species from the woodlands in Cwm Golau to the south of the site, and raise plants for use in the restoration scheme.
- 4.58 Indicative species which may be used are as follows:

Woodland Planting

Tree Species		Mix%
<i>Alnus glutinosa</i>	Common alder	15
<i>Betula pendula</i>	Silver birch	10
<i>Betula pubescens</i>	Downy birch	10
<i>Quercus petraea</i>	Sessile oak	15
<i>Sorbus aucuparia</i>	Rowan	10
<i>Malus sylvestris</i>	Crab apple	5
Shrub species		
<i>Corylus avellana</i>	Hazel	10
<i>Crataegus monogyna</i>	Hawthorn	5
<i>Prunus spinosa</i>	Blackthorn	..5

<i>Ilex aquifolium</i>	Holly	5
<i>Salix caprea</i>	Goat willow	5
<i>Ulex europaeus</i>	Gorse	..5

- 4.59 The potential benefits of phased planting, utilising pioneer/nurse species in the first instance to be followed after a few years by canopy species, will be considered. The aftercare schemes will include full details of planting and management proposals.

Hedge Planting

Tree species

<i>Fraxinus excelsior</i>	Ash	no.
<i>Quercus petraea</i>	Sessile oak	no.
<i>Sorbus aucuparia</i>	Rowan	no.
<i>Betula pubescens</i>	Downy birch	no.

Shrub species

<i>Corylus avellana</i>	Hazel	25
<i>Crataegus monogyna</i>	Hawthorn	55
<i>Prunus spinosa</i>	Blackthorn	5
<i>Ilex aquifolium</i>	Holly	5
<i>Rosa canina</i>	Dog rose	5
<i>Malus sylvestris</i>	Crab apple	5

- 4.60 All tree and hedge plantings will be protected against grazing animals by fencing until the end of the aftercare period.

5.0 Waste Management of former Landfills

Proposed Works

- 5.1 Three existing landfill sites, Landfill 13, Hoover and Merthyr Landfills, lie within the boundary of the proposed land reclamation scheme and most need to be relocated to allow the associated opencast mining operations to proceed. The locations of the landfills are shown on Figure 9. Subsequent to the mining process, it is proposed to carry out further restoration and return the area to beneficial use.
- 5.2 Residual materials from the reclamation operation which cannot be used on the site will be disposed of at the nearby licensed landfill site (or other suitable licensed landfill). An alternative option for disposal of residual material in a containment cell in the east of the site will not be implemented. Any hazardous waste encountered will be removed to a suitably licenced waste facility off site.
- 5.3 The reclamation operation and containment will be subject to appropriate licences and permits. It is anticipated that the removal of the landfills will be substantially completed in 9 months.
- 5.4 The waste strategy adopted is sufficiently robust for potential variation in the waste handling solutions to be accommodated.
- 5.5 Landfill Tip 13 and the Hoover Landfill will be removed entirely, together with part of the Merthyr Landfill. The area to be extracted will be set out with pegs to define the area prior to mining each landfill site. Any area including "hot spots" of elevated levels of contaminants will also be pegged out for further investigation. Additional sampling will be carried out to locate and further define any areas with excessively elevated levels of contamination.
- 5.6 Each landfill will be worked in blocks to the full depth of the landfill. The excavation will be benched to ensure that no faces occur which are higher than the machine working beneath them. Each bench will be worked down in horizontal layers ranging from 0.5 m to 3 m. This will reduce cross-contamination and enable the deposit to be worked down to any "hot spots" which require selective removal. Landfill Tip 13 will be worked from east to west. The Hoover and Merthyr Landfills will be worked from the north-west to the south-east.
- 5.7 Wherever possible, the face will be worked from the lowest to highest floor level to avoid flooding the extraction face. Temporary bunding would be constructed to collect leachate if this becomes a problem during excavation. A vacuum tanker would be used to suck up leachate from collection points if required.
- 5.8 Generation of significant volumes of leachate during excavation will be avoided through limiting the extent of the open excavation, and capping and control of surface water.

Removal of Extracted Material

- 5.9 The nature and potential contamination risk of the extracted material will determine the post extraction treatment.
- 5.10 Detailed protocols will be agreed with the regulators and will in place before the extraction operation is carried out.
- 5.11 It is anticipated that the excavation works and classification of materials arising will result in four product materials:

- (1) Uncontaminated, granular stone and ash soils capable of being utilised for on-site construction. This material will be stockpiled separately in clearly defined and labelled stockpiles. Testing to ensure the uncontaminated nature of this material will be carried out to agreed examination and testing protocols.
- (2) Material generally conforming to the above description but containing wood, metal, plastics, textiles and paper which can be separated out from the mass and disposed of to Trecatti landfill. The resulting inert materials will then be used as in 1 above.
- (3) Non-inert material (based on testing or visual or olfactory evidence) will be disposed to landfill at Trecatti landfill via the Cwmbargoed Disposal Point in accordance with the Duty of Care waste management legislation.
- (4) Any hazardous material excavated will be removed to a suitable licensed facility off site.

5.12 These works will be carried out under a Waste Management Licence.

Engineering Fills and Cover

5.13 There are abundant engineering fill materials on site for cover materials and structural fill. Drainage layers can be produced by crushing on-site materials or importing crushed/screening materials.

Landfill Gas Management

5.14 Part of the Merthyr Landfill would be left in-situ. This will leave an exposed face cutting the full depth of the landfill. It is proposed to seal the face with conditioned clay to a specification agreed with the Environment Agency.

5.15 The remaining parts of the landfill would be covered with an engineered cap. There are two options available. The whole area could be sealed with clay and topsoiled. Vents would be added to release any accumulation of landfill gas.

5.16 An alternative would be to cover the landfill with 1m of appropriate soil. This would provide a semi-permeable layer. Methane would slowly permeate through the soil where the large surface area of the soil would enable microbial activity to reduce the methane to water and carbon dioxide. This is likely to be the preferred option.

6.0 Ecology

Introduction

- 6.1 The ecological principles of the restoration strategy are:
- i to conserve features of ecological interest in situ where practicable.
 - ii to enhance such features through appropriate habitat creation and improvement.
 - iii to create areas of ecological interest as part of the restoration of the site.
 - iv to enhance both retained and newly created areas through appropriate management so far as this is in the control of the operator.
- 6.2 Subsequent to publication of the Ffos-y-fran Land Reclamation Scheme Environmental Statement in May 2003, the Merthyr Tydfil Biodiversity Action Plan was launched in June 2003. Whilst the Environmental Statement made reference to the then proposed action plan, the now published plan is considered further in this document.
- 6.3 The surveys and studies carried out to assist in the assessment of the ecological impacts of the Scheme are described in detail in the Environmental Statement. A number of further ecological surveys have been carried out, subsequent to completion of the Environmental Statement, as part of the continuing work in relation to the Scheme. These comprise:
- Breeding Birds Survey 2003
 - Bat survey 2003
 - Amphibian Surveys 2003 & 2004
- 6.4 The findings of these additional surveys are taken into account in this section of the Restoration Strategy.

Conservation and enhancement of existing features

- 6.5 The Ffos-y-fran Land Reclamation Scheme has been designed, so far as practicable, to avoid damage to nature conservation interests.
- 6.6 The conservation of features of ecological interest in situ has resulted in the abandonment of previous proposals which required a more extensive southern overburden store, which would have infilled the upper part of Cwm Golau with culverting of the Nant Gyrawd. This strategy has also enabled potential archaeological remains and elements of the prehistoric landscape to be preserved *in situ*. Reduction in the extent of the southern overburden store has been achieved through a proposed northern overburden store on land of little nature conservation interest on the restored area of the former Trecatti opencast site. Cwm Golau, with its ancient woodland, is now excluded from the site. This land (other than that part which is common land) will be retained, enhanced and managed in accordance with the second component of the strategy. A detailed management plan will be prepared and implemented to enhance the overall nature conservation value of this area following commencement of the scheme. This will include areas of tree and shrub planting, reinforcement of hedgerows, fencing and control of sheep stocking levels. New ponds to provide habitat for amphibians, particularly great crested newt, have already been constructed in this area.
- 6.7 The sheltered valley of Cwm Golau, with its woodland provides good habitat for bats. Improvements to hedgerows in the valley will be of benefit to bats since they typically forage along hedgerows and use them as movement corridors. Bat boxes will be

- placed in woodland and other suitable locations to provide additional opportunities for bat roosting.
- 6.8 The only indication of a potential roosting site for bats within the Ffos-y-fran Land Reclamation Scheme site in 2001 was at the Bogey Road bridge/cutting, where it was considered possible that two *Myotis* bats (probably whiskered bats) were roosting. These structures offer potential hibernation sites (in cracks/crevices within masonry) for both pipistrelles and *Myotis* bats.
- 6.9 A further bat survey was undertaken in 2003, the main aim of which was to investigate bat use of the Bogey Road bridge and cutting. No roosting bats were found at the bridge or cutting on any of six visits over the period June to September. Regular feeding activity of common pipistrelle and noctule bats was recorded, and whiskered bats were recorded on one occasion. It was considered likely that individual bats will occasionally use the roost potential of the masonry, although this was not confirmed.
- 6.10 These structures will not be affected by the Ffos-y-fran scheme. However, the Bogey Road bridge is in poor structural condition and it is possible that works may be needed to the bridge for reasons of public safety irrespective of the Ffos-y-fran operations. Insofar as any such works may affect a bat roost site, they would be carried out under licence granted by the Welsh Assembly Government under the Habitat Regulations. Once any necessary safety works were complete, incorporating any provision for bats required by the licence, including suitable bat roost features, the bridge would be maintained but would not be used as a public highway. It would therefore remain as a potential bat roost, as well as being of historical interest.
- 6.11 An area of nature conservation interest between the Bogey Road and the railway line, containing ponds where great crested newts and other amphibians have been recorded, will be retained. Suitable areas for reptiles will be retained in this area including the line of the former railway itself. Given the small numbers of reptiles likely to be affected by the works, this will be suitable as a receptor area for translocation of reptiles from other parts of the site. Most of this area has been excluded from the site and will be retained, enhanced and managed as an ecological area. An area to the west of the excluded area will be affected by the construction of a haul road between the extraction void and the southern overburden store, and settlement lagoons. As for Cwm Golau, a detailed management plan will be prepared and implemented for this area following commencement of the scheme.
- 6.12 A number of other ponds which would have been lost if previous proposals had been implemented, will be retained as part of the scheme as described later in this section.
- 6.13 The previous proposals would have involved the loss of much of a Site of Importance for Nature Conservation (SINC) known as Tair Carreg Moor. The Ffos-y-fran Land Reclamation Scheme does not include any of the land within the SINC.

Ecological considerations in the working and restoration of the site

- 6.14 There are opportunities for mitigation of adverse ecological effects through control of working methods and on restoration of the site, through sensitive landscape design and habitat creation. Whilst the overall project length is up to 17 years to final reinstatement (followed by 5 years of aftercare), the site will be progressively restored as the opencast operations work through the site. This will therefore release areas of restored land as the scheme progresses on which flora and fauna can begin to re-establish. There will also be opportunities for creation of wildlife habitat on the overburden mounds which will be in place for a period of some 10 years. These would be particularly suitable for ground-nesting birds such as lapwing and skylark.
- 6.15 Measures will be taken to ensure that no significant pollution of watercourses occurs as a result of site operations. Such measures will be designed and implemented to

the satisfaction of the Environment Agency and will be regulated by the Agency. Appropriate monitoring will be carried out to ensure effectiveness. Discharge consents are already agreed with the Environment Agency and are in place.

- 6.16 Measures will be taken to suppress dust which could be generated as a result of the operations. These measures, which were set out in the Environmental Statement, are standard in the industry, will be expected to be generally effective in controlling dust emissions. In so far as there will be deposition of dust on vegetation, this will only be likely to occur to any significant degree in the immediate vicinity of areas where heavy equipment is in use over long periods, such as along the haul roads between the excavation area and the overburden stores, and the Cwmbargoed Disposal Point. Whilst deposit of dust on leaf surfaces can reduce rates of photosynthesis, and can affect rates of gaseous exchange by blocking of stomata, any such effects will be localised and there is no likelihood of significant effects on vegetation as a result of the proposed operations.
- 6.17 There will be sources of noise during the operation of the site and measures will be taken to minimise such noise. Wildlife generally readily habituates to noise associated with such operations when it is not associated with any particular threat. Sudden loud noises, such as blasting, do cause disturbance of wildlife. However, although disturbance does occur, this is typically short-lived and does not necessarily result in any particular harm to wildlife populations.
- 6.18 Whilst there will be considerable levels of human activity and machine operation within the active extraction area of the opencast void throughout the period of opencast operations, much of the site will only be subject to disturbance for part of the operational period. For example, areas used for soil and overburden stores, and the haul roads serving them, will only be subject to significant disturbance during the construction of the stores in the early stages of working, and during removal of material from the stores at the end of operations. For the remainder of the operational period, these areas will be subject to little disturbance. As for noise, wildlife is able to habituate to heavy machinery, although humans on foot typically always result in disturbance of sensitive species. Given the nature of the proposed opencast operation, there is little potential for disturbance of wildlife beyond the active areas of the Ffos-y-fran site.
- 6.19 In order to avoid destruction of birds' nests, which are protected by law, it is normal industry practice to clear vegetation which may hold birds' nests outside the period March to August inclusive. In the case of the proposed operations, many of the bird species present are ground-nesting, and clearance of vegetation would largely be through stripping of soils. Given the nature of the soils at the site and the climatic conditions, it would generally not be practicable to begin soil stripping until April. In order to avoid destruction of nests, birds would be actively deterred from nesting in areas where soils are to be stripped, or which are otherwise to be affected by operations, by appropriate measures during March and April.
- 6.20 As explained in section 1, an Environmental Management Plan will be prepared and implemented for the Ffos-y-fran Land Reclamation Scheme operations. This will include the requirements for mitigation of ecological impacts described above, and additional measures described later in this section, such as the mitigation for protected species which is summarised at para 6.154.
- 6.21 Planning and supervision of operations will seek to ensure that disturbance to existing undisturbed habitats and species, whether protected, of conservation concern, or undesignated, is kept to a minimum. Where necessary and appropriate, protective fencing and warning signs will be erected around areas to be retained during site operations, to protect features of natural conservation importance. Such fencing and signage will be maintained for as long as required to protect the features. The importance and sensitivity of habitats and species (both those which will be undisturbed, as well as those which will be reinstated) would be explained to site

personnel before the start of works, and at appropriate times during the progress of the works.

Habitats present and their restoration

- 6.22 A vegetation and habitat survey of the site, and some areas of adjoining land, was undertaken during the summer and autumn of 2001. Habitats and vegetation units were mapped at 1:2500 scale using a combination of existing habitat maps, vertical aerial photographs and ground-truthing site visits. The habitats identified are shown on Figure 10.
- 6.23 Much of the site comprises land affected by past mining and other anthropogenic activities, large areas of which are of little nature conservation interest, but locally, secondary habitats of interest have developed on this land. The site area also includes a range of semi-natural habitat types. Much of the land is common land subject to common rights of grazing. The common land is grazed by sheep, cattle and horses. As is typical of such land in upland areas, past overgrazing has resulted in degrading of the vegetation with the development of extensive acid grasslands at the expense of dwarf shrub heath communities.
- 6.24 The main habitat types represented are as follows:
- A limited area of broad-leaved ravine-woodland to the south east of the site with some associated marginal scrub.
 - A small conifer plantation.
 - Various types of grassland including dry acid grassland and “marshy grassland” (i.e. types dominated mainly by rushes or, more locally, purple moor-grass. Sheep grazing has modified past upland heathland vegetation to varying degrees to create grassland types ranging from semi-natural acid-grasslands to semi-improved, more neutral grassland. Some areas have in turn been further agriculturally improved by reseeding and by the use of artificial treatments.
 - Large areas of acid grassland – wet dwarf-shrub heath mosaic, generally rather degraded and with only a limited dwarf-shrub component, occur over some parts of the site. Locally this vegetation is less degraded and includes a higher cover of the dwarf-shrub component. These areas are considered to be of greater nature conservation interest than the degraded areas. The largest area of this vegetation is included within the Tair Carreg Moor SINC to the north-east of the site. Although included in previous planning applications, this area is now excluded from the Ffos-y-fran land reclamation scheme as can be seen from Figure 2.
 - Small areas of dry dwarf-shrub heath dominated by heather or bilberry are generally confined to steep railway cuttings or embankments or to a few natural cliffs or steep valley sides. In this latter situation, however, heavy grazing suppresses the dwarf-shrub component to the detriment of the vegetation diversity.
 - Limited areas of continuous bracken are present on dry slopes, mainly in the south of the site.
 - Flushed areas and soakways are associated with springs and seepages, particularly in the small valleys of the upper Bargod Taf catchment, and often grade into ‘marshy grassland’.
 - Large areas within the site have suffered the effects of prolonged industrial activity and are either unvegetated, only sparsely vegetated, or have been regraded and seeded to a rye-grass based ley (with varying degrees of success).

- Upland streams flow generally southwards through or adjacent to the site, the most notable being the Nant Gyrawd and the headwaters of the Nant Bargod Taf.
- Man-made ponds and reservoirs together, with their associated marginal habitats, are of varying wildlife interest. The water-levels of some have been permanently lowered in the recent past exposing wide areas of often-unvegetated, gravelly, former lake-bed.
- Boundary habitats, including remnant hedgerows, banks, ditches and remnants of stone walls, are present dividing fields within the agricultural land in the south of the site. Stone abutments are also associated with old railway structures and around some of the curtilages of the demolished dwellings south of the Bogey Road.

6.25 The majority of the restored land will be used for upland grazing as urban common land. Bryn Caerau Farm (where disturbed) will be returned to agricultural use, and nature conservation measures will be incorporated throughout the restoration scheme. The site will be predominantly restored to grassland and moorland vegetation associated with the open areas of the common, with particular attention being given to re-instating the acid grassland presently adjacent to the Tair Carreg Moor SINC that is located outside the eastern boundary north of the Bogey Road.

6.26 As shown on the Restoration Plan (Figure 4), areas of woodland are proposed in the west of the site overlooking Merthyr Tydfil. A network of hedgerows would be established in the area north of Bryn Caerau Farm in the south of the site providing green links for foraging, access and shelter opportunities for birds, bats and other mammals.

6.27 The final distribution of land uses across the site will depend upon the soil and soil-forming resources available.

Wildlife Habitats

6.28 UK Biodiversity Action Plan Priority Habitats and Welsh Assembly Government Habitats of Principal Importance (including EC Habitats Directive Annex I Habitats) which occur within or in the vicinity of the site:

- Upland heathland
- Purple moor grass and rush pastures
- Ancient and/or species-rich hedgerows
- Upland oakwood

Upland heathland, purple moor grass and rush pastures

6.29 The site includes areas of upland heathland, purple moor-grass and rush pastures (largely comprising mosaics of these vegetation types) which will be affected by the scheme. There are some areas of lichen and bryophyte rich heath on old colliery spoil tips. The areas which will be affected by the operations are largely in the central and eastern part of the site north of the Bogey Road, and in the western part of the site south of the former railway. Acid grassland and wet grass/heath vegetation will be restored in this area on completion of the works, using soils which will be separately stripped and stored, and suitable seed mixtures as described in section 4. The most significant area of wet dwarf shrub heath/acid grassland mosaic within the area surveyed, much of which is within the Tair Carreg Moor SINC, is largely outside the site, although the western part of this area (outside the SINC) will be affected.

6.30 There are areas of these habitats within the central and Cwm Golau ecological areas, outside the site which will not be disturbed by the scheme. These areas will be

managed in order to maintain or enhance their ecological value. Management plans are to be prepared and implemented for these areas.

6.31 Dry heaths and wet heaths with cross-leaved heath are EC Habitats Directive Annex I habitats.

6.32 The Merthyr Tydfil BAP objectives for heathland are to:

- Halt the loss of areas of areas of heathland.
- Achieve favourable management of heathland.
- Create areas of new habitat where appropriate.

6.33 The Merthyr Tydfil BAP objectives for purple moor-grass and rhos pasture are to:

- Halt the loss of areas of purple moor-grass and rhos pasture.
- Achieve favourable management of purple moor-grass and rhos pasture.
- Create areas of new habitat where appropriate.

6.34 There will be loss of existing wet grass heath as a result of the scheme. The major part will be restored using appropriate soils placed within cells formed by clay bunds, as described in section 4.0, utilising suitable cultivation, seeding and management techniques. Where practicable seed will be supplemented with locally sourced seed from semi-natural vegetation. The potential benefits of spreading vegetative material from suitable habitats to provide a seed source will be considered. Full specifications will be provided in the detailed restoration plans to be prepared for the phases of the scheme.

6.35 Whilst the scheme conflicts with the BAP objective with respect to the loss of existing habitat, improved management of Cwm Golau and the central ecological area will enhance existing habitats, and similar habitats will be created through restoration.

Ancient and /or species-rich hedgerows

6.36 Almost all of the existing hedgerows within the Phase 1 Habitat Survey area (Figure 10) are on the lower ground north of Bryn Caerau Farm in Cwm Golau. Most of these hedgerows are excluded from the site and will not be affected by the scheme. Others are within the Cwm Golau ecological area and will be retained and new hedgerows planted as part of the enhancement of this area. Gaps in these existing hedgerows will be planted up. Locally native species of local provenance will be used in such plantings. If insufficient local stock is available this may be supplemented with commercial stock. Typical species which will be planted in these hedgerows are referred to in section 4. Aftercare plans will include requirements for hedgerow management.

6.37 The Merthyr Tydfil BAP objectives for ancient/species-rich hedgerows are to:

- Halt the loss of ancient/species-rich hedgerows.
- Achieve favourable management of all hedgerows.
- Create new species-rich hedgerows in appropriate areas.

6.38 The Ffos-y-fran proposals are fully in accord with the BAP objectives.

Upland Oakwood

6.39 There is no upland oakwood within the site. There is an area of such woodland to the south east of the site in the Cwm Golau ecological area. This woodland will not be affected by the scheme having been excluded because of its ecological interest. It will be retained and managed in a manner sympathetic to nature conservation.

6.40 As shown on the Restoration Plan (Figure 4), areas of woodland are proposed in the west of the site overlooking Merthyr Tydfil. Typical species which would be used in these plantings are referred to in section 4. The intention would be to establish woodland which, with management, would develop the characteristics of upland oak-birch woodland.

6.41 The Merthyr Tydfil BAP objectives for upland oakwood are to:

- Halt the loss of areas of upland oakwood
- Achieve favourable management of upland oakwood
- Create areas of new habitat where appropriate.

6.42 The Ffos-y-fran scheme fully accords with these objectives.

Local Biodiversity Action Plan Habitats

6.43 Local BAP habitats additional to the UK BAP habitats listed above, which are included in the Merthyr Tydfil BAP are:

- Coniferous Plantation
- Standing Open Water / Ponds
- Rivers & Streams
- Ffridd / Bracken Slopes
- Mineral Spoil Areas
- Acid Grassland

Coniferous Plantation

6.44 There is only one small coniferous plantation within the site situated south of the Bogey Road, immediately east of the former Ryan's offices. Although within the site, this plantation will not be affected by the proposed operations and will be retained as shown on the restoration plan (Figure 4).

6.45 The Merthyr Tydfil BAP objective for coniferous plantations is to:

- Increase the biodiversity value of all conifer plantations.

6.46 The conifer plantation within the site is very small and little could be done to enhance its biodiversity other than felling and replanting with native species. This is not proposed at present since it does provide shelter for birds and other wildlife in an exposed area where this is generally lacking.

Standing Open Water

6.47 Ponds would be retained as far as practicable. The following ponds, the locations of which are shown on Figure 10, will be retained. Where possible, these ponds have been correlated with the Merthyr Tydfil Pond Survey 1999-2000 (MTPS). The conservation value given to the ponds, in the local context, in the report of the survey is indicated where applicable:

Pond 5 (MTPS No.64 - High)

Isaac Morgan Pond. This former reservoir is outside the site and within the central ecological area. The open-water area supports a large and abundant population of floating bur-reed which is of at least county importance. The pond supports amphibians. Care will be taken in construction of the haul road linking the opencast excavation area to the southern overburden storage area, to avoid dewatering of this pond.

Pond 6 (MTPS No.56 - High)

This is a large, shallow pond with diverse aquatic and marginal vegetation which is also within the central ecological area outside the site boundary. A series of flushes feed into the pond on its northern side and merge into the adjacent semi-natural acid grassland and wet heath. They are rich in sedges and include small populations of lesser scullcap and marsh speedwell. The pond supports amphibians, including great crested newt, and is notable for its invertebrates.

Pond 11 (MTPS No. 62 - Moderate)

A largely overgrown small pond with fluctuating water-levels located at the edge of a regraded and re-seeded spoil tip, but with a more permanent area of water at the southern end dominated by water horsetail. The pond is immediately outside the eastern edge of the site within the Cwm Golau ecological area. It has been cleared of dense vegetation and made suitable for great crested newt.

- 6.48 Further ponds form part of, or are associated with, a Scheduled Ancient Monument and will be retained as part of the scheme. These are:

Pond 9 (MTPS No. 68 - Low)

A reservoir with rocky shores to a rock dam on its south-eastern side and more grassy banks to the west. This site supports a number of discreet rafts of floating bur-reed, large ones in deep water near the southern dam and also smaller rafts elsewhere. It supports amphibians.

Pond 28

A small former reservoir in an exposed position largely devoid of vegetation.

- 6.49 There are also a number of ponds within and to the south of the Tair Carreg Moor SINC which would also not be affected by the operations. These are:

Pond 7

A moderate sized, mainly open-water pond in an exposed position located to the north of the site of the former Tunnel Tavern. It supports a narrow marginal zone on its northern shore dominated by bog-moss (*Sphagnum* spp.), common cotton-grass and soft rush. The pond supports amphibians.

Pond 8

A large, shallow, former reservoir with little open water and largely vegetated-over with dominant floating sweet-grass. Round-leaved crowfoot is abundant in the marshy ground to the north of the pond and at its outlet on the eastern side. The pond is notable for its invertebrates

Pond 27

A vegetated-over former reservoir, having now become a bog moss dominated swamp with locally abundant common cottongrass, soft rush, and brown bent impounded behind a breached embankment, which supports a dry acid grassland community.

Pond 29

A small area of ponded water dominated by floating sweet-grass, at the junction of the Bogey Road and the Fochriw Road, with a swampy, rush dominated area flanking its northern margin. It is notable as it supports a large population of ivy-leaved crowfoot and rare round-leaved crowfoot.

Pond 30

A series of small, connected lagoons located at the site of the former wheel-wash at the eastern end of the East Merthyr Phase 2 site haul-road. They are largely unvegetated although small populations of round-leaved crowfoot are present in the connecting channels. Some amphibians have been recorded.

- 6.50 The following ponds would be lost through implementation of the scheme:

Pond 1 (MTPS No. 47 - High)

A medium sized, mature pond with good diversity although the edges are trampled and eroded, with poor bankside vegetation and litter. Dumped rubbish and domestic waterfowl detract from its ecological value. Although outside the site area, the indirect effects of excavation are likely to result in loss of water supply to this pond.

Pond 2 (MTPS No.105 - Low)

A lagoon with a generally unvegetated shale bed and shores but with sparse acid grassland colonising towards its south-western end. The pond supports amphibians.

Pond 3

A large exposed reservoir having little floral interest with little emergent or bankside vegetation except for stands of the aquatic form of bulbous rush along its northern shore. Its banks are dominated along the northern side by soft rush. The pond is often used by large numbers of lesser black-backed and herring gulls from the nearby Trecatti Landfill. The pond supports amphibians and one great crested newt was recorded in 2004.

Pond 4 (MTPS No. 53 - High)

The steeply sloping banks of this small pond allow some shelter which has favoured the growth of good stands of marginal and aquatic vegetation. Amphibians have been recorded (including one great crested newt in 2004), as well as some notable invertebrates.

Pond 4A (MTPS No. 55 - High)

This pond was recorded during the 1992-93 surveys as small and shallow, occupying a depression dammed up against the Bogey Road. The construction of the East Merthyr Phase 2 haul road on its northern side has resulted in its infilling with outwash from the unvegetated road embankment.

Pond 10 (MTPS No. 66 - High)

This pond supports broad-leaved pondweed with soft-rush on the banks and common spike-rush on the western margin and towards the shallower deltaic area in the north. This deltaic spoil deposit supported a large number of plant species characteristic of a diverse range of habitats.

Pond 10A (MTPS No.65 - Moderate)

A well vegetated, steep-sided, small reservoir close to, but upstream of pond 10, with locally abundant broad-leaved pondweed and a small colony of floating bur reed at the northern end. Round-leaved crowfoot was noted near the water inlet.

Pond 10B

A small pool at a c5m higher level than pond 10A dominated by bulbous rush, broad-leaved pondweed and locally dominant water-purslane, with marginal soft rush.

Pond 10C

A series of small pools about 4m above the level of pond 10. They are small and probably of little floral significance with soft-rush dominant around the margins. A single great crested newt was found here during the 2001 survey. Great crested newts were recorded here on three of the four survey visits in 2004, with a maximum of 6 individuals (1 male and 5 female) on a single visit.

Pond 13

This pond had become completely filled with spoil tip outwash and supported a quite diverse flora characteristic of somewhat base-enriched, wet or marshy soils.

Pond 14 (MTPS No. 60 - High)

A relatively large, linear, disused reservoir, impounded by a stone-faced bank on its south side. The eastern end and southern margin is dominated by soft rush and the

aquatic form of bulbous rush with some floating sweet-grass. Floating bur-reed is locally abundant at the western end, and a bed-forming sedge was recorded at the eastern end.

Pond 15

A small pond occupying a hollow in an old, well-vegetated, colliery spoil tip with marginal soft rush and emergent floating sweet-grass.

Pond 16

This is a small linear pond with a moderate water flow, being essentially a section of widened ditch on the north side of an access road. Marginal vegetation is dominated by rushes but also includes, for example, cuckoo flower, marsh thistle and common yellow-sedge. Emergent species include floating sweet-grass, bulbous rush, water horsetail, amphibious bistort, bog pondweed and round-leaved crowfoot whilst the moss *Fontinalis antipyretica* occurs below the water surface. Abundant frog-spawn was observed in March 2002. Amphibians, including great crested newts, were recorded in 2004.

Pond 17

An area of flooded rush-dominated marshy-grassland with small areas of open water with bog pondweed and floating sweet-grass. Frog tadpoles were noted in 1992.

Ponds 18, 19 & 20

A series of silted, former ponds supporting an unusual flushed vegetation community.

Pond 21

A large disused settling lagoon devoid of emergent or floating vegetation except a small patch of common spike-rush on the eastern side. The banks mostly consist of spoil with some spoil flats but are otherwise steep. The pond is used by large numbers of gulls from the nearby landfill.

Pond 26 (MTPS No. 59 - High)

A eutrophic pond located in a spoil tip depression at the western end of Pond 14. The banks are fringed with Soft Rush and the water surface dominated by Floating Sweet-grass.

Pond 31

A small, former lagoon now dry as its dam is now breached.

Ponds 32, 32A & 32B

A group of small, ephemeral ponds on the top of the sparsely vegetated Ryan's Tip. A single great crested newt was recorded in Pond 32b on one occasion in 2004.

Ponds at Cwmbargoed Disposal Point

- 6.51 There are four ponds in an area immediately south of the Cwmbargoed Disposal Point, outside the site area. These ponds were constructed in 1992 specifically to provide habitat for great crested newts which were displaced by the East Merthyr Reclamation Scheme, although no newts were introduced to the ponds. Three of these ponds were surveyed in 2003 and all four in 2004. A single great crested newt was recorded from one of the ponds in 2003. The species was recorded from all four ponds in 2004. Palmate newt, frog and toad were also recorded.

New Ponds in Cwm Golau

- 6.52 A number of new ponds were constructed in 2003 at suitable locations in Cwm Golau to provide habitat for great crested newts which will be translocated from the Ffos-y-fran Land Reclamation Scheme, under licence issued by the Welsh Assembly Government.
- 6.53 These ponds were surveyed in 2004. Palmate newts and frogs were recorded from some of the ponds.

6.54 Further ponds were constructed in Cwm Golau in 2004.

Future Pond Creation

6.55 A number of ponds will be created as part of the operation and restoration of the site. These will include ponds based on silt lagoons which will be restored to provide wetland habitats, and also ponds provided specifically for the conservation of great crested newts which will be constructed (or in some cases have already been constructed). Proposed locations of these ponds are shown on the restoration plan (Figure 4). The margins of new ponds will generally be constructed with gradients in the range 1:10 to 1:15 to encourage the development of marginal vegetation and aquatic fauna.

6.56 The Merthyr Tydfil BAP objectives for standing open water are to:

- Halt the loss of standing open water.
- Achieve favourable management of standing open water.
- Create areas of new habitat where appropriate.

6.57 The scheme will result in losses of existing standing open water, including ponds which are of local importance. New ponds have already been constructed in Cwm Golau and there would be further construction of new ponds and enhancement of existing ponds during the operation of the site. Further ponds will be created as part of the restoration, including some larger ponds based on silt retention lagoons. Where ponds are to be lost as a result of the Ffos-y-fran site operations, notable plant species associated with the ponds will be translocated to other retained ponds, or introduced to new ponds to be constructed, to aid in the establishment of vegetation and to assist in maintaining the quality of the aquatic environment.

6.58 The area of standing water on completion of the scheme will be no less than that which currently exists at the site, excluding those ponds and lagoons associated with the modern Ryan's tip washing operations south of the Bogey Road. The scheme will have regard to the need to maintain the quality of standing open water features on the site, and their associated marginal habitats.

Rivers & Streams

6.59 The majority of the Ffos-y-fran site lies within three main catchment areas drained by four significant watercourses. These are the Nant Morlais and Nant Cwm Blacs which flow westwards and are tributaries of the Afon Taf; and the Bargod Taf and its tributary the Nant Gyrawd which flow southwards and are also tributaries of the Afon Taf. Significant streams within the site are largely confined to the southern section and all flow southwards. Most have an upland character with stony or rocky bottoms and flow in moderately steep-sided valleys. The main watercourses are the Nant Gyrawd and the headwaters of the Bargod Taf. The Nant Gyrawd in Cwm Golau above Bryn Caerau Farm flows through a deep, rocky gorge.

6.60 The Nant Gyrawd would not be affected by the scheme, apart from one consented discharge. Its course is now entirely outside the Ffos-y-fran site. It forms an important feature of the proposed Cwm Golau ecological area.

6.61 Some of the headwater streams of the Bargod Taf are within the southern overburden storage area, and would be diverted in accordance with the existing consents from the Environment Agency.

6.62 These streams are generally within areas affected by previous mine spoil disposal. During site operations measures will be implemented to avoid damage to watercourses not directly affected by site operations, and to protect such watercourses from pollution through appropriate drainage systems and water

treatment facilities. All such measures will be discussed with the Environment Agency.

6.63 On restoration of the southern overburden storage area, headwater streams of the Bargod Taf will be reinstated as part of the drainage system of the restored site. The detailed proposals will be discussed with the Environment Agency.

6.64 The Merthyr Tydfil BAP objectives for rivers streams and floodplains are to:

- Maintain and enhance the existing habitat and species diversity of rivers, streams and floodplains.
- Where feasible, re-instatement of existing watercourses will be encouraged.

6.65 There will be some loss of watercourses during operation of the site, and thus some conflict with the first objective of the plan, but on restoration the scheme will accord with the second objective insofar as the watercourses will be replaced to replicate habitats provided by the natural streams so far as practicable. Given the upland nature of the watercourses there are no significant floodplains associated with them.

Ffridd / Bracken Slopes

6.66 Ffridd is the term for a complex mosaic of heath, bracken, woodland, acid grassland, old workings and wet flushes, usually grazed by sheep on valley sides between the enclosed land on the lower slopes and the open ridge tops. There are no extensive areas of such habitat within the Ffos-y-fran site although there are scattered patches of bracken in mosaic with other vegetation on better drained valley sides. The largest areas of bracken are on the sides of the Nant Gyrawd valley, north of the woodland. This area is within the Cwm Golau ecological area.

6.67 The Merthyr Tydfil BAP objectives for ffridd are to:

- Halt the loss of areas of ffridd.
- Achieve favourable management of ffridd.
- Create new areas of habitat where appropriate.

6.68 Given the limited extent of such habitat within the site, and that the largest areas of bracken will be retained within an area which will be subject to enhanced management for nature conservation, the scheme does not conflict with the objectives of the plan. The restoration of the lower sections of the western part of the site to a mosaic of small woodlands within grassland will, in the longer term, enable development of habitat resembling ffridd.

Mineral Spoil Areas

6.69 In the west and south of the site are areas of colliery spoil, some of which are well vegetated and have developed vegetation comparable with semi-improved grassland on disturbed soils elsewhere on the site. These are of limited wildlife value. Some of the older spoil tips carry a mosaic of dry acid grassland, dwarf shrub heath and lichen/bryophyte heath, including some good, but small areas of dwarf-shrub heath.

6.70 Less stable, steeply sloping areas of spoil are less well vegetated but support a characteristic assemblage of early colonising plant species. These areas of spoil will largely be within the area of the opencast excavation, and additional areas south of the Bogey Road will be affected by the Ffos-y-fran operations.

6.71 The Merthyr Tydfil BAP objectives for mineral spoil areas are to:

- Halt the loss of areas of mineral spoil of high biodiversity value.
- Achieve favourable management of mineral spoil areas for biodiversity.

- On mineral spoil areas of low biodiversity value encourage restoration to enhance biodiversity.
- 6.72 One of the main principles of the East Merthyr Restoration Scheme (Phase III of which is encompassed within the Ffos-y-fran scheme) is to restore the areas affected by spoil disposal from former mineral working and other industrial activity. It is thus inevitable that the vegetation associated with such spoil will be lost and, to the extent that some of these areas are of value for biodiversity, that the scheme does not accord with this objective of the plan.
- 6.73 It is inevitable that the complex topography, and thus variation in vegetation across these areas will be lost. Some areas of such spoil support habitats which are of local interest and which may be difficult to recreate on restoration, such as lichen-bryophyte heath. However, a suitable receptor site has been identified by Merthyr Tydfil County Borough Council and, subject to timing of the commencement of operations, surface material from selected areas of lichen-bryophyte heath will be separately stripped and spread on the receptor site to attempt to conserve this vegetation. Restoration of the site will restore significant areas to acid upland grassland on soil forming materials which will be managed to encourage the development of nature conservation value, so far as this is in the control of the operator. This is area 4M on Figure 8. As part of the restoration, small scale variation in topography will be introduced in this area to provide a range of soil moisture regimes to encourage variation in vegetation.

Acid Grassland

- 6.74 Areas of wet acid grassland have been considered previously. There are also extensive areas of dry acid grassland, particularly in the western part of the site, largely on areas of colliery spoil. All of this grassland is subject to grazing by sheep, horses and some cattle at varying intensities. The quality of the grassland in those areas which have been most intensively grazed has been degraded by the effects of grazing and by nutrient enrichment. The grassland in parts of the western section of the site has been degraded by former industrial activity and motor cycle scrambling.
- 6.75 Much of the dry acid grassland is in the section of the site from which coal will be extracted and will be lost through excavation of the opencast void. Other areas will be affected by overburden storage. These areas will be restored to grassland on completion of site operations. The Ffos-y-fran operations will also affect relatively small areas of such vegetation south of the railway.
- 6.76 The Merthyr Tydfil BAP objectives for acid grassland are to:
- Halt the loss of areas of acid grassland.
 - Achieve favourable management of acid grassland.
 - Create areas of new habitat here appropriate.
- 6.77 As explained above in relation to mineral spoil areas, one of the main principles of the East Merthyr Restoration Scheme (Phase III of which is encompassed within the Ffos-y-fran scheme) is to restore the areas affected by spoil disposal from former mineral working and other industrial activity. It is thus inevitable that the vegetation associated with such spoil, including acid grassland, will be lost and that the scheme does not accord with these objectives of the plan.

- 6.78 Extensive areas of the site will however be restored to acid grassland on completion.

Dry Stone Walls & Other Boundary Features

- 6.79 Boundary habitats excluding hedgerows, include banks, ditches and remnants of stone walls dividing fields within the agricultural land, largely outside the south of the site. Stone abutments are also associated with old railway structures and around

some of the curtilages of the demolished dwellings south of the Bogey Road. The majority of such features will not be affected by the Ffos-y-fran operations. Such features within the Cwm Golau ecological area will be improved as part of the scheme. Detailed proposals will be set out in the Management Plan for this area. As explained in section 3 (and shown on the Restoration Plan – Figure 4 – if suitable stone is recovered during the excavations, field boundaries in the south of the site will include some in dry stone construction

6.80 The Merthyr Tydfil BAP objectives for dry stone walls, banks and ditches are to:

- Halt the loss of dry stone walls and other boundary features.
- Achieve favourable management of all boundary features.
- Create new dry stone walls and other boundary features where appropriate.

6.81 The scheme does not conflict with the objectives of the action plan.

Restoration and species

6.82 The focus of restoration is inevitably on re-instatement of habitats. However, consideration is given here to those species for which there is a species action plan (or for which such a plan is proposed) in the Merthyr Tydfil BAP.

Birds

6.83 Birds recorded during the breeding bird survey carried out in 2001 are shown on Figure 11. The results of the 2003 breeding bird survey are shown on Figure 12.

Peregrine falcon

6.84 Sightings of peregrine during the ecological surveys in 2001 were of individual birds overflying the north eastern part of the site. No peregrines were recorded during the 2003 breeding bird survey. There is no evidence that the species is particularly associated with the site and there are no suitable nest sites within or in the close vicinity of the site. The Merthyr Tydfil BAP objectives for peregrine are to:

- Encourage the reporting of incidents to the Wildlife Crimes Officer, CCW or the Countryside Officer.
- Ensure all known sites are managed effectively for the benefit of peregrines.
- Ensure land managers etc. are aware of the risks associated with agro-chemicals and of the alternatives available.
- Ensure all known nesting sites are monitored annually, through South Wales Peregrine Watch
- Raise awareness in schools etc. of the value of quarry sites and the plight of peregrines.

6.85 The Restoration Scheme does not conflict with these objectives. In managing the land associated with the Ffos-y-fran scheme the operator will have regard to the action plan objectives.

Barn owl

6.86 In 2001, barn owl was recorded hunting on several occasions in the area between the Bogey Road and the railway, and in the southern part of the site. In 2003, there was evidence of barn owl nesting in the derelict office building in Ryan's yard, outside the site area. There are no buildings suitable for nesting within the operational areas of the Ffos-y-fran site.

- 6.87 There will be some loss of habitat suitable for hunting barn owls, particularly through construction of the Southern Overburden Store. Barn owls are less likely to hunt over the open areas in the north of the site.
- 6.88 The land which will be affected is likely to form only a small portion of the likely territory of the barn owls. Much of the area of the valley will remain undisturbed within the Cwm Golau ecological area. During the operational period, rough grassland areas will be retained around the margins of the operational site. This will support small mammal prey for barn owls. Restoration of the southern part of the site to fields with hedgerows will re-instate suitable habitat for this species in the long term.
- 6.89 The availability of suitable nest sites can be a constraint on barn owl populations, and the potential for provision of owl access and nesting platforms in suitable buildings within the operator's control will be investigated.
- 6.90 The Merthyr Tydfil BAP objectives for barn owl are to:
- Make the public aware of the threats to barn owl.
 - Halt the decline and aim to get former territories recolonised.
 - Increase public understanding of and encourage public participation in survey of Barn Owls.
 - Increase awareness of the link between pesticides and other chemicals and declining populations of natural predators of rodents.
- 6.91 The Restoration Scheme does not conflict with these objectives. Management of the land associated with the Ffos-y-fran scheme will have regard to the action plan objectives.

Song thrush

- 6.92 Song thrush was recorded breeding in three locations in 2003, two in the Nant Gyrawd woodland, and one in the Bargod Taf valley south of the site boundary. None of these territories will be affected by the operations. This area was not included in the 2003 survey and no breeding song thrushes were recorded elsewhere. Planting of hedgerows and sympathetic woodland management will be beneficial to this species.
- 6.93 The Merthyr Tydfil BAP objectives for song thrush are to:
- Safeguard the apparently healthy local population of Song Thrush, by raising the public awareness of the conservation value and biological richness of the County Borough – even the areas traditionally thought of as despoiled waste (an image problem).
 - Try to maintain existing feeding and breeding habitats and bring less suitable or poorly managed ones up to scratch, perhaps by encouraging landowners to take up schemes such as Tir Gofal.
 - Encourage wildlife friendly gardening and make the public aware of just how valuable gardens can be to wildlife.

- 6.94 The Restoration Scheme does not conflict with these objectives. Management of the land associated with the Ffos-y-fran scheme will have regard to the relevant action plan objectives.

Skylark

- 6.95 Skylark was the second commonest breeding bird species recorded during the 2001 breeding bird survey (after meadow pipit) with 46 territories recorded. This was also the case in 2003 when 51 skylark territories were recorded. Breeding territories were distributed across all of the open areas of the site. The excavation of the opencast

void, and storage of soils and overburden, will affect much of the habitat suitable for skylark. Once the overburden mounds are complete they will be seeded to establish a rough and patchy grass sward. With suitable management, these areas will provide habitat for breeding skylarks, as will retained grassland and moorland vegetation around the site margins. In the longer term restoration to grass moor and heath vegetation will provide for the continued presence of this species.

6.96 The Merthyr Tydfil BAP objectives for skylark are to:

- Prevent any decline of the current breeding population within the County Borough.
- Where possible, encourage an increase in the number of breeding pairs by habitat creation and management.

6.97 During the period of working, there will be a reduction in the extent of habitat for skylark and thus some conflict with the plan objectives. During the preparatory works for the site, and for each subsequent phase of working, nesting will be actively discouraged on the areas to be disturbed during the months immediately preceding soil stripping. Some of the skylarks will relocate to other suitable nesting areas, such as the overburden storage mounds and the Cwm Golau ecological area, which will be managed so as to provide suitable nesting areas. In the longer term, suitable nesting habitat will be recreated and managed appropriately in so far as this is in the control of the operator.

Linnet

6.98 Up to five breeding pairs of linnet were recorded in 2001. Three of these were in the Bargod Taf valley along the south western boundary of the site in an area which would not be affected by the operations. The remaining two pairs were in the west of the site north of the Bogey Road along the former railway line. This area will be affected by the excavation of the open-cast void.

6.99 Ten pairs were recorded in 2003. Two of these were in the Bargod Taf Valley. Seven were in the west of the site north of the Bogey Road and the remaining one on an area of tip west of the Nant Gyrawd. These latter eight pairs were in areas which will be affected by the operations.

6.100 Linnets are typically associated with relatively open habitats with plentiful sources of seeds. Areas of rough grassland around the margins of the site will provide suitable habitat during site operations. There will continue to be suitable marginal habitats in the longer term following restoration of the site. Enhanced management of Cwm Golau will provide improved habitat for linnet.

6.101 The Merthyr Tydfil BAP objectives for linnet are to:

- Halt the loss of both feeding and breeding habitats.
- Where possible seek to increase the quality and number of suitable habitats.
- Encourage favourable management of suitable habitats.

6.102 Whilst there will be some loss of suitable existing habitat for linnet, this will be off set by improved habitat management elsewhere. In the long term, overall the Restoration Scheme does not conflict with the objectives of the action plan.

Reed bunting

6.103 Up to nine singing male reed buntings were recorded during the 2001 breeding bird survey. These were predominantly associated with ponds and wet flush areas in the northern part of the site.

- 6.104 In 2003, fifteen pairs were recorded. These were again particularly associated with ponds and wet flushed areas in the northern part of the site, but there was also a concentration in the extreme south of the site in the Bargod Taf valley, some in areas which will not be affected by the scheme.
- 6.105 The reed bunting is ecologically restricted to particular types of dense and fairly low vegetation, mainly associated with high soil moisture. Its apparent attachment to marshes, fens, bogs, riversides and inland waters is indirect through dependence on their associated vegetation types rather than being linked with any special need for water.
- 6.106 The areas where reed buntings were recorded will generally be lost as a result of the Ffos-y-fran operations, other than some of the territories in the Bargod Taf valley. During site operations suitable habitat for reed buntings will remain in wetland areas in the central ecological area, and associated with the margins of silt ponds. On restoration of the site, wetland vegetation associated with the restored silt ponds will continue to provide suitable habitat.
- 6.107 The Merthyr Tydfil BAP objectives for reed bunting are to:
- Prevent any decline in the breeding population within the County Borough.
 - Encourage the favourable management of suitable habitat.
- 6.108 During the period of working, it is likely that there will be some reduction in the extent of habitat for reed bunting and thus conflicts to some extent with the plan objectives. However in the longer term, suitable wetland habitat will be recreated and managed appropriately.

Lapwing

- 6.109 Up to nine breeding pairs of lapwing were observed in 2001, although nest failure may have caused some birds to relocate and the number may be over estimated. The majority of these birds were recorded in the area of the spoil tip south of the railway. This area will be affected by the southern overburden storage mound required for the Ffos-y-fran scheme.
- 6.110 In 2003 seven pairs were recorded, all breeding in the restored area of Phase 2 of the East Merthyr Reclamation Scheme in the extreme west of the Ffos-y-fran site adjacent to the A4070 road. Lapwings have continued to breed in this area during 2004 and 2005. This area will also be affected by the scheme.
- 6.111 This lapwing population is important in the local context, and is likely to form part of a metapopulation breeding at a number of sites in the Heads of the Valleys area.
- 6.112 On restoration of the site, an extensive area at Garth Fawr will be managed specifically to provide a breeding area for lapwings. During the operation of the site the existing lapwing breeding area east of the A4070 will be progressively lost and other suitable areas will be made available for the birds. Initially the area of Ryan's Tip where breeding has previously occurred would be made more attractive to the birds through habitat improvements. As the works progresses habitat would be created on the northern and eastern overburden mounds until the permanent breeding area at Garth Fawr can be created. The sequence of habitat creation is shown in the table and figures at Appendix B.
- 6.113 Habitat provision for lapwing would comprise extensive open areas of land with sparse vegetation and shallow scrapes (with clay lining if necessary) to provide small areas of shallow water. Rushes would be planted around the edges of the scrapes to provide cover for young chicks. Consideration would be given to spreading of farmyard manure to encourage the development of soil invertebrate populations.

Around the edges of the nesting areas, growth of grass would be encouraged to provide cover and feeding for growing chicks.

6.114 Lapwings will be encouraged to settle in the nesting areas by the use of decoys in the early spring. Decoys were historically used in trapping of waders. Stuffed decoys were employed in the trapping of Golden Plover and Lapwing in Central Europe, as well as in the Mediterranean region, the Netherlands and France. Their number at a Lapwing trap typically varied between 15 and 20.

6.115 The Merthyr Tydfil BAP objectives for lapwing are to :

- Where possible halt the destruction or degradation of areas of suitable habitat, whether or not Lapwing currently use them.
- Enhance the breeding success on farmland and colliery spoil through appropriate management.

6.116 During the period of working, there will be loss of the current nesting area used for breeding by lapwing and thus a conflict with these plan objectives. However, Lapwings will be encouraged to relocate to other suitable nesting areas initially at Garth Fawr, and later on the overburden storage mounds, which will be managed so as to provide suitable nesting areas. In the longer term, suitable habitat will be recreated at Garth Fawr and managed appropriately. The Merthyr Tydfil BAP recognises that if coal spoil is restored and managed appropriately it can be attractive to lapwings.

Sand martin

6.117 Sand martin was recorded during the 2001 ecological surveys. None were recorded during the 2003 breeding bird survey. This species typically nests in vertical undercutting banks of rivers, or in physically similar habitats such as the edges of gravel pits. It is frequently seen as a passage migrant elsewhere. There is no evidence that it breeds at the site, or that the site is otherwise of particular significance.

6.118 The Merthyr Tydfil BAP objectives for sand martin are to:

- Protect existing breeding colonies and maintain the breeding population in the county borough.
- Provide advice to landowners, farmers, managers, consultants and engineers on mitigation measures for providing alternative nesting sites for this species.

6.119 The Restoration Scheme does not conflict with the objectives of the plan. Ponds and lagoons at the site will continue to provide feeding habitat for sand martin during site operations and following restoration.

Breeding bird assemblages

6.120 Figure 11 identifies areas of importance for woodland birds, breeding waders and ground nesting passerine birds in 2001.

6.121 The only area of importance for woodland birds was in the Nant Gyrawd valley, outside the site area. This area was not included in the 2003 breeding bird survey. This area will not be affected by the Ffos-y-fran operations, and enhancement and management of the Cwm Golau ecological area will benefit woodland birds.

6.122 Two of the six areas of importance for breeding waders (snipe) were in the area north of the Bogey Road which will be affected by the Ffos-y-fran opencast excavation. These areas were also important for snipe in 2003 and common sandpiper was also recorded although breeding was not confirmed.

- 6.123 A third area of importance for waders in 2001 was almost entirely within the area required for the southern overburden store. As explained above, this area was primarily of note for its breeding lapwings. Lapwings were not recorded here in 2003, but the colony had moved to the restored area of Phase 2 of the East Merthyr Reclamation Scheme, as explained above.
- 6.124 A fourth area was between the Bogey Road and the railway where a curlew nest was recorded in 2001. This area is largely outside the site and habitats here will be retained as the central ecological area. However, it will be necessary to construct a haul road across the western end of this area to transport overburden to the southern overburden store during its construction in years 2-7 of working, and to transport material back for restoration of the void during the last four years or so of the operations. Curlew was not recorded here in 2003. There was however, a single curlew territory in the south of the site in an area which will be affected by the construction of soil and overburden stores and lagoons.
- 6.125 The fifth area was to the east of the site in the angle between the Bogey Road and the Fochriw Road. There will be some disturbance at the western end of this area during construction and removal of northern overburden store, and also to a lesser extent through transport of coal between the excavation and the Cwmbargoed Disposal Point during the continued operation of the site. This area was not surveyed in 2003.
- 6.126 The final area of importance for breeding waders in 2001 was around pond 8 within the Tair Carreg Moor SINC to the north east of the site which will not be affected by the operations. This area was not surveyed in 2003.
- 6.127 Additional areas where breeding snipe were recorded in 2003 were in the east of the site, north of the Bogey Road, and in the south west of the site, west of the Bargod Taf. Both of these areas will be affected by the construction of overburden mounds.
- 6.128 A large part of the site north of the Bogey Road is of importance for breeding passerines, particularly skylark (as considered above) and meadow pipit. Meadow pipit was the commonest breeding bird at the site with 58 identified breeding territories in 2001 and 107 in 2003. The additional breeding territories recorded in 2003 were generally in the area south of the Bogey Road. Meadow pipit is generally the commonest breeding bird of upland grass moors and heaths. Given its wide distribution across the site, much of the breeding areas will be affected by the opencast excavation and construction of overburden stores. As explained above, the vegetated overburden and soil mounds, and on restoration, the grassland and heath of the restored site, will provide suitable nesting areas for these species, subject to appropriate control of grazing.

Mammals

Brown Hare

- 6.129 Low numbers of brown hares may use the site, although there were no sightings during any of the ecological surveys. During the operational period the extensive grassed overburden and soil stores will continue to provide suitable habitat for this species. Restoration of the site to upland grassland and heath would similarly provide suitable habitat in the long term.
- 6.130 The Merthyr Tydfil BAP objectives for brown hare are to:
- Survey for and monitor Brown Hare sites
 - Maintain and expand any existing population in the Merthyr Tydfil area.
- 6.131 To the extent that the negative findings of the ecological surveys have contributed to knowledge of the distribution of the brown hare in Merthyr Tydfil, the scheme has

already contributed to the BAP objectives. Given that no significant population is likely to be present at the site, the scheme does not conflict with the objectives.

Amphibians

Great crested newt

- 6.132 The results of an amphibian survey of the site in 2001 are shown on Figure 13.
- 6.133 Great crested newts have been recorded from waterbodies and terrestrial habitat within the site. No great crested newts were recorded from waterbodies or terrestrial habitats in the section of the site north of the Bogey Road in 2001. Terrestrial habitats within the area of the site to the north of the road, which are potentially suitable for the species, extend to within 250m of waterbodies where the species was recorded. There were also waterbodies within the northern section of the site which could potentially be used by great crested newts.
- 6.134 To the south of the Bogey Road, great crested newts were recorded from ponds 6 and 10c, and amongst the rubble of the former Isaac Morgan Cottages. Pond 6 is outside the Ffos-y-fran site, within the central ecological area, and will not be affected by the operations.
- 6.135 The Isaac Morgan Cottages ruins and Pond 10c are within the site boundary. The area of the ruined cottages will not be affected by the works, but Pond 10C is within the area which will be affected by construction of the southern overburden store.
- 6.136 A further amphibian survey was undertaken in spring and summer 2003 to confirm the distribution of the species within the site. Only one great crested newt was recorded. This was found in one of the ponds immediately south of the Cwmbargoed Disposal Point. This is one of four ponds constructed in 1992 to receive great crested newts affected by the East Merthyr Reclamation Scheme Phase II works. However, these ponds were not used and the newts were taken elsewhere.
- 6.137 A further amphibian survey was carried out in spring 2004 to provide additional information on the status of great crested newts in the light of the delay to the project. Great crested newts were recorded in a total of ten ponds. Four of these were the ponds south of the Cwmbargoed Disposal Point which are outside the site area and will not be affected by the works. There were also records from Pond 6 which is within the central ecological area and again will not be affected by the works.
- 6.138 Ponds 10c, 16 and 32b are south of the Bogey Road and will be affected by the scheme. Pond 10c also contained the species in 2001.
- 6.139 In 2004 great crested newts were for the first time recorded north of the Bogey Road with single individuals recorded once from Ponds 3 and 4. From the number of great crested newts recorded in the surveys, it is expected that during the progress of the works to the north of the Bogey Road, only small numbers are likely to be present.
- 6.140 A methodology for the translocation of great crested newts from the working area has been agreed with the Countryside Council for Wales. The principles of the methodology for protection of the species are to contain great crested newts breeding to the south of the Bogey Road within the central ecological area, which includes Ponds 5 and 6 and the Isaac Morgan Cottages ruins; to capture any great crested newts present at ponds and associated habitats which will be affected by the operations, and to transfer them to new ponds which have been constructed; and to prevent great crested newts moving into the working areas.
- 6.141 Additional breeding ponds for great crested newt were constructed in 2003 in areas of suitable terrestrial habitat on land within the Cwm Golau ecological area, to the south of Cwmbargoed Disposal Point, within the operator's control. Terrestrial habitat for

the species in areas close to the ponds has been improved by provision of rubble piles and fencing, and shrub planting.

- 6.142 Additional ponds were constructed in 2004 in Cwm Golau. The creation of several small ponds within 250m of each other is to be preferred over the creation of one large pond.
- 6.143 Whilst the measures are specifically designed for the protection of great crested newts, any other amphibians captured will also be transferred to suitable habitats outside the working area.
- 6.144 As part of the restoration of the site, further ponds will be constructed. Suitable terrestrial habitat for amphibians will be provided in the vicinity of these ponds.
- 6.145 These measures will ensure that suitable habitat for amphibians is provided in the area in the long term.
- 6.146 A licence under Regulation 44 of the Habitats Regulations has been issued by the Welsh Assembly Government to ensure that procedures are in place for appropriate measures to be implemented to protect great crested newts from harm as a result of the operations.
- 6.147 The Merthyr Tydfil BAP targets and objectives for great crested newt are to:
- Halt the decline of great crested newts within the borough.
 - Create 5 new newt ponds by 2004
 - Restore 5 degraded sites by 2004.
- 6.148 The scheme has already contributed to the action plan target by construction of new ponds for great crested newts at six locations in Cwm Golau. Creation of further ponds and improvements to terrestrial habitat, as part of the restoration of the site, will in the longer term provide a conservation benefit in providing additional habitat for great crested newts and other amphibian species in the area.
- 6.149 For the period of aftercare of the restored site, all of the existing and new ponds created for great crested newts will be managed by Miller Argent or their agents. Subsequent to the aftercare period, and whilst ownership remains with Miller Argent, the ponds will continue to be managed by them or their agents. At such time as ownership of the land may be transferred, measures to ensure the future management of the ponds through agreement with a suitable organisation would be agreed with CCW.

Palmate newt

- 6.150 Palmate newts are more widespread at the site than great crested newts and were recorded from ponds 3, 10c, 14 and 26 within the site area in 2001. In the 2003 surveys there were additional records from pond 13. There were additional records in 2004 from ponds 2, 2a, 4, 4a, 4b, 10, 10a, 10b, 16, 16a, 22, 28, 32b, 32c and 33
- 6.151 Records from ponds which will not be affected were from ponds 5 and 7 in 2001, and 5, 6, B and C in 2003. In 2004 there were additional records from ponds 9, 30, A, and D. Survey of the new ponds in Cwm Golau in 2004 recorded the species in ponds N1a, N1b, N1c, N2a, and N2b.
- 6.152 The Merthyr Tydfil BAP objectives for palmate newt are to:
- Halt the decline of this species
 - Increase the quality of suitable habitats, both aquatic and terrestrial
 - Raise awareness of the conservation needs of this species

- 6.153 The habitat creation and management measures described above for great crested newt will also provide for the effective conservation of palmate newt. Whilst the measures proposed for the capture and translocation of great crested newt are specifically targeted at that species, any other amphibians captured will also be transferred to suitable habitats outside the working area. The Restoration Scheme does not conflict with the objectives of the action plan.

Protected Species - Summary of Mitigation

- 6.154 The following table summarises the mitigation measures which will be implemented for protected species.

Species	Protection	Proposed Mitigation
Breeding birds	Wildlife and Countryside Act Part 1 Section 1	<p>In order to avoid destruction of nests, ground-nesting birds will be actively deterred from nesting in areas where soils are to be stripped, or which are otherwise to be affected by operations, by appropriate measures during March and April.</p> <p>Any hedgerows, trees or similar vegetation, which may provide nesting habitat, will be removed during the period September-February inclusive.</p> <p>During operation of the site, the tops of overburden mounds will be managed so as to provide suitable nesting habitat for lapwings. Suitable lapwing nesting habitat will be created on restoration of the site.</p>
Barn owl	Wildlife and Countryside Act Part 1 Section 1 & Schedule 1	The potential for provision of barn owl access and nesting platforms in suitable buildings within the operator's control, and on the edge of Cwm Golau woods, will be investigated.
Bats	Wildlife and Countryside Act Part 1 Section 9 and Schedule 5 Habitats Regulations Schedule 2	<p>Bat boxes will be placed in woodland and other suitable locations to provide additional opportunities for bat roosting at the site.</p> <p>Opportunities for creating underground bat roosts associated with the woodland to be planted south of the Bogey Road will be investigated</p>
Badger	Protection of Badgers Act 1992	A confirmatory survey will be carried out, prior to commencement of work in the area of the Southern Overburden Mound, in order to ensure that no badger setts have been constructed in areas which will be affected by the proposals.
Reptiles	Wildlife and Countryside Act Part 1 Section 9 (1 & 5) and Schedule 5	<p>A trapping programme will be implemented, in tandem with the great crested newt clearance works, in areas of most likely reptile habitat, and reptiles captured transferred to the central ecological area between the Bogey Road and the railway, including the line of the former railway itself.</p> <p>Specific features to provide hibernation and</p>

Species	Protection	Proposed Mitigation
		basking sites for reptiles will be provided within the restored site.
Great crested newt	Wildlife and Countryside Act Part 1 Section 9 and Schedule 5 Habitats Regulations Schedule 2	The great crested newt mitigation programme will be carried out in accordance with the Method Statement approved under the Regulation 44 Licence.
Other amphibians	Wildlife and Countryside Act Part 1 Section 9 (5) and Schedule 5	Any other amphibians captured during the great crested newt mitigation work will be transferred to suitable habitats outside the working area. As part of the restoration of the site, ponds will be constructed. Suitable terrestrial habitat for amphibians will be provided in the vicinity of these ponds. These measures will ensure that suitable habitat for amphibians is provided in the area in the long term.

7.0 Archaeology and the Historic Landscape

Introduction

- 7.1 The Ffos-y-fran Land Reclamation Scheme offers an opportunity to integrate commercial and economic activity of importance to the well-being of the town of Merthyr Tydfil with those of cultural, social, and heritage preservation and promotion objectives. The operators accept that there will be some losses of heritage assets as a result of the proposed scheme. The scheme will however comprehensively mitigate these losses, and innovative archaeological objectives are proposed. The implementation of mitigation objectives, with the preservation of industrial heritage resource in the rest of the designated Merthyr Historic Landscape, will be a major contribution to more broad based heritage research, preservation, and sustainable management objectives.
- 7.2 This section explains the principles and methods by which Miller Argent will mitigate effects on physical heritage resulting from the land reclamation scheme. It addresses mitigation options for effects at ground level and also in underground seams where opencast coal extraction is to occur.

Heritage Aspects considered

- 7.3 The general character of the resources has been defined as:
- Surviving natural landscape of Prehistoric origin and with soil structures, settlement sites and ecological content preserving testament to this.
 - Features of Medieval land use with field systems, enclosures, boundary markers, ditches.
 - Medieval and Post-Medieval Common Land with traditional and continuing pastoral land uses.
 - Surface coal and iron stone patch workings.
 - Spoil and surface structures/infrastructure relating to deep mining.
 - The Dowlais Free Drainage System.
 - Modern features that have affected the heritage assets

Historic Landscape Assessment

- 7.4 A significant component of the cultural heritage assets relates to remnants of the natural and prehistoric landscape on and in which are elements of later periods, particularly the early Industrial period. The landscape of the site is a small but interesting component of the identified historic landscape in and around Merthyr. The importance of the landscape is intimately related to the iron and coal industries of Merthyr and which was central to the industrial revolution and growth of the British Empire and more locally the growth of the major towns of Cardiff, Newport and Swansea. The site is part of an area designated as a 'Landscape of Outstanding Historic Interest in Wales'

The Proposals

- 7.5 Design of the development has involved an archaeological consultant as part of the multidisciplinary team. Some of the key inputs have been or will be:
- Protection designs for Scheduled Ancient Monuments (SAMs) and local surrounding setting, the designated prehistoric landscape, areas of adjacent 'old men's workings', a Listed Building (a wooden aqueduct) and other elements of built heritage value.
 - Integrating an archaeological contractor with the development, for providing desk study inputs, evaluating site resources, and developing mitigation strategies.

- Avoidance of key features by adopting modified/alternative designs and related to the design for top soil and subsoil stripping and new routes. This will encompass leats, boundary stones, enclosures, mining pit head structures.
- Planning for archaeological interventions and approvals.
- Employment and training of a mining surveyor in archaeological documentation, artefact recovery, emergency conservation. The roles are defined as follows and are an extension of those required by law for on-going coal resource mapping:
 - Mapping the extraction pattern in coal seat-earth and iron stone seams.
 - Mapping underground water drainage leats and other 'structural' features such as access and vent shafts and roof support pillars.
 - Documenting working processes, including timber propping, face tooling, tracks, and underground spoil.
 - Logging the location and recovery of artefacts, including for emergency conservation.
- Scientific programme related to the short term behaviour of archaeological structures and artefacts buried below spoil tips (deep backfill).
- Landscape restoration master planning.
- Design of post-scheme heritage promotion.

7.6 Given the scale and duration of the opencast mining, the scheme recognises that the Scheduled Ancient Monuments (SAMs) and other heritage features within the site, and immediately surrounding it, are vulnerable to accidental damage and vandalism. It is also the case that the SAMs and other upstanding structures are in poor condition and are rapidly decaying. Some archaeological features will be left exposed and others preserved under the tips. It is therefore part of the design that protection will be afforded to these assets, following documentation of the 'as found' condition, through:

- Identification markings.
- Secure fencing off.
- Some emergency stabilisation of structurally unsound elements.
- Burial under a sand or other compatible fill buffer formation.
- Regular monitoring.
- The details of these works will be formulated in conjunction with the statutory authorities via detailed specifications, and then approved via Scheduled Monument Consent and Merthyr planning procedures. The Glamorgan and Gwent Archaeological Trust (GGAT) will supervise the consented undertakings.

7.7 Significant mitigation has already been achieved through development of the scheme over the last few years. This has included:

- The discovery and preservation of an Iron Age Settlement within the south-western boundary.
- Withdrawal of the boundary from Tair Cerrig stones in the north-eastern part of the site.
- Exclusion from the site of the Sarn Howell Pond and Watercourses Scheduled Ancient Monument.
- Withdrawal of the south-eastern boundary to exclude and preserve older circular enclosures associated with Bryn Caerau Farm.
- Preservation of a wooden aqueduct (a listed building) over the disused mineral railway cutting in the central section of the site.
- Withdrawal of the eastern boundary to exclude more clearly defined and complex man-made channels associated with the Dowlais Free Drainage System.
- The development of the scheme has also already brought about what is probably the most in-depth study of the Dowlais Free Drainage System.

7.8 Potential impacts on heritage resources have thus been avoided through adjustments to the design of the scheme.

Adjustments to the Quarry Faces

- 7.9 Geotechnical investigations, examining for faults, joints, stratification, and hydrology, have been used to maximise the verticality of the quarry faces. This is essential for safety, the extraction process and for maximising coal recovery within the consented boundary of the quarry. There has been a specific aim to avoid, as far as possible, large scale battering back of the excavation faces into areas where there are heritage features that otherwise would be affected.

Modification to Tip Locations and Lagoon Locations

- 7.10 Responding to increased understanding of the 'workings' of the scheme, and related to results of site investigations and detailed design, the footprint of the storage mounds have evolved. As a result, the position and size of the settlement lagoons have also evolved. The storage mounds and lagoons have been specifically located to avoid known locations of archaeological sites and features. For example, the southern overburden mound was originally intended to cover the land where the Prehistoric settlement has now been located. The approach has been to move the mound rather than excavate this site.

Modification to the Haul Road etc

- 7.11 The route from excavation to storage mound has developed to take account of the public highway from Merthyr to Cwmbargoed, and also to avoid being close to key heritage features, especially reservoirs of the Dowlais Free Drainage system. Here the aim has been to minimise the risk of damage caused by potential vehicle vibrations and impact from accidental falling soils and overburden.

Further Investigations and Mitigation

- 7.12 The site works will further define the physical heritage resources prior to the implementation of the scheme, to more fully define mitigation solutions. Some mitigation will be developed during the scheme as a response to unforeseen discoveries, new and evolving objectives.

- 7.13 The further mitigation relates to three distinct phases:

- Prior to the start of site works - now and through the scheme procurement period.
- During the site works comprising preparation of the site, excavation and spoil mounding.
- During the progressive reinstatement of the land surface to its new modelled form and this associated with planning for reinstatement of traditional and new functions.

Early Heritage Site Works

- 7.14 The following works will be undertaken prior to and in the early stages of site operations.

- Further survey and research especially of mining records.
- On site survey and further investigation of the key parts of the Dowlais Free Drainage System.
- Archaeological 'Watching Brief' on engineering site investigations for roads and lagoons

- Protection and general survey of SAMs and other key identified heritage features where necessary.

During Operations

7.15 The following measures will be implemented during the subsequent operation of the site:

- Local excavations of identified resources that will be removed or covered by excavations and soil/overburden storage operations.
- Watching Brief on sites and at locations to be protected prior to top soil stripping.
 - General Watching Brief during top soil stripping
 - Watching Brief on excavation of the settlement lagoons and attenuation ponds.
 - Mapping of coal and other material extraction to define locations, extent, age, techniques, and
 - artefact recovery under controlled processes

Restoration - Creation of a Heritage Park

7.16 The Ffos-y-fran surface reclamation aims to be innovative, accepting that it is impossible to copy, nor is it desirable to totally reproduce, the original land forms. The surface will be landscaped in such a way as to allow historic husbandry practices to continue over the landscape to the east of Merthyr, but with features of both heritage and nature conservation interest being retained and serviced by an improved road and footpath network. This will encourage the urban common land to be more frequently used, understood, and appreciated by the people of Merthyr and outside visitors. Provision for heritage features will be integrated with common land and other functions to be re-established.

7.17 Heritage will be an integral part of the innovative landscape creation. The SAMs and other resources will be displayed. Some features of the Ffos-y-fran Land Reclamation Scheme will be incorporated to illustrate continuity of process. There are other possibilities for retaining heritage resources and these are noted further on in this chapter.

7.18 Reference will be made to the mines and discoveries made in the mines and to artefacts.

7.19 The design of such a park will consider long-term heritage management opportunities and procedures.

Conservation of Scheduled Ancient Monuments (SAMs) and Listed Buildings

7.20 The SAMs and associated features survive as derelict industrial features that do not significantly contribute to an understanding of the related industries. More particularly, the Dowlais Free Drainage System reservoirs (and the many related leats) are in a dilapidated state and are slowly decaying. The protection of these during the scheme aims to stop accidental damage and vandalism. The landscape restoration process will seek Scheduled Monument Consent to 'stabilise' the remains from further decay if necessary. In the long term this will make their original function more understandable as more original elements will have survived. This work may involve appropriate conservation and limited restoration.

7.21 Without some cleaning-up works to the leats associated with the SAMs and other reservoirs of the DFDS these will continue to be naturally infilled and so vanish from view. Without heritage-led interventions to keep them functioning, minor features could be at risk from general modern maintenance techniques.

- 7.22 The Listed Wooden Aqueduct is structurally dangerous and the wooden and iron components are highly decayed. Listed Building Consent will be sought for its protection, removal and safe storage. This will aim to ensure that it does not collapse and break up and to stop wood decay. With this achieved, a restoration strategy for the aqueduct will be developed and submitted to the LPA for approval during the early stages of the scheme. The aqueduct is shown in its existing position on the Restoration Plan (Figure 4). However the possibility of relocating the aqueduct to the location of a now destroyed similar aqueduct near the Bogey Road bridge is being discussed with CADW and Merthyr Tydfil County Borough Council.
- 7.23 Linked to the SAMs and associated DFDS leats will be the retention and promotion of heritage remains within the excluded central east west corridor, including:
- Railway cutting of the GWR and Rhymney Branch Railway.
 - Road bridge over the railway cutting.
 - Reservoirs and leats of the DFD System.
 - Elements of tram ways and rail ways.

Also retained within this corridor will be features of the natural historic landscape, providing context within which man-made heritage resources are set.

- 7.24 Within the landscape, where surface restoration will occur following the extraction of coal, archaeological heritage restoration objectives are being promoted, recognising the value and character of the present historic landscape. A range of restoration options are defined below but these can only be confirmed as implementable following further research and site investigation:
- Possible exposure of a not too high section of the quarry face, representing the linear topographic features of the sub surface strata outcrops and also illustrating continuity of industrial process.
 - Contouring of the hill side to illustrate natural drainage with superimposed man made elements, especially features of the Dowlais Free Drainage System descending down to the great iron works.
 - Pit head/adit structural elements, utilising the original materials archaeologically excavated, removed and stored. These would only be found and evaluated in 2007/2008 and if of good quality would be reset in their original positions.
 - Creation of a replacement Longtown Pond with links to retained attenuation ponds of the scheme.
 - The railway route traversing around the western hillside down to Dowlais.
 - Surface irregularity resembling tip and quarry workings and which can result in micro variations in soil and vegetation types. In his context, the potential for restoration of the two 'finger tip' complexes in the east of the site north of the Bogey Road will be explored.

Cultural Benefits to Merthyr Tydfil and South Wales

- 7.25 The Ffos-y-fran scheme will, in the long term, generate the following community benefits:
- Retained, conserved and restored historical structures within a safe accessible landscape, which can be better managed and promoted.
 - New features of industry, illustrating continuity of processes related to the coal extraction industry (for example, lagoons and possible exposure of part of the excavation face).
 - Artefacts for museums and mostly related to the industrial heritage of Merthyr.
 - Data and interpretative information about the behaviour of artefacts and sites preserved in situ below civil engineering works.
 - Innovative archaeological project linking above and below ground technological history.

- New innovative and safely restored landscape containing the preserved and restored heritage elements.
- Academic archaeological reports and more general literature for the public and schools related to the heritage and history of Merthyr.

7.26 In conclusion, the implementation of these heritage objectives will result in Merthyr Tydfil having what could be regarded as a sustainable working 'heritage park' (formed of common land husbandry, moorland ecology and the built heritage) and which could be integrated to other sites of significant cultural value in and around the town.

8.0 Public Access

- 8.1 Existing footpaths, both legal rights of way, and other claimed routes within the site area are shown on Figure 14.
- 8.2 Prior to commencement of operation of the Ffos-y-fran Land Reclamation Scheme, the site area will be fenced and public rights of access to the urban common will be temporarily suspended over the area of the scheme until the site is returned to common on completion of restoration. A temporary alternative route will be made available for the duration of the project as shown on Figure 14.
- 8.3 During reclamation and mining operations the perimeter of the scheme will be fenced, and in order to mitigate the consequential loss of access from the corridor of the A4060 trunk road to the common land to the east of the scheme, a new, temporary route will be created along the northern boundary of the site, as shown on Figure 14. This route will provide access on foot between the reclamation scheme and the Trecatti Landfill to the north, providing a means of walking to the greater area of the urban common whilst operations on site proceed.

Site Restoration

- 8.4 During the aftercare period, a footpath network will be created over the restored site that will reflect the original network, taking into account the changed topography, and will be to a condition not substantially less convenient to the public. Footpaths will avoid areas of ecological sensitivity, in particular the the lapwing breeding area to be established to the south of the Bogey Road.
- 8.5 As the restored landform will differ from that which currently exists, and new landscape and nature conservation features are to be established, heritage features retained and new features established, the alignment of the new routes will reflect the restored landscape rather than merely replicate the original network.
- 8.6 An indicative layout for the new network is shown on the Restoration Plan at Figure 4. The aims of the restoration strategy for public rights of way are to provide both circular routes and links to the surrounding network, and to link features within the site, both as destinations in their own right, and as features of interest along a route.
- 8.7 The overall effect of the network will be the same; to afford the public rights of way over the restored private land and urban common, in addition to their right to walk the common for air and exercise.
- 8.8 Sign posting and interpretation boards will be provided at appropriate locations.

9.0 Conclusions

- 9.1 This document sets out the restoration strategy for the Ffos-y-fran Land Reclamation Scheme. The Ffos-y-fran Land Reclamation scheme will bring about the completion of the East Merthyr Land Reclamation Scheme and achieve the objectives set out in Merthyr's Local Plan. The East Merthyr Land Reclamation Scheme was originally conceived in the 1980's by the County Council (Mid Glamorgan) and the Borough (Merthyr Tydfil), in partnership with the Welsh Development Agency (WDA), to achieve the reclamation of the largest area of acutely derelict land of its type in Western Europe. The Ffos-y-fran scheme is the result of many years of site investigation and consultation. The scheme would complete the local authority's reclamation objectives at East Merthyr.
- 9.2 The scheme accords with the local authority's Local Plan, provides a pragmatic approach to the conclusion of the East Merthyr Reclamation Scheme, and will achieve the restoration of 317ha of derelict land, the majority of which will be returned to common and agricultural land.
- 9.3 Environmental Management Plans will be prepared and implemented for the Ffos-y-fran operations. These will include the requirements for mitigation of environmental impacts. The plans will form an integral part of the contract for the operations and will be prepared in sufficient time for its requirements to be taken into account by those tendering for the work. Environmental specialists will attend pre-works meetings to ensure that the contractor is familiar with site conditions and environmental compliance requirements. All site personnel will be made familiar with the environmental requirements of the works at induction courses and tool-box talks, as necessary.
- 9.4 Site works will be monitored by an Environmental Liaison Officer who will call on the project's environmental and archaeological specialists, where necessary, to ensure that the environmental requirements are fulfilled.
- 9.5 Planning consent has been granted for a Visitor Centre at Cwmbargoed Disposal Point to be operated in association with the scheme. This will provide educational/training and interpretation facilities both for the land reclamation process, and for the natural and historical environment in the vicinity of the site.
- 9.6 The scheme will involve the recovery of coal by opencast methods, which will take between 13.5 and 17 years to extract, depending on the coal delivery rate. During this time the land will be progressively restored as the site is worked, and will be subject to a period of 5 years aftercare as areas are completed. It is expected that land will be restored in the south-western part of the site as early as year 6.
- 9.7 The restoration scheme will work progressively from south to north across the site. Detailed restoration plans for each phase of the scheme will be submitted for the approval of the Planning Authority at least six months prior to the cessation of the replacement of overburden in that phase. The plans will show the final landform, soil profile characteristics and all necessary agricultural facilities and woodland/wetland areas, including written specifications. The phases of working are shown in the Progressive Restoration Plans at Appendix A. The phases are as follows:
- | | |
|---------|--|
| Phase 1 | Preliminary operations (excavation of box cut) |
| Phase 2 | Excavation to maximum void |
| Phase 3 | Excavation to end of coaling |
| Phase 4 | Final void restoration |
- 9.8 The Restoration Plan for the completed site is shown on Figure 4.

- 9.9 The final profile, although based on the Restoration Plan, may have to be amended throughout the working of the site due to any fluctuation between the actual levels of bulkage and coal volumes extracted, and those anticipated. Regular surveys will be carried out to check the balance of the quantities excavated and the material available for restoration, to ensure that the final restoration scheme balances, i.e. to ensure that neither a void nor a dump is left at the end of working.
- 9.10 After the completion of coaling, overburden restoration will take approximately 24 months to complete. The southern overburden dump will be restored first, followed by the north eastern and north western dumps. On completion of overburden restoration, the remaining soil forming material, subsoil, and topsoil in dump, will be restored to complete the restoration stage of the site.
- 9.11 An Aftercare Scheme for each phase of the restoration will be submitted for the approval of the Planning Authority not later than six months prior to the completion of restoration (including soil spreading) of each phase.
- 9.12 A programme of maintenance and aftercare will follow the restoration of the working areas; this will be carried out for a period of 5 years after the restoration works are satisfactorily completed as certified by the LPA. Particular attention will be paid to grazing control, appropriate fertiliser application, soil structure development and drainage necessary to achieve the standards of agricultural land required by the local planning authority and the Agricultural & Rural Affairs Department of the National Assembly for Wales.
- 9.13 On completion of the 5 year aftercare period, and provided that the land has been restored to a standard acceptable to the local planning authority, the site will be returned to Common, Agricultural Tenants, or other Landowners, as required to meet any legal constraints or agreements.
- 9.14 The restoration plan has regard to Merthyr Tydfil County Borough Council's objectives and policies for the landscape. In particular the following objectives have been adopted:
- i. The restoration design aims to develop a range of landscape character appropriate to the different parts of the site, and to integrate it with the surrounding landscape
 - ii. The northern and north-western slopes are part of the landscape setting of Merthyr Tydfil, and their restoration treatment aims to enhance that setting.
 - iii. The project includes restoration of public access routes. Their enjoyment will be enhanced through improved signage and information, and indications of routes linking places or providing circular walks.
- 9.15 A key aim of the proposals is to produce a varied surface giving areas of light and shadow, and texture and grain to the landscape. It includes "macro features", such as valleys and stream courses, and minor variations in terrain, soil depth, drainage and micro-climate. Such "micro" features are frequently absent from older reclamation sites, and will support the aim of developing variety, by providing suitable conditions for different habitats.
- 9.16 All available topsoil will be stripped from all areas used for excavation, overburden, subsoil and soil forming material storage, roads, hard standing areas, water treatment facilities and building construction. All available suitable subsoil will be stripped from any area previously stripped of topsoil except those areas required for the storage of subsoil. Suitable soil forming material which has been identified will also be stripped. Wherever possible such material will be directly spread. Low compaction bulldozers, rather than scrapers or mechanical shovels only, will be employed for reinstating soils.

- 9.17 After laying the soil profiles, a range of agricultural activities will occur which will vary according to the particular after-use. These works may include ripping, soil levelling, stone picking, cultivation, power forking, disking and stone picking prior to cultivation. Appropriate seed mixtures will be specified according to the proposed afteruse of the various areas of the site.
- 9.18 As an alternative to commercial seed, the potential for harvesting seed from the site, or adjoining land, for use in restoration will be investigated. In the first instance, a seed crop has been harvested from land in the east of the site in summer 2005 and put in store for use in restoration. This will enable the quantity and content of the seed harvested to be assessed and consideration given to further harvesting from similar habitats elsewhere in future years for storage or direct use in restoration.
- 9.19 Three existing landfill sites, Landfill 13, Hoover and Merthyr Landfills, lie within the boundary of the proposed land reclamation scheme and most need to be relocated to allow the associated opencast mining operations to proceed. It is anticipated that the excavation works and classification of the soils arising will result in four product materials:
- i Uncontaminated, granular stone and ash soils capable of being utilised for on-site construction.
 - ii Material generally conforming to the above description but containing wood, metal, plastics, textiles and paper which can be separated out from the mass and disposed of to Trecatti Landfill. The resulting inert materials will then be used on site.
 - iii Any non-inert but non hazardous material will be disposed to Trecatti landfill.
 - iv Any hazardous material excavated will be removed to a suitable licensed facility off site.
- 9.20 These works will be carried out under a Waste Management Licence issued by the Environment Agency.
- 9.21 The ecological principles of the restoration strategy are:
- i to conserve features of ecological interest in situ where practicable.
 - ii to enhance such features through appropriate habitat creation and improvement.
 - iii to create areas of ecological interest as part of the restoration of the site.
 - iv to enhance both retained and newly created areas through appropriate management so far as this is in the control of the operator.
- 9.22 The conservation of features of ecological interest in situ has resulted in the abandonment of previous proposals which would have infilled the upper part of Cwm Golau with culverting of the Nant Gyrawd. Cwm Golau is now excluded from the site. A detailed management plan will be prepared and implemented to enhance the overall nature conservation value of this area. This will include areas of tree and shrub planting, reinforcement of hedgerows, fencing and control of sheep stocking levels. New ponds to provide habitat for amphibians, particularly great crested newt, have already been constructed in this area.
- 9.23 There is an area of nature conservation interest between the Bogey Road and the railway line, containing ponds where great crested newts and other amphibians have been recorded. Most of this area has been excluded from the site and will be

- retained, enhanced and managed as an ecological area. As for Cwm Golau, a detailed management plan will be prepared and implemented for this area.
- 9.24 The previous proposals would have involved the loss of much of the Tair Carreg Moor SINC. The Ffos-y-fran Land Reclamation Scheme does not include any of the land within the SINC.
- 9.25 It is proposed that the majority of the restored land will be used for upland grazing as urban common land. Bryn Caerau Farm (where disturbed) will be returned to agricultural use, and nature conservation measures will be incorporated throughout the restoration scheme. The predominantly moorland vegetation associated with the open areas of the common will be restored, with particular attention being given to re-instating the acid grassland presently adjacent to the Tair Carreg Moor SINC. The final distribution of land uses across the site will be dependent upon the soil and soil-forming resources available.
- 9.26 A methodology for the translocation of great crested newts from the working area is has been agreed with the Countryside Council for Wales and the necessary licence granted by the Welsh Assembly Government. Specific measures will be implemented to provide habitat for lapwings during the works.
- 9.27 The Ffos-y-fran Land Reclamation Scheme offers an opportunity to integrate commercial and economic activity of importance to the well-being of the town of Merthyr with those of cultural, social, and heritage preservation objectives. The implementation of mitigation objectives, with the preservation of industrial heritage resource in the rest of the designated Merthyr Historic Landscape, will be a major contribution to more broader based heritage research, preservation, and sustainable management objectives.
- 9.28 Significant mitigation has already been achieved through development of the scheme over the last few years. This has included:
- The discovery and preservation of an Iron Age Settlement within the south-western boundary.
 - Withdrawal of the boundary from Tair Cerrig stones in the north-eastern part of the site.
 - Exclusion from the site of the Sarn Howell Pond and Watercourses Scheduled Ancient Monument.
 - Withdrawal of the south-eastern boundary to exclude and preserve older circular enclosures associated with Bryn Caerau Farm.
 - Preservation of a wooden aqueduct (a listed building) over the disused mineral railway cutting in the central section of the site.
 - Withdrawal of the eastern boundary excluding more clearly defined and complex man-made channels associated with the Dowlais Free Drainage System.
 - The development of the scheme has also already brought about what is probably the most in-depth study of the Dowlais Free Drainage System.
- 9.29 The implementation of these heritage objectives will result in Merthyr having what could be regarded as a sustainable working 'heritage park' (formed of common land husbandry, moorland ecology and the built heritage) and which could be integrated to other sites of significant cultural value in and around the town.
- 9.30 The Ffos-y-fran surface reclamation aims to be innovative, accepting that it is impossible to copy, nor is it desirable to reproduce the original land forms. The surface will be landscaped in such a way as to allow traditional husbandry practices to continue over the landscape to the east of Merthyr, but with features of both heritage and nature conservation interest being retained and serviced by an improved road and footpath network. This will encourage the urban common land to be more frequently used, understood, and appreciated by the people of Merthyr and outside

visitors. Provision for heritage features will be integrated with common land and other functions to be re-established.

- 9.31 Heritage will be an integral part of the innovative landscape creation. The SAMs and other resources will be displayed. Some features of the Ffos-y-fran Land Reclamation Scheme will be incorporated to illustrate continuity of process. Reference will be made to the discoveries made in the mines and to artefacts. The design of such a park will consider long-term heritage management opportunities and procedures.
- 9.32 This Restoration Strategy provides a broad scheme within which, through detailed design, features will be introduced for visual and ecological variety. Small-scale variation in landform and degree of compaction of soils will lead to variation in the vegetation that will develop, thus providing patterns of light and shade, colour and texture, typical of surrounding hillsides.
- 9.33 A footpath network will be created over the restored site that will reflect the original network of legal and claimed footpaths. As the restored landform will differ from that which currently exists, and new landscape and nature conservation features are to be established, the alignment of the new routes will reflect the restored landscape rather than merely replicate the original network. The overall effect of the network will be the same; to afford the public rights of way over the restored private land and urban common, in addition to their right to walk the common for air and exercise.
- 9.34 The Ffos-y-fran Land Reclamation Scheme thus represents an integrated working and restoration scheme for the site incorporating the extraction of coal by opencast methods, which will finance the scheme. The restoration will seek to achieve a balance between sometimes conflicting interests, in particular agriculture, Rights of Common (including commoners' rights and the public right to walk the urban common for air and exercise), landscape, nature conservation, cultural heritage and recreation.

Figures

- Figure 1 Planning Application Site Area**
- Figure 2 East Merthyr Reclamation Scheme
Phases and Related Proposals**
- Figure 3 Site Features and Landscape**
- Figure 4 Restoration Plan**
- Figure 5 Management Compartments**
- Figure 6 Soil Mapping Units (Topsoil & Subsoil)**
- Figure 7 Soil Forming Materials**
- Figure 8 Soil Reinstatement Strategy**
- Figure 9 Waste Tip Assessment**
- Figure 10 Ecology
Phase I Habitat Survey**
- Figure 11 Ecology
Breeding Bird Survey 2001**
- Figure 12 Ecology
Breeding Bird Survey 2003**
- Figure 13 Ecology
Mammal & Herpetile Survey
(Excluding Badgers)**
- Figure 14 Footpaths**

Figure 1

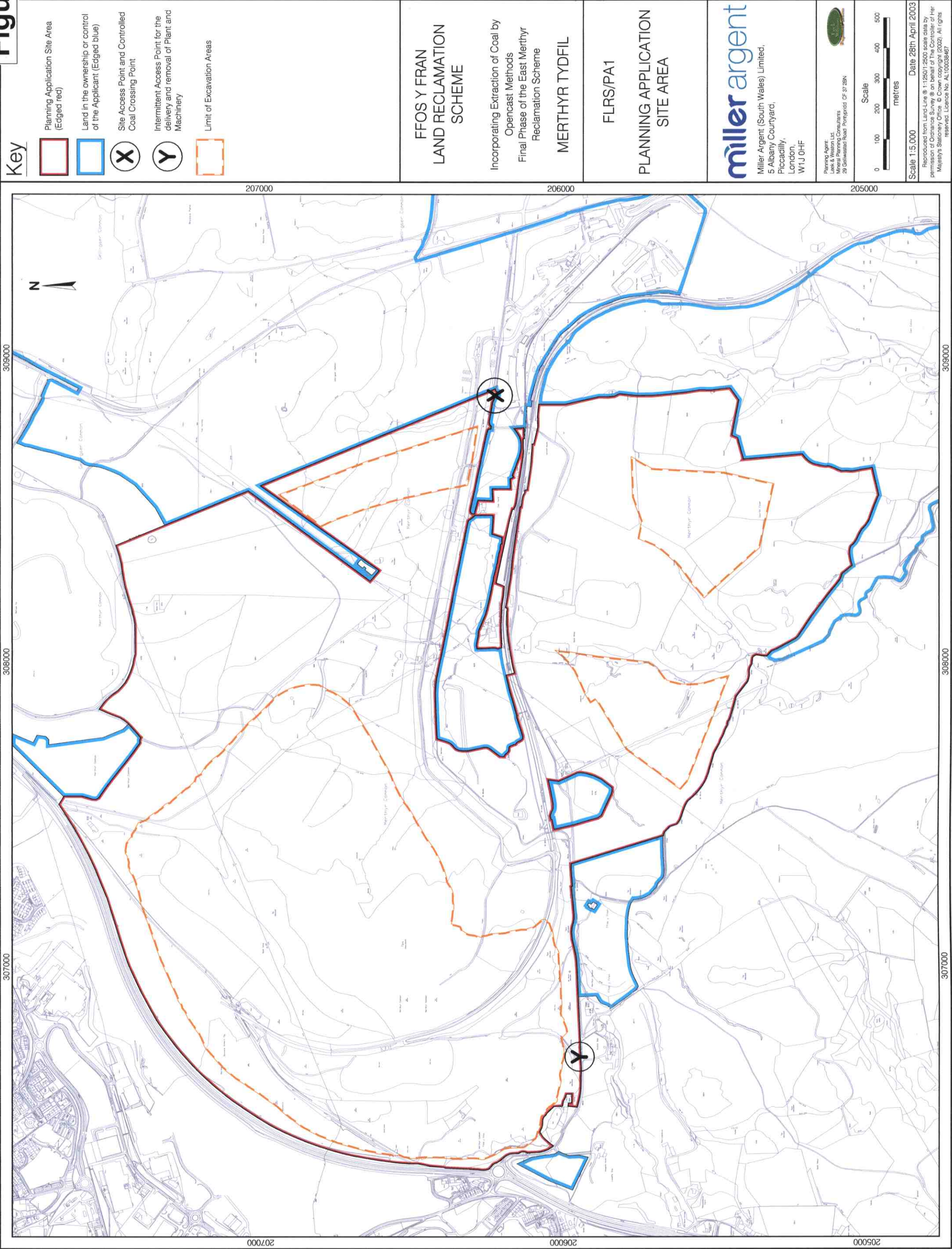


Figure 2

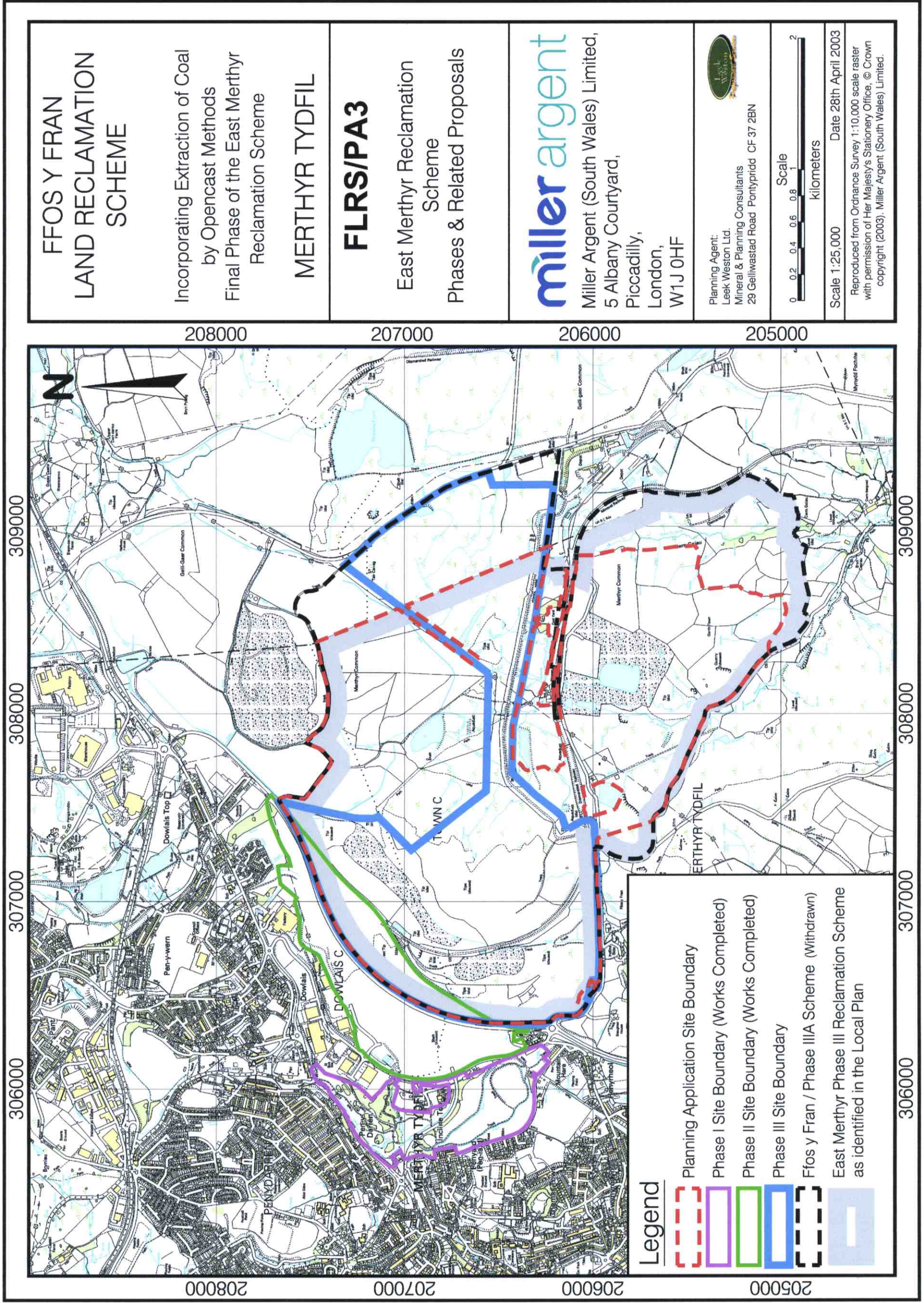
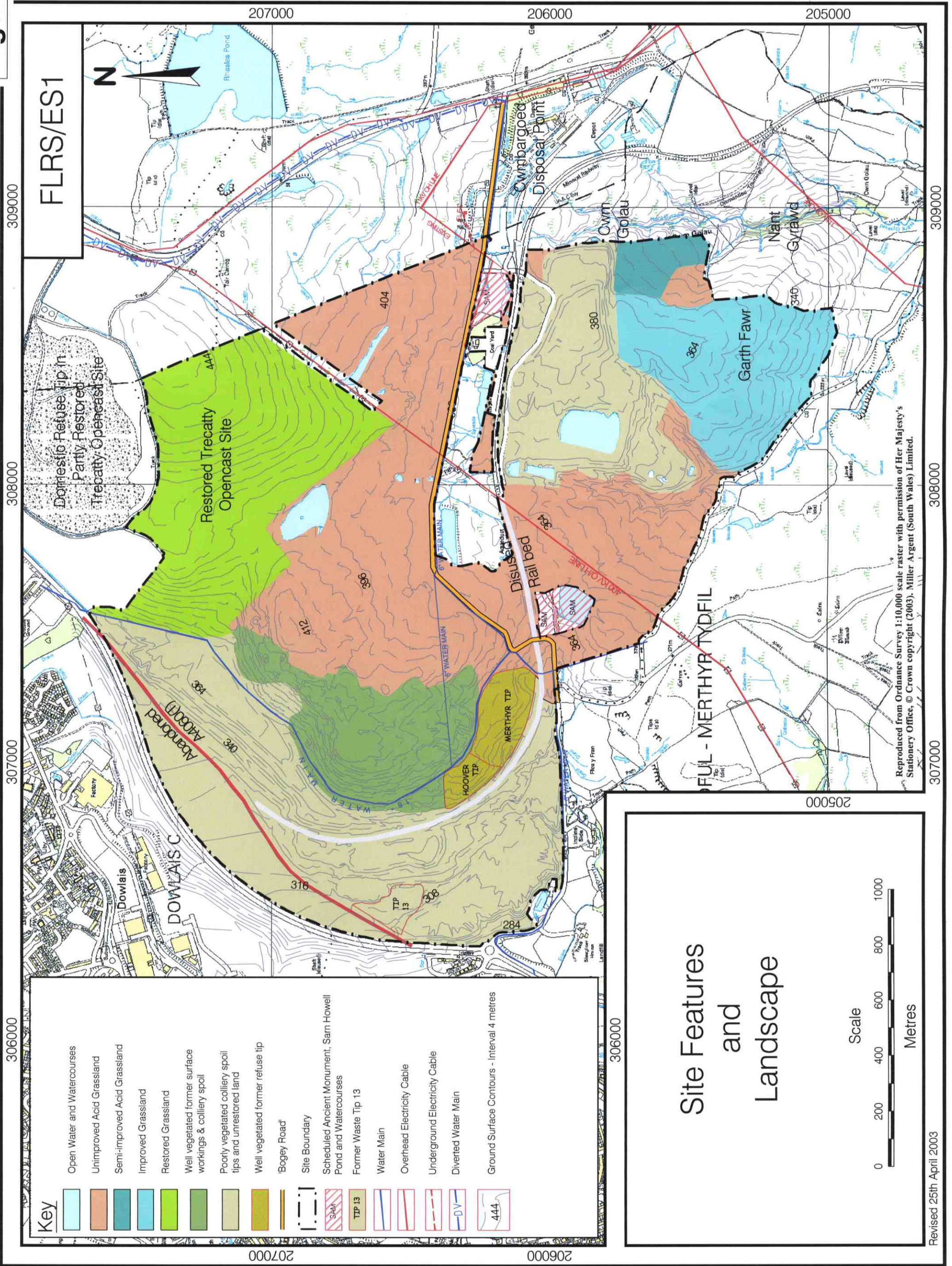
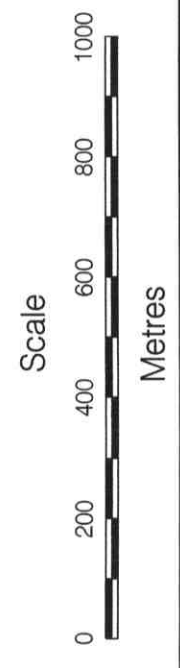


Figure 3



Symbol/Color	Description
Blue	Open Water and Watercourses
Light Green	Unimproved Acid Grassland
Dark Green	Semi-improved Acid Grassland
Light Blue	Improved Grassland
Light Green	Restored Grassland
Light Green	Well vegetated former surface workings & colliery spoil
Light Green	Poorly vegetated colliery spoil tips and unrestored land
Light Green	Well vegetated former refuse tip
Yellow	'Bogey Road'
Black dashed line	Site Boundary
Blue hatched	Scheduled Ancient Monument, Sarn Howell Pond and Watercourses
Orange hatched	Former Waste Tip 13
Blue hatched	Water Main
Red hatched	Overhead Electricity Cable
Red dashed	Underground Electricity Cable
Blue dashed	Diverted Water Main
444	Ground Surface Contours - Interval 4 metres

Site Features and Landscape



Reproduced from Ordnance Survey 1:10,000 scale raster with permission of Her Majesty's Stationery Office, © Crown copyright (2003), Miller Argent (South Wales) Limited.

306000

307000





















308000

309000

Figure 4



Legend:

-  Restoration contours @ 4.0m intervals
- Watercourses & waterbodies:**
-  Streams
-  Ponds
-  Ponds for Great Crested Newts
-  Wetlands
-  Existing ponds
- Vegetation:**
-  Upland grassland
-  Improved grassland
-  Acid grassland
-  Wet heath
-  Woodland and hedgerows
-  Existing woodland and hedgerows
-  Coniferous plantation woodland
-  Areas within the site undisturbed by operations
-  Existing field boundaries in Garth Fawr
- Other features:**
-  Potential exposed section of opencast high wall
-  Stone wall boundary in lieu of hedgebank (if suitable stone is recovered)
-  Potential area of "finger tips" to be carefully re-exposed
-  Footpaths
-  Pylons and overhead power cables

207000

207000

206000

206000

306000

Restoration Plan

Scale

0 200 400 600 800 1000

Metres

205000

205000

Reproduced from Ordnance Survey 1:10,000 scale raster with permission of Her Majesty's Stationery Office, © Crown copyright (2003), Miller Argent (South Wales) Limited.

307000

308000

309000

Figure 5

309000

308000

307000

306000

FLRS/ES3/5A

207000

206000

205000

307000

308000

309000

309000

308000

307000

306000

305000

304000

303000

302000

301000

300000

299000

298000

297000

296000

295000

294000

293000

292000

291000

290000

289000

288000

287000

286000

285000

284000

283000

282000

281000

280000

279000

278000

277000

276000

275000

274000

273000

272000

271000

270000

269000

268000

267000

266000

265000

264000

263000

262000

261000

260000

259000

258000

257000

256000

255000

254000

253000

252000

251000

250000

249000

248000

247000

246000

245000

244000

243000

242000

241000

240000

239000

238000

237000

236000

235000

234000

233000

232000

231000

230000

229000

228000

227000

226000

225000

224000

223000

222000

221000

220000

219000

218000

217000

216000

215000

214000

213000

212000

211000

210000

209000

208000

207000

206000

205000

204000

203000

202000

201000

200000

199000

198000

197000

196000

195000

194000

193000

192000

191000

190000

189000

188000

187000

186000

185000

184000

183000

182000

181000

180000

179000

178000

177000

176000

175000

174000

173000

172000

171000

170000

169000

168000

167000

166000

165000

164000

163000

162000

161000

160000

159000

158000

157000

156000

155000

154000

153000

152000

151000

150000

149000

148000

147000

146000

145000

144000

143000

142000

141000

140000

139000

138000

137000

136000

135000

134000

133000

132000

131000

130000

129000

128000

127000

126000

125000

124000

123000

122000

121000

120000

119000

118000

117000

116000

115000

114000

113000

112000

111000

110000

109000

108000

107000

106000

105000

104000

103000

102000

101000

100000

99000

98000

97000

96000

95000

94000

93000

92000

91000

90000

89000

88000

87000

86000

85000

84000

83000

82000

81000

80000

79000

78000

77000

76000

75000

74000

73000

72000

71000

70000

69000

68000

67000

66000

65000

64000

63000

62000

61000

60000

59000

58000

57000

56000

55000

54000

53000

52000

51000

50000

49000

48000

47000

46000

45000

44000

43000

42000

41000

40000

39000

38000

37000

36000

35000

34000

33000

32000

31000

30000

29000

28000

27000

26000

25000

24000

23000

22000

21000

20000

19000

18000

17000

16000

15000

14000

13000

12000

11000

10000

9000

8000

7000

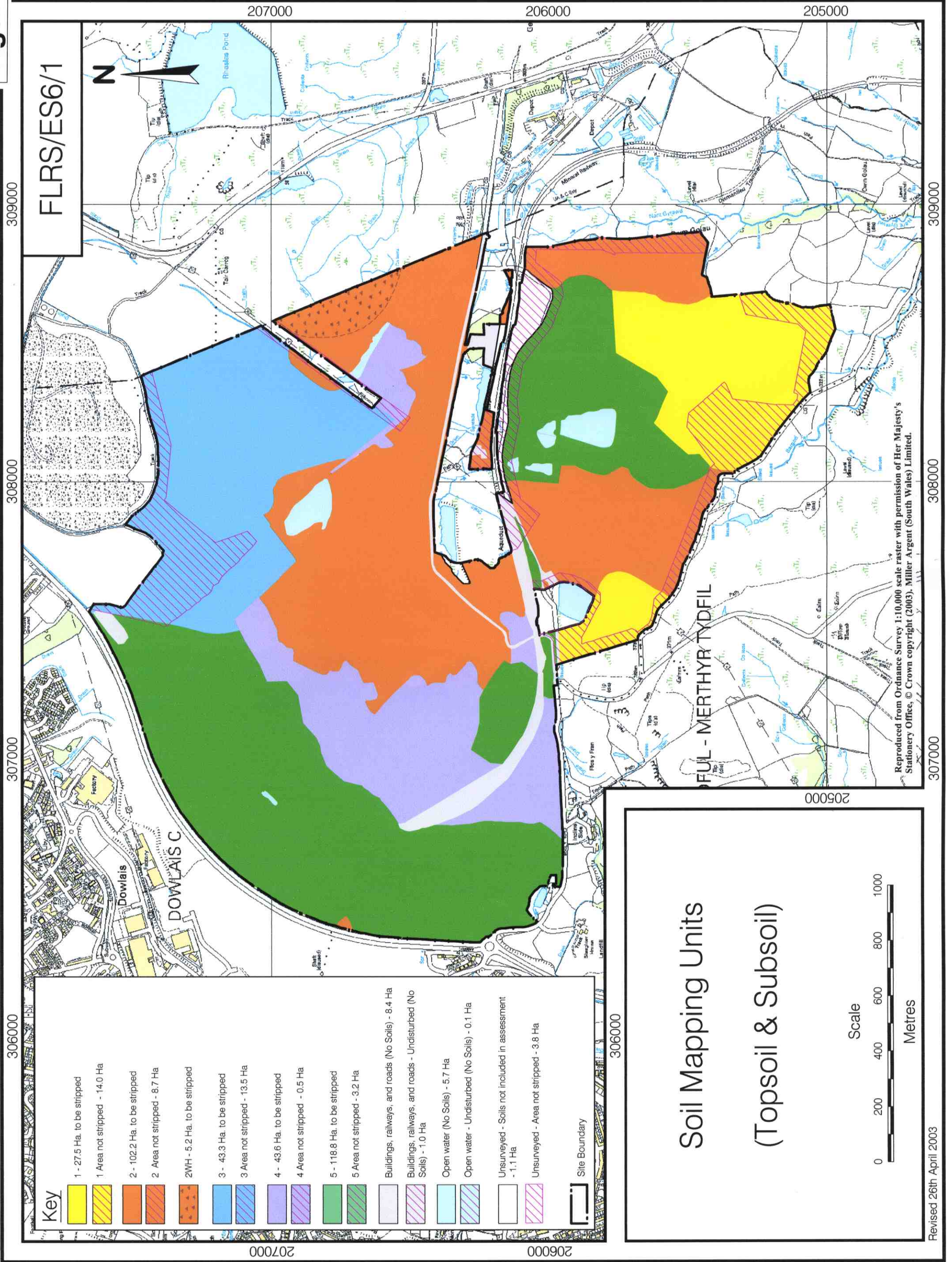
6000

5000

4000

3000

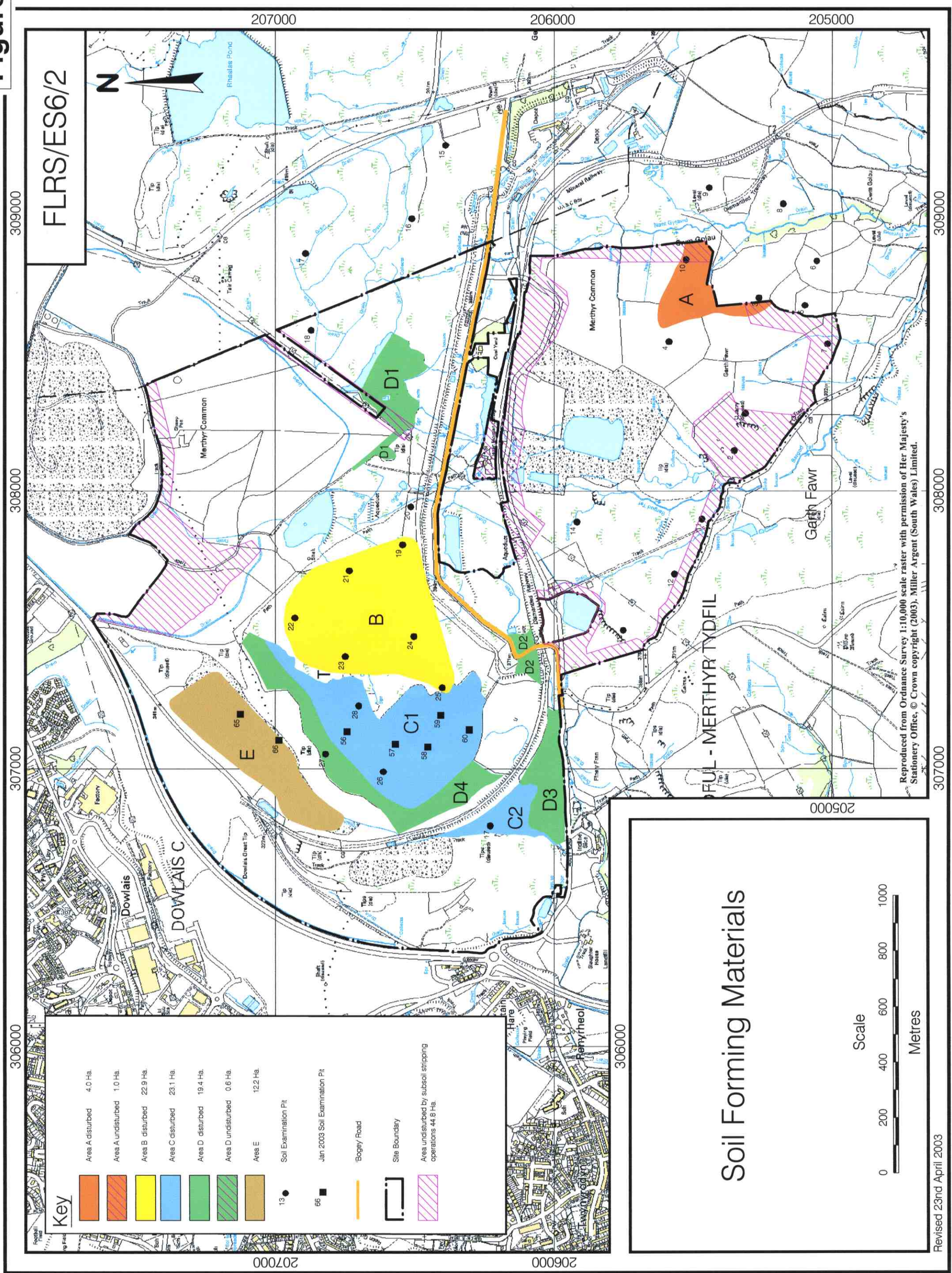
Figure 6



Key

- 1 - 27.5 Ha. to be stripped
 - 1 Area not stripped - 14.0 Ha
 - 2 - 102.2 Ha. to be stripped
 - 2 Area not stripped - 8.7 Ha
 - 2WH - 5.2 Ha. to be stripped
 - 3 - 43.3 Ha. to be stripped
 - 3 Area not stripped - 13.5 Ha
 - 4 - 43.6 Ha. to be stripped
 - 4 Area not stripped - 0.5 Ha
 - 5 - 118.8 Ha. to be stripped
 - 5 Area not stripped - 3.2 Ha
 - Buildings, railways, and roads (No Soils) - 8.4 Ha
 - Buildings, railways, and roads - Undisturbed (No Soils) - 1.0 Ha
 - Open water (No Soils) - 5.7 Ha
 - Open water - Undisturbed (No Soils) - 0.1 Ha
 - Unsurveyed - Soils not included in assessment - 1.1 Ha
 - Unsurveyed - Area not stripped - 3.8 Ha
- Site Boundary

Figure 7



Key	
	Area A disturbed 4.0 Ha.
	Area A undisturbed 1.0 Ha.
	Area B disturbed 22.9 Ha.
	Area C disturbed 23.1 Ha.
	Area D disturbed 19.4 Ha.
	Area D undisturbed 0.6 Ha.
	Area E 12.2 Ha.
	13 Soil Examination Pit
	66 Jan 2003 Soil Examination Pit
	Bogey Road
	Site Boundary
	Area undisturbed by subsoil stripping operations 44.8 Ha.

Figure 8

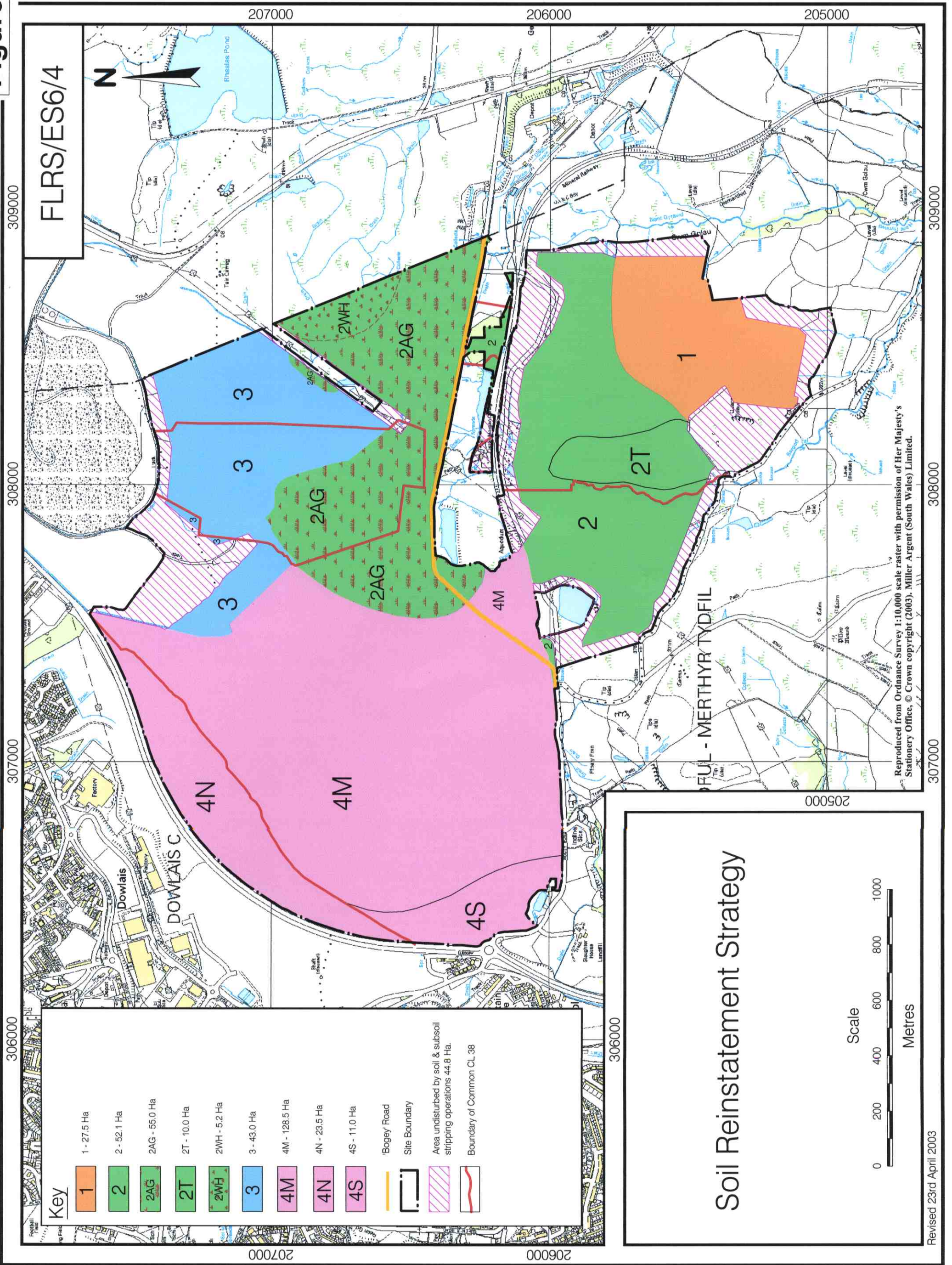
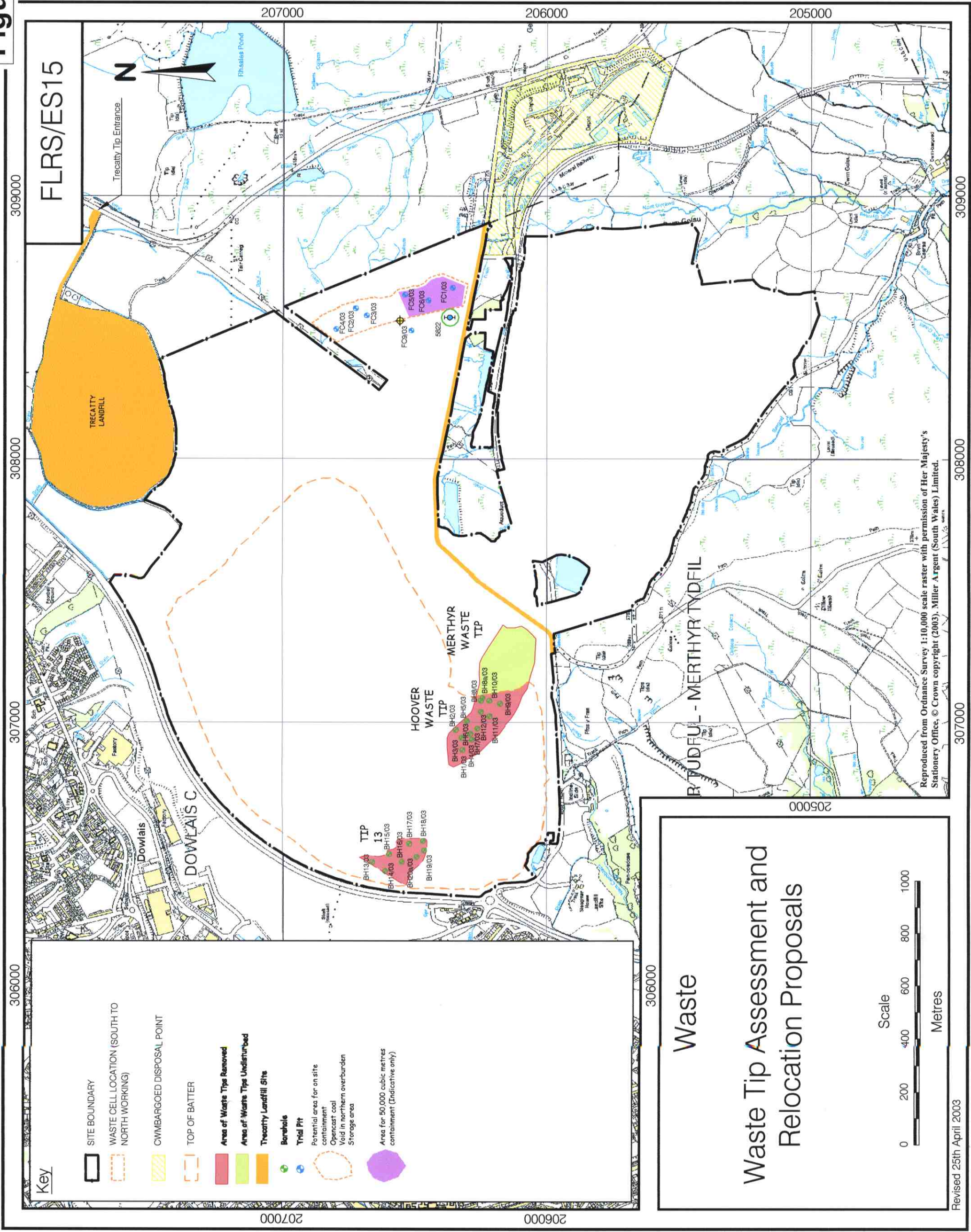
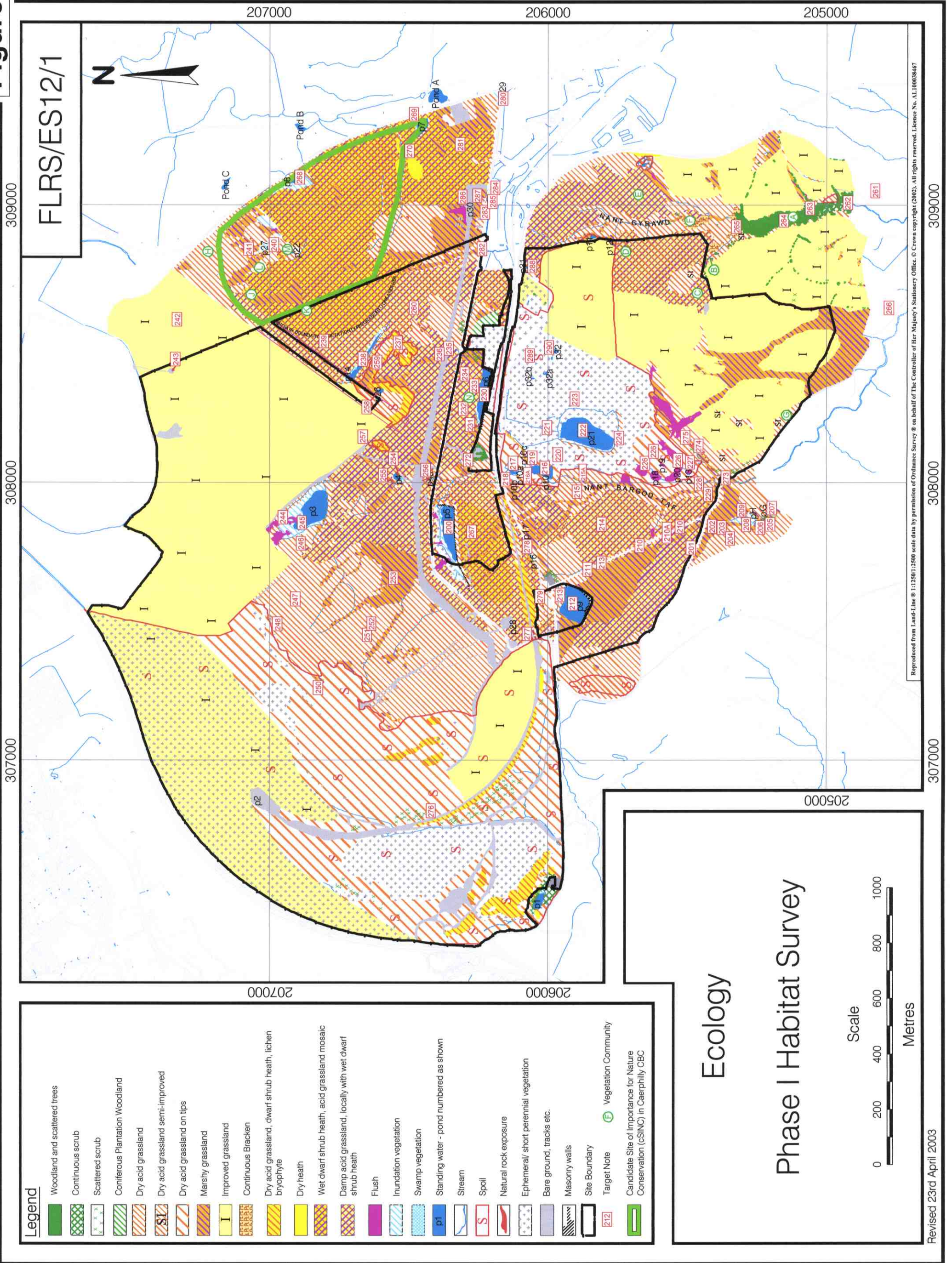


Figure 9



Reproduced from Ordnance Survey 1:10,000 scale raster with permission of Her Majesty's Stationery Office, © Crown copyright (2003), Miller Argent (South Wales) Limited.

Figure 10



- Legend**
- Woodland and scattered trees
 - Continuous scrub
 - Scattered scrub
 - Coniferous Plantation Woodland
 - Dry acid grassland
 - Dry acid grassland semi-improved
 - Dry acid grassland on tips
 - Marshy grassland
 - Improved grassland
 - Continuous Bracken
 - Dry acid grassland, dwarf shrub heath, lichen bryophyte
 - Dry heath
 - Wet dwarf shrub heath, acid grassland mosaic
 - Damp acid grassland, locally with wet dwarf shrub heath
 - Flush
 - Inundation vegetation
 - Swamp vegetation
 - Standing water - pond numbered as shown
 - Stream
 - Spoil
 - Natural rock exposure
 - Ephemeral/ short perennial vegetation
 - Bare ground, tracks etc.
 - Masonry walls
 - Site Boundary
 - Target Note
 - Vegetation Community
 - Candidate Site of Importance for Nature Conservation (cSINC) in Caerphilly CBC

Ecology

Phase I Habitat Survey

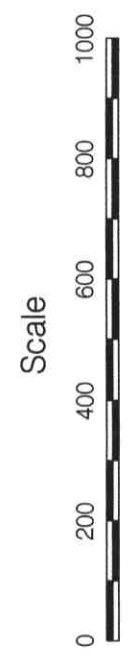
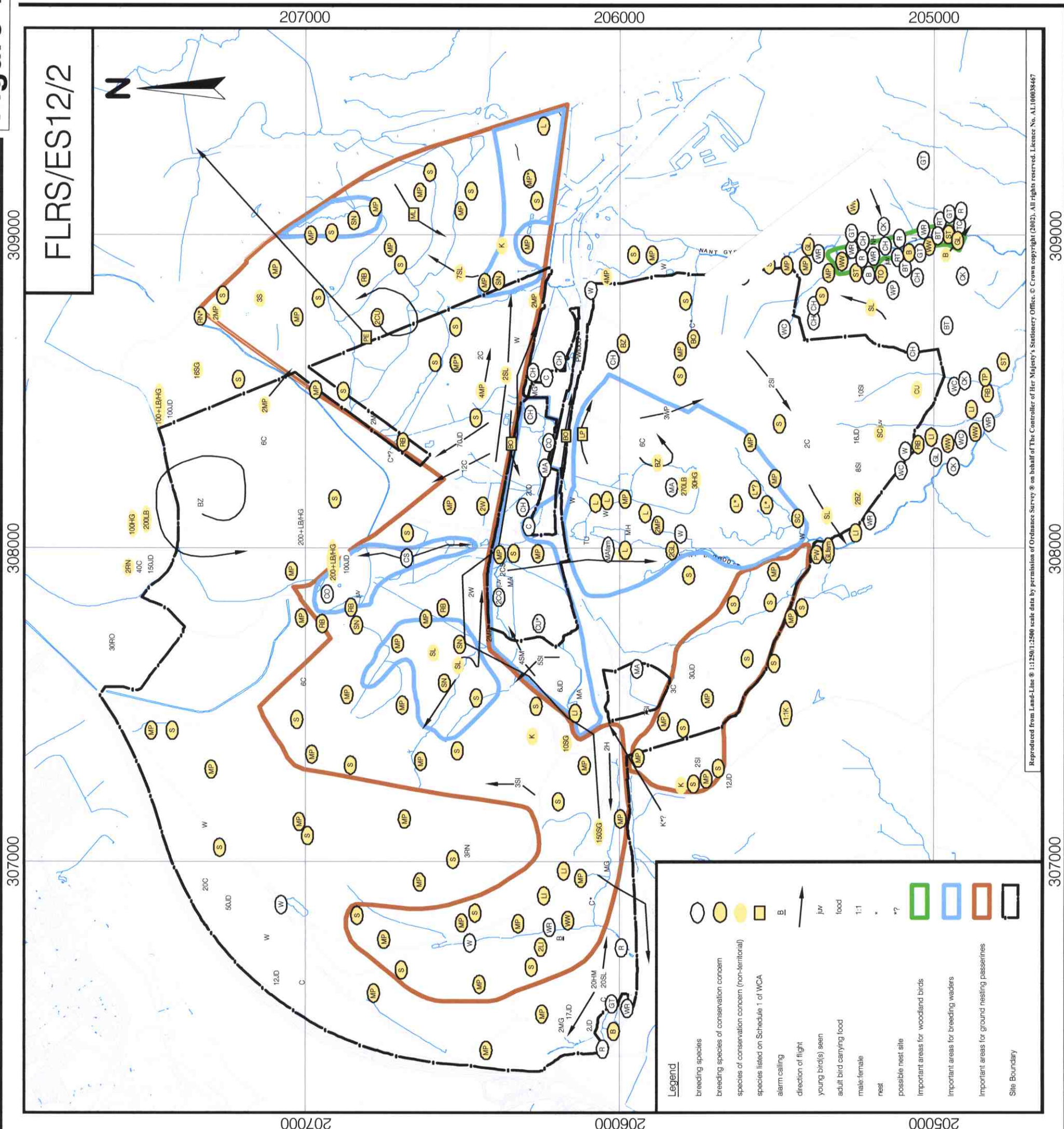


Figure 11



- Key to Bird Species**
- B Blackbird
 - BO Barn Owl
 - BT Blue Tit
 - BZ Buzzard
 - C Crow
 - CH Chaffinch
 - CK Cuckoo
 - CO Coot
 - CS Common Sandpiper
 - CU Curlew
 - GL Great Tit
 - GT Grey Wagtail
 - HG Grey Heron
 - HG Herring Gull
 - HM House Martin
 - J Jay
 - JD Jackdaw
 - K Kestrel
 - L Lapwing
 - LB Lesser Black-backed Gull
 - LJ Linnet
 - LP Little Ringed Plover
 - MA Mallard
 - MG Magpie
 - MH Moorhen
 - ML Merlin
 - MP Meadow Pipit
 - PE Peregrine
 - PW Pied Wagtail
 - R Robin
 - RB Reed Bunting
 - RN Raven
 - RO Rook
 - RT Redstart
 - S Skylark
 - SC Stonechat
 - SG Starling
 - SL Swallow
 - SM Sand Martin
 - SN Snipe
 - ST Song Thrush
 - TC Treecreeper
 - TO Tawny Owl
 - TP Tree Pipit
 - TU Tufted Duck
 - W Wheatear
 - WC Whinchat
 - WR Wren
 - WW Willow Warbler

Ecology

Breeding Bird Survey

Scale

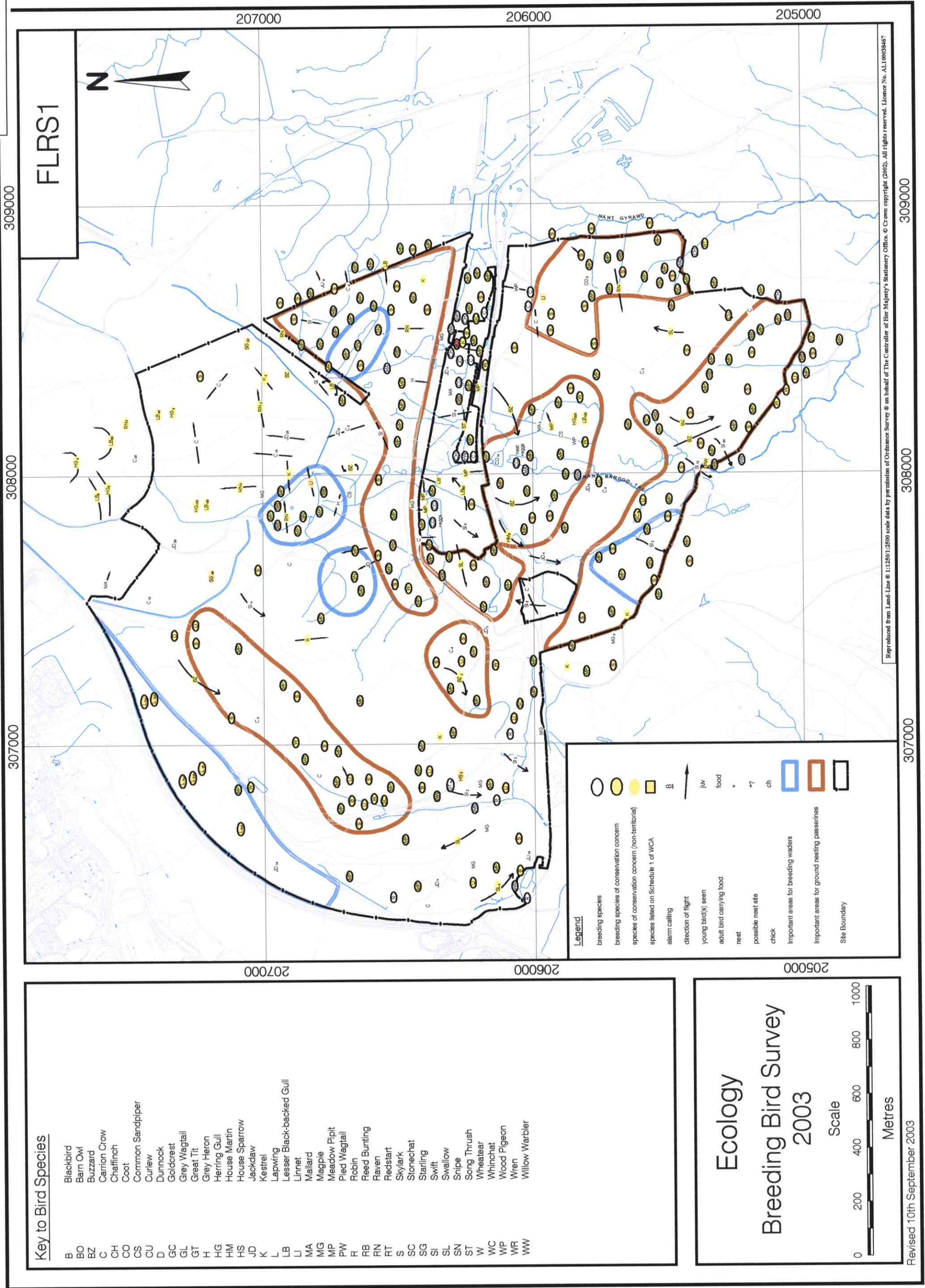
0 200 400 600 800 1000

Metres

Revised 13th April 2003

Reproduced from Land-Line © 1:25000 scale data by permission of Ordnance Survey © on behalf of The Controller of Her Majesty's Stationery Office. © Crown copyright (2002). All rights reserved. Licence No. A1100838467

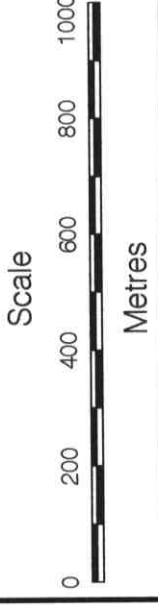
Figure 12



Key to Bird Species

- | | |
|----|--------------------------|
| B | Blackbird |
| BO | Barn Owl |
| BZ | Buzzard |
| C | Carrion Crow |
| CH | Chaffinch |
| CO | Coot |
| CS | Common Sandpiper |
| CU | Curlew |
| D | Duncock |
| GC | Goldcrest |
| GL | Grey Wagtail |
| GT | Great Tit |
| H | Grey Heron |
| HG | Herring Gull |
| HM | House Martin |
| HS | House Sparrow |
| JD | Jackdaw |
| K | Kestrel |
| L | Lapwing |
| LB | Lesser Black-backed Gull |
| LI | Linnet |
| MA | Mallard |
| MG | Magpie |
| MP | Meadow Pipit |
| PW | Pied Wagtail |
| R | Robin |
| RB | Reed Bunting |
| RN | Raven |
| RT | Redstart |
| S | Skylark |
| SC | Stonechat |
| SG | Starling |
| SI | Swift |
| SL | Swallow |
| SN | Snipe |
| ST | Song Thrush |
| W | Wheatear |
| WC | Whinchat |
| WP | Wood Pigeon |
| WR | Wren |
| WW | Willow Warbler |

Ecology
Breeding Bird Survey
2003



Revised 10th September 2003

Reproduced from Land-Line @ 1:12501:2500 scale data by permission of Ordnance Survey @ on behalf of The Controller of Her Majesty's Stationery Office. © Crown copyright (2002). All rights reserved. Licence No. AL100038467

Figure 13

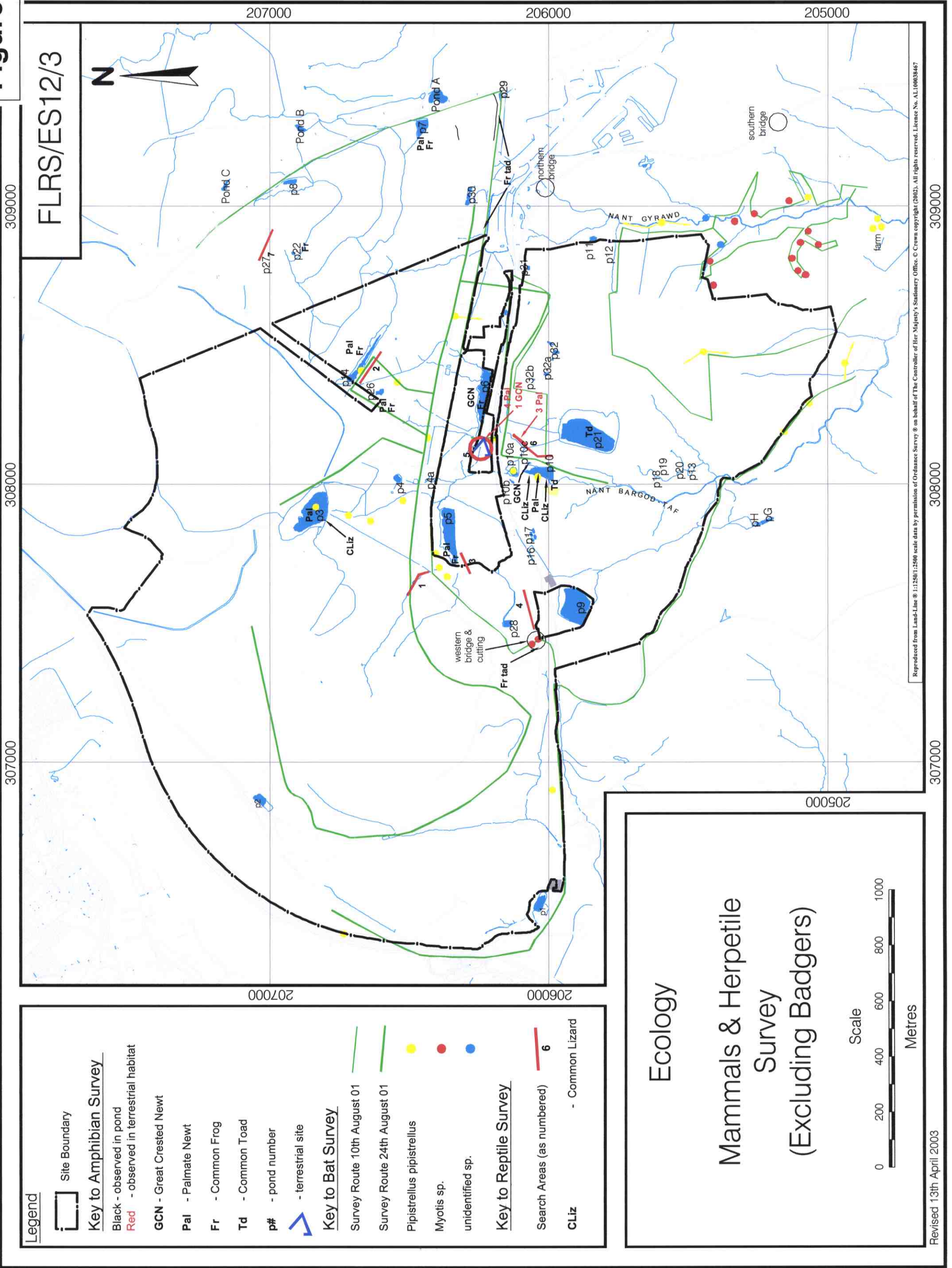
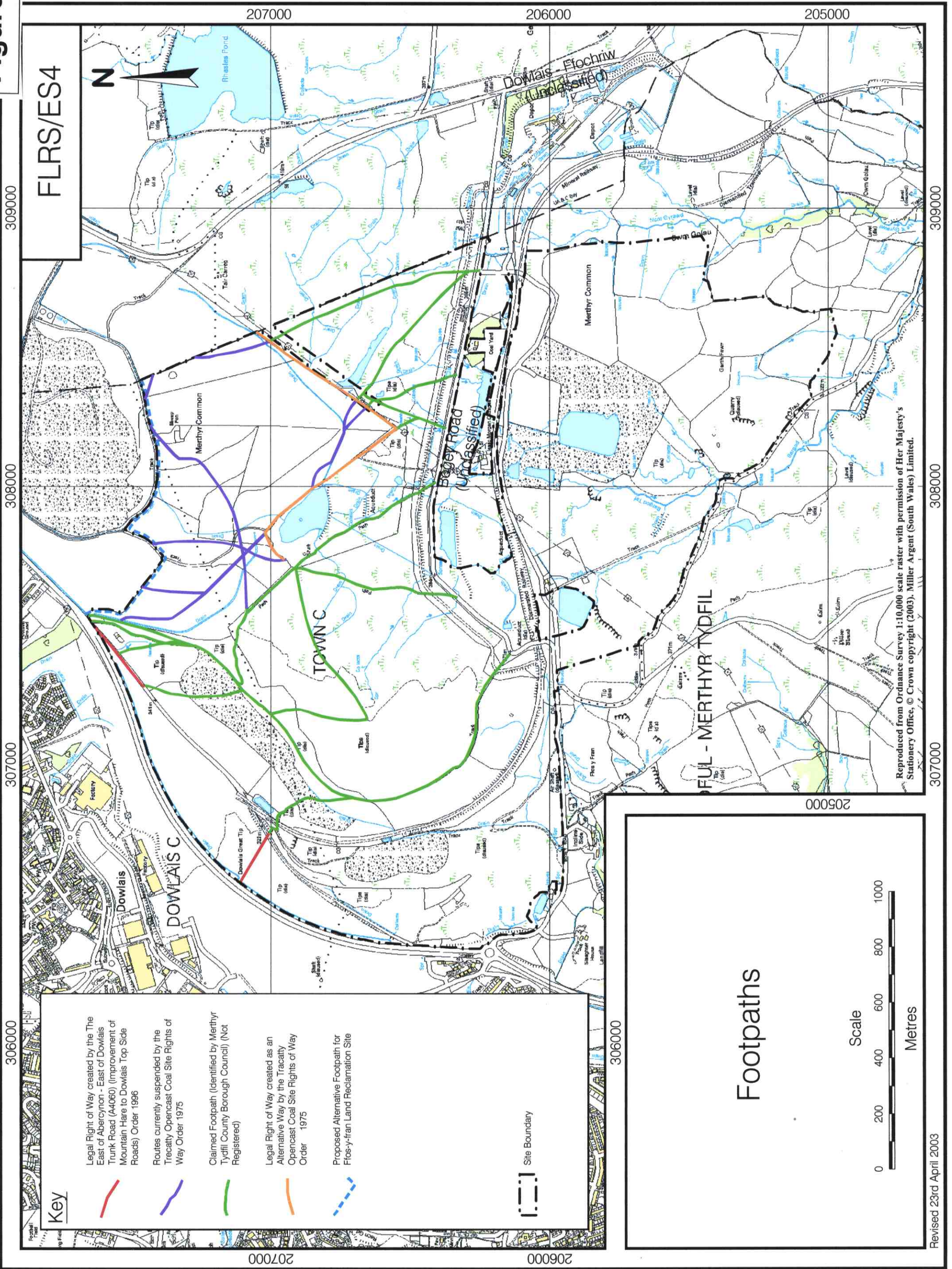


Figure 14



Key

- Legal Right of Way created by the East of Abercynon - East of Dowlais Trunk Road (A4060) (Improvement of Mountain Hare to Dowlais Top Side Roads) Order 1996
- Routes currently suspended by the Treacaty Opencast Coal Site Rights of Way Order 1975
- Claimed Footpath (Identified by Merthyr Tydfil County Borough Council) (Not Registered)
- Legal Right of Way created as an Alternative Way by the Treacaty Opencast Coal Site Rights of Way Order 1975
- Proposed Alternative Footpath for Ffos-y-fran Land Reclamation Site
- Site Boundary

Footpaths

Scale

0 200 400 600 800 1000

Metres

Appendices

Appendix A

Progressive restoration

306000

307000










308000

309000








Figure A1

Legend:






Operations:

-  Soil storage mounds
-  Overburden storage area
-  Extraction void
-  Backfilling in progress
-  Plant workshops
-  Direction of working
-  Direction of movement of material (dashed where intermittent)
-  Water treatment area
-  Sound baffle mound






Progressive Restoration:

-  Restoration contours @ 4.0m intervals
- Proposed Vegetation:
-  Upland grassland
-  Woodland and hedgerows
- Existing Vegetation:
-  Existing woodland and hedgerows
-  Coniferous plantation woodland
-  Areas within the site undisturbed by operations
-  Land beyond the site

Watercourses & waterbodies:

-  Streams
-  Ponds
-  Ponds for Great Crested Newts
-  Wetlands
-  Existing ponds

Other features:

-  Potential exposed section of opencast high wall
-  Stone wall boundary in lieu of hedgebank (if suitable stone is recovered)
-  Excavation boundary
-  Pylons and overhead power cables
-  Scheduled Ancient Monuments



207000

207000

206000

206000

306000

Progressive Restoration

Phase One Preliminary Operations

Scale

0 200 400 600 800 1000

Metres

205000

205000

Reproduced from Ordnance Survey 1:10,000 scale raster with permission of Her Majesty's Stationery Office, © Crown copyright (2003), Miller Argent (South Wales) Limited.

307000

308000

309000

306000

307000

308000

309000

Figure A2

Legend:

Operations:

- Soil storage mounds
- Overburden storage area
- Extraction void
- Backfilling in progress
- Plant workshops
- Direction of working
- Direction of movement of material (dashed where intermittent)
- Water treatment area

Progressive Restoration:

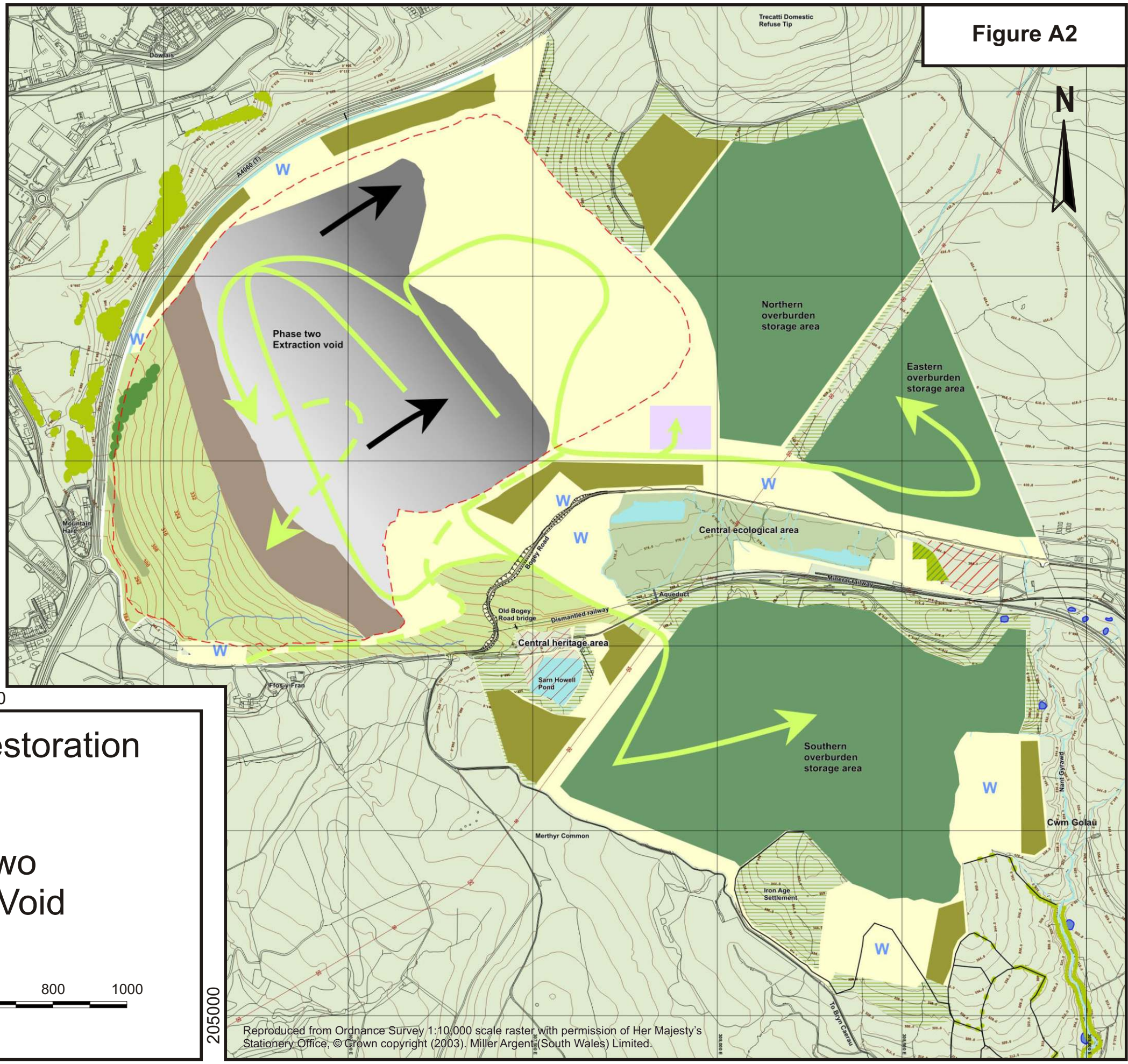
- Restoration contours @ 4.0m intervals
- Proposed Vegetation:**
- Upland grassland
- Woodland and hedgerows
- Existing Vegetation:**
- Existing woodland and hedgerows
- Coniferous plantation woodland
- Areas within the site undisturbed by operations
- Land beyond the site

Watercourses & waterbodies:

- Streams
- Ponds
- Ponds for Great Crested Newts
- Wetlands
- Existing ponds

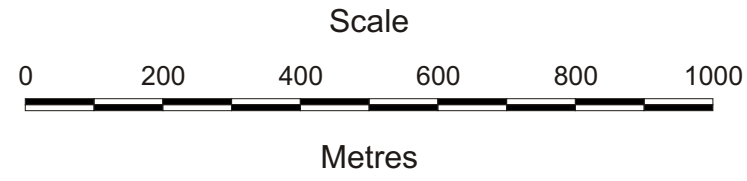
Other features:

- Potential exposed section of opencast high wall
- Stone wall boundary in lieu of hedgebank (if suitable stone is recovered)
- Excavation boundary
- Pylons and overhead power cables
- Scheduled Ancient Monuments



Progressive Restoration

Phase Two Maximum Void



Reproduced from Ordnance Survey 1:10,000 scale raster with permission of Her Majesty's Stationery Office, © Crown copyright (2003), Miller Argent (South Wales) Limited.

306000

307000

308000

309000

Figure A3

Legend:

Operations:

- Soil storage mounds
- Overburden storage area
- Extraction void
- Backfilling in progress
- Plant workshops
- Direction of working
- Direction of movement of material (dashed where intermittent)
- Water treatment area
- Sound baffle mound

Progressive Restoration:

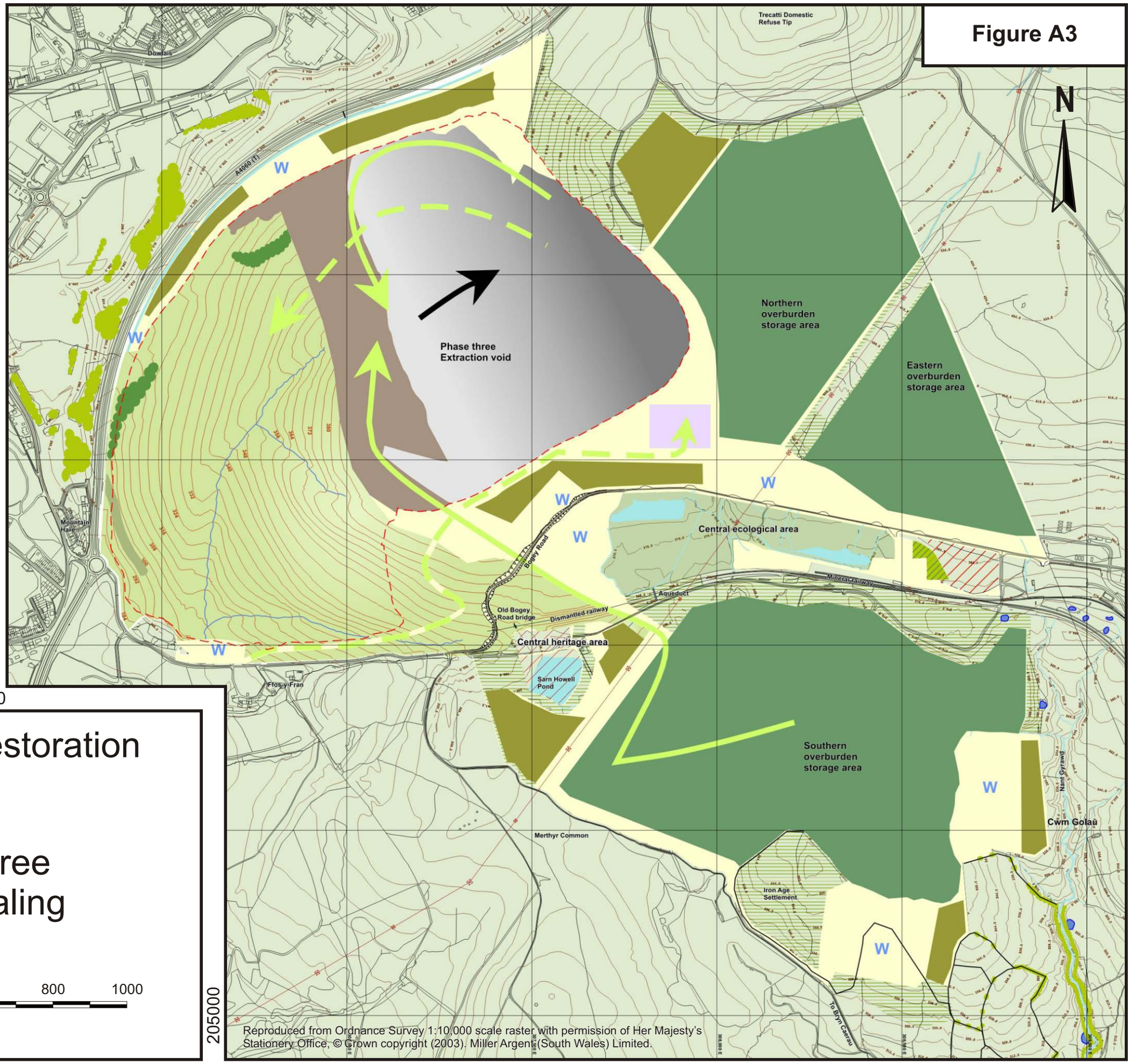
- Restoration contours @ 4.0m intervals
- Proposed Vegetation:
 - Upland grassland
 - Woodland and hedgerows
- Existing Vegetation:
 - Existing woodland and hedgerows
 - Coniferous plantation woodland
 - Areas within the site undisturbed by operations
 - Land beyond the site

Watercourses & waterbodies:

- Streams
- Ponds
- Ponds for Great Crested Newts
- Wetlands
- Existing ponds

Other features:

- Potential exposed section of opencast high wall
- Stone wall boundary in lieu of hedgebank (if suitable stone is recovered)
- Excavation boundary
- Pylons and overhead power cables
- Scheduled Ancient Monuments



207000

207000

206000

206000

306000

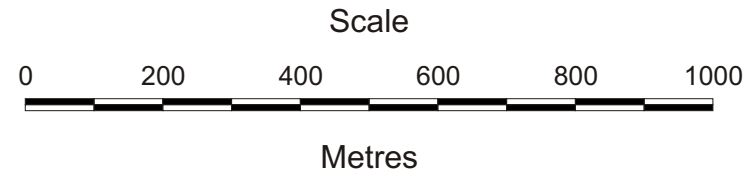
307000

308000

309000

Progressive Restoration

Phase Three End of Coaling



205000

205000

Reproduced from Ordnance Survey 1:10,000 scale raster with permission of Her Majesty's Stationery Office, © Crown copyright (2003), Miller Argent (South Wales) Limited.

307000

308000

309000

306000

307000









308000

309000


Figure A4

Legend:



Operations:

-  Soil storage mounds
-  Overburden storage area
-  Extraction void
-  Backfilling in progress
-  Plant workshops
-  Direction of working
-  Direction of movement of material (dashed where intermittent)
-  Water treatment area





Progressive Restoration:

-  Restoration contours @ 4.0m intervals






Proposed Vegetation:

-  Upland grassland
-  Woodland and hedgerows






Existing Vegetation:

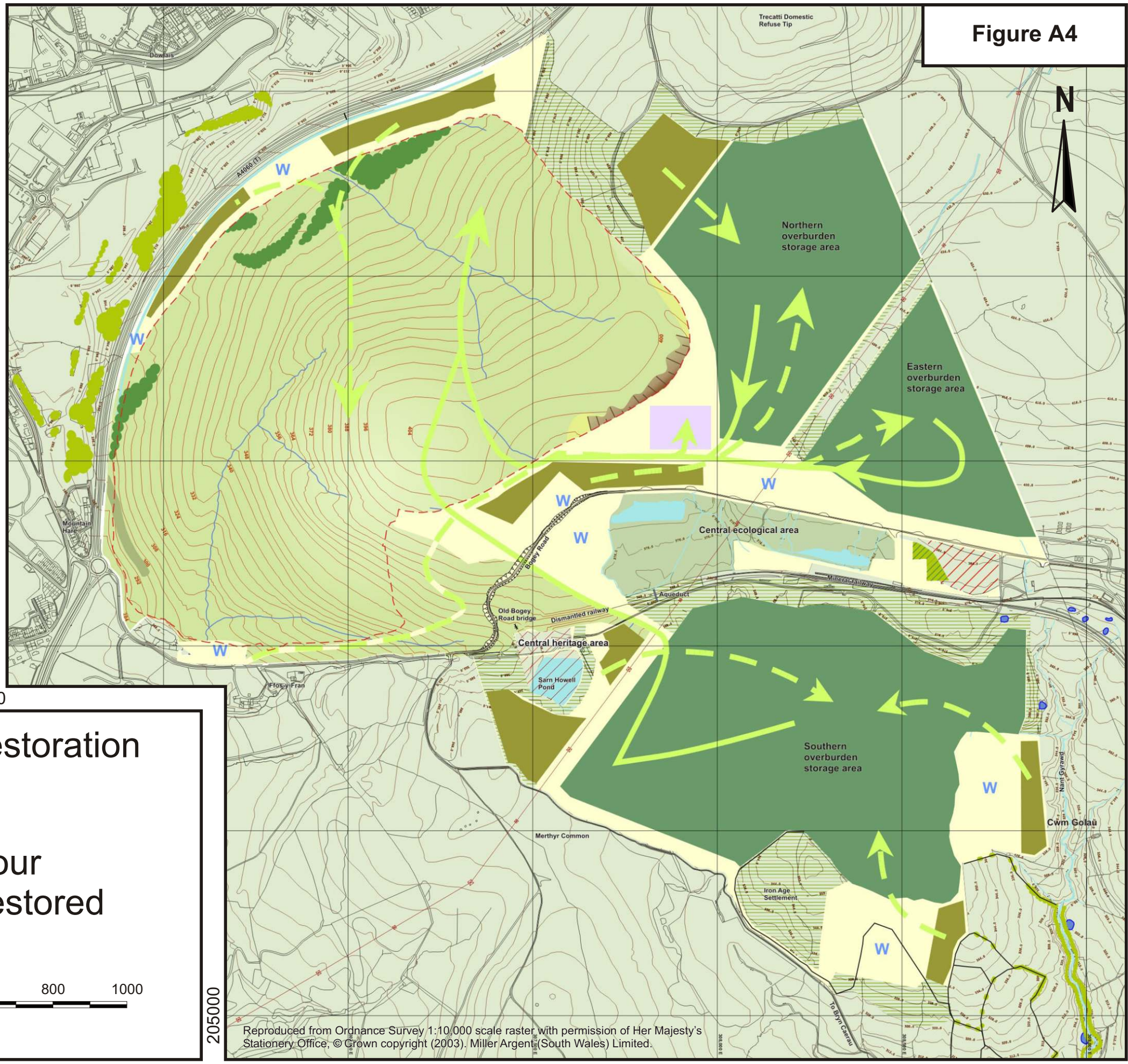
-  Existing woodland and hedgerows
-  Coniferous plantation woodland
-  Areas within the site undisturbed by operations
-  Land beyond the site

Watercourses & waterbodies:

-  Streams
-  Ponds
-  Ponds for Great Crested Newts
-  Wetlands
-  Existing ponds

Other features:

-  Potential exposed section of opencast high wall
-  Stone wall boundary in lieu of hedgebank (if suitable stone is recovered)
-  Excavation boundary
-  Pylons and overhead power cables
-  Scheduled Ancient Monuments



207000

207000

206000

206000

306000

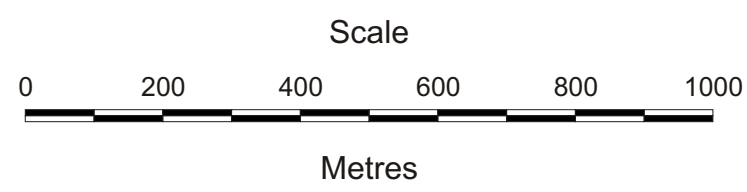
307000

308000

309000

Progressive Restoration

Phase Four Final Void Restored



205000

205000

Reproduced from Ordnance Survey 1:10,000 scale raster with permission of Her Majesty's Stationery Office, © Crown copyright (2003), Miller Argent (South Wales) Limited.

307000

308000

309000

Appendix B

Restoration of opencast coal sites: photographic record

Restoration of opencast coal sites
photographic record

PARK SLIP

Operational Opencast Site with Progressive Restoration



1996

Photograph 1 : View of the restored pond and wetland

SITE INFORMATION

Location : West of Aberkenfig
Approximately 2.0km from Bridgend

Ownership : British Coal

Size : 176 Ha

Tonnage : 2,330,215 (301/701 coking)

Coaling operations commenced : 1971

Coaling operations completed : 1979

Aftercare commenced : Progressive

Aftercare completed : 1992

Proposed/Restored landuse : Agriculture/Forestry/Nature conservation

Comments : The site has been progressively restored since 1984, initially for agriculture and more recently for nature conservation, with the creation of lakes, ponds, wetlands, rush meadows and wildflower meadows.

PARK SLIP

Operational Opencast Site with Progressive Restoration

Photograph 2 :
Example of a typical
restored watercourse
(1996)



Photograph 3 :
View of the restored lake
(1996)



PARK SLIP

Operational Opencast Site with Progressive Restoration



Photograph 4

Hedgerow and verge on
access road in August 1997



Photograph 5

PARK SLIP

Operational Opencast Site with Progressive Restoration



Photograph 6

Woodland planting and
grassland in August 1997



Photograph 7

PARK SLIP

Operational Opencast Site with Progressive Restoration



Hedgerow on bank in
August 1997

Photograph 8

PARK SLIP

Operational Opencast Site with Progressive Restoration



Photograph 9 : General view of restored pond and wetland with woodland in foreground and background.

2005



Photograph 10 : Restored Wetland

2005

PARK SLIP

Operational Opencast Site with Progressive Restoration



Photograph 11 : Watercourse - detail of cascade.

2005



Photograph 12 : Reed bed detail.

2005

PARK SLIP

Operational Opencast Site with Progressive Restoration



Photograph 13 : Restored marshy grassland.

2005



Photograph 14 : Restored footpath in wooded area.

2005

LLANILID WEST

Operational Opencast Site with Progressive Restoration



1996

Photograph 15: View of part of the restored site

SITE INFORMATION

Location	:	East of Pencoed Approximately 5.0km east of Bridgend, Mid Glamorgan.
Ownership	:	Celtic Energy Ltd
Size	:	271 Ha
Tonnage	:	c 700,000 (301/701 coking/Bit)
Coaling operations commenced	:	1970/1993
Coaling operations completed	:	1997
Aftercare commenced	:	Progressive
Aftercare completed	:	On-going
Proposed/Restored landuse	:	Agriculture/Amenity
Comments	:	Generally the restored hedgebanks across the site are poor. Sections of these are now being re-worked using a lower, wider bank profile, denser planting and more diverse species mix. Trials are also being undertaken with the use of rabbit guards.

LLANILID WEST

Operational Opencast Site with Progressive Resoration

Photograph 16:

Translocated hedgebank, majority of plants cut back with some standards retained and guyed. Trees beginning to re-establish.

1996



Photograph 17:

Existing hedgebank from alongside the Parish Road translocated in 2m sections, undertaken in 1990.



LLANILID WEST

Operational Opencast Site with Progressive Restoration



1996

Photograph 18: Re-worked restored hedgebanks with low, wide profile and rabbit guards (Previously restored hedgebank visible beyond)



1996

Photograph 19: Reworked restored hedgebank, again with wide, low profile and denser planting, but without rabbit guards.

LLANILID WEST

Operational Opencast Site with Progressive Resoration



1996

Photograph 20: Example of the temporary seeding of the drift head batter to limit visual intrusion.



1996

Photograph 21: Example of the successful seeding and natural establishment of vegetation on the drift head batter, significantly reducing its visual impact.

LLANILID WEST

Operational Opencast Site with Progressive Restoration



Photograph 22 : View towards Pencoed showing restored grassland and woodland.

2005



Photograph 23 : Restored grassland with gorse in the middle ground.

2005

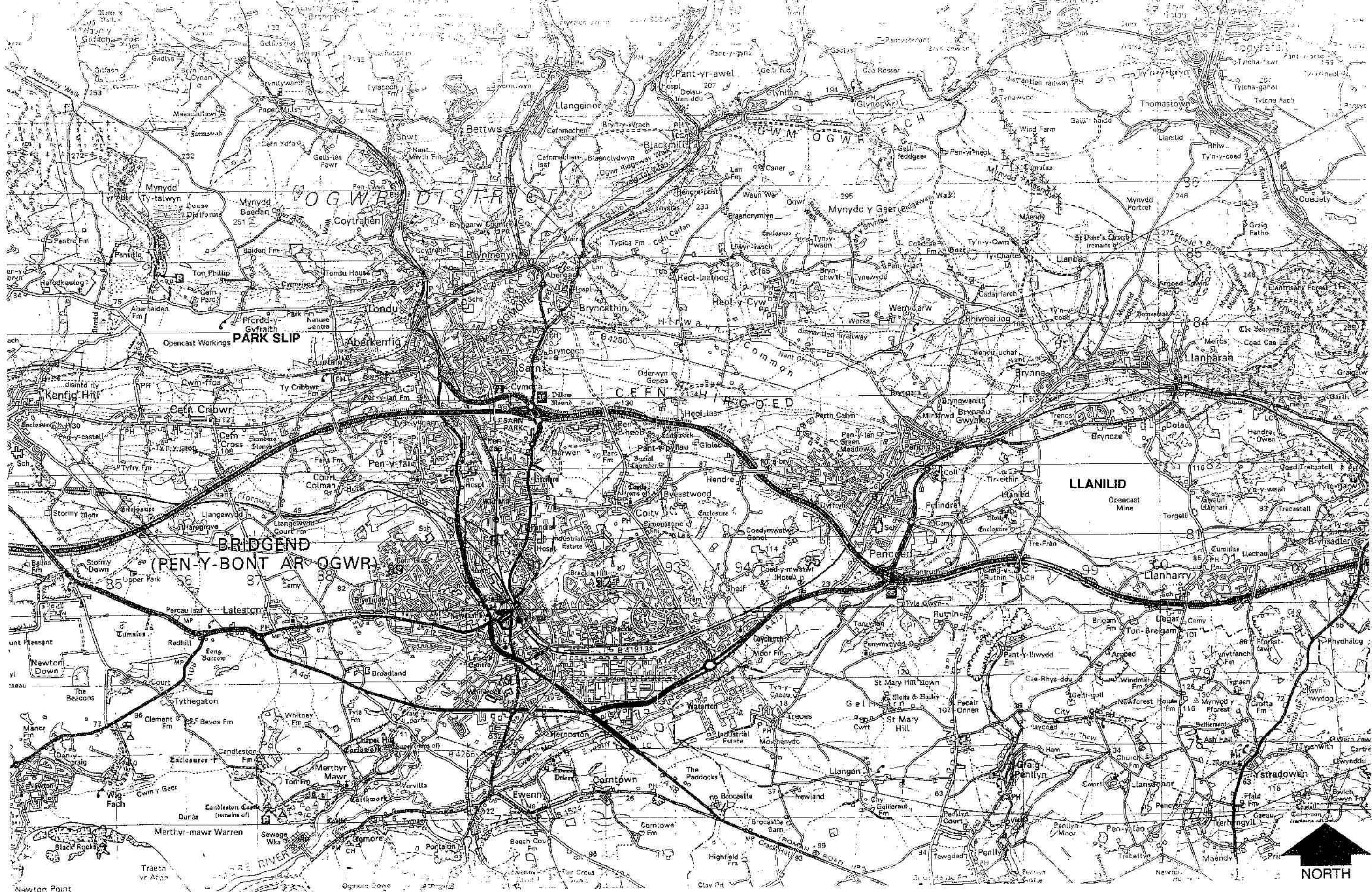
LLANILID WEST

Operational Opencast Site with Progressive Restoration



Photograph 24 : Restored grassland with shrubs and trees.

2005



LOCATION PLAN
Scale 1 : 50,000

BANWEN
Restored Opencast Site



1996

Photograph 25 : View of the restored site.

SITE INFORMATION

Location : East of the village of Banwen, adjacent to the A4109 to Abercraf. Approximately 3km north-west of Glyn-neath, West Glamorgan.

Ownership : British Coal

Size : 31 Ha

Tonnage : c 75,000 (102)

Coaling operations commenced : 1993

Coaling operations completed : 1994

Aftercare commenced : 1994

Aftercare completed : 1998

Proposed/Restored landuse : Agriculture

Comments :

BANWEN
Restored Opencast Site



1996

Photograph 26 : Restored grassland with heather transplants, recently implemented reflecting landform and habitat of adjacent land.



1996

Photograph 27 : Land adjacent to the restored area illustrated above.

BANWEN

Operational Opencast Site with Progressive Restoration



Photograph 28 : Pond and marginal vegetation well established.

2005



Photograph 29 :
Restored grassland and watercourse
blending with surrounding landscape.
2005

BANWEN

Operational Opencast Site with Progressive Restoration



Photograph 30 :
Watercourse detail at farm
access crossing
2005

NANT HELEN

Operational Opencast Site with Progressive Restoration



2005

Photograph 31 : View of restored site showing upland grassland, bogland, woodland and watercourse.

SITE INFORMATION

Location : South of the village of Abercraf, to the north-east of Ystradgynlais on the southern slopes of the Upper Tawe Vale

Ownership : Celtic Energy Ltd

Size : 306 Ha

Tonnage : 3.4 Mt

Coaling operations commenced : 1986

Coaling operations completed : 1998

Aftercare commenced : 1996

Aftercare completed : On-going

Proposed/Restored landuse : Agriculture, forestry, woodland

Comments :

NANT HELEN

Operational Opencast Site with Progressive Restoration



Photograph 32 : View towards bogland with upland grassland in the foreground crossed by a watercourse with ponds.

2005



Photograph 33 : Pond in bogland area

2005

NANT HELEN

Operational Opencast Site with Progressive Restoration



2005

Photograph 34 : Bogland and heather area



2005

Photograph 35 : Bogland and heather area detail fenced from commonland grazing.

NANT HELEN

Operational Opencast Site with Progressive Restoration



Photograph 36 :
Detail of marshy grassland
2005

BRYNHENLLYS

Operational Opencast Site with Progressive Restoration



2005

Photograph 37 : View from bridleway across restored site

SITE INFORMATION

Location : Cwmtwrch

Ownership : Celtic Energy Ltd

Size : 226 Ha

Tonnage : 1.1 Mt

Coaling operations commenced : 1996

Coaling operations completed : 2003

Aftercare commenced : 1999 (In part)

Aftercare completed : On-going

Proposed/Restored landuse : Enclosed agricultural land and woodland

Comments :

BRYNHENLLYS

Operational Opencast Site with Progressive Restoration



Photograph 38 : Restored Grassland

2005



Photograph 39 : View over site with marshy grassland in the foreground

2005

BRYNHENLLYS

Operational Opencast Site with Progressive Restoration



Photograph 40 : Restored Grassland

2005



Photograph 41 : Detail of marshy grassland

2005

BRYNHENLLYS

Operational Opencast Site with Progressive Restoration

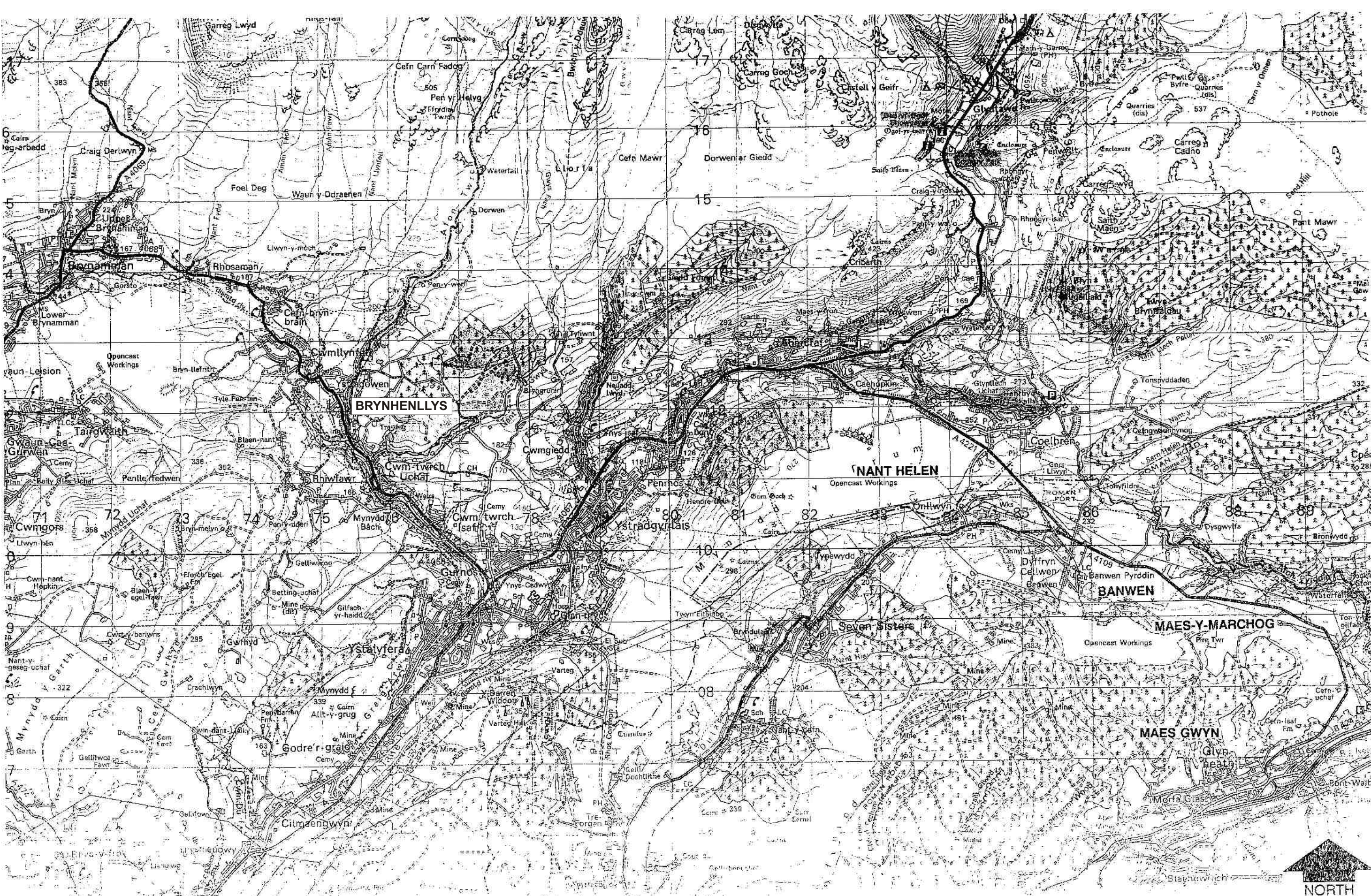


Photograph 42 :
Detail of wetland area
2005



Photograph 43 : Restored Grassland

2005



LOCATION PLAN
Scale 1 : 50,000

Appendix C

Provision of lapwing habitat during the works

Lapwing Breeding Areas and Phasing of the Works

Year	Area				
	EMLRS Phase 2 Restoration	Ryan's Tip	Northern Overburden Storage Mound	Eastern Overburden Storage Mound	Southern Overburden Storage Mound
2006	The current breeding area to the east of the A4060 would not be affected	Previous breeding site and the adjoining grassland area to the east, would be made more attractive as lapwing breeding habitat by levelling of existing mounds of spoil, and creation of shallow scrapes during late summer			
2007	Lapwings (and other ground nesting birds) would be deterred from breeding in the southern section which would be excavated as part of the initial box cut. The northern part would remain undisturbed during the breeding season. From August onwards soil storage mounds and a water treatment lagoon would be constructed along the western margin alongside the A4060.	Lapwings would be encouraged to breed by use of decoys. This area would remain undisturbed during the breeding season.	Construction of the overburden mound would commence.	Construction of the overburden mound would commence.	
2008	Lapwings (and other ground nesting birds) would be deterred from breeding in a further strip of land which would then be excavated.	The area would remain undisturbed during the breeding season. Lapwings would be encouraged to breed by use of decoys.	Construction of the overburden mound would continue.	Construction of the overburden mound would continue.	Soils would be stripped over the western and southern parts of the overburden storage area.
2009	Lapwings (and other ground nesting birds) would be deterred from breeding in a further strip of land which would then be excavated.	The lapwing breeding area would be reduced in size through construction of the southern overburden storage mound. Lapwings (and other ground nesting birds) would be deterred from breeding in the area which would be affected. Lapwings would be encouraged to breed in the remainder of the area by use of decoys.	Construction of the overburden mound would be completed and the mound seeded. The top of the mound would be prepared to provide lapwing breeding areas by provision of clay lined depressions (which would hold surface water) and scrapes. Application of organic matter, such as farmyard manure would be considered to encourage development of soil invertebrate populations.	Construction of the overburden mound would be completed.	Construction of the overburden mound would commence.
2010	Lapwings (and other ground nesting birds) would be deterred from breeding in the remainder of this area which would then be excavated.	The lapwing breeding area would be further reduced in size through construction of the southern overburden storage mound. Lapwings (and other ground nesting birds) would be deterred from breeding in the area which would be affected.	Lapwings would be encouraged to breed in this area by use of decoys. Habitat management would be carried out as necessary	The top of the mound would be seeded and prepared to provide lapwing breeding areas by provision of clay lined depressions (which would hold surface water) and scrapes. Application of organic matter, such as farmyard manure would be considered to encourage development of soil invertebrate populations.	Construction of the southern overburden mound would continue.
2011 - 2019		The lapwing breeding area would be lost through completion of the southern overburden store. Lapwings (and other ground nesting birds) would be deterred from breeding in the area which would be affected.	Lapwings would be encouraged to breed by use of decoys. Habitat management would be carried out as necessary	Lapwings would be encouraged to breed by use of decoys. Habitat management would be carried out as necessary	The southern overburden mound would be completed.
2020			Lapwings would be encouraged to breed by use of decoys. Habitat management would be carried out as necessary	Lapwings would be encouraged to breed by use of decoys. Habitat management would be carried out as necessary	The northern part of the southern overburden mound would be removed and the area restored to provide a lapwing breeding area.
2021			Overburden would be removed and the area restored. Lapwings would be deterred from breeding in this are if necessary.	Overburden would be removed and the area restored. Lapwings would be deterred from breeding in this are if necessary.	Lapwings would be encouraged to breed by use of decoys. Habitat management would be carried out as necessary
2022					Habitat management would be carried out as required.

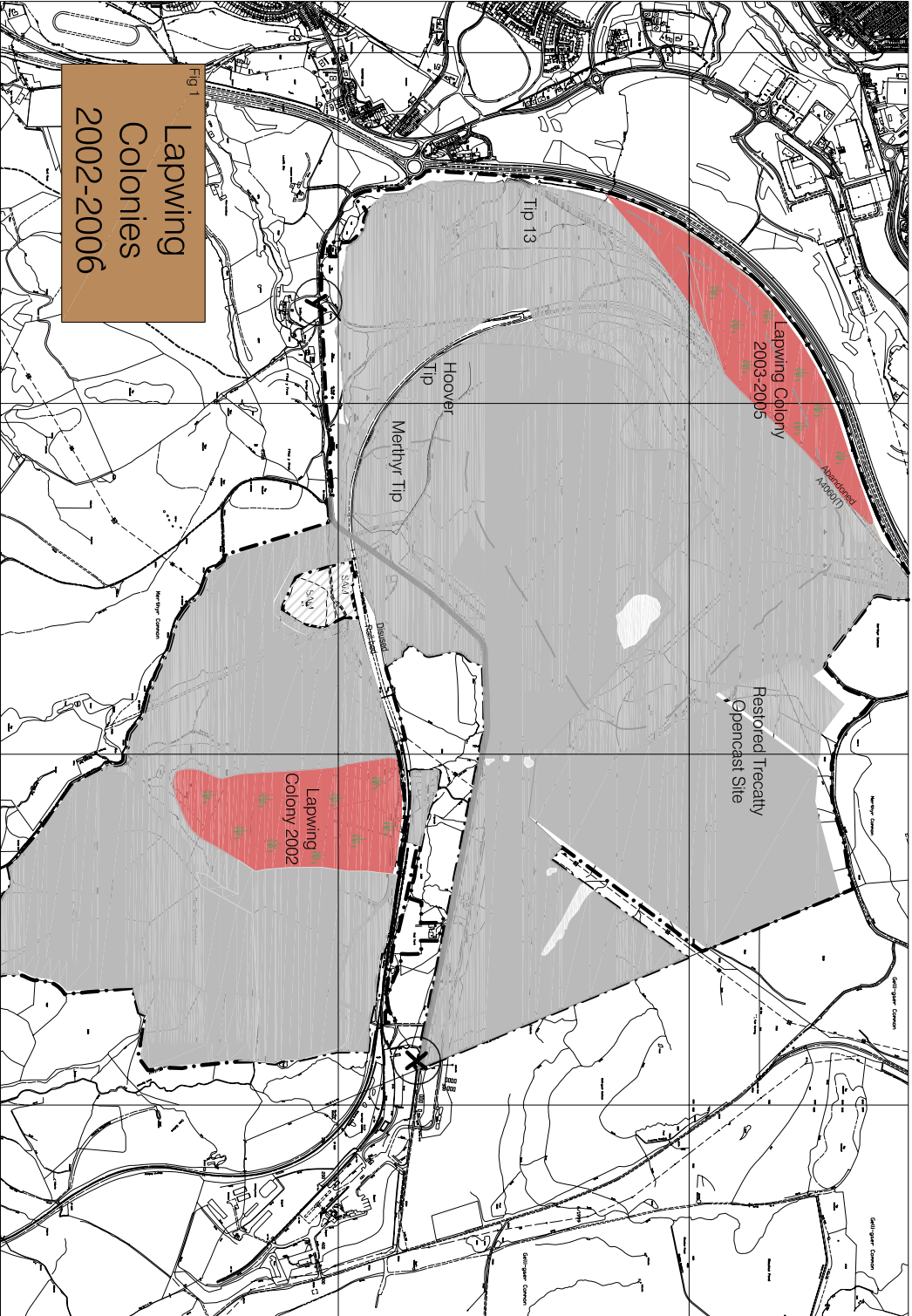


Fig 1
Lapwing Colonies 2002-2006

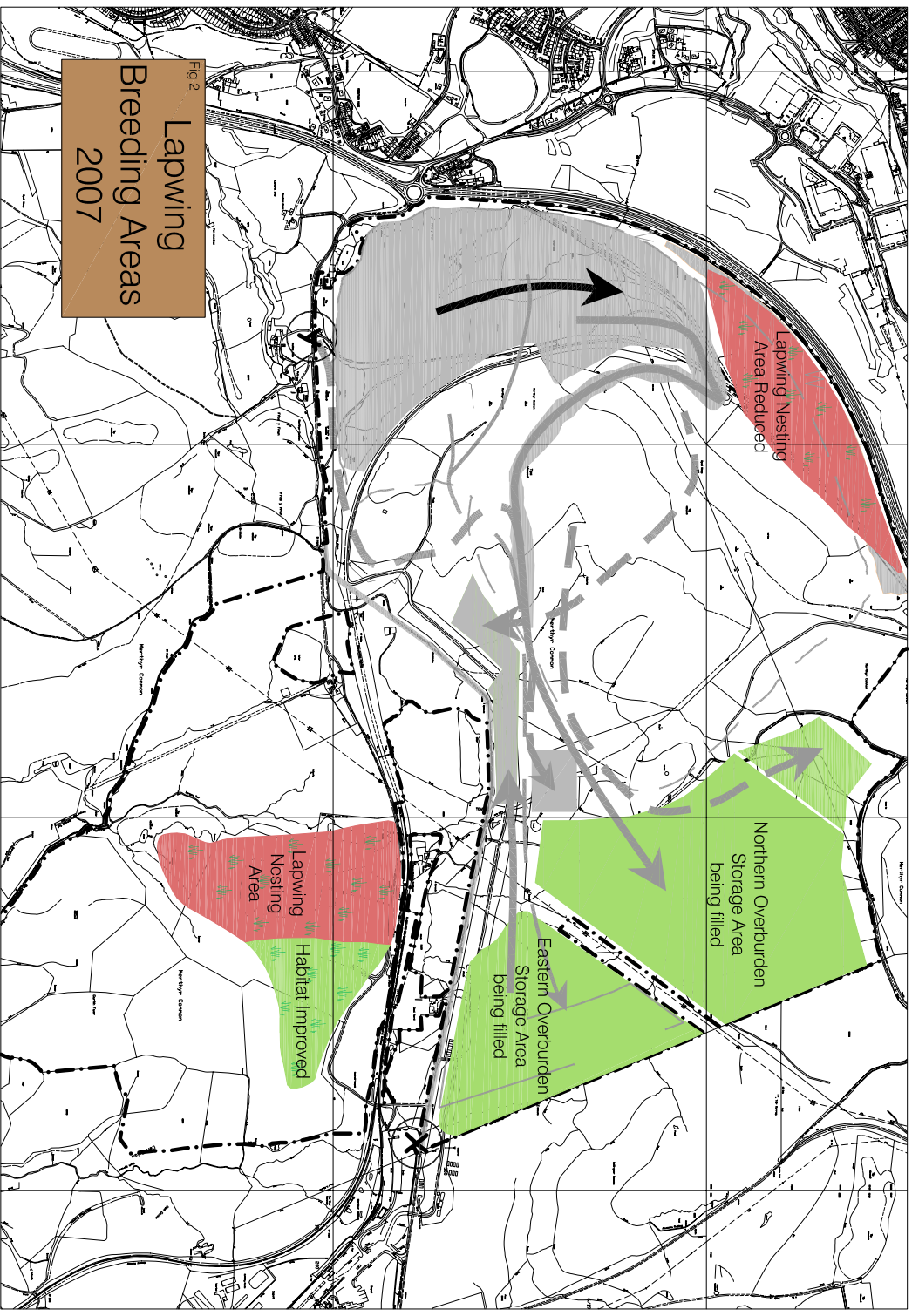


Fig 2
Lapwing Breeding Areas 2007

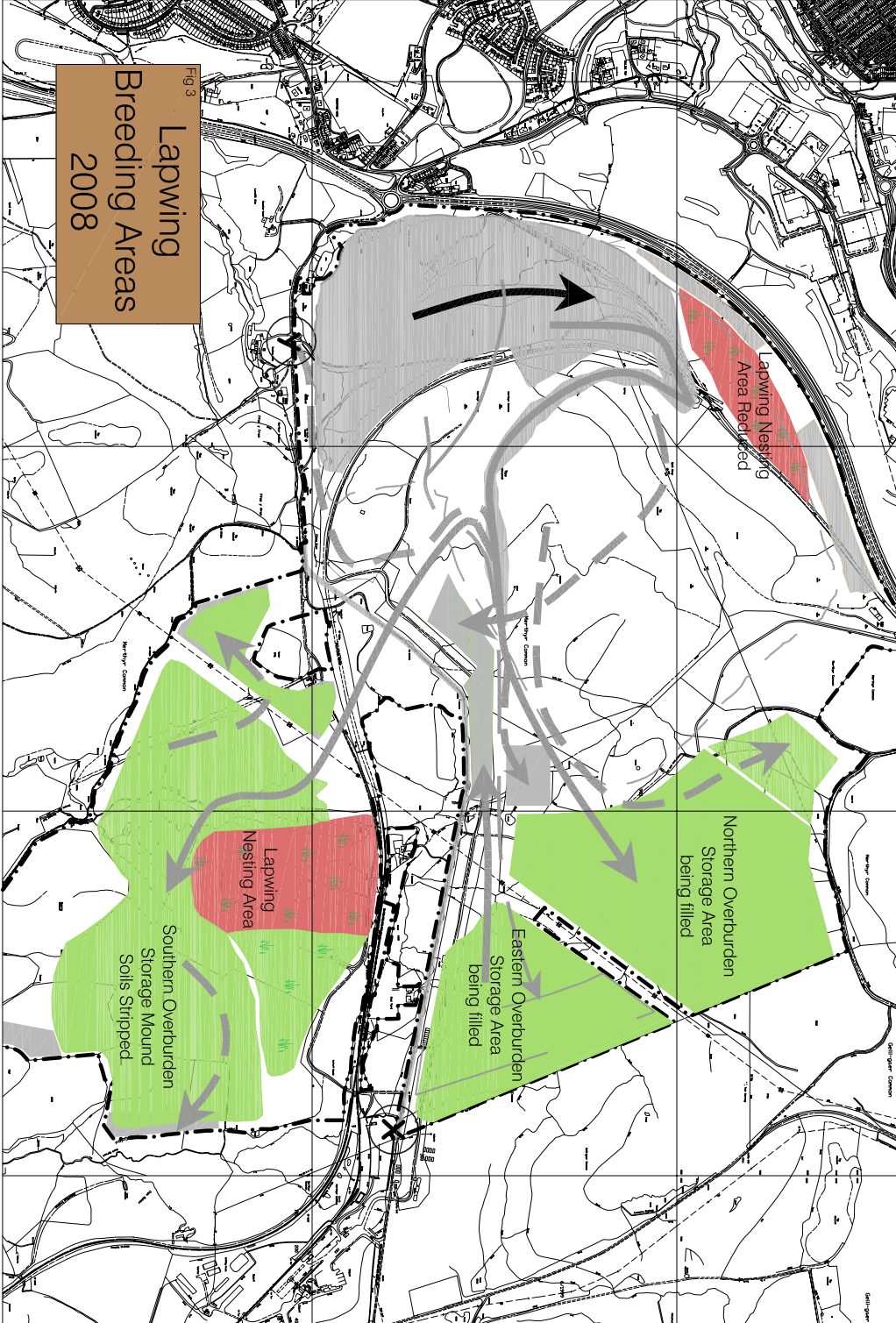


Fig 3
Lapwing Breeding Areas 2008

- Key**
-  Lapwing Nesting Habitat
 -  Site Boundary
 -  Limit of Excavation
 -  Direction of Working
 -  General material or plant movement direction dashed where intermittent



Project
**Ffos-y-Fran
Land Reclamation Scheme**

Title
Provision of Lapwing Habitat

Project Number	Figure Numbers
4533	1-3
Scale	Date
1:10,000	May 2007
O:\4533\Cadfiles\4533D050411_MM_Fig1-3.dwg	

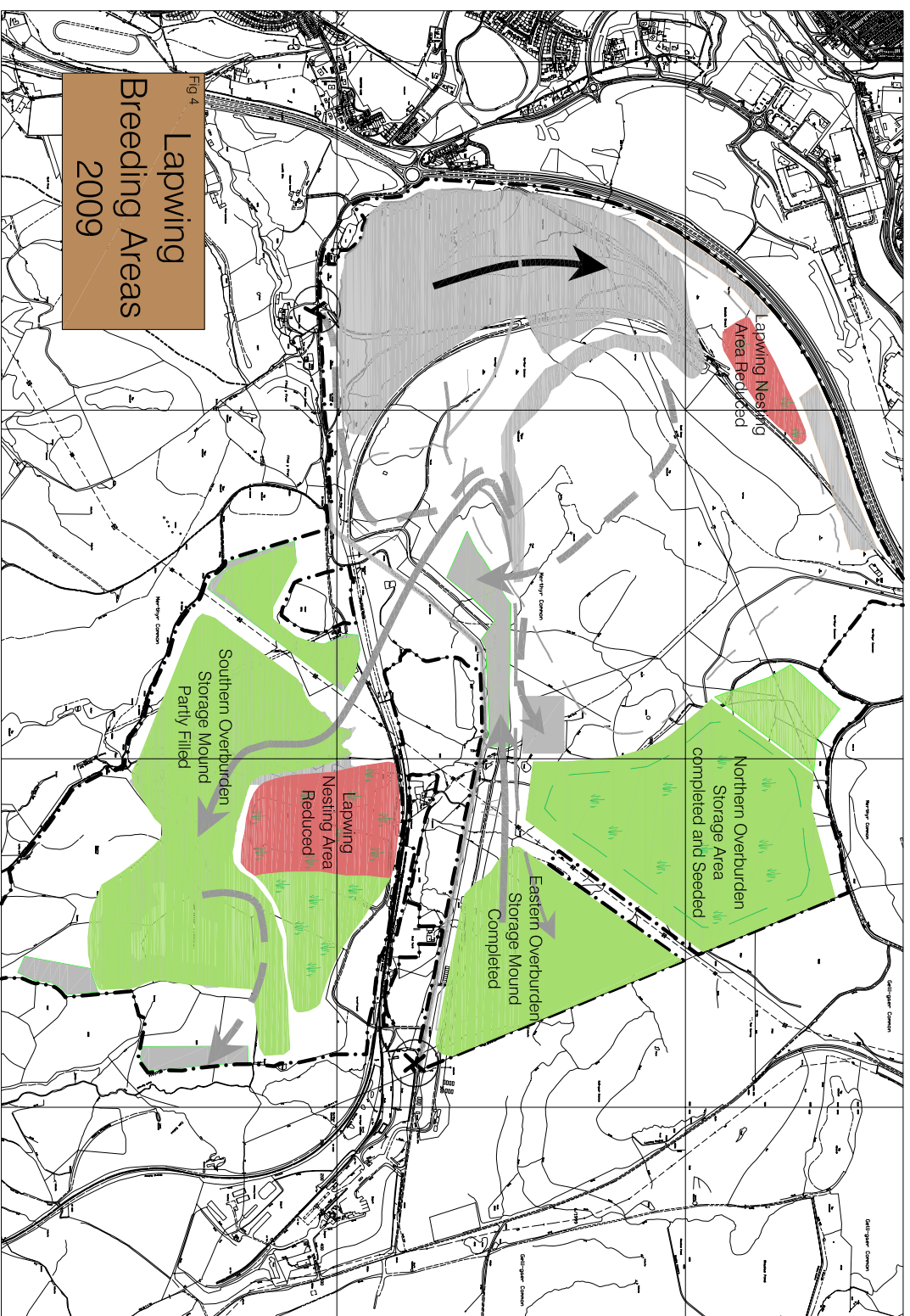


Fig 4
Lapwing
Breeding Areas
2009

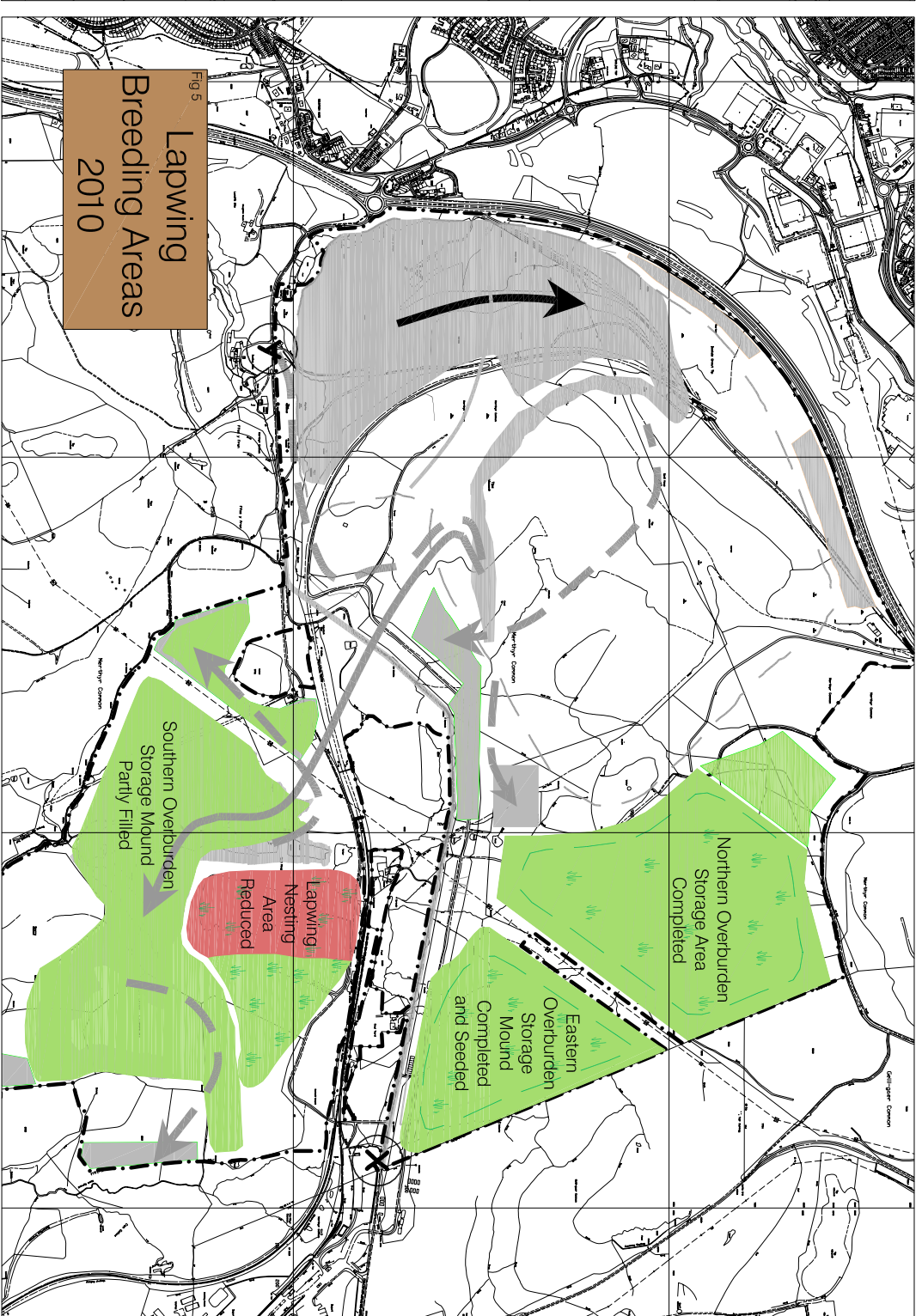


Fig 5
Lapwing
Breeding Areas
2010

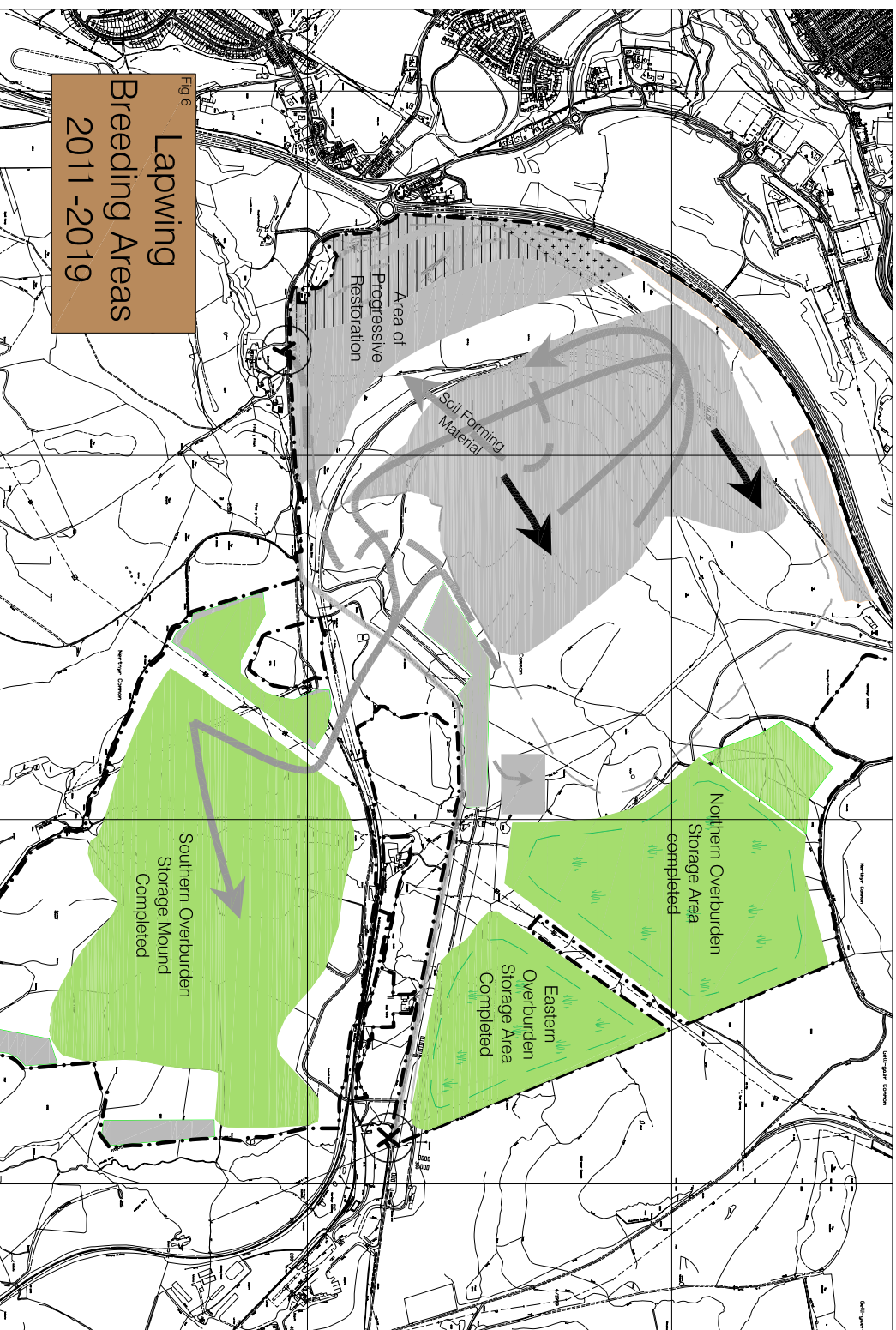



Fig 6
Lapwing
Breeding Areas
2011 -2019

- Key**
-  Lapwing Nesting Habitat
 -  Site Boundary
 -  Limit of Excavation
 -  Direction of Working
 -  General material or plant movement direction dashed where intermittent



Project
**Ffos-y-Fran
Land Reclamation Scheme**

Title
Provision of Lapwing Habitat

Project Number 4533 Figure Numbers 4-6
Scale 1:10,000 Date May 2007
O:\4533\Cadfiles\4533D0504\3_MM_Fig4-6.dwg

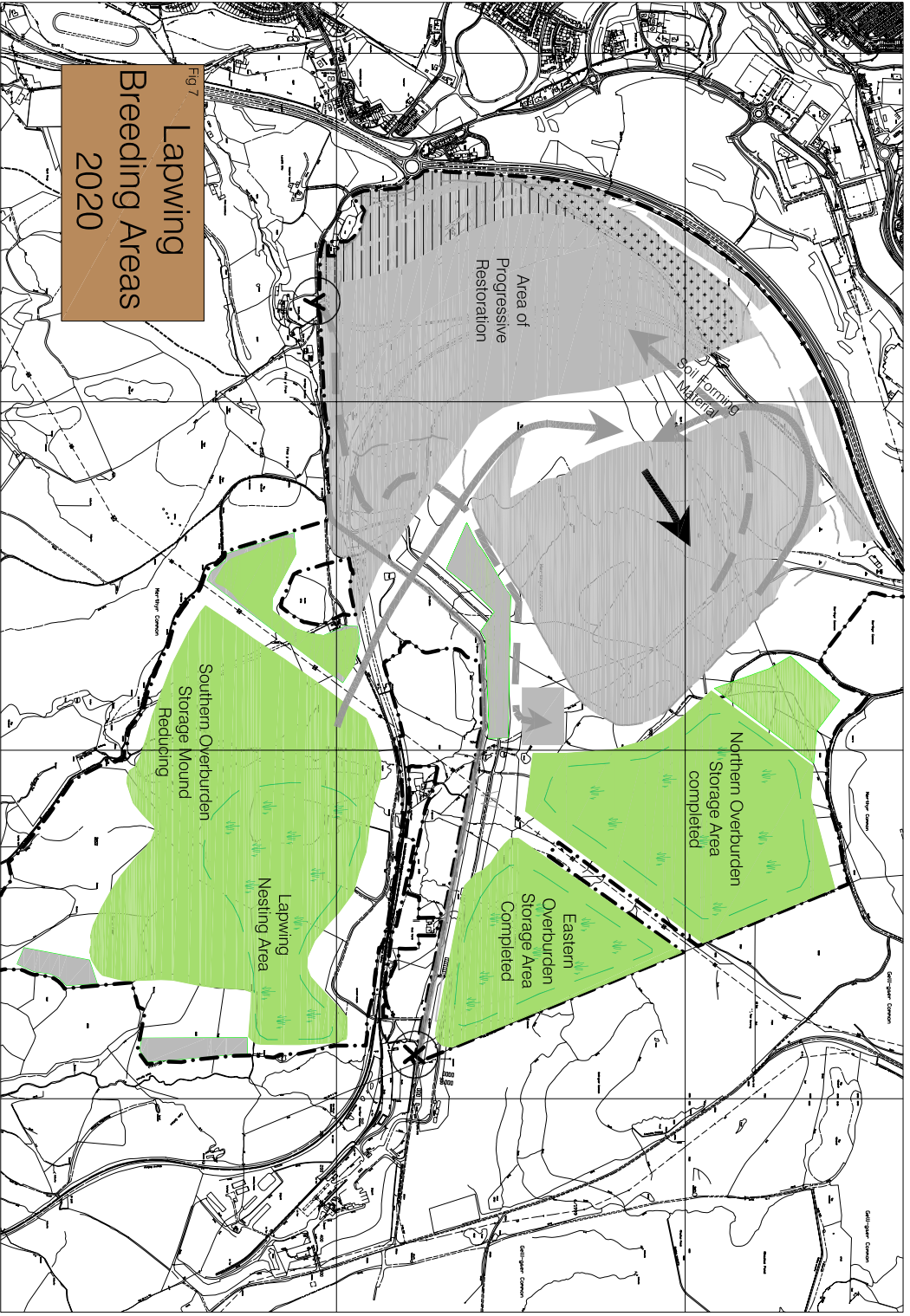


Fig 7
Lapwing
Breeding Areas
2020

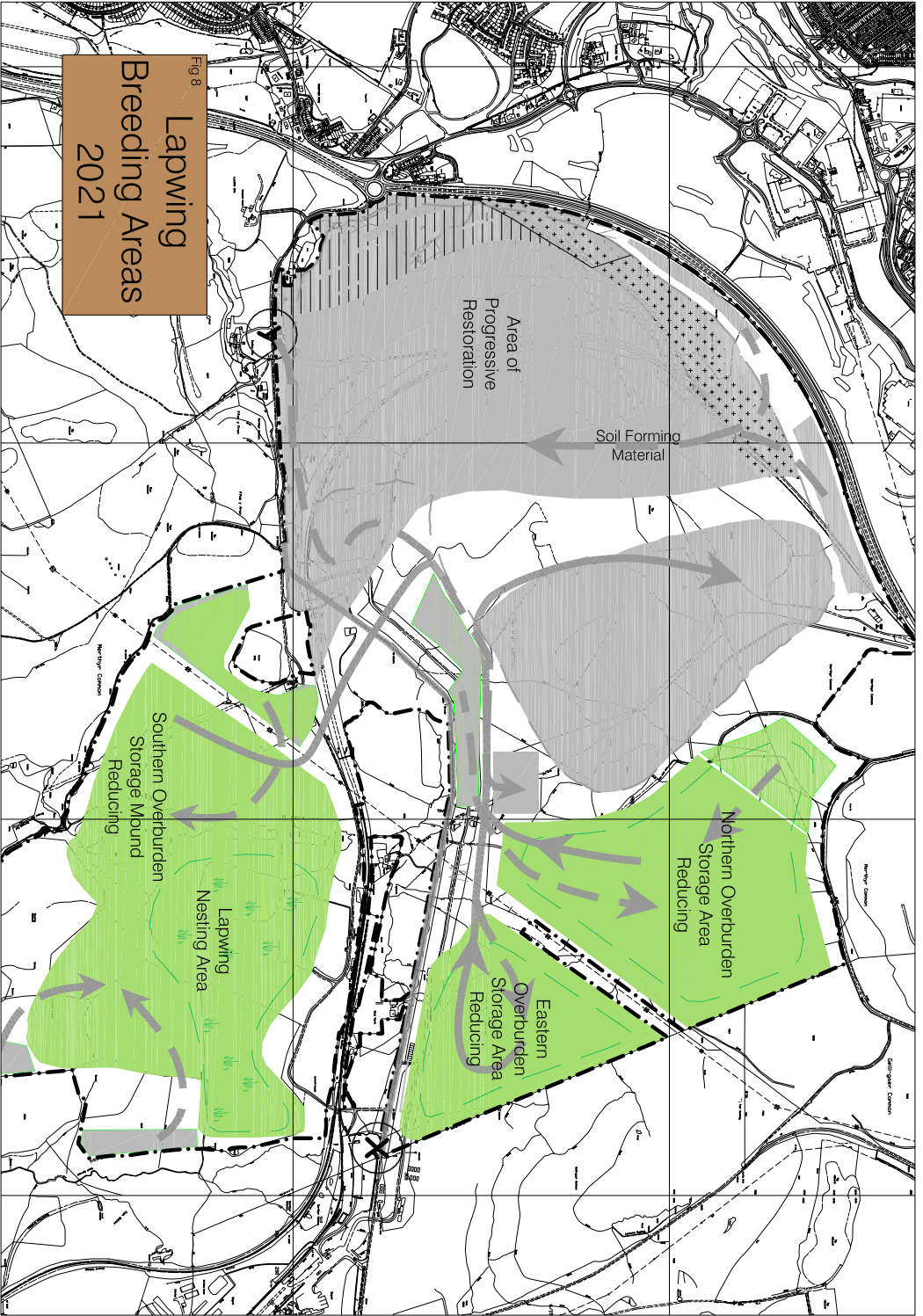


Fig 8
Lapwing
Breeding Areas
2021

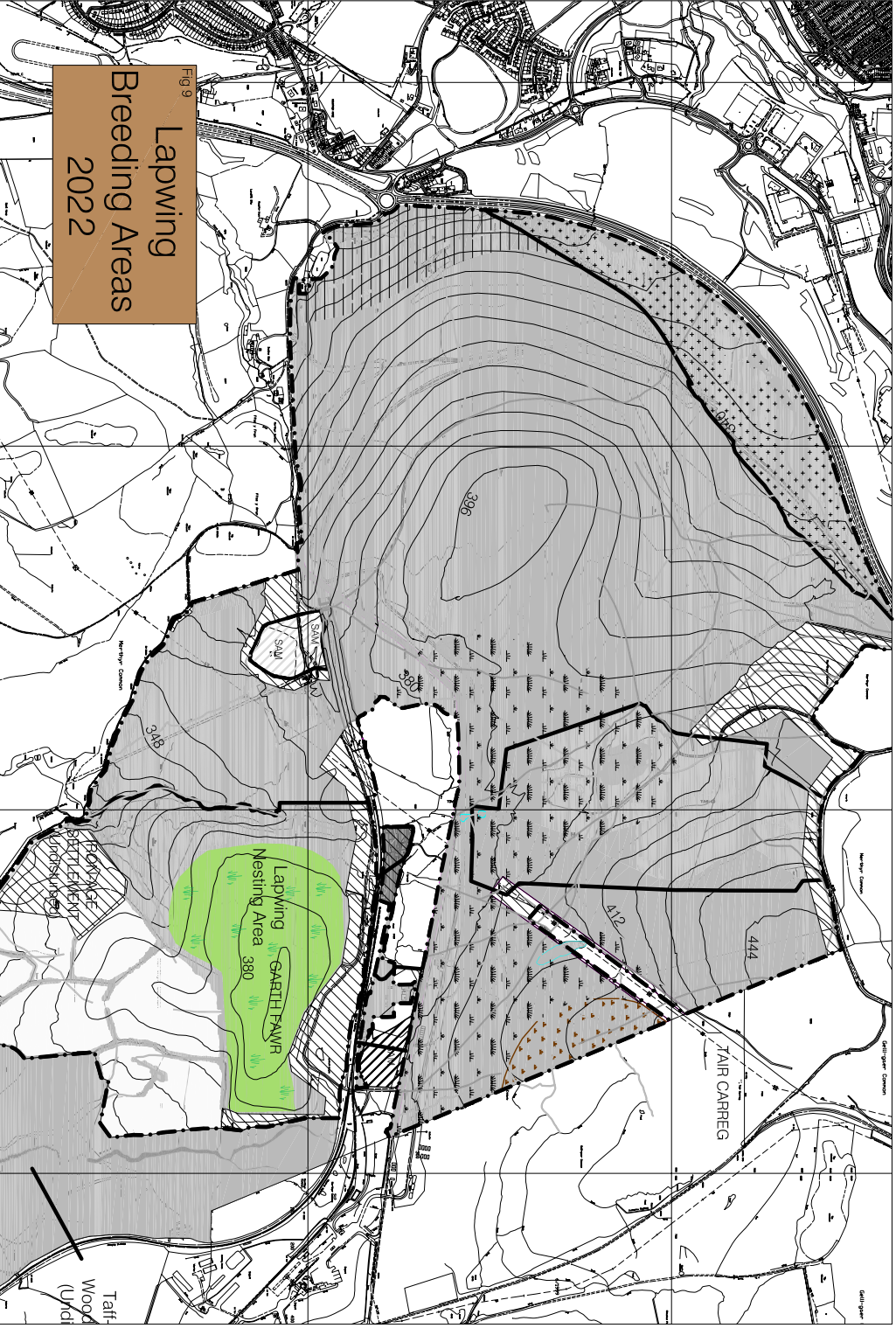







Fig 9
Lapwing
Breeding Areas
2022

- Key**
-  Lapwing Nesting Habitat
 -  Site Boundary
 -  Limit of Excavation
 -  Direction of Working
 -  General material or plant movement direction dashed where intermittent

RPPS

Project
**Ffos-y-Fran
Land Reclamation Scheme**

Title
Provision of Lapwing Habitat

Project Number
4533

Figure Numbers
7-9

Scale
1:10,000

Date
May 2007

0:4533\Cadfiles\4533D050413_MM_Fig7-9.dwg