

SECTION 16

ECOLOGY AND NATURE CONSERVATION

16 ECOLOGY AND NATURE CONSERVATION

16.1 Introduction

16.1.1 The purpose of this assessment is to determine the magnitude and significance of ecological impacts likely to be associated with the proposed Coed Darcy Urban Village. The scope of the assessment is in accordance with Section 4.4 of the Scoping Report ⁽¹⁾, and takes full account of the Scoping Opinion received from Neath Port Talbot CBC (and their Consultees) in February 2005.

16.1.2 The importance of ecology and nature conservation was recognised at the outset of the Coed Darcy project, and a programme of detailed ecological surveys was initiated in 1998, with a Stage 1 ecological report ^(2, 3). This investigated the likely presence of rare or protected species, and built an understanding of the nature conservation value of the site and the 'wider environs'. It also identified features, habitats or species that needed to be considered in the development of the subsequent Masterplan. The results of these surveys were used to produce an Environmental Assessment of the site in November 2002, and this report is presented at Appendix 16.A to this Environmental Statement.

16.1.3 Following the Environmental Assessment study in 2002, the need for further amphibian, bat and invertebrate surveys was identified, as was a supplementary assessment of an area of land to the south of the site associated with the proposed Southern Access. These surveys were undertaken during the 2003 and 2004 survey seasons in order to complete the baseline, and the results of this additional work are presented in Appendix 16.B.

16.1.4 Outputs from the ecological studies have continually informed the Scheme Proposals and the Masterplan, such that areas of the greatest nature conservation importance have been deliberately excluded from the development footprint.

16.1.5 This Chapter summarises the results of all the ecological surveys carried out between March 2001 and October 2004, along with any existing records, and therefore represents an assimilation of all existing ecological data for the site. This information has subsequently been used to inform a detailed assessment of the likely impacts of the proposals on habitats and species.

16.2 Assessment Methodology

Potential Impacts, Effects and Receptors

16.2.1 The surveys have indicated that the Llandarcy Oil Refinery, and the land along the proposed Southern Access, support a number of habitats and species of high nature conservation value. Several of the habitats are listed as Priority Habitats under the UK Biodiversity Action Plan (UKBAP), including wet woodland, reedbed, and lowland heathland, and the site also supports protected and/or UKBAP Priority Species, including invertebrates, amphibians (particularly the great crested newt (*Triturus cristatus*), reptiles, bats (particularly the lesser horseshoe bat (*Rhinolophus hipposideros*), and birds.

16.2.2 Surveys of the 'wider environs' (see Appendix 16.A) revealed further valuable habitats in the surrounding area, several of them associated with the adjacent Crymlyn Bog Special Area of Conservation (SAC).

16.2.3 The potential therefore exists for the proposed development to lead to the loss or degradation of valuable habitat, and for species of conservation concern to be

affected both directly and indirectly through the demolition, remediation and subsequent construction phase activities (largely involving habitat loss and disturbance effects), as well as during the operational phase of the project (with impacts associated with road traffic, increased proximity of the general public to the protected sites, etc.). Therefore, although the boundary of the outline planning application encompasses only a proportion of the refinery site as a whole (plus a narrow strip of land to the south), the ecological impact assessment extends to all areas of the refinery as well as to other valuable ecological receptors beyond the refinery fence.

- 16.2.4 Although the majority of ecological impacts associated with a development scheme of a scale and magnitude such as this tend to be adverse, the potential also exists for significant beneficial effects associated with the remediation of the site, including the removal of contaminated soils and the creation of new habitats, in particular wetland areas such as ponds, reed beds and other features of nature conservation value.

Legislation and Policy Framework

- 16.2.5 The following legislation, policy and guidance documents have been used to underpin this impact assessment:

- ❖ The Habitats Directive (92/43/EEC)
- ❖ The Conservation (Natural Habitats and c.) Regulations 1994
- ❖ The Bern Convention (on the Conservation of European Wildlife & Natural Habitats)
- ❖ The Wildlife and Countryside Act (1981, and subsequent amendments)
- ❖ Protection of Badgers Act (1992)
- ❖ The Biodiversity UK Action Plan
- ❖ Planning Policy Wales (PPW)
- ❖ Technical Advice Note (Wales) 5: Nature Conservation and Planning (1996)
- ❖ Neath Port Talbot County Borough Council Unitary Development Plan – Draft Deposit (January 2003).
- ❖ Neath Port Talbot County Borough Suggested Changes to the Deposit Plan, December 2004.

Study Area

- 16.2.6 For the purposes of this impact assessment, the important areas are determined by the outline planning application boundary and the development footprint/land take. These areas are clearly indicated on Figure 16.1, with a black line, and a dashed black line, respectively. However, the boundaries for the surveys undertaken during the original ecological assessment (which provided the majority of the baseline information) were based on the refinery fence and the wider BP/Welsh Development Agency land ownership boundary or 'wider environs' (indicated on Figure 16.1 with a dashed red line, and a full red line, respectively). Much of the baseline information therefore refers to areas within the 'refinery fence' or in the 'wider environs'. However, in order to be compatible with other chapters, the impact assessment section

concentrates on impacts within the 'outline planning application boundary' (i.e. the area within the refinery fence plus the Southern Access route corridor). Nevertheless, the potential exists for remote/ indirect effects on the habitats and species in this wider area of interest. Therefore, in addition to the assessment of areas within the application boundary, a more strategic assessment of areas outside this boundary (but within the study area set out in the development brief) has also been undertaken.

16.3 Baseline Environment Study Methodology

General Approach

16.3.1 The Ecological Assessment of the site undertaken since 1998 has provided a considerable amount of data. The detailed results of the survey work undertaken in 1998 are presented elsewhere (Cresswell Associates, 1998a, b), while the results of survey work carried out since 2001, are presented in Appendix 16.A (2001-2002) and Appendix 16.B (2003-2004). The baseline conditions used to underpin this impact assessment represent an assimilation of this information.

16.3.2 The following paragraphs present a summary of the methodologies used in the establishment of the ecological baseline for the impact assessment.

Desk Study and Consultation

16.3.3 A desk study was carried out to obtain any other existing ecological data relating to the site and its surroundings (as delineated by the survey boundary for the wider environs assessment). This included data requests from, and/or consultations with, the following organisations:

- ❖ Countryside Council For Wales
- ❖ Environment Agency
- ❖ Glamorgan Wildlife Trust
- ❖ Glamorgan Bird Club
- ❖ Glamorgan Badger Group
- ❖ Glamorgan Bat Group
- ❖ Butterfly Conservation
- ❖ Glamorgan Fungi Group
- ❖ Vincent Wildlife Trust

Field Surveys

16.3.4 Detailed ecological surveys have been carried out in all areas within the application boundary (as well as other areas within the refinery fence), and these are described in the section below. In addition, a more strategic level of assessment has been applied to the wider environs in order to identify the context of the site within the local area and to provide baseline information for the assessment of remote effects.

Area within the Application Boundary

Phase I Habitat Survey

- 16.3.5 Extended Phase 1 Habitat and Protected Species surveys of the area within the refinery fence (using standard CCW Phase 1 methodology) were undertaken in summer 2001; these were used to produce a detailed habitat map (see Figure 16.2a and Appendix 16.A). A subsequent survey of the Southern Access area was carried out in September 2003 (see Figure 16.2b).

Phase 2 Botanical Survey

- 16.3.6 More detailed botanical surveys were undertaken during summer 2001 (within the refinery fence) and July 2004 (Southern Access area). However, the areas of grassland within the refinery fence comprised pioneer plant communities that did not conform to the more natural habitats described in the NVC (National Vegetation Classification). Although it was possible to assign NVC communities, none of the other habitats within the refinery fence were deemed appropriate for detailed quadrat-based survey and NVC analysis, as they were either too small or insufficiently diverse to reliably assign sub-communities using quadrat sampling.

Bryophyte Survey

- 16.3.7 Targeted surveys for bryophytes (mosses and liverworts) were undertaken in November and December 2001, within the refinery fence. During the Phase 1 habitat surveys, areas were identified in advance in order to focus on the habitats and features most likely to be valuable for bryophytes. A total of 15 sites were surveyed; details of the survey locations for these surveys (and the lichen surveys) are provided in Appendix 16.A. At each site, the occurrence of bryophytes was noted during a general inspection of the area, and a more detailed search was made, and species list compiled at locations with significant bryophyte assemblages. In the case of smaller species, samples were collected for microscopic identification.

Lichens

- 16.3.8 The general value of the site for lichens was assessed, and targeted surveys were undertaken following a similar approach as for the bryophyte assemblages. The purpose of the surveys was to investigate the diversity of lichen communities across the site, to evaluate the site in terms of the current levels of atmospheric pollution, and to assess the potential future value of the site for lichen diversity. Further details of the survey technique employed are provided in Appendix 16.A.

Invertebrates

- 16.3.9 A comprehensive suite of invertebrate surveys was undertaken on land within the EIA boundary; land within the refinery fence was surveyed over the course of summer 2001, while that of the Southern Access and extension area was surveyed during the summer of 2004. The aims of the surveys were to investigate the presence of rare, protected or Biodiversity Action Plan (BAP) species, and to give an indication of the likely value for invertebrates of the different habitats and features present.

Terrestrial Invertebrates

- 16.3.10 A number of different sampling locations were identified within the refinery fence during the initial Phase 1 habitat survey, encompassing a range of different habitats and areas selected to be representative of the site as a whole. In order to sample

invertebrates effectively from a variety of microhabitats, a number of different sampling techniques were used. These included pitfall traps, sweep netting, flight interception traps/pan traps and moth surveys. The detailed methodologies for each of these techniques, as well as the locations of the survey areas, are provided in Appendix 16.A. Sampling was carried out on three occasions over the course of the summer in order to take account of seasonal variation in the emergence and activity of different species.

- 16.3.11 Such a detailed level of survey was not triggered for the habitats within the Southern Access route corridor during the Phase 1 habitat survey in 2003, owing to the limited nature conservation value of the improved and semi-improved grassland present. However, it was considered possible that a valuable moth fauna could be supported by the areas of marshy grassland to the west of the proposed route, and that these communities could potentially be affected by the proposals. A combination of field observation and moth trapping was used to assess the nature conservation value of the invertebrates of these habitats, and these surveys were undertaken during summer and autumn 2004 (see Appendix 16.B for details).

Aquatic Invertebrates

- 16.3.12 Aquatic invertebrate sampling was undertaken in the South Site Reservoir and the Triangular Pond during 2001 (see boxes 2 and 8, respectively, on Figure 16.2a). No other water bodies within the site were considered likely to support any more than a very limited aquatic invertebrate fauna, generally because of very apparent contamination and/or an absence of any plants or habitat features likely to provide shelter. The two water bodies were sampled with a standard Freshwater Biological Association pond net using the methodology employed for the National Pond Survey⁽⁵⁾. This consisted of a 3-minute kick-and sweep-sample covering all habitats and a 30-minute hand search. After collection, the samples were preserved on-site in 100% Industrial Methylated Spirit (IMS) and returned for identification. Further details of the methodologies used are provided in Appendix 16.A.

Amphibians

- 16.3.13 The likely value for breeding amphibians of all potentially suitable water bodies within the EIA area and within 500m of its boundary was assessed. During March 2001 a survey for frogs and toads, comprising a daylight search for spawn and a nocturnal torchlight survey, was undertaken at four water bodies (see Appendix 16.A). Following this, torchlight surveys of the triangular pond were undertaken in April and May in order to investigate the presence of, and subsequently assess the size of, the great crested newt population.
- 16.3.14 Further surveys for great crested newts were carried out between March and May 2003, and May and June 2004, with the intention of confirming (as far as reasonably possible) the presence or absence of this species elsewhere within the planning application boundary and the wider environs (see Appendix 16.B for details). A total of three suitable water bodies within the refinery fence and two suitable water bodies within 500m of the proposed Southern Access were identified; the locations of these water bodies are indicated in Appendix 16.B.
- 16.3.15 The surveys were undertaken as follows:
- ❖ four survey visits were conducted during the period mid-March to mid-June with at least two of the survey visits conducted between mid-April and mid-May;

- ❖ the surveys were conducted in suitable weather conditions (night-time air temp. >5°C, little/no wind, no rain); and
- ❖ the surveys employed three methods, as appropriate: egg searches, torching and bottle-trapping (details of these methods are provided in Appendix 16.B).

Reptiles

- 16.3.16 During a survey undertaken in 1998, reptiles (primarily common lizards) had been recorded in large numbers across the refinery site ^(2, 3). During the scoping for the EIA, it was considered that the entire area within the planning application boundary was likely to be of value to reptiles, and that a detailed assessment of population sizes would be both impractical (given the considerable size of the area involved) and unnecessary (as detailed information on population structure would be unlikely to further inform mitigation, given that a precautionary approach to reptiles was considered appropriate from an early stage).
- 16.3.17 A walkover survey of the site was carried out during 2001, however, in order to assess which of the remaining areas were most likely to be of value to reptiles, and a map of the site was produced illustrating the most valuable habitat areas for reptiles (see Figure 5, Appendix 16.A).
- 16.3.18 The suitability of habitats along the proposed Southern Access route for reptiles was assessed during the extended Phase 1 habitat and protected species survey in 2004, and, following the identification of suitable habitat, a targeted reptile survey was undertaken. A total of 100 artificial refuges (pieces of roofing felt) were placed in areas suitable for reptiles, focussing on the areas of marshy grassland, the edge of the swamp habitat, along the interface between the bracken and the grassland, and in the area around the farm buildings and the associated pond. The refuges were checked for reptiles on eight separate occasions between June and August, in suitable weather conditions (see Appendix 16.B for details) in parallel with careful searches for basking animals elsewhere.

Birds

- 16.3.19 Comprehensive bird surveys within the refinery fence were undertaken on four separate occasions during the summer (early-May, mid-June, mid-July and late-August, 2001), and once during the winter (January 2002) in order to take account of seasonal variation in the arrival and activity of different species. The survey visits were made in order to assess the importance of the breeding bird assemblage within the survey areas and to enable the impacts of the proposed development to be assessed. A series of transects was established throughout the areas within the planning application boundary. These transects were walked slowly, shortly after dawn, on each separate occasion, and all birds seen or heard were recorded. Evidence of breeding, including singing, nest-building and provisioning of young, was also noted, wherever applicable (see Appendix 16.A for details). Subsequently, bird surveys were also undertaken along the proposed Southern Access during spring and summer 2004 (late-March, late-April, late-May and early-July; see Appendix 16.B).
- 16.3.20 During the wider environs surveys (see below) it became clear that there was the potential for birds in these areas to be indirectly affected by the proposed development. Although these species spend the majority of their time outside the planning application boundary (particularly within the habitats of the SAC), it was considered possible that some may use the habitats within the refinery fence as supplementary foraging areas, and that any loss of habitats could have an indirect

affect on their populations by reducing the feeding resources available to them over the winter. Additional winter surveys were carried out to investigate the level of use of the site by these species; two surveys were therefore undertaken, in February and March 2002, during which the four main water bodies on the site were visited along with six areas of habitat considered most likely to represent winter foraging habitat for birds known to breed in the SAC (see Figure 6b, see Appendix 16.A).

- 16.3.21 More details of the bird survey techniques employed are provided in Appendix 16.A and Appendix 16.B.

Bats

- 16.3.22 The value of the area within the application boundary for roosting and foraging bats was assessed through internal/external inspections and emergence/activity surveys, respectively.

Internal/external Inspections

- 16.3.23 Buildings were carefully searched to assess their likely occupancy by roosting or hibernating bats. All buildings, particularly those due to be demolished, were searched by experienced, licensed bat workers in order to locate evidence of current or past bat roosts, in the form of bats, droppings, staining, feeding signs, and/or remains of bats. Where safety considerations prevented access into parts of some buildings, these areas were scrutinised with binoculars to assess their likely occupancy by roosting or hibernating bats. The outsides of the buildings were searched for access points, and any evidence of their use by bats. The surveys of suitable buildings within the refinery fence were undertaken during 2001 and March 2003, while those along the Southern Access were undertaken during September 2003.
- 16.3.24 All mature trees and other suitable structures were also carefully scrutinised with binoculars to assess their likely occupancy by roosting or hibernating bats. Where the crowns were low and access into the trees was relatively straightforward, the trees were climbed in order to investigate any potentially suitable holes or crevices. The likely value of the various habitat features for commuting or foraging bats was also critically assessed with a view to informing activity surveys (see below).

Emergence/activity Surveys

a) Within the Refinery Fence

- 16.3.25 The mosaic of species-rich grassland, scrub, woodland, wetland and heathland across the site suggests that it may be of considerable value for foraging bats. A series of surveys throughout summer 2003/2004 was therefore undertaken in order to assess the relative importance of different parts of the site. Three bat activity surveys were undertaken in 2003 during the months of July, September and October in order to identify foraging areas and commuting routes for bats. An additional bat activity survey was undertaken in June 2004, in order to investigate bat activity during the earlier part of their active season. The site was divided into five compartments, with one transect established within each compartment. Each transect passed through a representative sample of the habitats in that compartment focussing on those identified as being of particular value to foraging and commuting bats.
- 16.3.26 Surveys commenced before sunset, and continued for up to three hours. During each activity survey, five surveyors observed bat activity along the five transects; echolocation calls were recorded using Pettersson D240 bat detectors and Minidisc

players, to enable subsequent analysis of calls and identification of the species present, using Batsound™ software. Where possible, surveyors noted the behaviour and direction of flight of the bats observed, in order to identify commuting routes and areas of particular importance for foraging.

b) Proposed Southern Access

16.3.27 Bat emergence and activity surveys along the route of the proposed Southern Access were undertaken at monthly intervals between June and July 2004. The emergence surveys focussed on the complex of farm buildings comprising Penyscoed Farm (see yellow Target Note 7 on Figure 1, Appendix 16.B) and the two mature oaks to the west of the track leading down towards the Tennent Canal (yellow Target Notes 12 and 13). These surveys attempted to determine the presence or absence of roosting sites, the numbers and species of bats using any roosting sites on each occasion, and the commuting routes used by bats across the site to and from these roosting sites. The potential roost sites were observed, from the outside, from sunset for a period of at least one and a half hours; surveyors were positioned so as to cover all potential access points effectively.

16.3.28 Following each emergence survey, an activity survey along the proposed route of the Southern Access was carried out. Two surveyors walked in a northerly direction along the access track towards the refinery fence and two in a southerly direction on the track towards the Tennent Canal. Bat activity was observed/recorded using the same methodology as that for the activity surveys undertaken within the refinery fence (described above).

Badgers

16.3.29 Surveys of the site for signs of badger activity, including setts, dung pits, latrines and paths, were undertaken throughout the area within the planning application boundary. The area within the refinery fence was surveyed in early March 2002 (see Appendix 16.A), and the Southern Access route was surveyed in September 2003. Any badger sett identified was classified according to recognised definitions of both sett size and importance (e.g. 'main sett', 'annex', 'outlier' etc) and current level of activity of each sett entrance hole (i.e. 'well-used', 'partially-used', 'disused').

Otters and Water Voles

16.3.30 A survey for otter and water vole activity along the Tennant Canal, to either side of the pipe tracks, and within the two areas of marshy grassland in the vicinity of Penisa'r-coed Farm, was undertaken during September 2004. The survey involved searching for characteristic otter signs (including holts, spraints, footprints, lying up sites and slides), and searching suitable habitat within the survey area for water vole latrines, feeding signs and other remote indicators. In addition, the likely value of the different habitats for otters and water voles was critically assessed.

Wider Environs Surveys

16.3.31 An assessment of the habitats and species outside the refinery fence (but within the study area boundary set out in the development brief) was undertaken in December 2001. The survey area extended beyond Jersey Marine to the south and Skewen to the north, and as far as Crymlyn Bog to the west and the railway line to the east (see 'wider environs' boundary illustrated on Figure 16.1). Surveys were not undertaken within Crymlyn Bog since a substantial amount of background information is available for this site.

16.3.32 The survey comprised a general walkover of this large area (using CCW Phase I habitat maps as a guide) to underpin the development of a sensitivity/constraints plan of the of the refinery's surroundings. Areas were mapped according to their relative nature conservation value, and target notes were compiled to provide further details. This information was subsequently used to produce constraints maps, in which areas are classified as either of major constraint (red), moderate constraint (orange), minor constraint (yellow) or no constraint (green) based on designated status, habitat type etc. Further details on these assessment criteria are provided in Appendix 16.A. The surveys were used to identify further surveys required in order to investigate potential remote impacts associated with the re-development (including winter bird surveys and wider surveys for great crested newts, see above).

16.4 Assessment Criteria

16.4.1 The assessment has been carried out using a three-step process as set out below. The measures of receptor importance/sensitivity, impact magnitude and residual impact significance have been developed with reference to the Institute of Ecology and Environmental Management's (IEEM) draft *Guidelines for Ecological Impact Assessment*.

16.4.2 The first step in the impact assessment process has been to classify the importance and/or sensitivity of the various ecological receptors using the approach set out in Table 16.1.

Table 16.1 Importance/Sensitivity of the Receptor

Receptor Importance/Sensitivity	Examples
International = 'Very high'	An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site, Biogenetic Reserve). A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any regularly occurring population of an internationally important species, that is threatened or rare in the UK (i.e. it is listed as occurring in 15 or fewer 10km squares in the UK). A regularly occurring, nationally significant population of any internationally important species.
National = 'High'	A nationally designated site (SSSI, NNR, Marine Nature Reserve, etc.), or a discrete area which the country conservation agency has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified. A viable area of a priority habitat identified in the UKBAP, or smaller areas of such habitat which are essential to maintain the viability of a larger whole (this could include networks of ancient and/or species-rich hedges or even small groups of ancient trees). Any regularly occurring population of a nationally important species (for example, identified as a priority species in the UKBAP, or a species of principal importance for Welsh biodiversity under Section 74 of the CRoW Act (2000)) that is threatened or rare in the region or county.
County/Unitary Authority = 'Medium'	County/Unitary Authority designated sites and other sites that the designating authority has determined meet the published ecological selection criteria for designation (including SINCs, Local Nature Reserves and Wildlife Trust sites).

Receptor Importance/ Sensitivity	Examples
	Semi-natural woodland greater than 0.5 ha which is considered to be in 'good condition'. A viable area of habitat identified as a priority in the County/ Unitary Authority BAP. A regularly occurring, locally significant population of a species identified as important on a regional or County/Unitary Authority basis (but not identified as priority species in the UKBAP) Any regularly occurring population of a nationally important species (UKBAP, Section 74, Red Data Book, etc.) that is not threatened or rare in the region.
Local = 'Low'	Semi-natural woodland greater than 0.25 ha. Areas of habitat or populations/communities of species considered to appreciably enrich the habitat resource within the context of the parish or neighbourhood, e.g. species-rich hedgerows, ponds, etc.. A regularly occurring, locally significant population of a County/Unitary Authority important species during a critical phase of its life cycle.
Negligible	No site designation; species and habitats that are common and widespread and of very limited nature conservation value.

16.4.3

Impact magnitude has then been assessed for each site or group of sites on the four-point scale detailed in Table 16.2.

Table 16.2 Magnitude of Change (Impact)

<u>Large</u> - Loss of over 50% of a site, feature, habitat or population. - Adverse change to all of a site, feature, habitat or population. - For beneficial effects, an impact equivalent in nature conservation terms to a gain of >50% of a site, feature, habitat or population.
<u>Medium</u> - Loss affecting 20-50% of a site, feature, habitat or population. - Adverse change to over 50% of a site, feature, habitat or population. - For beneficial effects, an impact equivalent in nature conservation terms to a gain of 20-50% of a site, feature, habitat or population.
<u>Small</u> - Loss affecting 5-19% of a site area, feature, habitat or population. - Adverse change to 20-50% of a site, feature, habitat or population. - For beneficial effects, an impact equivalent in nature conservation terms to a gain of 5-19% of a site, feature, habitat or population.
<u>Negligible</u> - Loss affecting up to 5% of a site area, feature, habitat or population. - Adverse change to less than 20% of a site, feature, habitat or population. - For beneficial effects an impact equivalent in nature conservation terms to a gain of up to 5% of a site, feature, habitat or population.

- 16.4.4 The relationship between impact magnitude and the importance or sensitivity of the receptor is then used to derive a measure of impact significance as shown on Table 16.3 and applied in Table 16.5.

Table 16.3 Significance of Impact

Sensitivity	Magnitude of Impact			
	Large	Medium	Small	Negligible
Very high (International)	Substantial	Substantial	Moderate	Negligible
High (National)	Substantial	Moderate	Moderate	Negligible
Medium (County/unitary authority)	Moderate	Moderate	Slight	Negligible
Low (Local)	Moderate	Slight	Slight	Negligible
Negligible	Slight	Negligible	Negligible	Negligible

16.5 Baseline Conditions

Designated Areas and Other Desk Study Information

- 16.5.1 Llandarcy Oil Refinery is bordered on its western and southern sides by land of international importance for nature conservation (see Figure 16.1). The Crymlyn Bog Special Area of Conservation (SAC) (incorporating Crymlyn Bog SSSI, and Pant-y-Sais SSSI) is also designated a Wetland of International Importance under the Ramsar Convention, and nearly half (114 ha) has been declared a National Nature Reserve. The Bog is of special interest for its fen and swamp communities, associated invertebrate assemblages and breeding and over-wintering birds. It is the most extensive area of lowland fen in South Wales, and comprises a mosaic of valuable habitat types, including both rich and poor fen, swamp, wet heath, alder carr and acidic grassland. The citation for the SAC designation is presented in Appendix 16.A.
- 16.5.2 A large number of bird species have been recorded from the Crymlyn Bog SAC (see Appendix 16.A), including several species of conservation importance, and these may also use the Llandarcy refinery site and its surroundings during at least part of their life cycle.
- 16.5.3 Crymlyn Burrows SSSI, which lies to the south-east of the site (see Figure 16.1), is one of the last remaining sections of the Swansea Bay coastline which has remained largely unmodified by industrial development. The area comprises sand dunes interspersed with saltmarsh, and grades westwards into wet dune slacks and carr woodland. It supports a number of rare plant species, including Fen Orchid (*Liparis loeslii*) and Sea Stock (*Matthiola sinuata*) and is also an important site for over-wintering waders.
- 16.5.4 The Glamorgan Inventory of Ancient Woodland identifies two blocks of ancient woodland on the hillside above Jersey Marine (see Figure 16.1). Ancient Woodland is generally defined as land that has been continuously wooded since at least 1600. The habitat usually supports valuable assemblages of fungi, lichens, dead-wood invertebrates and ground flora, and also provides important foraging and nesting/roosting sites for bats and birds.
- 16.5.5 Information obtained from Glamorgan Bat Group reveals that pipistrelle bats (*Pipistrellus sp.*) have twice been recorded roosting in houses at Jersey Marine, and

a noctule bat (*Nyctalus noctula*) has frequently been recorded flying over the north-west of the survey area. Although a lesser horseshoe bat (*Rhinolophus hipposideros*) was recorded during the site surveys (see below), the nearest known roost for this species is 13 km to the west, on the Gower Peninsula, and the nearest hibernation site is more than 25 km to the north (Vincent Wildlife Trust, pers. comm.).

- 16.5.6 There are anecdotal reports of badgers using the woods above Jersey Marine, but no confirmed sett locations were available. A small number of setts, however, were recorded during the surveys (see below).
- 16.5.7 The Unitary Development Plan for Neath Port Talbot County Borough has not yet been finalised, so the process to designate Sites of Importance for Nature Conservation (SINCs) is still in progress, and no information on these locally important sites is currently available.

Survey Results

Plants and Habitats

- 16.5.8 The results of the various habitat surveys, including the Phase 2 botanical surveys, are summarised on the habitat maps presented in Figures 16.2a and 16.2b. For the refinery site, detailed plant species lists for each of the habitats identified, and described below, are presented in Annex 3 of Appendix 16.A. Detailed descriptions of the habitats associated with the proposed Southern Access route are presented as both text and target notes in Appendix 16.B.
- 16.5.9 The habitats within the planning application boundary comprised small blocks/areas of woodland, scrub, grassland, heathland and swamp vegetation, together with a number of areas of open standing water. Within the refinery fence (Figure 16.2a), the majority of these habitats had developed on land that had formally been occupied by large structures (mainly large storage tanks) associated with the oil refinery. Old tank bases, pipe tracks and other man-made structures were found in most habitat areas, including those that had clearly been established for several decades.

Woodland and Scrub

- 16.5.10 A number of blocks of wet woodland were recorded within the application boundary. Within the refinery fence, the most valuable of these areas, although it appeared to be drying out, was the alder-dominated woodland in the southern part of the site (see Box 12, Figure 16.2a), which supported a large amount of standing and fallen dead wood. A second area, dominated by birch and wetter with a more diverse ground flora than the other two, was located on the western edge of the refinery (Box 5), while a third woodland, also birch-dominated but with a relatively species-poor ground flora, occupied the triangular-shaped area between the disused rail lines in the north of the site (east of the South Site Reservoir, Box 2).
- 16.5.11 Further areas of wet woodland were also recorded along the route of the proposed Southern Access (Figure 16.2b). One area, dominated by alder and grey willow, was located at the northern end of the route, just south of the refinery fence (Box 1), and showed signs of becoming degraded due to grazing. A second area, also dominated by grey willow and alder, bordered a strip of swamp vegetation to the west of water body lying underneath the pipe-tracks (Box 5). This woodland forms part of the Crymlyn Bog SAC. A further two areas of damp woodland were also identified: a more open, heavily-grazed stand of alder woodland located to the north-west of Penisa'r-coed Farm, and another over-grazed patch of alder woodland just to the

north of the SAC woodland, to the east of the pipe track (see Figure 1, Appendix 16.B for details).

- 16.5.12 Wet woodland is a Priority Habitat in the UKBAP and Neath Port Talbot local BAP, and is a habitat of principal importance listed under Section 74 of the CRoW Act (2000).
- 16.5.13 The remaining blocks of woodland within the application boundary generally comprised areas of oak- and birch-dominated woodland that had become established on steep slopes (for example, Boxes 6, 10 and 12, Figure 16.2a, and Box 4 on Figure 16.2b), together with areas of secondary and planted woodland. It is likely that the woodlands within the areas indicated by Boxes 10 and 12 represent remnants of upland Oakwood, a habitat of principal importance listed under Section 74 of the CRoW Act (2000).
- 16.5.14 The application area also supported patches of dense, Common Gorse-dominated scrub, such as those at the northern and southern ends of the refinery (Boxes 1 and 10, respectively, Figure 16.2a), as well as several other areas of continuous scrub, and these are likely to represent an important nesting and foraging resource for birds, as well as provided cover for other species, particularly reptiles (when in conjunction with more open habitat).

Dry Grassland

- 16.5.15 As a result of the thin soils prevalent over much of the site, relatively species-rich grassland was quite widespread within the refinery fence. The largest and most diverse of these grasslands was found on the large hill-top area indicated by Box 6, Figure 16.2a, while a smaller, and slightly less diverse area was located in the south-west of the site (Box 11). These grasslands also supported diverse invertebrate faunas (including a Notable A beetle, and two Notable B species and 25 'local' species, respectively), and therefore would be considered to be of particular value [Notable A species are those known to occur in 15-35 10km squares in the UK, Notable B species occur in 35-100 squares, and 'local' species are known from 101-300.]
- 16.5.16 Many of the remaining grassland areas within the refinery fence had developed on former tank bases (for example, Boxes 4 and 9), while smaller patches were recorded amongst the areas of dense scrub found throughout the site. The grassland at the northern end of the hillside indicated by Box 12 was found to be of particular value for invertebrates, including 'rare' Red Data Book species, while the large areas of dense gorse scrub and herb-rich grassland indicated by Boxes 10 and 11, together with the area of scrub/scattered grassland to the north-west of this, were of particular value as nesting and foraging habitat for birds. These latter areas also constitute a valuable buffer between the refinery and the SAC.
- 16.5.17 Along the Southern Access, much of the habitat within the survey corridor comprised species-poor, semi-improved grassland which had been heavily grazed and which was becoming encroached by bracken (see Figure 16.2b). A couple of the fields to the west of the proposed route, and to the south and north of the farm buildings, supported only a limited range of grasses and a few common forbs, and were classified as improved grassland.

Wet Grassland

- 16.5.18 Within the refinery fence, large numbers of marshy grassland plants were recorded in areas where the tank bases had not been broken up, resulting in impeded drainage.

Areas supporting particular plant diversity included those at the southern end of the area indicated by Box 12, Figure 16.2a). In addition, two areas of marshy grassland were identified to the north and south of Penisa'r-coed Farm, within the survey corridor of the proposed Southern Access (Box 2, Figure 16.2b). The marshy grassland to the south of the farm was dominated by Soft-rush and was, at the time of the survey, in the process of being in-filled. Neither of these areas of marshy grassland were considered to be of particular intrinsic value, although they did represent potentially important habitat for grass snakes, reed buntings and reed warblers (see below).

Heathland

16.5.19 Small patches of Heather (*Calluna vulgaris*) were encountered throughout the refinery site in areas of grassland and woodland, but few areas were dominated by Heather. The largest area of heathland, on the steeply sloping hillside indicated by Box 6 (Figure 16.2a), was becoming colonised by young birch trees. Invertebrate surveys of this heathland revealed the presence of a rare rove beetle, *Aleochara fumata*, previously unrecorded in Wales. Smaller areas of heathy vegetation occurred in mosaic with scrub and grassland in several parts of the site, particularly within the area indicated by Box 12 and in the southern Tank Farm.

16.5.20 Heathland is a UKBAP and Neath Port Talbot local BAP Priority Habitat, and is a habitat of principal importance listed under Section 74 of the CRow Act (2000).

Swamp and Open water

16.5.21 A number of former tank bases had, over time, filled with water, and as a result supported swamp/fen-associated species. A particularly notable flora was recorded in the tank base within the scrub at the northern end of the area indicated by Box 9 (Figure 16.2a), and this area would be classified as S25a *Phragmites australis* – *Eupatorium cannabinum* tall herb fen (*Phragmites australis* sub-community). Although fen habitat is a UKBAP Priority Habitat, the tank bases are not considered to comprise priority habitat given their anthropogenic and ephemeral nature. Narrow strips of swamp vegetation were also recorded to either side of the long, narrow water body at the southern end of the Southern Access (Box 5, Figure 16.2b). This swamp habitat, together with the adjacent wet woodland, is part of the Crymlyn Bog SAC, and thus represents habitat of principal importance listed under Section 74 of the CRow Act (2000).

16.5.22 A number of areas of open water were also recorded during the surveys, ranging from large reservoir areas to small ephemeral water bodies, the majority of which showed signs of chronic contamination. However, in contrast, the triangular water body located in the centre of the site (Box 8, Figure 16.2a) supported a wide variety of plant species, including broad-leaved pondweed and white water-lily on the water surface, with bulrush dominating the margins. This pond was also found to support a breeding population of great crested newts as well as a rare caddis fly (see below). This pond, together with the surrounding area of scrubby heathland which is likely to be used by the great crested newts for foraging and hibernation, represented a valuable habitat feature.

16.5.23 The water body to the north of the Tennent Canal (Box 6, Figure 16.2b) is underneath the existing pipetracks, and consequently showed some signs of contamination with oil visible in the substrate and on the water surface. However, its eastern and western margins supported large areas of common reed, while much of the open water was dominated by pondweed species, with some algae present on the water surface. This water body is within the Crymlyn Bog SAC.

Invasive/non-native Plant Species

- 16.5.24 One stand of Japanese knotweed (*Fallopia japonica*) was identified on the southern bank of the Tennent Canal and this is indicated by red shading on Figure 16.2b. It is offence under the Wildlife and Countryside Act (1981) to spread or cause the spread of this plant into the wider countryside. Material containing any amount of plant material has to be treated as 'contaminated waste'.

Bryophytes

- 16.5.25 A total of 75 species of mosses and liverworts were recorded during the bryophyte surveys (see Appendix 16.A, Annex 3b, for a full species list). The most valuable sites for bryophytes were those supporting old woodland, particularly those with impeded drainage (indicated by Boxes 5, 10 and 12, on Figure 16.2a). The number of species recorded is more an indication of the range of micro-habitats and substrates which exist across the site, rather than a reflection of the intrinsic value of the habitats for lower plants. Indeed, no rare species were recorded, and the majority of the bryophyte assemblages were not particularly species rich.

Lichens

- 16.5.26 The lichen floras occurring within the refinery fence were found to be relatively species-poor (see Appendix 16.A, Annex 3c for a full species list). Only 47 species were found, and again no rare species were recorded. The most valuable sites for lichens were the semi-natural habitats on the periphery of the site, in particular the oak woodland at the south-western end of the site (indicated by Box 10 on Figure 16.2a), the heathy rock face (to the south-east of the grassland indicated by Box 11), and some boundary oak trees at the very north of the refinery site, near the south-eastern corner of the North Site Reservoir.
- 16.5.27 The relatively low diversity of the lichen flora is probably due to a previously high level of air pollution; indeed, some trees supported large patches of *Lecanora conizaeoides*, a species that has largely disappeared from Britain as a result of improvements in air quality. However, the presence of some pollution-intolerant species suggests that the air quality has improved significantly since the refinery ceased operating. With the retention of suitable habitats, such as woodland, old tress and natural outcrops and stones, a richer flora is likely to develop over the next few decades. More information on air quality is provided in Section 9 of the ES.

Protected Species and other Species of Nature Conservation Value

Invertebrates

Terrestrial Invertebrates

- 16.5.28 The invertebrate surveys revealed a very diverse assemblage, including a number of species of conservation importance. A total of 300 species were collected during the pitfall trapping, flight interception trapping and sweep netting within the refinery fence over the three summer sampling periods in 2001. A number of the species recorded were of conservation importance, including two Red Data Book species (i.e. they are known from fewer than 15 10km squares in the UK) and eight that are nationally notable/scarce (i.e. they are known from between 15 and 100 10km squares). Detailed results are presented in Annex 2 to Appendix 16.A.
- 16.5.29 The high diversity is likely to be due to the variety of habitats present, as well as to the close proximity of the Crymlyn Bog SAC, which is known to support a very

extensive invertebrate fauna. The most valuable areas for invertebrates were the large mosaic of woodland, grassland and heathland in the south-eastern corner of the site (Box 12, Figure 16.2a), the areas of species-rich grassland in the south-western corner (Box 11), and the heathland/grassland habitats on the hillside in the centre of the site (Box 6). However, species of conservation importance were distributed throughout the site, including areas of regenerating rubble and hard standing.

- 16.5.30 One of the most valuable habitats for invertebrates was the large expanse of acid grassland and marshy grassland at the southern end of the hillside indicated by Box 12; species richness was relatively high with invertebrates collected including a 'rare' (Red Data Book category 3) horse fly, *Haematopota grandis*, two 'Notable B' species and 32 species of 'local' status. The grassland at the northern end of this area also supported a relatively diverse invertebrate fauna, including a number of species of conservation importance. Notable B species were also recorded in the grasslands within the areas indicated by Boxes 4 and 11.

- 16.5.31 A rove beetle, *Aleochara fumata*, previously unrecorded in Wales (and considered likely to be a 'rare', RDB3, species), was collected from the heathland hillside (Box 6) and the large area of scrub on the north site (Box 1). However, subsequent targeted surveys for this species across the site in 2003, using mushroom traps, failed to record any more individuals.

Moths

- 16.5.32 In addition to the 300 invertebrate species collected within the refinery fence by pitfall trapping, flight interception trapping and sweep netting, a total of 195 moth species were recorded during the three light-trap surveys. A full species list for the site is presented in Appendix 16.A (Annex 2). Moth traps were also used to assess the fauna supported by the habitats along the route of the proposed Southern Access, and again a valuable moth fauna was recorded, particularly associated with the areas of marshy grassland (Box 2 Figure 16.2b; see Appendix 16.B for details).

- 16.5.33 A number of Notable and 'local' species were recorded during these surveys, including Dentated Pug, Silky Wainscot, Thyme Pug, Marsh Opaque-barred, Dusky Thorn and Frosted Orange, all of which are local priority species. However, the most significant result of the moth surveys was the presence of the double line moth, which was recorded both in the south-west of the refinery site, near to the Crymlyn Bog, and within the corridor of the proposed Southern Access route. This 'Notable B' species is listed as a Priority Species in both the UKBAP and the Neath Port Talbot LBAP, and is a species of principal importance listed under Section 74 of the CRow Act (2000). It is largely restricted to unimproved and marshy grassland habitats in Devon, Cornwall and south-west Wales, and has recently been recorded from only four other sites in Neath Port Talbot. Known foodplants include a range of grasses, such as Cock's-foot *Dactylus glomerata*, Meadow-grass (*Poa* spp.) and Bent (*Agrostis* spp.). It is therefore considered likely that its population is centred on Crymlyn Bog, but that areas of marshy grassland in the vicinity of the Bog are also used.

- 16.5.34 Light traps can attract moths from relatively large distances so it is not possible to make detailed assessments of the moth faunas of particular habitats. Nevertheless, the results of the moth surveys suggest that the areas of scrubby grassland, woodland and scattered patches of heathland and wetland in the southern parts of the site, and along the route of the proposed Southern Access, are at least of some local nature conservation importance for moths, and probably represent a valuable extension to the habitats found in the SAC.

Aquatic Invertebrates

- 16.5.35 A relatively diverse assemblage of aquatic invertebrates was recorded from the triangular pond (Box 8, Figure 16.2a), including two species of conservation importance. The most important of these was the caddis fly *Tricholeiochiton fagesii*, a species recently given the status of 'rare' (RDB3). This caddis fly has a very scattered distribution, and has only previously been recorded from two other sites in Wales, in Gwynedd and South Glamorgan. The hairy dragonfly *Brachytron pratense* was also recorded from this pond, both as larvae and as adults. This species is very localised in its distribution and is classified as 'Notable B'.
- 16.5.36 The South Site Reservoir (Box 2) supported a less diverse invertebrate community; however, despite the apparently polluted status of this water body, it did support a reasonable number of dragonfly species, and has the potential to become a valuable wetland feature following remediation. The refinery site as a whole also appeared to be important for the red-veined darter, a migrant dragonfly, although the species was not recorded breeding. Detailed results of the aquatic invertebrate surveys are presented in Appendix 16.A, Annex 2).

Amphibians

Frogs and Toads

- 16.5.37 None of the features surveyed for amphibians in March 2002 were being used by breeding frogs or toads. The northern and southern reservoirs are unlikely to be used by amphibians due to the oil contamination. Frog spawn was, however, recorded incidentally in ephemeral water bodies (such as flooded ruts), particularly in damp habitats in the south-eastern corner of the site.

Newts (including Great Crested Newts)

- 16.5.38 The presence of great crested newts (*Triturus cristatus*) was confirmed within the triangular pond (see Box 8, Figure 16.2a), and this pond was also revealed to support a large population of palmate newts (*Triturus helveticus*). Great crested newts were recorded during both the 2001 and 2003 surveys, and the peak counts indicate that this water body supports a 'moderate' population of great crested newts (see Appendices 16.1 and 16.2).
- 16.5.39 The areas of heathland, grassland, wetland and scrub surrounding the triangular pond are likely to be the most important areas of foraging and hibernation habitat for the great crested newts breeding in the pond. However, decommissioning activities in this area, largely involving the removal of tanks with unavoidable disturbance to neighbouring habitats, have lead to the loss of a proportion of the newt foraging habitat.

Reptiles

- 16.5.40 The assessment of potentially suitable reptile habitat across the refinery (see Figure 5, Appendix 16.A) indicated that much of the site, particularly in the south, is likely to be potentially valuable for reptiles, particularly as basking and foraging habitat. The site is known to support four of the six UK species of reptile (slow worm, common lizard, grass snake and adder), and appears to represent an important site for common lizards in particular. The most important areas for reptiles were the areas of heathland, particularly those on south-facing slopes, but impacts on reptiles will need to be considered across the site, including areas of rubble and hard standing otherwise considered to be of limited nature conservation value.

- 16.5.41 Surveys undertaken between June and August 2004 revealed that the route of the proposed Southern Access is also of value to reptiles. Grass snakes and common lizards were present in reasonable numbers. The most valuable areas for reptiles were the area of swamp where the pipe-tracks cross the SAC (Box 5, Figure 16.2b), the wooded bank (Box 4), and the farm buildings and around the dense stands of bracken and gorse at the north-eastern end of the survey corridor (Box 3; see Appendix 16.B for details).

Birds

- 16.5.42 It is clear from the bird surveys that the area within the application boundary supports a diverse bird fauna, including a number of species of conservation importance. A total of 65 species were recorded during the surveys undertaken throughout 2001 and 2004; of these 40 showed signs of breeding on the site. Willow scrub dominates much of the area within the refinery fence, and willow warbler was the most abundant breeding species recorded. Whitethroat, robin, wren, blackbird, blue tit, great tit and song thrush were also present in large numbers. Along the proposed Southern Access, the most frequent species recorded was the blackbird, although robin, wheatear, great tit, chaffinch and linnet were also abundant.
- 16.5.43 Of the 10 UKBAP Priority Species of bird known to occur in Neath Port Talbot County Borough, five were recorded within the refinery fence (bullfinch, linnet, reed bunting, song thrush and spotted flycatcher), whilst four were recorded along the proposed Southern Access (skylark, song thrush, linnet and reed bunting). These species also feature in the Neath Port Talbot local BAP and on the RSPB Red List of birds of 'high conservation concern', and are identified under Section 74 of the CRoW Act, as being of 'principal importance in Wales for the purpose of conserving biological diversity'.
- 16.5.44 One other local BAP Priority Species, lapwing (an RSPB Amber List species of 'medium conservation concern'), was also recorded within the refinery fence; this is also a species of principal importance listed under Section 74 of the CRoW Act (2000). In addition to the lapwing, eleven other Amber list species were also recorded on the site.
- 16.5.45 Of the species of conservation importance, bullfinch, linnet, song thrush and lapwing were all confirmed to be breeding within the application boundary. Lapwings were only recorded breeding on the area of hard standing in the north-east of the site (see Box 1, Figure 16.2a). Although they are also known to nest on an area of hard standing adjacent to the site, on the D'Arcy development, this land is also due for development.
- 16.5.46 The winter bird surveys indicated that the refinery site is not of particular value as winter foraging habitat for important bird species from the SAC. None of the valuable species known to occur on the Crymlyn Bog were recorded using the site during any of the winter surveys. It was clear, however, that the network of water bodies located within the containment area (Box 7) are potentially of value for lapwings. These ponds are heavily contaminated with oil sludge, but are currently in the process of being cleaned up as part of the remediation of the site. The proposed reinstatement in this location of the reedbeds, within a mosaic of more open wetland areas, will lead to considerable improvement in the suitability of this part of the site for this important species.
- 16.5.47 The broad distribution of BAP bird species throughout the area within the application boundary, and the high diversity of bird species recorded, indicates that both the refinery and route of the proposed Southern Access comprise a wide range of habitats that are of value to birds, in particular song thrush, linnet and bullfinch.

However, although birds of conservation importance were recorded throughout the survey area, it is the mosaic of woodland, grassland and heathland habitats, both in the south-western and south-eastern corners of the site Boxes 10, 11 and 12), that are considered to be the most important for birds.

Bats

Roost Surveys

16.5.48 The surveys undertaken within the refinery fence during 2001 revealed that lesser horseshoe bats were both roosting and feeding within the site. One building (see Figure 4, red Target Note 9, in Appendix 16.A) was being used as a day roost, and a number of other, mainly derelict, buildings scattered across the site (largely within the area indicated by Box 3 on Figure 16.2a) showed evidence of being used a feeding perches by lesser horseshoe bats. However, the very small quantity of droppings present in the day-roosts indicates use by a small number of bats, probably either a lone male, or a small number of non-breeding animals (rather than a maternity roost) and no horseshoe bats were recorded during the activity surveys in 2003 and 2004 (see below). None of the other various electricity sub-stations and former air-raid shelters showed signs of being used by roosting/ hibernating bats. A number potentially suitable bat roost sites in trees with dead wood, holes and fissures were identified (see Figure 4, red Target Note 13, in Appendix 16.A). The site was assessed as likely to represent a significant foraging resource for bats and to support habitats used by bats commuting from roosts outside the survey area.

16.5.49 With regard to the proposed Southern Access, although no droppings or other signs of roosting bats were recorded during the interior inspection of Penisa'r-coed Farm, a small number of pipistrelles were recorded during the emergence surveys (see Appendix 16.B for details). Given that no droppings were recorded, it is likely that they are using cracks and crevices in the stonework. Two mature oaks containing woodpecker holes suitable for roosting bats were identified at the edge of the steep hillside covered in sessile oak (Box 4, Figure 16.2b), although no bats were recorded emerging from these features.

Emergence/activity Surveys

16.5.50 The application area was found to be used by up to five species of foraging and commuting bat (common and soprano pipistrelles; possible Natterer's and whiskered/Brandt's bats; and Noctule), although they were recorded in lower numbers than anticipated for such a site. No horseshoe bats were recorded during these surveys, suggesting that the droppings recorded during the roost surveys in 2001 were indeed likely to have been produced by a lone individual using the site only on an occasional basis. The water bodies within the application boundary provided a focus for foraging bats, with common pipistrelles being recorded foraging over the North Site Reservoir and, in particular, over the areas of open water in the former tip/containment area in the west of the site (Box 7, Figure 16.2a). Noctules were also recorded flying in the vicinity of these water bodies on a number of occasions.

16.5.51 The areas of species-rich grassland, and to a lesser extent the wetter areas in and around the tank bases, also provided a focus for foraging bats, predominantly common pipistrelles and to a lesser extent soprano pipistrelles, noctules and *Myotis* species. The grasslands of particular value appeared to be those on the site of the old tank bases in the south-east of the site (particularly those at the northern end of Box 12), and the large area of grassland and associated dry heath in the middle of the site (Box 6).

16.5.52 Of particular value for foraging bats, particularly pipistrelle species, appeared to be the areas of tall scrub and woodland blocks, in particular those along the railway line at the western edge of the site (between Boxes 5 and 6, Figure 16.2a), the track running in a north-east, south-west alignment in the south of the site (i.e. the western edge of the area indicated by Box 12), and the tree-lined track along the northern edge of the containment area (Box 7). These particular habitat features, together with the woodland areas at the southern boundary of the refinery (Boxes 10 and 12), also appeared to be of value for commuting bats, notably pipistrelle species and, on a few occasions, noctules, natterer's and myotis species.

16.5.53 A number of foraging and commuting routes were identified along the route of the proposed Southern Access. The canal and the open strip within the wet woodland (Box 5, Figure 16.2b) represented particularly valuable foraging habitat, and a number of pipistrelles and myotids were also recorded foraging along the northern edge of the SAC woodland. The track that runs alongside the refinery fence (to the north of the woodland indicated by Box 1) also represented a valuable foraging and commuting route. The habitats to the east of the proposed new road were of limited value, and no bats were recorded flying over this hillside. Again, no horseshoe bats were recorded during these surveys.

Badgers

16.5.54 The badger population within the application boundary does not appear to be significant. Within the refinery fence, the majority of the badger activity is focussed in the south-eastern corner of the site (Box 12, Figure 16.2a), where the woodland and scrub habitats border large areas of farmland dominated by grazed pasture. Two small 'outlying' setts were identified in this area as well as a dung pit, several paths and two crossing points under the refinery fence. A further small 'outlying' sett was recorded in the far north of the site (Box 1).

16.5.55 A former 'main' badger sett was identified along the proposed Southern Access, on the steep hillside covered in grazed Sessile Oak and Bracken (Box 4, Figure 16.2b). Very few obvious paths were present, suggesting low levels of activity, and that the sett is probably now being used sporadically as a 'subsidiary' sett or as a 'main' sett by a declining social group. The sett had nine entrances, comprising one well-used, three partially-used and five disused entrance holes. There is the potential for a further ('annexe') sett to be present within an area of gorse to the south of the former 'main' sett; however, no paths into the scrub were visible, and therefore the presence of a sett is considered unlikely. A number of semi-improved grassland fields to either side of the proposed route of the Southern Access appeared to represent potential badger foraging habitat, but few signs of badger activity were recorded.

Otters and Water Voles

16.5.56 Signs of otters were recorded along the Tennant Canal (Box 7, Figure 16.2b), although no holt sites were found. No signs of water voles were recorded, neither along the canal, nor within the swamp (Box 5), nor the areas of marshy grassland near to the derelict farm (Box 2), although the canal and the areas of swamp did represent potentially valuable habitat for this species.

16.6 Assessment of Nature Conservation Importance

General Overview

- 16.6.1 An important feature of the application area is the wide variety of different habitats that have developed, particularly within the refinery fence, including species-rich grassland, heathland, scrub, woodland and aquatic habitats. The full range of habitat succession is represented, from areas of concrete and bare soil through to mature oak and birch woodland, and this has provided habitat for a large number of species (notably diverse assemblages of birds and invertebrates).
- 16.6.2 Lesser horseshoe bats, great crested newts and otters are all protected under the Wildlife & Countryside Act (1981, and amendments) (WCA) and under the EC Habitats Directive (as enacted in the UK under the Conservation (Natural Habitats &c.) Regulations, 1994), and are also listed as Priority Species in the UKBAP and the Neath Port Talbot local BAP. They are also listed as species of principal importance for biodiversity in Wales, under Section 74 of the CRoW Act (2000). Lesser horseshoe bats may forage over much of the site, and are certainly using a number of the refinery buildings as places of shelter. Great crested newts breed in the triangular pond in the centre of the site, and are likely to hibernate and forage in suitable habitats within a radius of up to 500m from the pond (although the majority will be within 250m). However, no additional populations of this species were found to occur within the wider environs of the refinery, thus the origins of this population are unclear. Otters are known to use the Tennant Canal.
- 16.6.3 Common lizards, which are also given some protection under the WCA, are also known to occur over much of the application area, and this is likely to represent a locally important population of this species. Grass snakes, slow worms and adders are similarly protected, and have also been recorded in certain habitats within the application boundary
- 16.6.4 A large number of bird species, including at least five UKBAP Priority Species, have been recorded within the boundaries of the refinery. The relatively large numbers and diverse assemblage of birds that the site supports are likely to be due to a combination of the wide variety of habitats available and the currently low levels of human disturbance (both within the refinery and in the farmland to the south). The lack of disturbance over much of the site, with certain areas (particularly in the south of the refinery) barely visited by refinery staff since decommissioning, is likely to be a key factor in its value for birds.
- 16.6.5 One UKBAP Priority Species of invertebrate, the double line moth, was recorded during the invertebrate surveys. This species is largely restricted to wet grassland habitats in Devon, Cornwall and south-west Wales, and has recently been recorded from only four other sites in Neath Port Talbot. The site overall supports a very diverse invertebrate fauna, and this is again likely to be due to the variety of habitats present, as well as to the close proximity of the Crymlyn Bog SAC. A number of other invertebrates of particular conservation importance were recorded, including two Red Data Book species (i.e. they are known from fewer than 15 10km squares in the UK) and eight that are nationally notable/scarce (i.e. they are known from between 15 and 100 10km squares). The most valuable sites for invertebrates were the large mosaic of woodland, grassland and heathland in the south-eastern corner of the site (see Box 12 on Figure 16.2a), the areas of species-rich grassland in the south-western corner (Box 11), and the heathland/grassland habitats on the hillside in the centre of the site (Box 6).

Assessment of Nature Conservation Value

- 16.6.6 In order to undertake a meaningful assessment of nature conservation importance, the ecological resources of the refinery site and the surrounding area have been classified into readily identifiable ecological sub-units based on the results of the extensive survey work carried out over the last seven years (see Appendices 16.1 and 16.2).
- 16.6.7 The most obvious, and clearly the most important, of these units is Crymlyn Bog. This site is designated a Special Area of Conservation (SAC) (incorporating Crymlyn Bog SSSI, and Pant-y-Sais SSSI), is also designated a Wetland of International Importance under the Ramsar Convention, and nearly half (114 ha) has been declared a National Nature Reserve. It is therefore considered to be of 'international' importance.
- 16.6.8 As part of the initial, detailed ecological assessment of the site (see Appendix 16.A) a number of key areas, or 'zones', within the refinery site were identified as representing separate ecological units of particular nature conservation importance. These zones (which equate in part to the areas indicated by the summary text boxes on Figure 16.2a) are illustrated in Figure 16.3 and are described and assessed below, along with the remaining areas of habitat both within the refinery fence and along the corridor of the proposed Southern Access route.
- 16.6.9 Two areas of wet woodland, a Priority Habitat in both the UKBAP and the Neath Port-Talbot local BAP (and a Section 74 habitat of principal importance for biological diversity in Wales), occur on the western and north-western boundaries of the refinery site (see Zone 1 on Figure 16.3). These both represent reasonable areas of important BAP habitat (with the area beneath the railhead being of particular value because of its important bryophyte flora), and both also provide an important natural buffer between the refinery and the SAC. A detailed evaluation of the nature conservation importance of Zone 1 on the basis of the criteria/guidelines presented in Ratcliffe (1977) ⁽⁶⁾ and Treweek (1999) ⁽⁷⁾ is provided in Appendix 16.A. According to the Glamorgan assessment criteria for Sites of Importance for Nature Conservation (SINC), Zone 1 would be considered a candidate for SINC status on the basis of: (i) the presence of more than 0.5 Ha of 'semi-natural carr woodland'; and (ii) its role as an important buffer to the Crymlyn Bog SAC.
- 16.6.10 In combination, therefore, these two areas of wet woodland would be classified as being of 'County/Unitary Authority' importance for nature conservation.
- 16.6.11 Zone 2 comprises a hilltop of species-rich dry grassland skirted by a hillside dominated by Heather. The heathland habitat (which is a Priority Habitat in both the UKBAP and the Neath Port-Talbot local BAP, and also a Section 74 habitat) is considered to be the most valuable area within the application boundary for reptiles. It was also found to contain a rare (RDB3) rove beetle not previously recorded in Wales, while the grassland supported a diverse invertebrate fauna, including three nationally scarce species. A detailed evaluation of nature conservation importance, as above, confirmed that Zone 2 would also be considered a candidate for SINC status. This is on the basis of: (i) the presence of more than 0.5 Ha of 'degraded and secondary heathland and/or grass-heath communities', and (ii) the presence of Red Data Book and nationally scarce species of invertebrates.
- 16.6.12 This zone is therefore classified as being of 'County/Unitary Authority' importance for nature conservation.

- 16.6.13 Zone 3, which occupies the south-western corner of the refinery site, comprises a large mosaic of habitats including mature oak woodland, species-rich dry grassland and scrub. It represents an important natural buffer between the refinery and the SAC and other valuable habitats to the south and west of the site. The area supports a diverse invertebrate fauna, including at least two nationally notable/scarse species, and is also an important area for reptiles, birds and bats. According to the Glamorgan SINC assessment criteria, Zone 3 would be considered a candidate for SINC status on the basis of at least three features: (i) the presence of more than 0.5 Ha of 'undegraded semi-natural woodland dominated by Oak; (ii) the presence of nationally scarce species of insects; and (iii) its role as an important buffer to the Crymlyn Bog SAC.
- 16.6.14 This zone is therefore also classified as being of 'County/Unitary Authority' importance for nature conservation.
- 16.6.15 Zone 4 comprises a large, west-facing expanse of wooded hillside interspersed with areas of heathland, grassland and scrub. A proportion of the woodland, towards the bottom of the slope, is classified wet woodland. The area supports a diverse invertebrate fauna, including a rare horse fly (RDB3) and at least five nationally notable species, and is also an important area for bats, reptiles and birds. Zone 4 would be considered a candidate for SINC status on the basis of at least three features: (i) the presence of more than 0.5 Ha of 'undegraded semi-natural woodland.. dominated by Oak..'; (ii) the presence of more than 0.5 Ha of 'degraded and secondary heathland and/or grass-heath communities'; and (iii) the presence of nationally scarce species of insects.
- 16.6.16 The triangular pond located in the centre of the site (red Target Note 15, Figure 16.2a) is one of the most important habitat features within the refinery fence, and is marked in red on the constraints plan. The pond itself supports a breeding population of great crested newts, as well as the RDB3 caddis fly *Tricholeiochiton fagesii* and the Notable B dragonfly *Brachytron pratense*, and is surrounded by a narrow band of scrubby heathland. The areas of grassland, wetland and scrub habitat in the vicinity of the pond are likely to be the most important areas of foraging and hibernation habitat for great crested newts, and together these features represent Zone 5 on Figure 16.3. However, much of this area currently comprises cleared ground or hard standing following decommissioning of the site. Because of the newt population, the pond and its surroundings would also qualify for SINC status. Great crested newts are relatively uncommon in the local area, and, given the small size and relative isolation of the Llandarcy population, the risks of stochastic extinction appear to be high and the population is likely to be on the margins of viability.
- 16.6.17 Zone 5 is therefore also classified as being of 'County/Unitary Authority' importance/sensitivity.
- 16.6.18 Throughout much of the rest of the site, areas of scrub and relatively species-rich grassland have developed on the thin soils. Although very much typical brownfield environments, these habitats have been found to be of some local importance for their populations of invertebrates, reptiles and birds, and would therefore, particularly because of the large scale of the site, be considered to be of 'local' importance for nature conservation.
- 16.6.19 The remaining areas of the refinery site generally comprise bare ground, hard standing, disused buildings and contaminated water bodies, and these would normally be considered to be of negligible nature conservation value. However, some of the areas of bare ground and hard standing provide potential nesting habitat for lapwings, while a number of the buildings have also been found to provide temporary

shelter for night-roosting bats, as well as nesting sites for birds. These features would therefore be considered to be of 'negligible to local' value for nature conservation.

- 16.6.20 The small areas of wet woodland and marshy grassland within the corridor of the proposed Southern Access route (outside of Crymlyn Bog SAC) were considered to be of some intrinsic nature conservation value. In addition, these areas were found to be of some value to birds, reptiles and invertebrates (particularly moths, including the double line moth, a UKBAP priority species). However, the habitats are relatively small and degraded (largely through over-grazing), so these features would therefore be considered to be of 'local' value for nature conservation.
- 16.6.21 Finally, the remainder of the corridor of the proposed Southern Access generally comprises common and widespread habitats, such as improved/species-poor semi-improved grassland, bracken and scattered scrub. These areas are therefore considered to be of no more than 'negligible' nature conservation importance.
- 16.6.22 These various zones and features are listed in Table 16.4 along with the importance/sensitivity category assigned to each one.

Table 16.4 Summary Assessment of Nature Conservation Importance

Receptor	Importance/ Sensitivity
Crymlyn Bog SAC	International
Zone 1 - Wet woodland on the western and north-western boundaries of the refinery site	County/Unitary Authority
Zone 2 – Heathland hillside and species-rich grassland within the centre of the refinery site	County/Unitary Authority
Zone 3 – Mosaic of oak woodland, heathland, scrub and species-rich grassland on the south-western boundary of the refinery site	County/Unitary Authority
Zone 4 - Mosaic of oak/wet woodland, heathland, scrub and species-rich grassland in the south-eastern corner of the refinery site	County/Unitary Authority
Zone 5 – Great crested newt pond and foraging habitat	County/Unitary Authority
Areas of scrubby grassland and other regenerating habitats throughout the refinery (including their resident reptile and invertebrate populations)	Local
Remaining areas of bare ground, hard standing, buildings and contaminated water bodies within the refinery site	Negligible/Local
Areas of wet woodland and marshy grassland within the corridor of the proposed Southern Access route (outside of Crymlyn Bog SAC)	Local
Remaining features within the corridor of the proposed Southern Access route (mainly improved, or species-poor semi-improved, grassland, but including reptile and bird assemblages)	Negligible/local

16.7 Future Trends without the Project

Ecological Trends

- 16.7.1 The current ecological trend across much of the site is of natural succession, from bare ground to grassland/ephemeral herbs, and then to scrub and finally woodland, which is typical of such areas of former industrial land. As buildings and tanks are demolished, and areas are cleared, the resultant patches of bare ground, hard-standing and rubble are gradually becoming recolonised. In many areas, particularly where a thin soil has developed (such as on the former tank bases), a combination of grasses and low-growing ruderal herbs has developed into a relatively species-rich grassland. In other areas, often where rubble and areas of degraded hard standing are present, scrub is beginning to become established. Scrub is now also starting to invade the more established habitat areas, such as the heathland and species-rich grassland. Birch and Buddleia are the most vigorous of the colonising species, and it is likely that these will become dominant throughout much of the site over the next ten to twenty years.

The Do-Nothing Scenario

- 16.7.2 The do-nothing option would result in the majority of the site being left in its existing post-demolition condition for an indeterminate amount of time, such that the natural succession described above would continue.
- 16.7.3 It is anticipated that there would be some negative and some positive ecological effects associated with such a scenario. Clearly, if the site were not to be developed, large areas of habitat that would otherwise be lost under the footprint of the development would be retained. However, it should be emphasized that most of habitat due to be lost comprises existing hard standing, and that the Masterplan for the scheme has specifically been designed with the intention of retaining the majority of the valuable habitat. Nevertheless, even those areas that are currently of relatively low nature conservation value would, in time, develop into scrub and eventually woodland.
- 16.7.4 Furthermore, without development the site would also remain a very large area of undisturbed habitat, allowing sensitive and more reclusive species, particularly birds, to thrive. Without artificial lighting, it is also likely that the site would become more attractive to those species of bats that tend to avoid well-lit areas, in particular horseshoe bats and long-eared bats.
- 16.7.5 Conversely, if the site were to be left alone with no human intervention, a number of the habitats present with the refinery fence would lose value over time without some form of management. For example, two of the more important habitats on site, heathland and species-rich grassland, are currently in the process of being invaded by scrub. Without active scrub management, these features would eventually disappear, along with the species associated with them, particularly invertebrates, reptiles and birds (including lapwings). A crucial feature of the site is the mosaic nature of the habitats, and this intimate juxtaposition of grassland, bare ground, heathland, scrub and woodland has contributed in large part to the wide variety of species present. Without intervention, habitat diversity would reduce significantly.
- 16.7.6 In addition, the creative conservation measures proposed in Section 16.10, in particular the creation of large areas of valuable wetland habitat, would not take place. These wetland areas would represent an extremely valuable extension to the SAC, and would be of value to a wide range of species, including wildfowl and

waders, reed buntings and reed warblers, otters, water voles, grass snakes and great crested newts. Currently, the great crested newt population is confined to one small water body, the triangular pond in the centre of the site. Without the creation of an extensive network of new ponds, the carrying capacity of the site for this species is limited, and the population may even not be viable in the longer term, as it is small enough to be vulnerable to stochastic extinction.

- 16.7.7 Finally, without the development remediation strategy, contamination of the soil and groundwater would persist both within the refinery site and in ecologically valuable off-site receptors (particularly Crymlyn Bog). This could lead to a long-term suppression of species diversity (particularly pollution-intolerant species) in those areas most seriously affected. It is likely that less contaminated parts of the site would bio-remediate (i.e. without the need for human intervention) over a shorter time scale (see Section 4 for a detailed assessment of contamination issues under the Do-Nothing Scenario).

16.8 Predicted Impacts during Construction

Avoidance of Impacts through the Master planning Process

- 16.8.1 The potential impacts associated with construction of the scheme were substantially avoided/reduced from the outset of the project through the deliberate use of ecological information in the design of the Masterplan. Detailed ecological surveys were undertaken early in the process in order to identify the most important features at the site to allow their conservation. The results of this survey work were used to inform production of an ecological constraints plan for both the refinery site and the proposed Southern Access (see Figures 16.4a and 16.4b, respectively).
- 16.8.2 The areas marked in red on the constraints plans (Figures 16.4a and 16.4b) are the most valuable and ecologically sensitive, and were therefore considered to represent the greatest constraint to the remediation and re-development of the application area. The majority of these areas comprise habitats listed in the UKBAP as Priority Habitats; although these habitats are not legally protected, the presumption against their development has been strengthened through the Countryside and Rights of Way (CRoW) Act (2000) and the planning process. Some of the red areas were also selected on the basis of the presence of protected species (e.g. great crested newts in the triangular pond). Wherever possible, the red areas were deliberately retained intact and, where appropriate, will be enhanced as mitigation for losses elsewhere within the site (see Section 16.9, below).
- 16.8.3 Orange areas comprise habitats that are not classified as UKBAP Priority Habitats but which are of some nature conservation importance, not least because of the diversity of species they support (particularly invertebrates, reptiles and birds). Many of these areas would benefit from improved management to increase their value. This includes areas of potentially valuable grassland that would benefit from an appropriate grazing/cutting regime, and habitats that are currently becoming degraded by the development of scrub (in particular, gorse and birch scrub).
- 16.8.4 Much of the remainder of the site represents habitat that is of limited intrinsic nature conservation value but which may be of importance to reptiles, birds and a range of more common species. Impacts of development on these areas (marked in yellow on Figure 16.4a, b) are unlikely to be significant, although some mitigation will be required. This includes: capture and re-location exercises for reptiles (and possibly great crested newts) prior to site clearance, followed by destructive searching of habitat; the removal of potential bird nesting habitat outside of the breeding season; and the provision of habitats and features within the landscaping proposals that would

encourage the use of the newly-created site by a range of species (see Section 16.10, below).

- 16.8.5 Finally, those areas marked in green on the constraints plan were considered to represent no constraint to development.
- 16.8.6 This constraints map was then used in the masterplanning process to ensure that areas of greatest nature conservation importance would be retained, and that the focus of the re-development of the site would be on those areas marked in green and yellow. This was done not only to maintain the nature conservation value and long-term ecological sustainability of the site, but also to help contribute to the natural landscape character of the proposed scheme.
- 16.8.7 Nevertheless, because of the sheer scale of the scheme and the relatively high ecological value of the site as a whole (in spite of the fact that it is, essentially, a brownfield site), there will clearly be some ecological impacts associated with the proposals. The most likely impacts from the demolition, remediation and re-development of the site would be associated with habitat loss and fragmentation, effects on the hydrology of the site, the potential for incidental mortality of protected and/or UKBAP priority species, and indirect effects on sensitive species (such as disturbance of breeding birds or dust contamination of lichens). These impacts are described in the following paragraphs, with each of the ecological receptors identified in Section 16.4 considered in turn.

Crymlyn Bog SAC

Southern Access

- 16.8.8 A potential direct impact on Crymlyn Bog during the construction phase would be at the far southern end of the scheme, where it is proposed that a viaduct will be constructed to carry the Southern Access road over the canal and the wet woodland of the SAC. The design of the crossing has been developed to minimise all impacts on the SAC (see Section 4), but without additional mitigation, there would be a possibility of effecting a small amount of habitat along the edge of the construction corridor (which is necessarily narrow at this point) as well as localised disturbance, pollution and sedimentation of the sensitive wet woodland and swamp habitats. Bird nesting, in particular, could potentially be disrupted in the vicinity of the works, and the potential also exists for amphibians and reptiles to be killed during the process of pier construction. There is also the potential for localised impacts associated with dust deposition along the edge of the retained habitat as a result of construction operations.
- 16.8.9 Mitigation measures are proposed in Section 16.10 which would address these issues and thus remove any significant potential for adverse impacts to occur.

Drainage Issues West of Refinery

- 16.8.10 Potential effects on the bog associated with the drainage system for the proposed Coed Darcy Urban Village are discussed in Section 15 Water Resources and Water Quality of the ES and hence are not dealt with in this section.

Zone 1 - Wet Woodland and Scrub

- 16.8.11 The valuable areas of wet woodland and scrub along the western margins of the site would not be affected by direct habitat loss, as they are outside the land-take for the development and will not require intrusive remediation. There will, however, be the

potential for nesting birds to be disturbed in the vicinity of the works, and for localised impacts associated with dust deposition along the edge of the retained habitat as a result of earthwork operations.

Zone 2 – Heathland Hillside and Species-rich Grassland

- 16.8.12 The majority of this hillside is to be retained within the scheme design, with only approximately 5-10% of the habitat (mainly comprising species-rich grassland known to support a diverse invertebrate assemblage) due to be lost under the footprint of the development. In addition, only limited remediation work will be required in this area, largely comprising removal of remaining pipe-work and other small remnants of refinery infrastructure.
- 16.8.13 There will, however, be the potential for incidental mortality of reptiles during the site clearance and earthworks activities in the area due to be lost, as this is one of the more valuable parts of the site for reptiles.
- 16.8.14 In addition, the potential also exists for nesting birds to be disturbed in the vicinity of the works, and for localised impacts associated with dust deposition along the edge of the retained habitat as a result of earthwork operations. It is likely that the use of this part of the site by foraging bats will not be affected to a significant degree.

Zone 3 – Mosaic of Oak Woodland, Heathland, Scrub and Species-rich Grassland

- 16.8.15 Approximately 60% of this zone (largely comprising areas of scrub and species-rich grassland, but also an area of heathland) would unfortunately be lost under the footprint of the development. This would also have a knock-on effect on the valuable invertebrate, reptile and bird assemblages present, including a loss of habitat for several species identified as priorities on the UK and local BAPs. These impacts would be permanent.
- 16.8.16 The potential also exists for nesting birds to be disturbed in retained habitats in the vicinity of the works, and for localised impacts associated with dust deposition along the edge of the retained habitat as a result of earthwork operations.

Zone 4 - Mosaic of Oak/wet Woodland, Heathland, Scrub and Species-rich Grassland

- 16.8.17 Approximately 40% of this zone (largely comprising areas of wet woodland, species-rich grassland, but also an area of heathland) would be lost under the footprint of the development in this location, although approximately 10-20% of the area to be lost (in the vicinity of the former LPG plant) currently comprises hard standing. The habitat loss would be permanent, and would have a knock-on effect on the valuable lower plant, invertebrate, reptile and bird assemblages present, once again including some loss of habitat currently used by species identified as priorities on the UK and local BAPs. In addition, the proposed development works would also affect some of the features identified as most heavily used by foraging bats. It is unlikely that works in this zone would have a significant effect on badgers (nor would any significant impacts be anticipated elsewhere across the site).
- 16.8.18 Construction works in the wet areas at the bottom of the slope (that is, the western strip of this area) will be complicated by the presence of peat to a depth of approximately 10m, and could also have a hydrological impact on neighbouring retained areas of similar habitat.

- 16.8.19 The potential also exists for nesting birds to be disturbed in retained habitats in the vicinity of the works, and for localised impacts associated with dust deposition along the edge of the retained habitat as a result of earthwork operations.

Zone 5 – Great Crested Newt Pond and Foraging Habitat

- 16.8.20 Although a small proportion of the existing habitat within this zone could be retained within the landscape planting for this area of the site, it is likely that at least 90% of the zone would permanently be lost. This will include not only the existing pond, used as a breeding site by great crested newts, but also areas of heathland, scattered scrub and species-rich grassland in the vicinity of the pond that represent an important foraging area for the newts. The loss of the pond would also represent an adverse impact on the local populations of the RDB3 caddis fly and the Notable B dragonfly recorded during the aquatic invertebrate surveys.

- 16.8.21 Removal of the newt pond will be required for two reasons. Firstly, surrounding development will need to be preceded by an extensive remediation programme, which will generally involve the excavation of soils down to depth of several metres. These works are necessary for public health protection and will deal with the legacy of oil contamination in the southern tank farm area. The efficacy of works would be compromised if areas of the former tank farm (where the newt pond is located) were left unremediated. Secondly, alterations will be made throughout the area to facilitate drainage for the new development. Currently water levels in the pond are maintained through runoff from surrounding areas, but as the development advances the final ground profile would be flatter and surface water drainage measures would be in place around buildings and in roadways. The long-term viability of the pond would therefore be uncertain at best.

- 16.8.22 In addition, several of the features within this zone were used by breeding birds (including several species identified as priorities on national and local BAPs), and supported populations of reptiles. Development in this zone would therefore also represent a loss of habitat for these groups.

Other Areas of Scrubby Grassland and Other Regenerating Habitats Throughout the Refinery

- 16.8.23 The majority of the areas of regenerating scrub, grassland and ephemeral vegetation across the site would be lost under the footprint of the development. Furthermore, because of the post-industrial, contaminated nature of these areas, even those parts not due for development are likely to require extensive remediation that would require habitat clearance and soil stripping. Although these areas largely represent recently-disturbed, anthropogenic habitats, they have been identified during the surveys as being of some importance for their bird, reptile and invertebrate populations. Therefore, although the habitats themselves are of relatively limited intrinsic nature conservation value, the loss of such a large area of this habitat would clearly, without mitigation, lead to a reduction in the resources available to these species locally.

- 16.8.24 As well as the permanent impacts related to habitat loss, construction activities in these areas also have the potential to result in the incidental mortality of individual reptiles, not only directly, but also through indirect effects associated with elevated population levels in neighbouring habitats caused by reptiles escaping the construction site.

- 16.8.25 The potential also exists for nesting birds to be disturbed in any retained areas in the vicinity of the works. Development and remediation works in some of these other areas would affect parts of the site used by foraging and commuting bats; however,

most of the more heavily-used areas and habitat features would remain available to them.

Remaining Areas of Bare Ground, Hard Standing, Buildings and Contaminated Water Bodies within the Refinery Site

16.8.26 The effect of the proposals on wetland habitat will be highly beneficial. Large areas of new reedbed, ponds and other wetland habitat are to be created, both within the former containment area and the South Site Reservoir, and these will be of value to a wide variety of wetland species, including great crested newts, grass snakes and reed buntings.

16.8.27 While the Masterplan has been developed specifically to utilise these areas of lowest nature conservation value, a potential does exist for adverse impacts on reptiles and lapwings in these areas. Construction activities again have the potential to result in the incidental mortality of individual reptiles (as above), and mitigation measures will need to be applied through the development and implementation of an Environmental Management Plan (EMP) to minimise the likelihood of these impacts. See also proposed Mitigation Measures in Section 16.10 below.

16.8.28 The loss of these areas will also have an adverse effect on lapwings, which are known to nest on these habitats in certain parts of the site. Given that the D'Arcy site (where lapwings are also known to nest) is also to be lost, the effect of the development would represent a cumulative impact on lapwings in the local area. The potential also exists for other nesting birds to be disturbed in any retained areas in the vicinity of the works.

16.8.29 Development and remediation works in some of these areas would also affect parts of the site used by foraging and commuting bats; however, most of the more heavily-used areas and habitat features would remain available to them. Several structures occasionally used by bats as night feeding perches (such as electricity sub-stations) would also be lost, although this would not represent a significant impact.

Areas of Wet Woodland and Marshy Grassland within the Corridor of the Proposed Southern Access Route (outside of Crymlyn Bog SAC)

16.8.30 Any impacts on these habitats are likely to be indirect, as they are some distance from the line of the proposed Southern Access. The most important of these is likely to be potential effects on the hydrology of these habitats, as their value is linked to the drainage characteristics of the local area, which could be disrupted by construction of the road. Drying out of these features could lead to a reduction in their value for several species of conservation importance, including rare moths (such as the double line), grass snakes and wetland birds such as reed buntings.

16.8.31 The potential also exists for nesting birds to be disturbed in retained habitats in the vicinity of the works, and for localised impacts associated with dust deposition along the edge of the retained habitat as a result of earthwork operations.

Remaining Features within the Corridor of the Proposed Southern Access Route (mainly Improved, or Species-poor Semi-improved, Grassland)

16.8.32 Although these features are of relatively low intrinsic nature conservation value, their loss would represent a reduction in available foraging habitat for reptiles and badgers. As well as the permanent impacts related to habitat loss, construction activities in these areas also have the potential to result in the incidental mortality of individual reptiles, not only directly, but also through indirect effects associated with elevated

population levels in neighbouring habitats caused by reptiles escaping the construction site.

- 16.8.33 The road would also have an impact on the badger sett located within the small area of grazed Oak woodland, either directly as a result of land take, or indirectly through disturbance. Whichever is the case, the sett is certainly within 30 metres of the proposed centre line of the road, so any construction activities would have to take place under licence to CCW. Depending upon the scope of the works, the sett may have to be removed and an alternative artificial sett built nearby, within the territory of the resident social group.

Importation of soil

- 16.8.34 Although the levels of soil importation extrapolated in the Remediation Strategy (see Section 4) would result in a substantial increase in lorry journeys, it is not anticipated that this would have a significant impact on species of conservation importance, given that vehicle speeds will be carefully controlled (thus minimising the risk of vehicle strike for birds, etc.). It is not possible at this stage to assess the impacts on the donor sites, as it will be the responsibility of the individual Developers to resource this and to identify suitable locations. It will, however, be an important feature of the development code to ensure that soil is not sourced from habitats of nature conservation importance, and this will need to be undertaken in consultation with the statutory consultees. It is therefore anticipated that the extraction of soil from donor areas will not have a significant adverse ecological impact.

16.9 Predicted Impacts during Operation

Generic Issues

- 16.9.1 Predicted impacts during the operational phase of the development are likely to be relatively generic across the entire application area, and are not therefore considered here on an area-by-area or zone-by-zone basis.
- 16.9.2 As with the construction phase, the potential impacts associated with the operational phase of the scheme have been avoided and reduced as much as practicable through the master-planning process. In particular, the decision to identify many of the more ecologically important habitats as areas of restricted access (as part of the overall landscape strategy) will greatly minimise the extent to which the habitats are trampled and the resident species disturbed. In addition, the footpath network has also been designed to discourage access to the more valuable areas. This is set out in detail in Section 11 (Landscape and Visual), and is also summarised in Section 16.9.3, below.
- 16.9.3 The provision of such a large new residential development could lead to ecological impacts associated with an increase in recreational use of the area. These impacts are likely to include an increase in litter and trampling of some sensitive habitats, including the retained areas of Zones 1 to 4. The potential for impacting areas of the Bog will be minimised through enforcing restricted access along the Western Margin of the site and the area alongside the southern access viaduct.
- 16.9.4 There will also be an increase in the incidental mortality of birds, newts and reptiles as a result of road kill, predation by cats, and by drains acting as traps. Again, it is difficult to quantify the magnitude of these impacts, but it would be appropriate to adopt the precautionary principle and to minimise their effect through specific mitigation measures.

- 16.9.5 In terms of species, the group most likely to be affected during the operational phase of the development is the birds, for which the site currently represents a relatively large and undisturbed area of diverse habitat. However, given that the former use of the site was as an active oil refinery, and that the site has been subject to sporadic demolition activities during the decommissioning process, it is considered that disturbance of birds in this area has historically been high, and that there would not be a significant increase.

Crymlyn Bog SAC

- 16.9.6 The proposals for the Southern Access have taken potential ecological impacts into consideration, with the aim of minimising their likelihood and magnitude. Specific mitigation measures have been incorporated into the proposals, which would mitigate issues such as the release of pollutants (from vehicle accidents), litter, light-spill, drainage and car emissions. These are discussed in Sections 16.10.12 – 16.10.16 below.
- 16.9.7 Whilst the potential exists for there to be shading effects on the habitats beneath the viaduct, the height of the viaduct (between 7 and 8 metres) is such that this is unlikely to be an issue. Impacts on bats and birds are also unlikely to be significant, as they will continue to be able to forage and commute underneath the structure, and will be unlikely to be at risk from vehicle strike.
- 16.9.8 Potential effects on the bog associated with the drainage system for the proposed Coed Darcy Urban Village are discussed in Section 15 Water Resources and Water Quality of the ES and hence are not dealt with in this section.

16.10 Proposed Mitigation Measures

- 16.10.1 The mitigation principles underpinning the redevelopment of the site are as follows:
- ❖ avoid impacts wherever possible;
 - ❖ where impacts are unavoidable then to seek to minimize them;
 - ❖ to attempt to ameliorate any remaining effects by *in-situ* enhancements of retained habitats and features; and
 - ❖ only when absolutely necessary, compensate for unavoidable losses by off-site habitat creation or enhancement.
- 16.10.2 As described in Section 16.7.1, above, impacts have been avoided to a great extent through the acknowledgement and incorporation of ecological constraints into the master-planning process. This has included providing ecological input to the development of the RAP, the remediation strategy ⁽⁸⁾, the landscape strategy, the Crymlyn Bog crossing, the overall site drainage scheme, and the long-term protection and enhancement of retained areas within the application boundary. All of these are considered in more detail below, along with species-specific mitigation measures designed to further minimise impacts.

Ecological Input to the RAP and the Remediation Strategy

- 16.10.3 The Remedial Action Plan (RAP) (see Appendix 4.C) has been developed with the objective of setting out a strategy for the protection of off-site receptors (particularly Crymlyn Bog) from potential risks resulting from on-site contamination. It thus relates largely to the periphery of the application area, focussing on the Western

Margin/Crymlyn Bog, the Containment Area, the North and South Site Reservoirs, the Southern Margin, Llandarcy Bog and the Neath Valley to the east (see Section 4 for details). This process is a statutory action, and would need to take place with or without the re-development of the refinery site.

- 16.10.4 In contrast, the Remediation Strategy ⁽⁸⁾ has been developed to deal with on-site contamination issues, specifically because this area is now proposed for mixed-use development, including a significant component of residential end-use.

- 16.10.5 In summary, the RAP aims to minimise impacts on non-human receptors off-site, whilst the site-wide Remediation Strategy addresses the future use of the application area as an Urban Village. The Remediation Strategy and the RAP are thus complementary, and both have the potential to have adverse and beneficial effects on ecology (although the adverse effects are generally short-term, while the benefits are long-term). Both will be further developed and implemented in consultation with the EA, CCW and Neath Port Talbot County Borough Council, with a view to minimising the adverse impacts and maximising the opportunities for ecological enhancement.

Ecological Benefits Associated with the RAP

- 16.10.6 Protection and enhancement of the Crymlyn Bog SAC, and related habitats, is one of the over-riding principles of mitigation associated with the re-development scheme. This has required, and will continue to require, close and continuing collaboration between the ecological advisors and statutory and non-statutory consultees, and those responsible for re-development master-planning, hydrological investigations, remediation proposals and drainage solutions.

- 16.10.7 The RAP for the site has primarily been developed in order to ensure that the SAC and other sensitive environmental receptors near to the site (including the Neath Valley/River and Llandarcy Bog to the south and east of the site) are protected from potential contamination. However, the RAP also provides the potential for a more proactive, positive approach, involving active habitat creation and enhancement for the benefit of biodiversity. As with the development of the Masterplan, therefore, ecological objectives have also been an important feature in the development of the RAP, and it has effectively been used as an opportunity to provide off-site mitigation for the scheme in areas otherwise outside the application boundary.

- 16.10.8 For example, the South Site Reservoir (in the north-western corner of the site) is to be converted into a valuable wetland habitat that will also serve as an attenuation lagoon as part of the new Sustainable Drainage System (SDS) for Coed Darcy Urban Village. Similarly, the long interception trench at the base of the western margin of the site, extending from the South Site Reservoir to the western tip of the Containment Area, will also be designed specifically to maximise its wetland biodiversity. Water from the trench will discharge to a linear reedbed, from which there will be a diffuse discharge to the Bog. For both ecological and Health & Safety reasons, access to this area will be severely restricted through landscape planting (see below), thus protecting it from disturbance during the operational phase of the development.

Remediation Strategy

- 16.10.9 The potential for ecological impacts as a result of remediation works has been carefully considered. Proposals aim to reduce any unnecessary loss of valuable habitats and species. Most significantly, a strategy of restricted access (see Section 11: Landscape) has been adopted in many areas where there is a combination of relatively low contamination and relatively high value habitat, thus allowing such

features to be retained without there being a risk to public health. This will mean that significantly less habitat will be lost as a result of the re-development of the site.

- 16.10.10 The installation of new trenches and wells across the site as part of the remediation process also has the potential to lead to the incidental mortality of great crested newts, along with other amphibians and reptiles. These structures will therefore be designed in such a way that they do not act as traps for these species.
- 16.10.11 Finally, in places, remediation will simply be achieved through the creation of ponds with associated reedbeds, into which contamination from the surrounding area will be drawn and then bio-remediated. These features will be designed specifically with a view to enhancing their value for wetland biodiversity.

Crymlyn Bog Crossing

- 16.10.12 The form of the viaduct for the Crymlyn Bog crossing, and the proposed construction methodology, have been designed specifically to minimise all significant ecological impacts. In particular, a method has been developed that will avoid alterations to the hydrology of the surrounding parts of Crymlyn Bog, through the use of piles that will inhibit the formation of new flow-paths. In addition, careful measures will be implemented to ensure that potential impacts on the neighbouring habitat during the construction process (for example, through sedimentation, pollution and disturbance) will be avoided. These measures (including sediment traps, oil interceptors, etc.) are explained in detail in Section 4, and are not therefore repeated here. However, it will also be necessary to employ measures to protect reptiles and amphibians during the construction operations, and to minimise disturbance effects on nesting birds (see species-specific mitigation in Section 16.10.42 to 16.10.45, below, for details). These measures will all be implemented through the Environmental Management Plan (EMP) for the scheme (see Section 16.10.54, below).
- 16.10.13 With regard to the operational phase of the development, the drainage system for the viaduct has been designed specifically to ensure that water quality is not affected, with run-off designed to drain away from the Bog and to be treated *ex-situ* (see Sections 4 and 15 for details). Furthermore, the sides of the viaduct will include a footpath/cycleway sloping towards the kerbline, an edge parapet approximately 75mm higher than the footway, and a mesh incorporated in the safety barrier. Detailed design of the crossing will also consider options to minimise the risk to of vehicles accidentally falling into the above.
- 16.10.14 These measures will minimise the risk of pollutants being released into the Bog and will also serve to minimise the likelihood of litter dropping into the Bog from the viaduct. The removal of litter from the viaduct and its surroundings will be an important element of the long-term management of the operation of the crossing.
- 16.10.15 Given that car emission levels will be below the accepted limits for human health and the protection of ecosystems (see Section 9: Air Quality), and that the viaduct will be raised high above the Bog (with the resultant dilution and dispersal effect), it is anticipated that there will be no significant adverse effects on the Bog from air pollution. Furthermore, the planting of hedgerows alongside the Southern Access will further minimise any potential effects of air pollution on neighbouring habitats. As noted in Section 9, predicted NO_x levels with the Southern Access in operation at the Crymlyn Bog are below the current UK annual of objective of 30µg/m³.
- 16.10.16 The height of the viaduct is such that impacts on bats and birds are unlikely to be significant, as they will continue to be able to forage and commute underneath the structure, and will be unlikely to be at risk from vehicle strike. Furthermore, the

crossing will deliberately not be lit, so that potential impacts on foraging bats, particularly those species that tend to avoid light (such as horseshoe and long-eared bats) will be avoided.

Ecological Input to the Landscape Strategy

- 16.10.17 In addition to the use of detailed ecological information in the masterplanning and RAP/remediation processes, ecological and biodiversity objectives have also played an important part in the development of the Landscape Strategy (see Section 11 for details).

Habitat Retention/creation

- 16.10.18 In particular, existing woodland and scrub will be retained wherever possible (i.e. where remediation will not require their clearance), and these woodland blocks will be linked by new planting on remediated areas. Where possible, new planting will comprise native species of local provenance, although planting schemes nearer to the centre of the development (i.e. in more urban areas) may involve ornamental species.
- 16.10.19 As part of this process, a 'green corridor' will be created across the central part of the site (see Figure 11.10), linking the woodland hillside to the east with Crymlyn Bog to the west, thus contributing to the ecological sustainability of the development. Features of particular value to invertebrates, newts, reptiles, nesting and foraging birds, and foraging bats will be incorporated into the detailed design of this corridor, which will be developed in consultation with CCW.
- 16.10.20 In addition, the wetland attenuation features required to service the drainage of the site will be designed to enhance their value for wildlife. On the site of the former tip, in particular, South Bay will be enlarged at an early stage of the development to take water from the new residential areas associated with Phase 2. In conjunction with this, new newt breeding ponds (and neighbouring foraging habitat) will be created, probably in association with the Lagoon at the western end of this area (see Section 16.10.34 to 16.10.38 for more details). Consideration will also be given to planting appropriate woody species with a view to creating wet woodland in the longer term.
- 16.10.21 All design of these features will be undertaken in consultation with CCW and the Local Authority Ecologist, to ensure that features of particular value for nature conservation are included, thus contributing to local biodiversity initiatives and targets. In order to screen this new wetland area from the rest of the site, and provide habitat enhancement for bats and birds, the belt of trees along the eastern edge of the tip will be retained and strengthened.
- 16.10.22 Any other areas of habitat across the site that do not require remediation will be retained, wherever possible, to ensure that relatively mature habitats are present throughout the development area. Where areas containing such habitats will need to be treated through the remediation process, but will nevertheless remain part of the landscaping for the site (for example, the green corridor and the area of grassland directly east of the railhead), the replacement habitats will be created specifically to optimise their value for invertebrates, reptiles, newts, birds and bats.

Restriction of Access

- 16.10.23 In order to minimise the potential impacts of human disturbance during the operational phase of the development, particularly on the Bog but also in other valuable retained habitats (especially those within Zones 1 to 5), landscape planting

will be used to restrict access to these features. This planting will be specially designed to fulfil both landscape and access- restriction functions, and will therefore comprise thorny, thicket-forming species such as Gorse and Blackthorn in order to create impenetrable barriers (see Section 11 for details). It is intended that, for Health & Safety reasons, these barriers will be created as early in the development process as possible, in order to prevent residents from Phases 1 and 2 from accessing these areas.

- 16.10.24 In addition, the locations of viewing points across the Bog have specifically been selected with a view to minimising potential disturbance effects, with limited access instead provided to the new wetland features to be created in the former tip/containment area (this is likely to comprise a perimeter path around the area, plus viewing points/bird hides).

Treatment of Temporarily Undeveloped Areas

- 16.10.25 It has been agreed with the statutory and non-statutory consultees (Ref. Meeting of 29th November, 2004) that there will be a need to keep these areas free of significant ecological constraints to development, but that there was a desire to achieve this without precluding potential short-term ecological gains (such as providing nesting areas for lapwings, scrub for other nesting birds, and valuable habitat for reptiles).

- 16.10.26 However, given that the consultees have suggested that emerging European legislation may be an obstacle to pragmatic agreements of this nature being made, it will be necessary to develop this element of the landscape proposals with caution. For the purposes of this impact assessment, however, the worst case scenario has been assumed (i.e. that these areas will be lost), and attempts will be made as the project develops to resolve the issue for the benefit of nature conservation. However, it is probably more likely that these areas will be allowed to develop into scrub, a habitat that is unlikely to represent a significant constraint in the future, however stringent European legislation and regulation may become.

Protection, Restoration and Enhancement in Retained Areas

- 16.10.27 Given that it will not be necessary to remediate the soils in the majority of the more valuable habitats across the site (as contamination levels in these areas are generally very low), it will be important to retain and protect as much as possible of Zones 1-4 (see Figure 16.3), as well as other retained habitats within the application area.

- 16.10.28 A buffer zone, comprising a combination of dense planting and protective fencing, will be created around the edge of all retained areas of Zones 1 to 4 to help protect the important habitats. A detailed description of these barriers is provided in Section 11: Landscape. It is intended that these buffer zones are created early in the re-development of the site, not only to discourage access during the early phases, but also to provide protection from potential dust deposition associated with the earthworks operations. Other dust suppression measures, including the use of bowsters across the site to spray water on dry earth, will also be employed (and implemented through the EMP), and these are described in detail in Section 9: Air Quality. In combination, it is anticipated that these measures will ensure that sensitive habitats are not adversely affected by dust.

- 16.10.29 It will also be important to make provision for the short- and longer-term management of these retained areas, since some of their elements represent transitional habitats (which would degrade without intervention), and others require remedial management. This will be undertaken through the development and implementation

of an ecological management plan for the site that will form part of the overall Environmental Management Plan (see Section 16.10.54 below).

- 16.10.30 In addition, all engineering works in the vicinity of the wet woodland that comprises Zone 1, the wet woodland in Zone 4, and the wet woodland and marshy grassland along the route of the Southern Access, will be designed to ensure that the hydrological regimes in these areas are protected, and natural catchments within these areas will be re-instated (see Sections 4 and 15).
- 16.10.31 Opportunities exist to deliver on UKBAP commitments by extending existing areas of Priority Habitat within the refinery fence, or enhancing the value of areas of habitat that, with careful management, could attain UKBAP status. For example, much of the hillside in the centre of the application area has the potential (through targeted scrub removal) to become high quality heathland habitat, while the potential also exists to create more wet woodland around the periphery of the site as part of the site drainage and remediation proposals. Furthermore, the plans to create reedbeds as part of the remediation of surface water across the site would result in the creation of entirely new areas of UKBAP habitat.
- 16.10.32 Similarly, expansion, or improved management, of existing habitats could also serve to improve the value of the site for a variety of UKBAP Priority Species, in particular birds such as linnet (which will benefit from the use of Gorse in the landscape buffers), bullfinch and reed bunting (which will benefit from the extensive wetland creation proposed). Within retained areas, management will ensure that an appropriate mosaic of open grassland and scrub habitat is maintained to maximise their value for reptiles, while new wetland areas will be created specifically to benefit great crested newts. For more details on species-specific mitigation see Sections 16.10.34 to 16.10.52 below.

Site Drainage

- 16.10.33 Mitigation measures integrated in the Project to minimise potential adverse impacts associated with the site drainage on Protected Habitats in the Bog are discussed in Section 15 of the ES.

Species-specific Mitigation

Great Crested Newts

- 16.10.34 Surveys both within the site and in the surrounding areas indicate that the great crested newts occurring in the triangular pond are isolated, and possibly represent either a relict or introduced population. At present, this population is therefore vulnerable to local extinction. The creation of a more substantial, and varied, network of ponds and other wetland features, along with additional areas of potentially valuable terrestrial habitat and 'links' to other newly created or retained features throughout the site, will ensure the long-term preservation (and potentially expansion) of the population.
- 16.10.35 In particular, a number of new ponds, as well as extensive areas of foraging habitat, will be created in the area of the former tip/containment area. In addition, Llandarcy Bog (to the northeast of the existing contractors' yard) will also be enhanced for newts, largely through the opening up of existing overgrown ponds to create suitable breeding habitat. These two areas would be linked to each other by the heathland hillside (which will be retained and enhanced as part of the development proposals; see Zone 2 on figure 16.3) and to the habitats in the south-eastern corner of the site by the 'green corridor' (see Figure 11.10).

- 16.10.36 Newts from the existing pond will need to be captured and relocated to the new ponds. Fencing will be erected around the triangular pond during the spring, when the majority of the adult newts will be in the pond, then emerging newts will be captured in pitfall traps set alongside the fence and transported to the receptor areas. This will probably need to take place over the course of at least two years, to ensure that the whole population is moved. It will also need to be carried out under licence to the Welsh Assembly Government, with a clear justification of the reasons for removing the pond.
- 16.10.37 The longer the new ponds have to develop in advance of this translocation process the better, as it will be important to move the newts into a relatively mature habitat. Furthermore, at least one of the new ponds would need to be designed to be as similar as possible to the existing pond in order to replicate the conditions. This will be important not only for the newts but also for the rare caddis fly and for the hairy dragonfly, both of which are also known to breed in the pond. Consideration will also be given to translocating caddis fly and dragonfly larvae from the pond, or indeed seeding the new features with water extracted from the existing pond by bowser.
- 16.10.38 Measures will also be implemented to protect the newts from future mortality associated with infrastructure roads (for example, underpasses), although the relocation of the population away from the main body of the site (i.e. to the new wetlands on the site of the former containment area) would minimise the likelihood of road mortality. In the interim, measures to avoid the incidental mortality of great crested newts would need to continue to be employed in the vicinity of the triangular pond. Any activities likely to kill or injure great crested newts, or to damage or destroy their habitat (in particular, site clearance and earth works), would need to be carried out under licence to the Welsh Assembly Government, and at the time of year when the majority of newts will be in the pond (i.e. April/May).

Reptiles

- 16.10.39 Many of the most valuable areas and features for reptiles would persist within the retained areas of Zones 1-4. However, reptiles are present throughout the site, and measures to avoid their incidental mortality will need to be employed. Where necessary, individuals will be relocated to selected parts of these retained zones. Maximising the current and future value of these zones for reptiles, through targeted habitat management, will be an important element of their short- and longer-term management.
- 16.10.40 Works likely to affect reptiles do not currently need to be carried out under licence. However, there is a legal requirement to take all reasonable care to avoid the incidental mortality of reptiles, and it is recommended that works in areas of suitable habitat are undertaken during the summer months, when reptiles are active and thus able to escape. Significant impacts on reptile habitat may require areas to be fenced and individual reptiles captured and relocated; likely impacts would therefore need to be reviewed to determine where capture/ relocation exercises are necessary, and this will be implemented through the EMP.
- 16.10.41 Measures will also be implemented to protect the reptiles from future mortality associated with infrastructure roads and drainage features. This could include underpasses under roads (where appropriate), and reptile- (and newt-) friendly road drainage structures. In addition, ramps will be installed in interception trenches to allow reptiles (as well as small mammals and other species) to escape.

Birds

- 16.10.42 A significant proportion of the more important habitat for breeding birds would also be retained within Zones 1-4, and protection of these habitats from disturbance during the operational phase of the development (see Sections 16.10.27 to 16.10.32, above) will be particularly important for birds, whose breeding can readily be disrupted. However, much of the remainder of this 'mosaic' site will be lost, and this has also been found to be valuable for birds. All new landscape planting will therefore be created with a view to optimising its value for birds, and seasonal constraints will need to be placed on site clearance activities.
- 16.10.43 Wherever it is unavoidable that trees have to be felled, or areas of scrub have to be cleared, this will be undertaken outside the bird breeding season (that is, not between mid-March and mid-August), wherever possible. Where works in this season are unavoidable, the site would need to be cleared or the material cut down during the preceding winter. It is also possible that site clearance or ground remediation works could affect ground-nesting birds. For this reason, work involving the clearance of any established vegetation will need to be reviewed.
- 16.10.44 Seasonal restrictions may also be necessary and/or measures proposed to dissuade birds from nesting in the affected areas. Works associated with the construction of the Crymlyn Bog viaduct should ideally commence before the onset of the bird nesting season, so that birds that have already started breeding are not disrupted by the commencement of construction activities. As has taken place to date (during the decommissioning process), it will be necessary to review and resolve the potentially competing seasonal constraints associated with birds and reptiles on a case by case basis.
- 16.10.45 It would also be appropriate to take every opportunity to retain existing trees and scrub within the structural landscaping of any new scheme, and this is a principal component of the Landscape Strategy. In addition, any new planting schemes will be designed to be of optimum value to birds, whilst minimizing mortality 'hot-spots' on new infrastructure roads. In an attempt to mitigate the loss of breeding habitat for a range of species, developers will be encouraged, through the town code, to incorporate a bird-box scheme into their proposals, and home-owners will also be encouraged to make their gardens bird-friendly.

Bats

- 16.10.46 Specific mitigation and licence applications (to the Welsh Assembly Government) may be required before works to, or demolition of, any of the structures identified as having been used by bats, should it be confirmed that they represent roosts. A pipistrelle roost was confirmed in the derelict farm alongside the proposed Southern Access, and a licence would be required should it be necessary to demolish this building. However, it appears unlikely that any of the structures within the refinery site in which horseshoe bat droppings were recorded would be classified as roosts, given that they appeared only to represent night-feeding perches used for a short period in 2001, and that no further evidence of the species has been recorded. Nevertheless, further surveys of these structures would need to be carried out prior to any demolition works to ensure that this remains the case.
- 16.10.47 The majority of the mature trees within the application area that could support roosting bats would be retained within the landscape areas/habitat zones. However, wherever such trees would be lost (for example, within the woodland part of Zone 4 due for development), it will be necessary to carry out climbing inspections and/or emergence surveys to confirm the presence or absence of bats. This also applies to

the two trees within the corridor of the proposed Southern Access identified as being potentially suitable for roosting bats. Should bats be recorded, any felling of these trees would again need to be carried out under licence, preferably in October, when neither hibernating bats nor females with dependant young would be present. A detailed method statement for the removal of these features would need to be agreed with CCW and submitted with the licence application.

- 16.10.48 Although few features of value for roosting bats were recorded across the application area (due to the relative unsuitability of most of the buildings, and the immaturity of much of the woodland, particularly in those areas that would be developed), consideration should be given to the provision of artificial roosting and/or hibernating sites to enhance the value of the site for these protected species.
- 16.10.49 With regard to foraging, much of the best quality habitat for bats would be retained within Zones 1-4, and high quality additional habitat would be provided through the wetland creation proposed, particularly in the containment area and around the South site Reservoir. In addition, habitat 'linkages' between the retained and newly-created areas will be created (for example, the 'green corridor'), and it will be particularly important to optimise the value of these features for bats. This would involve not only creating habitats with an optimal invertebrate diversity and biomass, but also ensuring that a dark corridor is created to encourage both foraging and commuting.
- 16.10.50 Along the route of the proposed Southern Access, hedgerows will be planted alongside the road. These will not only discourage bats from flying directly across the road (encouraging them instead to fly parallel to the road, and guiding them towards favourable foraging habitats away from the road), but will also provide a valuable additional linear foraging feature.

Badgers

- 16.10.51 The results of the badger survey would need to be used to inform site clearance, remediation or demolition proposals in those areas identified as containing badger setts (i.e. in the far north and the south-east of the refinery site, and along the Southern Access). In general, work involving heavy machinery and/or excavation within 30m of a sett may require a licence, as may work involving light machinery within 20m, and work with hand tools within 10m of the nearest entrance hole of a sett. Particularly extensive or potentially disruptive operations (blasting, pile-driving etc.) at greater distances may also require a licence. Given the proximity of a sett to the proposed Southern Access (see Box 4, Figure 16.2b), it may be necessary to close this sett under licence, and replace it with an artificial structure nearby.
- 16.10.52 The need for badger-proof fencing (and, potentially, an underpass) along the proposed Southern Access will need to be reviewed, in consultation with CCW.

Ecological Monitoring and Long-term Management

- 16.10.53 Given the significant ecological constraints associated with much of the site and its surroundings, it is very important that a formal environmental management framework is established so that there is continual ecological input to all on-going and future phases of the site's re-development (including demolition, remediation, construction and subsequent operational activities). This would ensure that potential impacts on valuable habitats and species continue to be either avoided or effectively mitigated, and would also allow for the continued input of positive biodiversity enhancement measures throughout the whole development process.

- 16.10.54 A system of ecological survey, monitoring, supervision and advice has already been set in place, and this will continue to be undertaken in full consultation with, and support from, the relevant consultees, through the development of a detailed Environmental Management Plan (EMP) for the scheme. An effective relationship between the appointed developer(s) and contractor(s), the specialist ecologist, the environmental manager and the statutory and non-statutory consultees is essential to ensure that impacts continue to be monitored and minimised. Such a framework will also facilitate compliance with the Welsh Development Agency's Biodiversity Guidelines, which aim to 'guide WDA staff and its consultants towards best practice in the avoidance, minimisation and management of biodiversity impacts, and to promote positive biodiversity gains in all of their project work'.
- 16.10.55 Specialist ecological input and advice throughout the re-development process is particularly important for ensuring that legal obligations and best practice requirements are met. It will continue to be necessary, for example, to update ecological surveys, to implement measures to avoid or at least minimize the incidental mortality of reptiles during the remaining demolition, site clearance and remediation works. As has already been the case through the decommissioning of the refinery, this would involve some elements of supervision, setting limits to working areas, fencing off the most valuable features and, where necessary, carrying out translocation and relocation operations, where necessary.
- 16.10.56 During the operational phases of the development, it is envisaged that a Management Company will be established. One of the responsibilities of this organisation will be to manage the common open spaces, including the retained areas of valuable habitat, in accordance with a detailed habitat management plan. It is anticipated that an Ecology Liaison Officer will be appointed by the Developer to manage this ecological input throughout the development. This will include monitoring progress against the ecological objectives set in the management plan, and ensuring that corrective action is taken wherever objectives are not being met.
- 16.10.57 Given the scale of the site, it is likely that monitoring would focus on a photographic record of the relevant areas to ensure that large-scale habitat objectives are being achieved (such as the maintenance of valuable heathland habitat on the hillside in the centre of the site, or ensuring that the wet woodland to either side of the viaduct does not become degraded). However, more detailed monitoring of habitats and species may be required (such as monitoring the great crested newt population within the former containment area, or monitoring lichens on trees adjacent to the Southern Access viaduct), and this would need to be developed in consultation with CCW and other relevant consultees.
- 16.11 Assessment of Significance of Residual Impacts**
- 16.11.1 A summary of the ecological impact assessment for the Coed Darcy Urban Village development is presented in Table 16.5, below. The significance of the residual impacts (i.e. those remaining following mitigation) is shown in the final column of the table; this is the result of considering the value/sensitivity of the receptor and the magnitude of the impact, as shown on Table 16.3.
- 16.11.2 Overall, the careful incorporation of ecological considerations into the development of the Masterplan, the RAP, the Remediation Strategy, the Landscape Strategy and proposals for the long-term management of the site, has meant that the residual impacts are small given the considerable size of the project and the sensitivity of the ecological receptors. This is particularly important in the case of Crymlyn Bog SAC, a site of international importance for nature conservation, for which the residual impacts following mitigation would be 'negligible'.

- 16.11.3 There would be a number of residual benefits as a result of the proposals. In particular, the long-term beneficial effect on wetland habitats will be of 'slight to moderate' significance for nature conservation, with many existing water bodies being cleaned up and others created, along with other wetland habitat such as reedbed. There will also be a beneficial residual effect in the wet woodland of Zone 1; this has been classified as being of 'negligible to slight' significance.
- 16.11.4 Loss of some local habitats across the application area will be inevitable, with knock-on effects on resident species. This will result in residual impacts of 'moderate' significance on Zones 3 and 4, as well as on the scrubby grassland habitats occupying much of the refinery site. The residual adverse impact of the proposals on the heathland hillside in the centre of the site, Zone 2, will be of 'slight' significance.
- 16.11.5 With regard to species of conservation importance, the loss of so much of the scrub and species-rich grassland habitat across the site will represent a cumulative residual impact on local bird and reptile populations of 'moderate' significance. The residual impacts on great crested newts will depend on the effectiveness of the mitigation, although relocation would be expected to be successful if undertaken in accordance with best practice. An improvement in the status of the population is therefore expected as a result of the extensive wetland habitat creation proposed.
- 16.11.6 Bats are unlikely to be significantly affected by the re-development of the site, since no known roosts are to be lost, and many of the better foraging areas will be retained within the landscape design. The maintenance of habitat connectivity, through dark 'green corridors' will also allow light-sensitive bat species to access all of the more valuable areas of the site.

Table 16.5 Summary Impact Assessment Table

Ecological Receptor	Value of Receptor	Description of Potential Impacts	Mitigation Measures	Impact Magnitude after Mitigation	Significance of Residual Impacts
Crymlyn Bog SAC	International	Construction: Re-design of site drainage could result in reinstatement of natural drainage regime. Potential pollution and sedimentation of water discharging into the Bog as a result of construction activities. Potential disturbance to nesting birds. Operational: Limited increase in disturbance/damage to habitats and species from public, cats, dogs etc. Disturbance, air pollution, shading, vehicle strike etc. associated with the new bridge for the Southern Access.	Development of RAP and remediation strategy in consultation with EA and CCW. Interception trenches will prevent free-phase hydrocarbons contaminating the Bog. Diffuse discharge to replace the existing point discharge. Reed beds to be used. Water quality protection measures during construction and operational phases (see Section 15). Operational surface water drainage to be designed to maintain current discharge rates into bog. Public access to the Bog to be restricted. Viaduct for the Crymlyn Bog crossing to be 7-8m above Bog. Construction methodology for viaduct carefully designed to minimise impacts, including those on hydrology, bats reptiles and amphibians.	Negligible adverse	Negligible
Zone 1 - Wet woodland and scrub	County/Unitary Authority	Construction: No loss of habitat. Limited disturbance of nesting birds. Operational: Disturbance effects very limited due to difficult terrain and access.	Area to be retained with very restricted access to the public. Habitat to be left to bioremediate through the RAP; should lead to increases in biodiversity. Hydrological protection measures during construction and operational phases (see Sections 4 and 15).	Small/negligible benefit	Negligible/slight
Zone 2 - Heathland hillside and species-rich grassland	County/Unitary Authority	Construction: Approx 5-10% of the species-rich grassland would be lost; some effects on reptiles possible. Disturbance of nesting birds in retained habitats.	Over 90% of the area is to be retained and managed to enhance its nature conservation value (e.g. removal of birch scrub). Public access will be restricted to minimise disturbance. Site clearance will be sensitive to reptile, bird and other species issues.	Small adverse	Slight

SECTION 16 ECOLOGY AND NATURE CONSERVATION

COED DARCY URBAN VILLAGE ENVIRONMENTAL STATEMENT

Ecological Receptor	Value of Receptor	Description of Potential Impacts	Mitigation Measures	Impact Magnitude after Mitigation	Significance of Residual Impacts
		Operational: Likely increase in disturbance/damage to habitats and species in retained areas from public, cats, dogs etc.			
Zone 3 – Mosaic of oak woodland, heathland, scrub and species-rich grassland	County/Unitary Authority	Construction: Loss affecting over 50% of the habitat, including habitats of importance for invertebrates, reptiles and birds. Disturbance of nesting birds in retained habitats. Operational: Likely increase in disturbance/damage to habitats and species in retained areas from public, cats, dogs etc.	The retained areas will not need to be remediated, so there will be no loss/ disruption to the remaining habitats. Site clearance will be sensitive to reptile, bird and other species issues. Public access will be restricted to minimise disturbance.	Large adverse	Moderate
Zone 4 - Mosaic of oak/wet woodland, heathland, scrub and species-rich grassland	County/Unitary Authority	Construction: Loss affecting 20-50% of the habitat, including habitats of importance for lower plants, invertebrates, reptiles and birds. Operational: Likely increase in disturbance/damage to habitats and species in retained areas from public, cats, dogs etc.	The retained areas will not need to be remediated, so there will be no loss/ disruption to the remaining habitats. Site clearance will be sensitive to reptile, bird and other species issues. Public access will be restricted to minimise disturbance. Hydrological protection measures during construction and operational phases (see Section 15).	Medium adverse	Moderate
Zone 5 – Great crested newt pond and foraging habitat	County/Unitary Authority	Construction: Loss affecting over 50% of the existing habitat, including the breeding pond. Extensive areas of replacement habitat to be created. Operational: Significantly larger areas of breeding habitat will become available. Likely increase in mortality in retained /new areas from cats, dogs etc.	Extensive areas of replacement newt habitat to be created on the site of the former tip, including a significant increase in the amount of potential breeding habitat (in the form of new ponds). Translocation to take place over several seasons.	Depends on the success of any translocation	Depends on the success of any translocation

Ecological Receptor	Value of Receptor	Description of Potential Impacts	Mitigation Measures	Impact Magnitude after Mitigation	Significance of Residual Impacts
Other areas of scrubby grassland and other regenerating habitats throughout the refinery (including their resident bird, reptile and invertebrate populations)	Local	Construction: Loss affecting the majority of the habitat; resultant impacts on birds, reptiles and invertebrates. Disturbance of nesting birds in retained habitats. Operational: Likely increase in disturbance/damage to habitats and species in retained areas from public, cats, dogs etc.	A green corridor will be created through the centre of the site (see Landscape Section); this will be designed to be of optimum value for birds, reptiles and invertebrates, either through retaining (if possible) or recreating scrubby grassland habitat. Elsewhere, natural habitat is to be retained within the landscape design wherever possible (see Section 11). Reptiles will need to be re-located; bird habitat will be cleared outside the nesting season.	Large adverse	Moderate
Remaining areas of bare ground, hard standing, buildings and contaminated water bodies within the refinery site	Negligible to local	Construction: Loss affecting the majority of the terrestrial habitat; reduction in nesting areas available to lapwings, loss of foraging habitat for reptiles. However, the aquatic and wetland habitats will benefit significantly from remediation and habitat creation. Operational: Likely increase in disturbance/damage to habitats and species in retained/created areas from public, cats, dogs etc.	Reptiles will need to be captured and relocated, and short term alternative nesting sites for lapwings will be provided as part of the landscaping scheme. Access will be restricted to new wetland areas.	Large adverse (terrestrial habitats) Large beneficial (wetland habitats)	Slight to Moderate Slight to Moderate
Areas of wet woodland and marshy grassland within the corridor of the proposed Southern Access route (outside of Crymlyn Bog SAC)	Local	Construction: Potential hydrological impacts as a result of construction activities leading to drying out of damp habitats. Disturbance of nesting birds in retained habitats. Operational: Limited increase in disturbance/damage to habitats and species from public, cats, dogs etc.	Construction of new road will be designed to maintain the hydrological regime and ensure that drainage characteristics of the hillside are not affected. The planting of hedges alongside the road will minimise potential impacts on bats and moths, and will reduce possible effects of dust deposition.	Negligible	Negligible



SECTION 16 ECOLOGY AND NATURE CONSERVATION

COED DARCY URBAN VILLAGE ENVIRONMENTAL STATEMENT

Ecological Receptor	Value of Receptor	Description of Potential Impacts	Mitigation Measures	Impact Magnitude after Mitigation	Significance of Residual Impacts
Remaining features within the corridor of the proposed Southern Access route (mainly improved, or species-poor semi-improved, grassland)	Negligible	Construction: Loss of a narrow corridor of species-poor grassland habitat along the former route of the refinery pipetrack. Disturbance of nesting birds in retained habitats. Operational: No impacts	Generally not considered necessary. However, reptiles may need to be captured and relocated.	Negligible adverse	Negligible

16.12 Summary

- 16.12.1 A comprehensive suite of ecological surveys has been undertaken across the Llandarcy Refinery site and the proposed route of the Southern Access over the last four years. This has provided a considerable amount of ecological information about the application area, including the distribution and status of protected, rare and/or priority habitats and species.
- 16.12.2 The most valuable features within the refinery site are contained within five ecological sub-units, or 'zones', all of which comprise a combination of habitats and species that would qualify them for SINC (Site of Importance for Nature Conservation) status. The most valuable ecological receptor addressed in the impact assessment is Crymlyn Bog SAC, which has the potential to be affected both indirectly (mainly through the scheme drainage proposals) as well as directly (through construction and operation of the Crymlyn Bog viaduct). The remainder of the application area is of lower nature conservation importance, although even these habitats are of some importance (mainly for reptiles and birds), and few areas have no ecological constraints associated with them.
- 16.12.3 Overall, the careful incorporation of ecological considerations into the development of the Masterplan, the RAP, the Remediation Strategy, the Landscape Strategy and proposals for the long-term management of the site, has meant that the impacts associated with the scheme (assuming successful implementation of the mitigation measures) are relatively small given the considerable size of the project and the sensitivity of the ecological receptors. This is particularly important in the case of Crymlyn Bog SAC, a site of international importance for nature conservation, for which the residual impacts of the scheme have been assessed as 'negligible'.
- 16.12.4 There will be a number of positive residual benefits as a result of the proposals. In particular, the long-term beneficial effect on wetland habitats will be of at least 'slight to moderate' significance for nature conservation, with many existing water bodies being cleaned up and others created, along with other wetland habitat such as reedbeds and wet woodland. There will also be a beneficial residual effect of 'negligible to slight' significance in the wet woodland of Zone 1.
- 16.12.5 There will necessarily be loss of habitat across the application area, with knock-on effects on resident species. This will result in impacts of 'moderate' significance on Zones 3 and 4, as well as impacts on the heathland hillside in the centre of the site (Zone 2) of 'slight' significance.
- 16.12.6 With regard to species of conservation importance, the loss of scrub and species-rich grassland habitat across the site will represent a cumulative residual impact on local bird and reptile populations of 'moderate' significance. The residual impacts on great crested newts will depend on the success of any translocation exercise, although it would be anticipated that an improvement in the status of the population would occur as a result of the extensive wetland habitat creation proposed. Bats are unlikely to be significantly affected by the re-development of the site, since no known roosts are to be lost, and many of the better foraging areas will be retained within the landscape design. Furthermore, the maintenance of habitat connectivity, through unlit 'green corridors', will also allow bats (including light-sensitive species such as horseshoe bats) to access all of the more valuable areas of the site.

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