



SEVERN ROAD RESOURCE RECOVERY CENTRE

**CHAPTER 12
ECOLOGY AND NATURE CONSERVATION**

Viridor

SLR REF 402.0036.00374

September 2009



solutions for today's environment

CONTENTS

Introduction	2
Guidance and Industry Good Practice	2
Sources of Information	3
Assessment Approach	3
ECOLOGICAL Baseline.....	13
Contextual Information	13
Designated Sites	13
Habitats	13
Flora	14
Evaluation of Ecological Features.....	21
Criteria for Evaluation.....	21
Evaluation	26
Recognised Sites / Features of Biodiversity Value.....	30
Habitats	30
Species	31
Potential Impacts	32
Characterisation of Potential Impacts.....	32
Mitigation	42
Mitigation Incorporated into Scheme.....	42
Further Recommended Mitigation and Enhancement.....	44
Assessment of Residual Impacts.....	48
Conclusions	50

Drawing 12-1 Phase 1 Habitat Plan



INTRODUCTION

- 12.1 An Ecological Impact Assessment (EclA) can be considered as having three purposes:-
- to provide an objective and transparent assessment of the ecological effects of a proposed development or activity;
 - to permit objective and transparent determination of the consequences of the proposals in terms of national, regional and local policies relevant to nature conservation; and
 - to demonstrate that a proposed development or activity will meet the legal requirements relating to species and habitats.
- 12.2 In assessing the effects of any such proposal it is necessary to define the spatial and temporal area of study and to focus the assessment upon those features or resources that are of ecological value in the context of that proposal. The scope of this assessment has been determined through the consideration of the possible direct and indirect impacts associated with the proposal by an assessment of ecological receptors that may be affected.
- 12.3 The site description and development proposals are described in full in Chapters 2 and 3 of this ES which should be read in conjunction with this chapter. Chapter 12 of this ES deals solely with potential ecological impacts associated with the proposed development.
- 12.4 Due to the extensive levels of data collection and analysis which has been used to inform this assessment, much of the detailed methodologies used and survey results are provided in individual specialist Technical Appendices (Provided in Volume 3). Relevant aspects of these reports are summarised within the main text of this chapter, however please refer to the relevant Technical Appendix for more details.

Guidance and Industry Good Practice

- 12.5 The scope of this EclA, collection of baseline data, evaluation of ecological resources, description and assessment of the significance of impacts follows guidelines set out by the Institute of Ecology and Environmental Management (IEEM) and references therein¹.
- 12.6 Specific guidance for the collection of specialist baseline data has also been adhered to and this is referenced in each of the appropriate Technical Appendices.

¹ Institute of Ecology and Environmental Management (May 2005) Guidelines for Ecological Impact Assessment. Final Draft for Agency Approval.

Sources of Information

- 12.7 A variety of archived information sources have been used to inform this assessment, including:
- Bristol Regional Environmental Records Centre (BRERC) databases;
 - Bristol City Council (BCC) planning portal website;
 - Joint Waste Core Strategy Habitats Regulation Assessment²;
 - Multi-Agency Geographic Information for the Countryside (MAGIC) website; and
 - National Biodiversity Network (NBNgateway) website.
- 12.8 In addition to this, extensive ecological field studies have also been carried out at the site specifically to inform this assessment in respect of habitats and species.

Assessment Approach

Area of Study

- 12.9 The area of study has been established through careful consideration of the type of development concerned and the ecological receptors which are present.
- 12.10 The field work focused primarily on land within the planning boundary of the application site and as shown on Drawing 12-1, however desk based studies included an area extending up to 10km from the site itself, and the impact assessment also considers potential ecological receptors within this area.

Collation of Baseline Data – Biological Records

- 12.11 Information on statutory wildlife sites within 10km of the application site has been obtained from published sources chiefly Natural England's published resources and the MAGIC website³. Information on non-statutory sites within 2km of the site has also been obtained through consultation with BRERC. Information on the presence of notable, rare and legally protected species near the site has also been gathered for a minimum 2km study area by analysis of BRERC records and consultation of the NBNgateway website⁴. Please note that BRERC do not permit the unauthorised reproduction or distribution of their records to third parties, therefore these records are not included in this assessment, but summarised in the text below and the relevant Technical Appendices.
- 12.12 Where EIA has also been carried out recently on planning applications near the application site, these documents have been reviewed and the data collected and used to inform the current assessment in terms of flora and fauna in the local area.

² Environmental Resource Management (2009) *West of England Joint Waste Core Strategy: Habitats Regulations Assessment*. ERM, Bristol.

³ www.magic.gov.uk

⁴ <http://data.nbn.org.uk/>

Collation of Baseline Data – Field Survey

- 12.13 The scope and detail of the surveys undertaken for this assessment follow those recommendations made by the former Institute of Environmental Assessment⁵ and have been designed through formal scoping exercises and discussions with consultees. The methods used for ecological survey are in accordance with those established and generally accepted methodologies for field survey, as published by the Institute of Ecology and Environmental Management (IEEM).
- 12.14 Specialist surveys have also been undertaken for habitats and legally protected and notable fauna; details of the methodologies used to collect this data are provided in the relevant Technical Appendices as follows:
- Habitats – Technical Appendix 12.1;
 - Water vole – Technical Appendix 12.2;
 - Reptiles – Technical Appendix 12.3;
 - Amphibians – Technical Appendix 12.4;
 - Breeding birds – Technical Appendix 12.5; and
 - Invertebrates – Technical Appendix 12.6.

Constraints to current surveys

- 12.15 It is considered that sufficient information has been collected during the above surveys to accurately assess the ecological value of the habitats and species present, identify any potential impacts to them and to inform an appropriate mitigation scheme to ensure that current and future development activities can be undertaken without adversely affecting the ecological receptors identified in this EclA.
- 12.16 A small waterbody in the car breakers yard to the north of the site could not be surveyed during the amphibian surveys due to a lack of access permission. Nonetheless, it is considered that a sufficient proportion of the waterbodies present within the vicinity of the site were surveyed to provide a robust assessment of amphibian populations in the locality.

Planning Policy Background

National: PPS9 – Biodiversity and Geological Conservation (2005)

- 12.17 PPS9 suggests that proposals on sites which are important for nature conservation should incorporate advantageous biodiversity and geological features within the design of development, and prevent harm to biodiversity and geological conservation interests.

⁵ Institute of Environmental Assessment (1995) Guidelines for Baseline Ecological Assessment. E. & F.N. Spons.

- 12.18 PPS9 also places high importance on protected species, suggesting that planning authorities should ensure the implementation of mitigation measures through conditions. These should be actively used or alternatively planning permission should be refused where harm to species and/or habitats may result.

Regional: RPG10 – Regional Planning Guidance for the South West

- 12.19 Policy EN1 of RPG10 recommends that local authorities should have regard for landscape and biodiversity in their development plans, policies and proposals. These recommendations include:
- provide for the strong protection and enhancement of the region's internationally and nationally important landscape areas and nature conservation sites;
 - encourage the maintenance and enhancement of the biodiversity resources of the region;
 - promote the restoration and expansion of depleted and vulnerable biodiversity resources in order to reverse fragmentation and create continuous viable habitats; and
 - indicate that the protection and, where possible, enhancement of the landscape and biodiversity should be planned into new development.

Regional: Draft Regional Spatial Strategy

- 12.20 The following policies within the emerging RSS are relevant to this assessment:
- **ENV1 Protecting and Enhancing the Region's Natural and Historic Environment:** The quality, character, diversity and local distinctiveness of the natural and historic environment in the South West will be protected and enhanced, and developments which support their positive management will be encouraged. Where development and changes in land use are planned which would affect these assets, local authorities will first seek to avoid loss of or damage to the assets, then mitigate any unavoidable damage, and compensate for loss or damage through offsetting actions. Priority will be given to preserving and enhancing sites of international or national landscape, nature conservation, geological, archaeological or historic importance. Tools such as characterisation and surveys will be used to enhance local sites, features and distinctiveness through development, including the setting of settlements and buildings within the landscape and contributing to the regeneration and restoration of the area.
 - **Policy ENV4 Nature Conservation** states that the distinctive habitats and species of the South West will be maintained and enhanced in line with national targets and the South West Regional Biodiversity Action Plan. Local authorities should use the Nature Map within the RSS to help map local opportunities for biodiversity enhancement in Local Development Documents, taking into account the local distribution of habitats and species, and protecting these sites and features from harmful development. Priority will be given to meeting targets for maintenance, restoration and recreation of priority habitats and species set out in the RSS, focusing on the Nature Map areas. Proposals which provide opportunities for the beneficial management of these areas and habitats and species generally, should be supported, including linking habitats to create more functional units which are more resilient to climate change.
 - **RE4 Meeting the Targets through Development of New Resources:** When considering individual applications for development of renewable energy facilities, Local Planning Authorities will take into account the wider environmental, community and economic benefits of proposals, whatever their scale, and should be mindful that schemes should not have a cumulative

negative impact and that proposals in protected areas should be of an appropriate scale and not compromise the objectives of designation.

Local: Joint Replacement Structure Plan

12.21 Policy 18 of the Joint Replacement Structure Plan recommends that local authorities must have consideration for enhancement of nature conservation through development:

'Priority should be given to enhancing the overall ecological quality, extent, capacity, structure and functioning of locations and the surrounding ecological network by creating new habitats, buffer areas and landscape features. Such effort should be concentrated in those locations where habitats and/or species have been identified as being particularly vulnerable.'

12.22 Policy 29 concerns waste facilities including environmental considerations:

'Provision will be made for the development of waste management facilities employing the best practicable environmental option (BPEO), utilising previously developed land where appropriate, in locations where... no threat is posed to watercourses and surface/groundwater resources.'

Local: Bristol City Local Plan

12.23 Several policies within the adopted Local Plan relating to energy, waste and the natural environment are considered relevant to this application. These are included below:

- **ME1 – Energy Conservation: Renewable Energy Installations.** Proposals for the utilisation and development of renewable sources of energy will be permitted providing there is no unacceptable impact on:
 - (i) The amenity of local residents due to noise or other disturbance;
 - (ii) Public health and safety;
 - (iii) The visual quality of important landscape designations;
 - (iv) The natural environment.
- **ME2 - Pollution: Location and Design of Developments.** Development which has an unacceptable impact on the environmental amenity or wildlife of the surrounding area by reason of fumes, odour, dust or other forms of air, land or water pollution will not be permitted.
- **ME5 - Pollution: Protection of Groundwater Supplies.** The location and design of development will be required to incorporate appropriate remedial measures to avoid harm to groundwater supplies which may otherwise result from the development.
- **ME8 - Watercourses: Coastal Area.** Development within the coastal zone defined on the Proposals Map, will only be permitted where:
 - (i) A coastal location is an operational requirement.
 - (ii) Appropriate flood defence works are undertaken as part of development.
 - (iii) Nature conservation interests are not significantly affected, either directly or indirectly.
- **NE4 - Watercourses and Wetlands.**
 - (I) Development which would cause unacceptable harm to the natural watercourse system or to the extent of the loss of natural flood-plain will not

- be permitted unless satisfactory compensatory measures are provided which take full account of requirements for land drainage, watercourse management, good water quality, nature conservation and amenity.
- (II) Development which conserves or enhances the water environment will be permitted, provided that measures are included as appropriate to:
- (i) Safeguard or enhance water quality (eg by decontamination);
 - (ii) Ensure there is no unacceptable damaging run-off from hard surfacing;
 - (iii) Prevent pollution where harmful discharges are likely to occur;
 - (iv) Retain wetland habitats and natural waterside vegetation and ensure their future management.
- **NE5 - Sites of Nature Conservation Interest.**
 - (I) Sites of Nature Conservation Interest, set out in the Schedule and defined on the Proposals Map will be protected, having regard to the relative significance of their designation.
 - (II) Development which is likely to have an adverse effect on the nature conservation objectives or the integrity of a potential or classified Special Protection Area, a candidate or designated Special Area for Conservation or a Ramsar Site will not be permitted.
 - (III) Development affecting a site of Special Scientific Interest will not be permitted unless it can be made subject to conditions that will prevent damaging impacts on wildlife habitats or important physical features, or if other material factors outweigh the national nature conservation considerations.
 - (IV) Development which would harm the substantive nature conservation value of sites of citywide importance will not be permitted, except where the significance of the site for nature conservation is outweighed by the importance of the development.
 - **NE6 - The Wildlife Network.**
 - (I) The city's wildlife network will be protected and, where possible, enhanced.
 - (II) Development on wildlife network sites, as defined on the Proposals Map, will not be permitted unless:
 - (i) An open corridor is retained which maintains an effective link in the network;
 - (ii) An open buffer zone which gives effective added protection to any adjoining site of nature conservation interest is retained;
 - (iii) Habitats or features of identified importance to wildlife are retained and protected from any significant adverse effect.
 - (iv) The site is shown not to serve or support any substantive wildlife interest, including the necessary function of the wildlife network, as a result of further detailed site assessment.
 - (III) Development which maintains the integrity of the wildlife network and includes measures to enhance the nature conservation value of remaining open land, will be permitted.
 - **NE8 - Protected Species.** Development which would cause unacceptable harm to a species protected under national legislation, or its habitat, will not be permitted unless the adverse effect is capable of being overcome by measures to be carried out prior to or during development, as identified in a thorough site survey.

Evaluation

12.24 The baseline information obtained has been used in undertaking an assessment of the value of ecological features within the study area. Ecological features are defined as:

- statutorily protected (Natura 2000 sites, Sites of Special Scientific Interest, National Nature Reserve) or locally designated (e.g. County Wildlife Sites) sites and features;
- recognised sites and features of biodiversity value not designated in this way, e.g. areas listed on published inventory of priority biodiversity habitats (e.g. Ancient Woodland Inventory, lowland grassland inventory) or areas of habitats subject to UK or Local Biodiversity Action Plan targets (see Table 1 below); and
- species of biodiversity value or significance, including those protected and controlled by law (see Table 2 below).

12.25 An evaluation of the above ecological features has been based upon the IEEM guidelines as follows.

Table 1 – Ecological Evaluation of Non-designated Habitats and Features

Geographic Frame of Reference	Examples of Non-Designated Habitats and Features that are Ecologically Significant at that Level
International	<p>Areas of habitats of International importance, i.e. those included on Annex 1 of the Habitats Directive should have been designated, or identified for designation, as SAC. Where a site supporting Annex 1 habitats carries a lower level of designation, e.g. SSSI, it should be considered important at that level.</p> <p>A viable area of an Annex 1 habitat not designated in this way may be valuable at this level, for instance where the habitat is in a management state such that it does not meet SAC criteria for selection, but is capable of being restored in a reasonable timeframe to a state that could be designated as such.</p>
National	<p>All sites of national ecological importance should have been designated at this level by the country agency. Where a site carries a lower level of designation it should be considered important at that level.</p> <p>A viable area of a priority habitat identified in the UK BAP where the UK BAP states that all areas of that habitat are to be protected may be important at a National level.</p> <p>Sites supporting a viable area of a habitat of priority biodiversity action, as identified in EN published habitat inventories, where the habitat has been identified as being scarce at a national level.</p> <p>A site where field survey shows that the site would meet published SSSI guidelines or has the potential to meet these guidelines within a reasonable timeframe.</p>
Regional	<p>Sites supporting a viable area of a habitat of priority biodiversity action, e.g. UK or Regional HAP or included in EN published habitat inventories, where the habitat has been identified as being scarce at a regional level or where they are essential to maintain the viability of a larger area.</p> <p>Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile.</p> <p>A site where field survey shows that the site would meet published Regional ecological selection criteria or has the potential to meet these guidelines within a reasonable timeframe.</p>
County/ Metropolitan	<p>A site where field survey shows that the site would meet published County/Metropolitan ecological selection criteria or has the potential to meet these guidelines within a reasonable timeframe.</p> <p>A viable area of habitat identified in County BAP or appropriate Natural</p>

Geographic Frame of Reference	Examples of Non-Designated Habitats and Features that are Ecologically Significant at that Level
District/ Borough	<p>Area profile where the protection of all areas of that habitat is a published target of the BAP or the habitat is identified as scarce at a County level.</p> <p>Areas of habitat identified in a sub-county (district/borough) BAP or in the relevant Natural Area profile that are scarce within the district/borough.</p> <p>Sites/features that are scarce within the district/borough or which appreciably enrich the district/borough habitat resource, e.g. an ecologically diverse hedgerow network.</p>
Parish/ Neighbour- hood	<p>Areas of habitat considered to enrich appreciably the habitat resource within the context of the Parish or the neighbourhood, e.g. species-rich hedgerows, municipal parklands or individual veteran trees.</p> <p>Areas of habitat with limited intrinsic ecological value, but that buffer the negative effects of a more valuable feature, e.g. a County-designated site.</p>

Table 2 – Ecological Evaluation of Species

Frame of Reference	Examples of Species that are Ecologically Significant at that Level
International	<p>A regularly occurring population of an internationally important species, which is threatened or rare in the UK. i.e. it is a UK Red Data Book species or listed as occurring as 15 or fewer 10km squares in the UK or of uncertain conservation status or of global conservation in the UK BAP.</p> <p>A regularly occurring, nationally significant population/number of any internationally important species, e.g. a bird population representing greater than 1% of the international population.</p>
National	<p>A regularly occurring, regionally or county significant population/number of a nationally important species.</p> <p>A regularly occurring population of a nationally important species on the edge of its natural range.</p> <p>A species assemblage of national significance.</p>
Regional	<p>A regularly occurring, locally significant population of a species listed as being nationally scarce. For example, a species which occurs in 16-100 10km squares in the UK, or is highlighted in a Regional BAP, Red Data Book or relevant Natural Area on account of its regional rarity or localisation.</p> <p>A regularly occurring, locally significant number of a regionally important species.</p> <p>A species assemblage of regional significance.</p>
County/ Metropolitan	<p>Any regularly occurring, locally significant population of a species which is listed in a county/metropolitan Red Data Book or BAP on account of its regional rarity or localisation.</p> <p>A regularly occurring, locally significant number of a county/metropolitan important species.</p>
District/ Borough	<p>A population of a species that is listed in a district/borough BAP because of its rarity in the locality or in the relevant Natural Area profile because of its regional rarity or localisation.</p> <p>A regularly occurring, locally significant number of a district/borough important species during a critical phase of its life cycle.</p>
Parish/ Neighbour- hood	<p>Populations or species assemblages considered to enhance the local ecological resource, e.g. a breeding bird assemblage</p>
Negative	<p>The presence of injurious or legally-controlled weeds, e.g. those identified under The Weeds Act 1959, Schedule 8 of the WCA1981 (e.g. Japanese knotweed, giant hogweed), or the Ragwort Control Act 2003 would be considered an ecological, commercial or social disbenefit, usually at a local or site level.</p>

Impact Assessment

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

- identification of the range of potential impacts that may arise resulting from the proposed development;
- consideration of the systems and processes in place to avoid, reduce or mitigate the possible effects of these impacts;
- identification of the opportunity for ecological enhancement associated with the proposals;

- assessment of the residual impacts, following consideration of the success of avoidance, mitigation and enhancement measures; and
 - where necessary, identification of compensation required to offset any significant residual effects.
- 12.27 As previously highlighted, the significance of residual impacts is assessed on three separate levels. These can be summarised as:
- impacts upon biodiversity resources;
 - consequences in terms of national and local nature conservation planning policy; and
 - legal requirements relating to species and habitats.
- 12.28 All species and populations of species, including those with statutory protection, are evaluated on the same basis. It should be noted that even when a species is protected under European and UK statute, the presence of a small population on a site within a region where this species is widespread is unlikely to be assessed at a value of greater than district-level importance. Equally, a particular feature on a site may attract large numbers of an unprotected species that has limited distribution and this may represent a feature of regional importance.
- 12.29 The criteria used to determine the biodiversity value of a species or features that may support a species include the following general considerations based on the Radcliffe approach⁶:
- rarity at a geographical level (international, national or local);endemism and locally distinct varieties or sub-species;
 - species on the edge of geographic range;
 - size of populations in the local geographical context;
 - species-rich assemblages of a larger taxonomic grouping, e.g. herpetofauna or wintering birds;
 - plant communities, ecosystems or habitat mosaics/associations that provide habitat for any of the above species or assemblages; and
 - populations of species considered as significant under locally published guidelines or red data books.
- 12.30 Recent IEEM guidelines (2005) suggest that to ensure a consistency of approach, ecological features are valued in accordance with their geographical frame of reference as follows:
- International;
 - UK;

⁶ Radcliffe, D. (1977) *A Nature Conservation Review*, Vol 1. Cambridge University Press, Cambridge

- National (England);
- Regional (South-West);
- County (Avon);
- District (Bristol City);
- Local or Parish (Avonmouth); and/or
- Within immediate zone of influence only (less than local value).

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

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

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

12.34 When describing the nature of the impacts the descriptors set out in Table 3 are used.

Table 3 - Key Considerations When Characterising Impacts

Descriptor	Definition ⁷
Direction of impact	Positive or negative impact.
Probability of occurring	Broadly defined on three levels: Certain, Probable or Unlikely.
Complexity	Direct, Indirect or Cumulative.
Extent and Context	Area/number affected and % of total.
Magnitude	Describe severity of effect in words.
Duration	Permanent or Temporary in ecological terms (e.g. within the lifetime of the species effected).
Reversibility	Whether or not the effect can be reversed in an ecological timescale.
Area	Expressed as area or percentage of the study area.

⁷ Definitions for these terms and further information relating the methods of assessment are given in Guidelines for Ecological Impact Assessment (IEEM, 2005).

ECOLOGICAL BASELINE

Contextual Information

- 12.35 The application site covers approximately 8.3ha in area and is located at the northern end of the industrial area of Avonmouth, Bristol (National Grid Reference 353797, 181739), which comprises a belt of industrial development which runs along the southern shore of the Severn Estuary stretching from Avonmouth Village to the chemical plant at Dyers Common, and comprises several distribution centres, factories, manufacturing plants, a chemical plant and a power station.
- 12.36 The wider area lies almost entirely within the Severn floodplain and land to the east of the Avonmouth industrial belt comprises open countryside of predominately pasture fields separated by a network of hedgerows, ditches and rhines. This belt of pasture forms a substantial area of floodplain grazing marsh habitat which stretches from Avonmouth village in a north west direction as far as the first Severn crossing. The Severn Estuary lies immediately to the west of the Avonmouth industrial belt, with adjacent habitats including significant areas of mudflats and saltmarsh.
- 12.37 The application site itself is situated on the eastern edge of the Avonmouth industrial belt, approximately 600m east of the Severn Estuary at its closest point. It is immediately bounded by a former clay extraction site and landfill (no restored to grassland) to the north, warehouses and yards to the west, Severn Road (and the wider former Sevalco site) to the south, and floodplain grazing marsh to the east.
- 12.38 The application site itself is dominated by a former chemical plant comprising hard standing, a network of pipe work, storage sheds and settling tanks. Land to the east of this plant includes a mature tree line, grassland, scrub, ephemeral vegetation and reed beds. The site is bounded to the south and east by a deep ditch which is connected to the wider Avonmouth ditch network, to the north by a car storage yard and to the east by warehouses.

Designated Sites

Habitats

- 12.39 This section summarises the habitats recorded during the Extended Phase 1 survey. More detailed habitat descriptions including Target Note descriptions are available in Technical Appendix 12.2, while the location, extent and distribution of habitat features is shown on Drawing 12-1.
- 12.40 The western half of the site is dominated by areas of hard standing, buildings and infrastructure of the former Sevalco Plant, with little or no semi-natural habitat. The eastern half of the site includes a substantial proportion of scrub, some of which has been planted as part of the landscaping associated with the Sevalco plant (Target Note 12), while other areas are dominated by dense patches of bramble which have colonised naturally through lack of management (Target Note 3). Several mature trees are also present in the southern half of the site; these are predominately poplars which are likely to have been planted as part of the landscaping scheme for the Sevalco plant. Areas of ephemeral / ruderal vegetation are present as a mosaic

with other habitats of scattered scrub, grassland and bare ground (Target Note 9), while more established areas of semi-improved species-poor grassland are present in marginal areas of the site (Target Note 20).

- 12.41 Several waterbodies are present within the site, however these are predominately concrete lined settling tanks with no aquatic vegetation and very turbid water (Target Notes 16 and 7). Two more natural waterbodies are present in southern half of the site; the first of these is a settling lagoon with very steep sides (Target Note 14), however the water appears very turbid and water quality is likely to be very low given the lack of aquatic and marginal vegetation. The second pond appears likely to have been created as an attenuation pond for the Sevalco plant (Target Note 18) and has clear water with wide vegetated margins along its southern and eastern sides and is dominated by Canadian pondweed (*Elodea Canadensis*).
- 12.42 Some shallow ditches are present in the north of the site are dominated by common reed (*Phragmites australis*) (Target Note 10); these appear to hold water only seasonally, however the presence of abundant sedges and reeds in the adjacent areas indicates that this area is likely to flood occasionally.
- 12.43 Deeper ditches are present around the perimeter of site to the east and south (Target Note 22). The ditch along the southern boundary has steep sides and permanently holds water; this appears to be regularly dredged with banks dominated by coarse grasses and reeds. The ditch along the eastern edge of the site holds much less water and is neglected with heavily scrubbed over banks along most of its length.

Flora

Rare / Notable Species

- 12.44 Records of protected and notable plant species have been obtained during consultation with the BRERC for a search area extending up to 2km from the study site. These records relate predominately to aquatic species associated with the rhine system of the wider Avonmouth area and the saltmarsh on the southern shore of the Severn, however no records were returned for the site itself.
- 12.45 An area of grassland and marsh is present approximately 200m to the west of the site; this is known as Sevalco Fields and is known to support several locally Scarce and Rare species including oval sedge (*Carex ovalis*), fen bedstraw (*Galium uliginosum*), small toadflax (*Chaenorhinum minus*), compact rush (*Juncus conglomeratus*), ivy-leaved duckweed (*Lemna trisulca*) and sticky groundsel (*Senecio viscosus*). The IUCN Endangered⁸ three-lobed water-crowfoot (*Ranunculus tripartitus*) was also recorded at this site, likely to have been present in the ditch system. The locally scarce brackish water-crowfoot (*Ranunculus baudotii*) has also been recorded in the adjacent ditch system alongside Severn Road, which is in hydrological continuity with the perimeter ditch around the site. These species were not recorded on the site itself during habitat surveys.

⁸ IUCN (2009) *IUCN List of Threatened Species*. IUCN, Gland, Switzerland and Cambridge, UK.

Invasive Species

- 12.46 A stand of giant knotweed (*Fallopia sachalinensis*) was identified on the southern perimeter ditch during the Extended Phase 1 Habitat survey (the location of the stand is indicated on Drawing 12-1). This species is related to Japanese knotweed, and while it forms dense stands of up to 5m tall and spreads rapidly by transfer of rhizomes, it is not thought to have the same destructive characteristics. However, its true importance is as the main pollen parent of the hybrid *Fallopia x bohemica*, whose hybrid vigour may render it an even greater threat than Japanese knotweed.
- 12.47 No other invasive species were recorded during the Extended Phase 1 Habitat Survey or any other site visits.

Fauna

- 12.48 Records of protected and notable fauna within the 5km search area returned by BRERC and the NBN website were consulted and analysed alongside field surveys and habitat assessments.

Mammals

Badger

- 12.49 No evidence of badger (*Meles meles*) was recorded during any of the site visits, and much of the site has limited potential to support this species due to the extensive areas of hard standing, buildings and plant infrastructure. The densely scrubbed banks of the relatively dry ditch on the eastern perimeter of the site could potentially conceal setts, however given the lack of tracks or other field signs in the vicinity of this feature, this is considered highly unlikely.
- 12.50 16 records of badger activity were returned by BRERC within 2km of the site, which included field records and road casualties. The location of badger setts is treated as confidential and this information was therefore not included in the information provided; however it is known that seven sett records are known to be present within the search area, the closest of which are at least 600m away.
- 12.51 Given the results of the desk and field surveys, the site is considered highly unlikely to be used by badger.

Bats

- 12.52 Buildings within the site are predominately comprised of large warehouses of a steel construction with a single skin of concrete asbestos, metal sheeting and Perspex skylights; providing negligible potential to support roosting bats. A number of small brick buildings are also present within the main Sevalco plant, however these generally have brickwork in good condition with a concrete flat roof or concrete asbestos covering; these are also considered to offer negligible potential to support roosting bats.
- 12.53 Habitats within the site are of limited potential for foraging bats, although solitary pipistrelle bats were observed flying back and forth along tree lines and ditches around the margins of the site during the great crested newt surveys.

- 12.54 BRERC returned 44 records of nine species within the 2km search area surrounding the site including serotine (*Eptesicus serotina*), noctule (*Nyctalus noctula*), leisler's (*Nyctalus leisleri*), daubenton's (*Myotis daubentonii*), common and soprano pipistrelles (*Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*), brown long-eared (*Plecotus auritus*), whiskered (*Myotis mystacinus*) and greater horseshoe (*Rhinolophus ferrumequinum*); these records predominately relate to the Blaise Estate approximately 3km to the south east of the site, with none of the records less than 2km from the site. The distribution of bat roost records is similar, with the closest known roost present being a whiskered maternity roost approximately 3km to the east of the site. The majority of other roost records relate to the Blaise Estate.

Water vole

- 12.55 BRERC returned almost 100 records of water vole (*Arvicola terrestris*) within the 2km search area, and indeed Avonmouth is known to be a stronghold for this species. The vast majority of these records are concentrated to the south of the railway line at Hallen Marsh, over 1km south of the site. The closest records relates to the ditch on the southern boundary of the site itself from 1997 and 1998; these three records include a sighting, burrows, latrines and runways. No records were returned for the adjacent ditch system, although this may be a reflection of a lack of survey effort, rather than an absence of water vole in these ditches, particularly as water vole tends to form meta-populations.
- 12.56 A possible water vole latrine was observed on the southern perimeter ditch during the Extended Phase 1 Habitat Survey, however it was not possible to confirm this at the time of survey. A water vole specific survey of all ditches was therefore carried out using two surveyors to confirm the presence / absence of water vole at the site. This survey included the areas of remnant ditch habitat in the north eastern corner of the site and the perimeter ditch on the southern and eastern boundaries of the site; detailed results of this survey are provided in Appendix 12.3 and summarised below.
- 12.57 Evidence of water vole (burrow, runs, latrines, burrows and feeding station) was recorded frequently in the ditch along the southern boundary of the site, indicating the presence of a population in this feature; this section has steep sides and is dominated by a dense covering of common reed, providing extensive cover and foraging opportunities. No evidence was recorded in the eastern section of the ditch, however this was predominately dry at the time of survey and is heavily scrubbed over along much of its length, reducing the availability of foraging vegetation, although this also precluded effective survey in places. No evidence of water vole was recorded in the remnant ditch system; this area is predominately dry, with the exception of small shallow channels, however it is heavily vegetated by established reed beds and could be suitable for summer nesting, given its proximity to the surrounding ditch network. No evidence of summer nesting was recorded in this area was recorded, however summer nests are very difficult to detect within areas of dense vegetation. No evidence of water vole was recorded around the margins of the attenuation pond; this was the only waterbody considered to have potential to support water vole.
- 12.58 The ditch along the southern boundary of the site covers a distance of approximately 390m. Female breeding territories typically cover 30-50 metres in

high quality habitat⁹, although this increases up to approximately 150m in sub-optimal habitat¹⁰; given that this ditch provides extensive cover and foraging opportunities for water vole, it is estimated that this stretch of ditch supports in the region of ten water vole territories.

Hedgehog

12.59 BRERC returned four records of hedgehog (*Erinaceus europaeus*) within the search area indicating the presence of a local population. These animals are likely to be associated with the rank grassland and scrub associated with the Avonmouth ditch and hedgerow network given their requirement for sufficient cover for nesting, and tendency to be most abundant where grassland is in close proximity to woodland, scrub or hedgerows. This species is likely to be present in the adjacent open countryside given the extensive areas of suitable habitat present, while the site itself also offers some potential habitat for this species as areas of bramble scrub and coarse grassland.

Brown Hare

12.60 BRERC returned a single record of brown hare (*Lepus europaeus*) within the field system to the east of the site, although no brown hares were observed during any of the site visits. Brown hare utilises meadows and open ground usually adjacent to grassland or arable fields; habitats within the application site are therefore broadly unsuitable, and unlikely to represent a significant resource to the local brown hare population.

Water Shrew

12.61 BRERC returned a single record of water shrew (*Neomys fodiens*) at Chittering Warth to the west of the site and is likely to be present in the wider Avonmouth ditch network, which represents a substantial area of suitable habitat. Relatively little is known about water shrew distribution and status in Britain, however recent national studies have confirmed that they occur throughout mainland Britain¹¹ (see Figure 1), although their populations are likely to have declined in recent years due to habitat loss and populations are believed to be becoming fragmented.

⁹ Mammals of the British Isles, 4th Edition. S. Harris & D.W. Yalden. The Mammal Society 2008.

¹⁰ Water Vole Conservation Handbook 2nd Edition. R. Strachan & T.Moorhouse. Wildlife Conservation Research Unit 2006.

¹¹ Carter, P. and Churchill, S. (2006) *Distribution and Habitat Occurrence of Water Shrew in Britain* (Science Report SC010073/SR). Environment Agency, Bristol

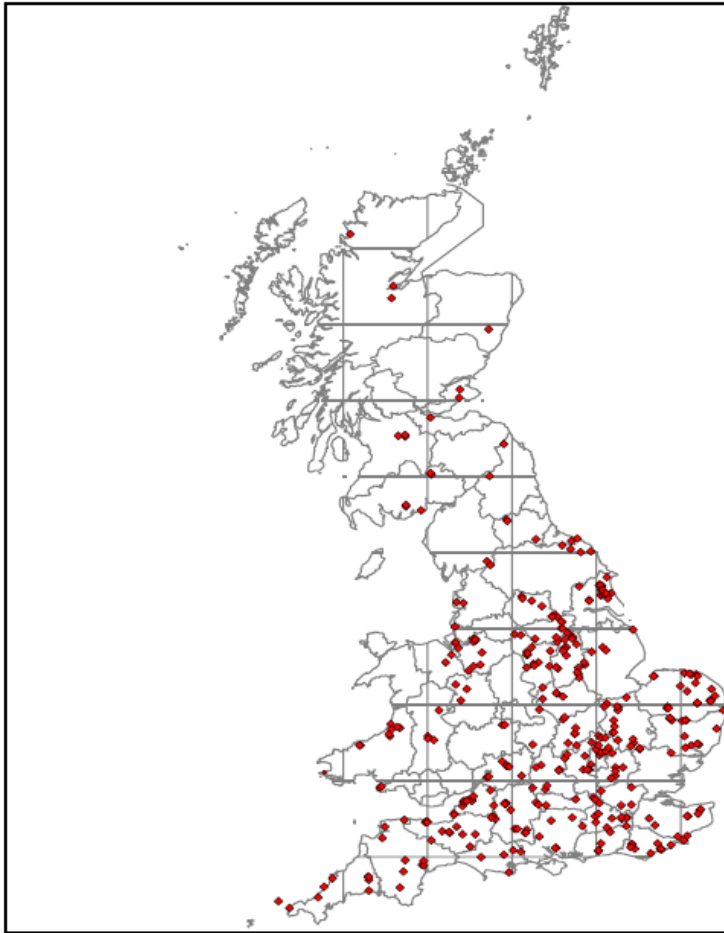


Figure 1 – Distribution of Water Shrew in Great Britain According to a National Survey Carried Out During 2004–05.

Other Species

- 12.62 Other mammalian species known to be present in the local area include stoat, weasel and common shrew; these are all common and widespread, and most likely to be associated with the tall grassland habitats of the ditch network.

Herpetofauna

Reptiles

- 12.63 The BRERC report included three records of reptiles including slow worm (*Anguis fragilis*) and grass snake (*Natrix natrix*). Slow worm is known to occur at Sevalco field, approximately 400m to the west of the site and at Hallen Marsh, over 1km south east of the site; habitats within the wider Avonmouth area to the east of the site are broadly suitable for this species, where it is likely to be widespread, while it also has potential to occur within the ditch network running through the industrial belt. A single record of grass snake was also returned for Avonmouth sewage works, approximately 2km to the south of the site; this species is frequently associated with waterbodies, and is likely to be abundant within the wider Avonmouth area.
- 12.64 Habitats within the site are largely unsuitable for reptiles, however during the Extended Phase 1 Habitat Survey it was noted that the area of established sward

around the eastern margins of the site are suitable for slow worm, areas of tall, coarse grassland on the northern edge of the site, reedbeds in the north-eastern corner of the site and the attenuation pond are all suitable for grass snake; the decision was therefore taken to carry out a reptile specific survey to establish the presence / absence of reptiles and provide an assessment of the distribution and size of any population(s) present. The detailed results of this survey are shown in Technical Appendix 12.3 and summarised below.

- 12.65 The survey involved a total of seven site visits involving an experienced surveyor walking transects of the site using direct observation and searches of potential refugia such as rubble and debris; this was supplemented by the use of artificial refugia to improve the efficiency of the survey. Grass snake was recorded on six out of the seven site visits, with a peak count of four individuals recorded comprising both adults and juveniles. This peak count is equivalent to a Good population according to published Froglife guidance¹². Grass snake was only recorded within tall grassland strips in the north of the site, however it is likely that this species also occurs within the ditch network around the perimeter of the site and in the wider Avonmouth area. No other reptile species were recorded during the reptile survey or any other site visits, and it is considered unlikely that other reptile species occur onsite.

Amphibians

- 12.66 BRERC returned six records of amphibians within the search area including smooth, palmate and great crested newt (*Lissotriton vulgaris*, *Triturus helveticus* and *Triturus cristatus*). The majority of these records relate to the Avonmouth Pools and Lawrence Weston Moor Avon Wildlife Trust Reserves, approximately 2km to the south of the site, however the closest records relates to smooth newt recorded in the ditches at the Sevalco field site, approximately 300m west of the site; this ditch network is continuous with that flowing along the southern boundary of the site. A single record of great crested newt was returned, however this relates to the Zeneca Chemical Works plant, approximately 1.5km to the north of the site.
- 12.67 The site itself supports seven waterbodies, including settling tanks, a large settling lagoon, a landscaped attenuation pond, a remnant ditch network and a perimeter drainage ditch; these were all surveyed during the amphibian survey. A further pond is located approximately 40m north of the site, within the car storage yard; this waterbody was viewed over a fence at the time of the Phase 1 Habitat Survey and was not accessible for the amphibian survey. The only other waterbodies within 250m of the site are an attenuation pond linked to the local ditch system which periodically fills with flood water and empties completely and open tanks within the nearby industrial units; all are considered unsuitable for use by amphibians.
- 12.68 The amphibian survey involved four nocturnal and daytime sessions comprising torchlight searches, egg searches, bottle trapping and netting between April and June inclusive. Low numbers of smooth newt were recorded in the attenuation pond (peak count of 3), however no amphibians were recorded elsewhere within the site, probably due to the presence of stickleback fish, the highly ephemeral nature of some waterbodies and the water quality within the tanks. It is considered highly

¹² Froglife (1999) *Reptile Survey: An Introduction to Planning, Conducting and Interpreting Surveys for Snake and Lizard Conservation*. Froglife, Halewood.

unlikely that any other amphibians are present within the site during either their terrestrial or aquatic life stages.

Birds

- 12.69 BREC returned over 1,800 records of birds within a 2km radius of the site. The vast majority of these relate to the nearby Severn Estuary, particularly for wading birds over wintering; are a reflection of the importance of this feature to birds, although its designation has probably increased the need to regularly monitor annual bird populations and therefore increased surveyor effort. Records of black redstart (*Phoenicurus ochruros*) were returned for the surrounding areas, and given the suitability of habitats at the site and the additional legal protection afforded to this species (Schedule 1, Wildlife and Countryside Act), particular effort was made to detect this species.
- 12.70 Suitable nesting habitats of dense scrub, reed beds and waterbodies were noted during the Extended Phase 1 Habitat survey, therefore a breeding bird survey was carried out at the site between April and July 2009; the results of the survey as summarised herein, and presented in full in Technical Appendix 12.5. A total of six visits were carried out, commencing one hour before dawn in order to detect singing black redstarts. A total of 31 species were recorded during the survey, of which 21 were considered likely to have been breeding during 2009. The species assemblage included 14 species listed on local / national BAPS or Red / Amber lists, although the overall assemblage is typical of the habitats presence and the location.
- 12.71 No black redstarts were recorded on any of the site visits and no Schedule 1 species were considered likely to have bred at the site during 2009; peregrine falcon was noted on the former chimney stacks, however this bird was considered likely to have been using this feature as a hunting / plucking post as it offers good views of the estuary.
- 12.72 The site is not considered likely to be suitable as an overwintering area or high water roost given its small size and the levels of disturbance from adjacent areas include the industrial activities to the west, the breakers yard to the north and Severn Road to the south.

Invertebrates

- 12.73 BRERC returned 111 records of invertebrates within the search area. The majority of records appear to relate to the ditch system within the wider Avonmouth area, which is reflected in the large number of records for water beetles, dragon flies and damselflies.
- 12.74 An invertebrate survey of the Sevalco Fields site 200m to the west of the site was carried out in 2006, which recorded 167 species including 21 with local distributions, 12 Nationally Notable and two with RBD1 status; these species were predominately flies and water beetles. The RBD1 species were the fly *Cistogaster globosa*, and the water beetle *Graptodytes bilineatus*; both of these species have potential to occur onsite.
- 12.75 Habitats recorded on site during the Extended Phase 1 Habitat survey were broadly suitable for a wide range of invertebrate types including permanent standing water, ephemeral pools, grassland, reedbeds, dense scrub, rubble piles and ephemeral

vegetation; recommendations were therefore made for an invertebrate survey of the site to investigate the value of the invertebrate assemblage which it supports.

- 12.76 The invertebrate survey of the site was carried out in late-May and mid-July 2009 and sampled all habitat types using a mixture of sweep netting, vacuum sampling, pond netting, stone turning and foliage beating. The survey recorded a total of 460 species including 86 beetles, 231 flies, 79 bugs and 48 species in several other orders; these species included three Red Data Book species and 16 nationally scarce species.
- 12.77 The habitat feature of most importance was the remnant ditch system (pools, reedbeds, shallow ditches, damp ground with spike-rush), while the large ponds were of little or no interest. Dry ground resulting from rubble being laid down was of less interest but still formed a useful habitat. Neglected amenity grassland, bramble scrub, shaded scrub under tall trees and the large poplar and sycamore were considered of low value for invertebrates. The mosaic of habitats was probably responsible for the high species richness of the site.

Other Notable Fauna

- 12.78 No other relevant notable fauna records were noted during the desk or field surveys.

Ecological Processes and Trends

- 12.79 In the absence of development, the mosaic of ephemeral habitats, grassland, reed bed and scrub would probably develop into a continuous area of scrub and eventually may revert to woodland. The area of buildings and hard standing in the west of the site is likely to develop ephemeral vegetation followed by grassland scrub over time. The water in the onsite waterbodies is likely to improve in quality over and may develop more aquatic / marginal vegetation.

EVALUATION OF ECOLOGICAL FEATURES

Criteria for Evaluation

- 12.80 Recent IEEM guidelines (2005) suggest that to ensure a consistency of approach, ecological features are valued in accordance with their geographical frame of reference as follows:
- International;
 - UK;
 - National (England);
 - Regional (South-West);
 - County (Avon);
 - District (Bristol);
 - Parish (Avonmouth); and/or
 - within immediate zone of influence only (Site Value).
- 12.81 These categories are then applied to the features identified in baseline surveys and desk-top studies. Some features can already be recognised as having ecological value and as such they may be designated as a statutory or non statutory wildlife site, other features may require an evaluation based upon their previously un-

assessed biodiversity value. The rationale for grading such features is provided below.

Designated Sites

- 12.82 In the UK, sites of international importance are generally designated as Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or Ramsar sites under the Habitats Directive 92/43/EEC, Birds Directive 79/409/EEC and / or The Convention on Wetlands respectively. In the case of SACs, these are selected by the Joint Nature Conservancy Council (JNCC), generally from a list of sites of nationally recognised importance i.e. Sites of Special Scientific Interest (SSSIs) and presented to the European Council for adoption. Candidate sites are given full legal protection under the Habitats Regulation 1994 (as amended) when they are nominated.
- 12.83 Natural England has powers to notify sites of national importance for nature conservation as SSSIs, although some sites that are of national importance for certain species have not been so designated. The first SSSIs were identified in 1949 when the then Nature Conservancy notified local authorities of SSSIs under the requirements of the National Parks and Access to the Countryside Act, so their conservation interest could be taken into account during the development planning process. Natural England is now responsible for identifying, designating and protecting SSSIs in England under Section 28 of the Wildlife and Countryside Act, 1981 (as amended). In some instances a site that is considered to be of national importance can also be purchased or leased by NE and declared as a National Nature Reserve. Internationally important sites may also be designated as SAC, SPA or Ramsar sites.
- 12.84 Sites of Nature Conservation Importance (SNCIs) are of local importance within the Greater Bristol area, and represent the area's critical stock of natural capital. Many sites in urban Bristol afford people their only direct contact with nature and have an enhanced local importance as a consequence of this. All SNCIs have been designated against strict criteria which established that they are of substantive value for nature conservation on a local basis. The importance of local, non-statutory sites, particularly in urban areas, is recognised in PPS9. Although SNCIs are not legally protected, they are protected through the planning process under Policy NE5 (see above).

Undesignated Features of Biodiversity Importance

Habitat Value

- 12.85 For features that have not been formally recognised by a designation SLR has undertaken an evaluation based upon those guidelines suggested by the IEEM. The features being evaluated are considered in the context of the site and locality. In this way it is possible to provide a more accurate assessment of the impacts in the locality.
- 12.86 The baseline information obtained has been used in undertaking an assessment of the value of ecological features within the study area. Ecological features are defined as:

- statutorily protected (Natura 2000 sites, Sites of Special Scientific Interest, National Nature Reserve) or locally designated (e.g. County Wildlife Sites) sites and features;
- recognised sites and features of biodiversity value not designated in this way, e.g. areas listed on published inventory of priority biodiversity habitats (e.g. Ancient Woodland Inventory, lowland grassland inventory) or areas of habitats subject to UK or Local Biodiversity Action Plan targets (see Table 4 below); and
- species of biodiversity value or significance, including those protected and controlled by law.

12.87 An evaluation of the above ecological features has been based upon the IEEM guidelines as follows.

Table 4 – Ecological Evaluation of Non-designated Habitats and Features

Geographic Frame of Reference	Examples of Non-Designated Habitats and Features that are Ecologically Significant at that Level
International	<p>Areas of habitats of International importance, i.e. those included on Annex 1 of the Habitats Directive should have been designated, or identified for designation, as SAC. Where a site supporting Annex 1 habitats carries a lower level of designation, e.g. SSSI, it should be considered important at that level.</p> <p>A viable area of an Annex 1 habitat not designated in this way may be valuable at this level, for instance where the habitat is in a management state such that it does not meet SAC criteria for selection, but is capable of being restored in a reasonable timeframe to a state that could be designated as such.</p>
National	<p>All sites of national ecological importance should have been designated at this level by the country agency. Where a site carries a lower level of designation it should be considered important at that level.</p> <p>A viable area of a priority habitat identified in the UK BAP where the UK BAP states that all areas of that habitat are to be protected may be important at a National level.</p> <p>Sites supporting a viable area of a habitat of priority biodiversity action, as identified in EN published habitat inventories, where the habitat has been identified as being scarce at a national level.</p> <p>A site where field survey shows that the site would meet published SSSI guidelines or has the potential to meet these guidelines within a reasonable timeframe.</p>
Regional	<p>Sites supporting a viable area of a habitat of priority biodiversity action, e.g. UK or Regional HAP or included in EN published habitat inventories, where the habitat has been identified as being scarce at a regional level or where they are essential to maintain the viability of a larger area.</p> <p>Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile.</p> <p>A site where field survey shows that the site would meet published Regional ecological selection criteria or has the potential to meet these guidelines within a reasonable timeframe.</p>
County/ Metropolitan	<p>A site where field survey shows that the site would meet published County/Metropolitan ecological selection criteria or has the potential to meet these guidelines within a reasonable timeframe.</p> <p>A viable area of habitat identified in County BAP or appropriate Natural</p>

Geographic Frame of Reference	Examples of Non-Designated Habitats and Features that are Ecologically Significant at that Level
District/ Borough	<p>Area profile where the protection of all areas of that habitat is a published target of the BAP or the habitat is identified as scarce at a County level.</p> <p>Areas of habitat identified in a sub-county (district/borough) BAP or in the relevant Natural Area profile that are scarce within the district/borough.</p> <p>Sites/features that are scarce within the district/borough or which appreciably enrich the district/borough habitat resource, e.g. an ecologically diverse hedgerow network.</p>
Parish/ Neighbour- hood	<p>Areas of habitat considered to enrich appreciably the habitat resource within the context of the Parish or the neighbourhood, e.g. species-rich hedgerows, municipal parklands or individual veteran trees.</p> <p>Areas of habitat with limited intrinsic ecological value, but that buffer the negative effects of a more valuable feature, e.g. a County-designated site.</p>

Value for Species

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

- rarity at a geographical level (international, national or local);
- endemism and locally distinct varieties or sub-species;
- species on the edge of geographic range;
- size of populations in the local geographical context;
- species-rich assemblages of a larger taxonomic grouping, e.g. herpetofauna or wintering birds;
- plant communities, ecosystems or habitat mosaics/associations that provide habitat for any of the above species or assemblages; and
- populations of species considered as significant under locally published guidelines or red data books.

12.89 All species and populations of species, including those with statutory protection, are evaluated on the same basis. It should be noted that even when a species, great crested newt for example, is protected under European and UK statute, the presence of a small population on a site within a region where this species is widespread is unlikely to be assessed at a value of greater than district level importance. Equally, a particular feature on a site may attract large numbers of an unprotected species that has limited distribution and this may represent a feature of regional importance. The legal implications associated with the present of any protected species is dealt with in the final section of this report.

Table 5 – Ecological Evaluation of Species

Frame of Reference	Examples of Species that are Ecologically Significant at that Level
International	<p>A regularly occurring population of an internationally important species, which is threatened or rare in the UK. i.e. it is a UK Red Data Book species or listed as occurring as 15 or fewer 10km squares in the UK or of uncertain conservation status or of global conservation in the UK BAP.</p> <p>A regularly occurring, nationally significant population/number of any internationally important species, e.g. a bird population representing greater than 1% of the international population.</p>
National	<p>A regularly occurring, regionally or county significant population/number of a nationally important species.</p> <p>A regularly occurring population of a nationally important species on the edge of its natural range.</p> <p>A species assemblage of national significance.</p>
Regional	<p>A regularly occurring, locally significant population of a species listed as being nationally scarce. For example, a species which occurs in 16-100 10km squares in the UK, or is highlighted in a Regional BAP, Red Data Book or relevant Natural Area on account of its regional rarity or localisation.</p> <p>A regularly occurring, locally significant number of a regionally important species.</p> <p>A species assemblage of regional significance.</p>
County/ Metropolitan	<p>Any regularly occurring, locally significant population of a species which is listed in a county/metropolitan Red Data Book or BAP on account of its regional rarity or localisation.</p> <p>A regularly occurring, locally significant number of a county/metropolitan important species.</p>
District/ Borough	<p>A population of a species that is listed in a district/borough BAP because of its rarity in the locality or in the relevant Natural Area profile because of its regional rarity or localisation.</p> <p>A regularly occurring, locally significant number of a district/borough important species during a critical phase of its life cycle.</p>
Parish/ Neighbour- hood	<p>Populations or species assemblages considered to enhance the local ecological resource, e.g. a breeding bird assemblage</p>
Negative	<p>The presence of injurious or legally-controlled weeds, e.g. those identified under The Weeds Act 1959, Schedule 8 of the WCA1981 (e.g. Japanese knotweed, giant hogweed), or the Ragwort Control Act 2003 would be considered an ecological, commercial or social disbenefit, usually at a local or site level.</p>

Social, Community or Economic Value

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

Evaluation

Designated Sites

12.92 No statutory wildlife designations occur within or immediately adjacent to the application site, however Table 6 below provides details of statutory designations occurring within the 10km search area as shown in Appendix 12-1.

Table 6 –Statutory Designations within 10km of the application site

Level of Value	Site/Feature at this Value	Location at closest point ¹³	Reason for Importance or Selection Criteria ¹⁴
International (10km)	Severn Estuary SAC / SPA		Habitats Directive - Annex I habitats include extensive areas of mudflats, salt flats and saltmarsh habitats. Annex II species include sea lamprey, river lamprey and twaite shad. Birds Directive – Annex 1 species include over wintering populations of bewicks swan, gadwell, great white-fronted goose, dunlin, shelduck and redshank.
	Avon Gorge Woodlands SAC		<i>Tilio-Acerion</i> forests (Annex 1) on limestone cliffs and screes particularly important due to a high concentration of small-leaved lime. The presence of rare whitebeams including two unique to the Avon Gorge and other uncommon plants. Species-rich transitions to scrub and grasslands are associated with the woodland. Small groves of yew also occur.
	River Wye SAC		Annex I habitats include extensive <i>Ranunculus</i> beds with a varied water-crowfoot <i>Ranunculus</i> flora; stream water-crowfoot <i>R. penicillatus</i> ssp. <i>pseudofluitans</i> is abundant, with other <i>Ranunculus</i> species including <i>R. fluitans</i> – found locally. Other species include flowering-rush, lesser water-parsnip and curled pondweed. There is an exceptional range of aquatic flora in the catchment including river jelly-lichen <i>Collema dichotum</i> .

¹³ Approximate distance.

¹⁴ Criteria used by BRERC.

Level of Value	Site/Feature at this Value	Location at closest point ¹³	Reason for Importance or Selection Criteria ¹⁴
National (10km)	Severn Estuary SSSI		One of the largest and most important areas of mudflats, sand banks, rocky platforms and saltmarsh in Britain. Estuarine fauna includes: internationally important populations of waterfowl; invertebrate populations of considerable interest; and large populations of migratory fish, including the nationally rare and endangered Allis Shad <i>Alosa alosa</i> .
	Ashton Court SSSI		Woodland and parkland habitats including many ancient trees which support a rich saproxylic invertebrate fauna including many nationally scarce species.
	Cattybrook Brickpit SSSI		Two localities of geological importance, exposing rocks of Westphalian (Upper Carboniferous) age with important fossil plant remains.
	Quarry Steps SSSI		A fissure deposit representing the last remnant of an extensively quarried area (Durdham Down). Two species of the saurischian dinosaur <i>Thecodontosaurus</i> , a phytosaur and two species of sphenodontid lizards have been found in fissure fillings.
	Ham Green SSSI		A section through Pleistocene sediments, which include two to three metres of red-brown, gritty, stony silts, with abundant Greensand chert and other far-travelled rock-types.
	Aust Cliff SSSI		Areas of Rhaetian and Triassic exposures including insects and marine reptile fossils.
	Horseshoe Bend SSSI		A wooded river cliff and a narrow fringe of saltmarsh. The river cliff supports the largest known English population of the nationally rare true service-tree, nationally rare whitebeams, the nationally scarce large-leaved lime, field garlic and pale St John's-wort. Two nationally scarce plant species, slender hare's-ear and long-stalked orache also occur within areas of saltmarsh.
	Avon Gorge SSSI		Nationally rare plants include round-headed leek, Bristol rock-

Level Value	of	Site/Feature at this Value	at	Location closest point ¹³	at	Reason for Importance or Selection Criteria ¹⁴
						<p>cross, compact brome, nit-grass, little robin, western spiked speedwell, honewort, fingered sedge, dwarf sedge, dwarf mouse-ear, hutchinsia, spring cinquefoil, autumn squill and rock stonecrop. Other plants of restricted distribution include little-robin and lesser meadow-rue. Angular Solomon's-seal, which is nationally scarce, occurs in the woodland.</p>
		River Wye SSSI				<p>A rare example of a near natural, large western eutrophic river which has not been subject to significant modification from human activities. The river is of special interest for three main aquatic plant community types - rivers on sandstone, mudstone and hard limestone, clay rivers and lowland rivers with minimal gradient, as well as for certain flowering plants and bryophytes.</p>
		Portishead Pier to Black Nore SSSI				<p>Sections of alluvial sandstones at Portishead pier provide the best exposure of Upper Carboniferous rocks in the Avonmouth Coalfield. At Portishead Point important exposures of geological structures formed during the Variscan mountain building episode (orogeny) in the Carboniferous period of geological history. Exposures of the Devonian sequence at Portishead are intermediate between the mainly continental sequence of South Wales and the continuous, largely marine sequence of North Devon.</p>

Non-Statutory Sites

- 12.93 No SNCIs are present within the site itself or immediately adjacent, however Table 7 lists the SNCIs within 2km of the site and the locations of these sites are shown in Appendix 12-1.

Table 7 –Statutory Designations within 10km of the application site

Level of Value	Site/Feature at this Value	Location at closest point ¹⁵	Reason for Importance or Selection Criteria ¹⁶
County (2km)	Moorhouse Farm and Stuppill Rhines SNCI		Rhines with marginal and aquatic vegetation. Grass Vetchling, Meadow-sweet, Water Figwort, Reed Mace, Common Water Plantain, Blunt-fruited Water-starwort, Lesser Pondweed (<i>Potamogeton pusillus</i>). Good numbers of dragonfly species, including Four-spotted Chaser & Emerald Damselfly.
	Hallen Marsh Junction SNCI		Grassland, scrub, limestone ballast, pools and areas of reed. Ox-eye Daisy, Imperforated St. John's Wort, Weld, Sticky Groundsel, Oval Sedge, Shining Crane's-bill, Prostrate Toadflax, Common Reed. Reed Warbler, Sedge Warbler, Lesser Whitethroat, Whitethroat, Little Ringed Plover, Oystercatcher.
	Salt Rhine and Moorhouse Rhine SNCI		Brackish rhine and bankside vegetation. Narrow strip of grassland. Water Figwort, Celery-leaved Buttercup, Gypsywort, Bulrush, Fennel-leaved Pondweed, Common Water-starwort, Water Voles, dragonflies, molluscs, water beetles.
	Severn Estuary SNCI		The intertidal zone of mudflats, sand banks, rocky platforms and saltmarsh form very important habitats for plants, waterfowl, invertebrates and migratory fish. Internationally and nationally rare species within the Estuary include Allis Shad, Twaite Shad, Sea Lamprey, Curlew, Redshank, Ringed Plover and Grey Plover.
	Lawrence Weston Roads Rhines SNCI		Rhyne, bankside vegetation and unimproved calcareous grassland. Lesser Water Parsnip (<i>Berula erecta</i>), Water Figwort (<i>Scrophularia auriculata</i>), Horned Pondweed (<i>Zannicellia palustris</i>), Blunt-fruited Water-starwort (<i>Callitriche obtusangula</i>), Spiked Water Milfoil (<i>Myriophyllum spicatum</i>). Water Voles. Dragonflies.
	Impool, Middle Compton and Upper Compton Rhines SNCI		Diversity of flora & fauna esp. invertebrates. <i>Graptodytes bilineatus</i> (RDB3), <i>Haliphus heydeni</i> (Nb), <i>Helochares lividus</i> (Nb), <i>Agapus chalconatus</i> (Nb), plus many Nat.local sp.
	Sporanium Hill SNCI		Diverse woodlands (bluebell woods) and grassland. Oak/Ash wood, Bluebells, Dyer's Greenweed, Grizzled Skipper, Slow-worm,

Recognised Sites / Features of Biodiversity Value

- 12.94 The MAGIC website confirmed that the Severn Estuary is also designated by the Royal Society for the Protection of Birds (RSPB) as an Important Bird Area (IBA). The IBA Programme of BirdLife International is a worldwide initiative aimed at identifying and protecting a network of sites, critical for the conservation of the world's birds. These sites were selected on the basis of the bird numbers and species complements they hold. IBAs are particularly important for species that congregate in large numbers, such as wintering and passage waterbirds and breeding seabirds. Many sites have also been identified for species of global, and European/EU conservation concern.
- 12.95 The area of pasture to the east of the Avonmouth industrial belt is recognised as Floodplain and Coastal Grazing Marsh on Natural England's Biodiversity Action Plan Habitat Inventory. This is a spatial dataset that describes the geographic extent and location of the UK Biodiversity Action Plan (UKBAP) priority habitats in England. Floodplain and Coastal Grazing Marsh is defined as periodically inundated pasture, or meadow, usually mesotrophic, with ditches which maintain water levels, containing standing brackish or fresh water; these ditches are especially rich in plants and invertebrates. Almost all areas are grazed and some are cut as hay or silage. Grazing marshes are particularly important for the number of breeding waders such as snipe, lapwing and curlew they support. Internationally important populations of wintering wildfowl also occur including Bewick swans and whooper swan.
- 12.96 Other BAP habitats within 2km of the site include areas of Mudflat, Maritime Cliffs and Slopes, and Saltmarsh along the shore of the Severn, and areas of Lowland Deciduous Woodland at Berwicks Woods to the west; this woodland is also recognised in the ancient woodland inventory.
- 12.97 Two Strategic Natural Areas (SNAs) are also present within 2km of the site; these are the Severn Estuary SNA (Maritime Cliffs and Slopes) approximately 300m to the west and the Blaise SNA (Woodland) approximately 1.5km to the east. SNAs are recognised on the South West Nature Map, which shows the priority areas to maintain and expand (through restoration and/or re-creation) terrestrial wildlife habitats at a landscape scale across the South West. There are many different tools and mechanisms in place that contribute to conservation, and Nature Map is a significant addition to the wider strategy for biodiversity conservation in the region. It is a spatial representation of the South West's BAP habitat targets and an ambitious 50 year vision.

Habitats

- 12.98 Habitats within the site are of limited ecological value, given that most of these are common in the wider area and many are likely to be lost over time through natural succession and a lack of management; as summarised in Table 8.

Table 8 – Ecological Value of Habitat Features within the Site

Level of Value	Site / Feature at this Value	Reason for Importance
Parish	Reedbeds	Support breeding bird assemblage
	Remnant ditch network	Support diverse invertebrate assemblage
	Perimeter ditch	Supports water vole population. Links adjacent ditch habitats.
	Attenuation pond	Diverse marginal vegetation
Site	Species poor-grassland	Supports grass snake. Limited botanical diversity.
	Dense Scrub	Supports breeding bird assemblage.
	Ephemeral vegetation	Supports limited invertebrate assemblage
	Tall herb communities	Supports limited invertebrate assemblage
Negligible	Hard standing	None
	Tanks	None
	Buildings	None

Species

12.99 The results of the species specific surveys (where available) have been used to put a value on the populations of those species present. Where such data is not available, an estimate of the significance of those populations likely to be present has been made based on the habitat requirements of those species and those habitats present within the site and surrounding areas; this is summarised in Table 9 below.

Table 9

Level of Value	Site / Feature at this Value	Reason for Importance
District	Invertebrate assemblage	High species diversity including several Nationally Notable and RDB species.
Parish	Breeding birds	Assemblage includes several declining species (BAP and Red / Amber listed), but common in the wider landscape.
	Water vole	Small population present, declining nationally but common in the wider landscape.
	Grass snake	Small population present, declining nationally but common in the wider landscape.

Level of Value	Site / Feature at this Value	Reason for Importance
Site	Smooth newt	Small number, likely to be common throughout the wider landscape
	Brown hare	If present, only in small numbers. Unlikely to be critical habitat resource.
	Hedgehog	If present, only in small numbers. Unlikely to be critical habitat resource.
	Bats	No roosting opportunities. Foraging observed, but unlikely to be significant resource.

POTENTIAL IMPACTS

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

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

12.102 The following features of ecological significance (above Site level) have been identified as having the potential to be affected by the development proposals:

- designated sites;
- semi-natural habitat;
- grass snake;
- water vole;
- invertebrates; and
- birds.

12.103 The following assessment of potential impacts will only consider effects upon those features that have been identified as being of Parish ecological significance or above.

Characterisation of Potential Impacts

Proposed Scheme

12.104 The scheme involves the demolition of all existing structures associated with the former Sevalco plant including all buildings and areas of hard standing. This will be followed by extensive preparation works including the excavation of the EfW bunker

beneath the proposed EfW plant, remediation works, re-contouring and installation of all necessary underground services. The perimeter ditch will also be recontoured to provide additional attenuation volume and additional waterbodies will be excavated. The EfW and MRF facilities including all additional access and infrastructure will then be erected. It is estimated that the construction phase will take place between 2011 and 2013.

12.105 The following predicted construction impacts have been identified and are discussed below:

- Habitat loss, fragmentation and isolation through land-take;
- Indirect effects upon fauna through habitat loss, fragmentation and isolation;
- Alterations to ground water;
- Alterations to surface water flow and quality;
- Noise and visual disturbance; and
- Dust deposition.

Habitat Loss, Fragmentation and Isolation through Land-Take

12.106 Habitat loss involves the direct destruction or physical take-up of vegetation, or other structures of conservation interest, such as dead wood or bare ground. Habitat loss may also occur as a result of a change in land or water management, for instance the drying-up of ponds or successional events leading to a change in habitat type.

12.107 Habitat loss can result in the direct loss of individuals or populations of plant or animal species. It may also cause other populations to become demographically unstable or unsustainable, due to loss of prey species or habitat niches.

12.108 Fragmented and isolated habitats are likely to be more vulnerable to external factors that may have a negative affect upon them; e.g. disturbance, and may be less resilient to change, including climate and management change; than connected habitats because colonising species may be unable to reach the habitat. Due to the complexities of ecological systems, it is not possible to quantify the potential effects that may occur to isolated habitats. The potential effects upon fauna associated with fragmented habitats are considered in the next section.

12.109 The construction phase of development would lead to the loss all semi-natural habitat including all waterbodies; these are of predominately negligible value with the exception of the attenuation pond, the loss of which is likely to significant at up to a Parish level. The loss of the remnant ditch system and the associated reed beds will also have a negative impact at a Parish level, while the proposed works to the perimeter ditch will be so significant as that they could also effectively result in the temporary removal of this feature while it is re-profiled, and fragmentation of the wider ditch network which would be significant at a Parish level. Loss of other habitats including semi-improved species-poor grassland, dense scrub, ephemeral vegetation and tall herb communities are unlikely to be significant beyond the context of the site itself, and would not have any fragmentation or isolation effects. A summary of the proposed habitat loss is provided in Table 10 below.

Site / Feature to be Lost	Extent of Habitat Loss
Reedbeds	1614m ²
Remnant ditch network	210m
Perimeter ditch	390m
Attenuation pond	600m ²
Species poor-grassland	14,399m ²
Dense scrub	1,726m ²
Ephemeral vegetation	11,933m ²
Tall herb communities	5,631m ²
Hard standing	22,461m ²
Tanks	2873m ²
Buildings	12,640m ²

Table 10 – Showing Areas of Habitat to be Lost during Construction Phase of Development

Indirect Effects upon Fauna through Habitat Loss, Fragmentation and Isolation

Invertebrates

12.110 Indirect effects of habitat loss will be most significant for terrestrial ground dwelling invertebrates, given the small home range of many of these species; habitat loss could result potentially in the loss of one or more populations of these species during the construction phase both directly through killing or injury as the site is re-contoured and indirectly through the removal of habitat. Habitat loss is likely to be less significant for aquatic species which are also likely to be present in the adjacent ditch network, and for flying insects which are more mobile and likely to simply colonise other areas of suitable habitat nearby. Given that the vast majority of notable and rare species present at the site are aquatic beetle and flies, impacts on the local invertebrate community should only be significant at the Parish scale given the small size of the site.

Birds

12.111 The assemblage of breeding birds at the site is typical of the area and given the small size of the site, the loss of this habitat is unlikely to be significant at any greater than a Parish level. Given that up to 21 species may also breed at the site in a typical breeding season, direct effects through the damage or destruction of active nests could also be significant at up to Parish level if vegetation clearance was to be undertaken during the breeding season.

12.112 Loss of habitats is considered unlikely to be significant to the wintering bird populations as a winter or high-tide roost, including those species recognised as a qualifying criteria for the adjacent Severn Estuary SPA designation which is also considered unlikely to be significantly impacted by the development.

Water Vole

12.113 A water vole population is present in the ditch along the southern boundary of the site. The majority of this ditch will remain intact, however some engineering works

are likely to be required in localised areas where new access crossings are required, or the existing channel is to be additional rhines or ditches as part of the proposed scheme. Where such works are required, this could potentially involve the damage and destruction of water vole burrows, potentially killing and / or injuring water voles present at the time.

Grass Snake

12.114 Grass snake was recorded in relatively low numbers in predominately marginal areas of the site during the survey work. Removal of these habitat has the potential to have a direct effect on the local population through killing or injury of a small number of individual animals which may be present at the time, however given that grass snakes are highly mobile this is only likely to occur outside the main active season (May – September inclusive) when animals are less active. Indirect effects through habitat loss e.g. loss of foraging areas, isolation etc are unlikely to be significant given the small areas involved and the large home range of the typical adult grass snake.

Alterations to Groundwater

12.115 Full details of the hydrogeological impacts of the proposed operational phase development are provided in Chapter 9 of the ES.

12.116 Disruptions to ground water levels and flows could disrupt aquatic ecosystems in the wider Avonmouth area which rely on the hydrological regimes. Contamination of these groundwater sources could also lead to damage of sensitive ecosystems which rely on high levels of water quality.

12.117 The construction of the refuse bunker below the water table will require temporary dewatering and may disrupt groundwater levels and resources within the local area; however the risk of this occurring has been assessed as low. Over-pumping to the Rhines will be carried out via settlement/attenuation ponds under a consent to discharge.

12.118 During the construction of the site, there is a risk of contaminated runoff being generated from accidental spillage of fuels and lubricants, required by construction plant and from the vehicles moving around the site and increase in suspended solids during the construction phase resulting from the proposed earthworks entering the groundwater system.

12.119 During the demolition of the former carbon black production plants, redundant power plants, product warehouse and pipe network there is a potential for runoff contaminated with carbon black and/or solidified feedstock oil to contaminate the underlying aquifer.

Alterations to Surface Water Flow and Quality

12.120 The site is situated in close proximity to the Avonmouth network of ditches, which in itself is an ecologically valuable and sensitive ecosystem, however this network also forms a functional link between the site and a series of other sensitive ecosystems including the Severn Estuary to the west and extensive areas of floodplain grazing marsh to the east; disruptions to the hydrological regime in this area could therefore disrupt this and other sensitive ecosystems in the area. It could also act as a potential vector for pollution pathways to these receptors. Impacts upon the

surrounding ditch network are unlikely to affect receptors which are upstream or significantly further inland including those watercourses which have been designated as SNCIs. Full details of the hydrological impacts of the proposed construction phase development are provided in Chapter 9 of the ES.

- 12.121 During the demolition of the former carbon black production plants, redundant power plants, the product warehouse and pipe network there is a potential for runoff contaminated with carbon black and/or solidified feedstock oil to contaminate surrounding surface water features.
- 12.122 During the construction of the site, there is a risk of contaminated runoff being generated from accidental spillage of fuels and lubricants, required by construction plant and from the vehicles moving around the site and increase in suspended solids during the construction phase resulting from the proposed earthworks entering the local water courses.

Noise and Visual Disturbance

- 12.123 Increased levels of noise during construction and traffic during the operational phase have the potential to have a negative effect on the existing wildlife value of the site. This is likely to be most significant for disturbance to sensitive species, notably bird and mammal species.
- 12.124 Some species of bird are likely to be more vulnerable to noise and visual disturbance than others. For example, an analysis of the responses of certain bird species to disturbance found that a passive, low-level and continuous disturbance is likely to lead to habituation and active, high level and discontinuous disturbance is likely to lead to the displacement of many bird species from the disturbed area, leaving only very tolerant species.
- 12.125 On construction site sources of noise and visual disturbance are from the movements of personnel and traffic as well as from static machinery, particularly piling equipment.
- 12.126 It is likely that mobile species such as birds and water vole will simply move to other suitable habitats within the local area when disturbance is introduced to new areas (provided that they do not have dependant young at the time). This displacement is likely to have a temporary impact upon these species, with animals initially moving away from the disturbance, and eventually habituating to it and perhaps returning to retained or re-created habitats.
- 12.127 Less mobile species may not be able to move far enough away from the source of disturbance within their own home range. Stress levels in these animals are likely to significantly increase, reducing body condition and reproductive fitness over time. Impacts upon these species are likely to have longer term effects, with population densities decreasing in relation to the proximity of the source of disturbance.
- 12.128 Full details of the noise disturbance impacts of the proposed operational phase development are provided in Chapter 8 of the ES. This generally detected minor or no impact from the development proposals, although the receptors were all over 1.5 km away to the east of the development.
- 12.129 Increased levels of noise due to the operation and increased traffic during the operational phase have the potential to have a negative effect on the existing wildlife value of the site. Impacts are likely to be greatest during the construction

phase of development when site preparation works, piling works, foundation works and buildings works are being carried out. These are unlikely to be detected by birds within the estuary given that this is over 400m away at its closest point and the high levels of background noise along this stretch of the shore line from the A403, the railway line and the Seabank Power Station, however open land to the east of the site may be used by wintering birds as a high tide roost or a foraging area for grassing birds such as geese. While this area is likely to be subject to background noise from traffic along Severn Road and the nearby breakers yard, high impact, high level noise is likely to increase disturbance in this area.

- 12.130 Similarly, visual impacts during the construction phase are unlikely to be noticed by birds within estuary given the distance and height of intervening buildings, however visual disturbance in the areas of grassing marsh to the east of the site is likely to be increased, particularly during the demolition of the existing chimney and tall plant, and the construction of the EfW building.

Potential Operational Impacts

Alterations to Surface Water Flow and Quality

- 12.131 There is a potential impact associated with the rapid inundation of floodwater into the development site from tidal sources following a breach of the tidal defences coincident with a significant tidal event. The probability of rapid inundation is considered to be unlikely given the probability of a breach of the defence coinciding with a significant tidal event, however the magnitude of impact is deemed to be 'severe' giving an overall 'Low' risk of impact. Although no mitigation is required, inherent mitigation will be provided to further reduce the risk of impact, in the form of hydrostatic resistance built into the fabric of the building structure.
- 12.132 There is a potential impact associated with the rapid inundation of floodwater into the development site from fluvial sources during a significant fluvial event. The probability of rapid inundation is considered to be low given the low probability of a significant fluvial event occurring.
- 12.133 During the operation of the site, there is a risk of contaminated runoff being generated from the following potential sources and entering the local water courses:
- accidental spillage of fuels and lubricants, required from operation of the facility and from the vehicles moving around the site;
 - contaminated run-off from the temporary storage of bottom ash and change in land (weighbridges and vehicle movement areas); and
 - washout of pollutants by water used to put out a fire onsite.
- 12.134 During the operation of the incinerator bottom ash treatment and recycling facility, bottom ash storage areas and MRF, there is the potential for the leaching of contaminated water high in metals to cause contamination of the surrounding surface water features. Without mitigation, it is considered that the storage of waste prior to processing could result in an impact on surface water quality if leachate is allowed to form and escape.
- 12.135 In the event of a fire, it is considered that, without mitigation, firewater could potentially wash out pollutants from the site leading to contamination of the local watercourse network.

12.136 Due to the implementation of an improved drainage system and pollution control measures on-site compared to that of the baseline situation (heavy industrial site with ageing drainage system), it is considered that, without further mitigation, there will be an improvement to the existing 'baseline' regime in terms of a reduction in the risk of pollutant / contaminant washout from roofs, highways and other external hardstanding areas being released to local watercourses.

Alterations to Groundwater

12.137 The potential of alterations to groundwater levels and flows by reducing the amount of recharge to groundwater has been assessed as being low due to the site currently being developed at this time with a high proportion of hard standing present and the Alluvium being a Non-aquifer. The refuse bunker being situated below the water table could potentially disrupt groundwater flow within the Alluvium on a long term basis and raise ground water levels in the surrounding areas, although the risk of this occurring is considered to be low.

12.138 During the operation of the site, there is a risk of contaminated runoff being generated from the following potential sources and entering the groundwater system;

- accidental spillage of fuels and lubricants, required from operation of the facility and from the vehicles moving around the site;
- contaminated run-off from the temporary storage of bottom ash and change in land (weighbridges and vehicle movement areas); and
- washout of pollutants by water used to put out a fire onsite.

12.139 During the operation of the incinerator bottom ash treatment and recycling facility, bottom ash storage areas and MRF, there is the potential for the leaching of contaminated water high in metals to cause contamination of the underlying aquifer.

12.140 Without mitigation, it is considered that the storage of waste prior to processing could result in an impact on groundwater quality if leachate is allowed to form and escape to ground.

12.141 In the event of a fire, it is considered that, without mitigation, firewater could potentially washout pollutants from the site leading to contamination of the underlying aquifer.

Air Quality

Potential Impacts

12.142 Energy from Waste facilities produce a number of aerial emissions as by products of incineration, several of these including NO_x, SO_x and NH₃, which have two main impacts upon vegetative communities; namely acidification and eutrophication.

12.143 Acidification is a natural process usually described as the loss of nutrient bases and their replacement by acidic elements. However, acidification is commonly associated with atmospheric pollution arising from anthropogenically derived sulphur (S) and nitrogen (N) as NO_x or ammonia. Anthropogenically derived pollutant deposition enhances the rates of acidification, which may then exceed the natural neutralising capacity of soils. Acidification affects all aspects of the natural environment: soils, waters, flora and fauna. Although there have been several reviews of acidification of the natural environment by anthropogenic sources of S

and N, to date there have been relatively few attempts to quantify the specific damage to designated protected sites in Britain, nor to relate this to emission sources. Despite difficulties in proving conclusively the ecological effects of air pollutants, the weight of evidence suggests that enhanced S and N deposition is causing damage to a wide variety of habitats, communities and species in Britain.

- 12.144 Inputs of atmospheric N are also a source of essential nutrients, which commonly limits growth in temperate ecosystems. The gradual increase and enrichment of ecosystems by nutrients such as N and/or P is termed eutrophication. Increased availability of N from enhanced atmospheric inputs impacts species composition, favouring those plants with a high demand for nitrogen. Where there are large inputs of reduced nitrogen (ammonia), which are not immobilised, in the soil, this may result in the suppression of the uptake of other essential plant nutrients such as potassium (K⁺) or magnesium (Mg).
- 12.145 As most temperate natural and semi-natural ecosystems are N limited, additional N inputs in the first instance act to stimulate plant growth. However, there is a limit to how much additional N input can be utilised. Soils and ecosystems with N inputs in excess of plant nutritional requirements are often referred to as N saturated. Ultimately, increased losses of both inorganic and organic N from terrestrial systems may contribute to freshwater, coastal and marine eutrophication, where N is a limiting nutrient.
- 12.146 In forest ecosystems, subject to increased N deposition, effects on the tree component are uncommon and vary with species type and geographical location. However changes to woodland ground flora has been recorded, while visible injury to pine and spruce needles has also been observed. In heathland communities, rapid changes in the species composition have occurred as a result of increased nutrient availability and such changes have been attributed to catastrophic death of *Calluna* caused by frost, drought or heather beetle attack. Such changes in these plant communities have also been linked to the disappearance of some butterflies, amphibians and birds in these habitats.
- 12.147 Predicted impacts of aerial pollution as discussed in Chapter 7 of the ES, while the results of the air dispersion modelling are also provided in Appendix 7.1 and summarised herein.

Air Dispersion Modelling

- 12.148 Air dispersion modelling has been carried out to determine the levels of increase in aerial pollutants (particularly NO_x, SO_x and NH₃) likely to occur at particular geographical locations as a result of the development. This has been carried out with particular relevance to potentially sensitive receptors within a 10km radius of the development, namely all SACs and all SSSIs, as listed in Table 6. This dispersion modelling has been carried out according to the Environment Agency's best practice guidance on how to implement the Habitats Regulations¹⁷. Dispersion modelling has used meteorological data over a five year period and taken into account cumulative effects from other potential sources of aerial pollution in the local area.
- 12.149 For each habitat type at each site / receptor, a series of critical levels / loads have been determined, based on the best available current knowledge; these have been obtained from the Air Pollution Information System website (www.apis.ac.uk)

12.150 Critical Loads and Levels are generally defined as: “ a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge” (Nilsson & Grennfelt, 1988). The critical load relates to the quantity of pollutant deposited from air to the ground, whereas the critical level is the gaseous concentration of a pollutant in the air.

- **Critical Loads** - The threshold level for the deposition of a pollutant above which harmful indirect effects can be shown on a habitat or species, according to current knowledge. Additional deposition above the Critical Load is termed Critical Load Exceedance. Pollutants concerned with critical loads in the APIS database are:
 - Nitrogen deposition (kg Nitrogen ha⁻¹ year⁻¹)
 - Acid deposition (keq ha⁻¹ yr⁻¹)
- **Critical Levels** - The threshold level for the atmospheric concentration of a pollutant above which harmful direct effects can be shown on a habitat or species, according to current knowledge. Pollutant air concentrations above the Critical Level are termed Critical Level Exceedances. Pollutants that are concerned with critical levels in the APIS database are:
 - Ammonia (µg m⁻³)
 - Sulphur Dioxide (µg m⁻³)
 - Nitrogen Oxides (µg m⁻³)
 - Ozone (ppb hours)

12.151 APIS has been used as a Simple Site-Based Assessment tool to assist in obtaining a broad indication of the likely pollutant impact at specific locations. This provides a quick tool to screen-out queries where there is clearly little risk of air pollution impact on a habitat or species at a specified location. Where this method suggests likely significant pollutant impact, a detailed site-based assessment must be conducted.

12.152 The Simple Site-Based Assessment is based on national maps of air pollutant exposure and Critical Loads or Critical Levels. Atmospheric deposition is compared with the most relevant critical loads, while air concentrations are compared with critical levels. In many cases the Critical Loads and Levels applied do not vary spatially, but are linked to a specific habitat type. This process of using nationally available mapped data and habitat specific values is subject to a series of uncertainties. These include:

- Maps of pollutant air concentrations and deposition are generated by a combination of models and measurements (see www.edinburgh.ceh.ac.uk/negtap). If the queried location is close to known large emission sources, then this tool should be used with caution as it may underestimate deposition or concentrations.
- Maps of pollutant concentration and deposition are mostly available at a 5 km grid resolution. The uncertainties are particularly large for the concentrations of primary pollutants e.g. NH₃ , NO_x and SO₂.

- The critical loads data for acidity are linked to mapped soils data. The critical load is based on the dominant soil type in a 1km grid square may not represent small areas of a square which may be more sensitive.
- 12.153 The habitat specific critical loads and levels data are only available for a limited number of habitat types. In this case the most similar habitat is assigned to the habitat being considered. There are, therefore, uncertainties in both the best estimates of the critical loads and levels and in the assignment of habitats.
- 12.154 The current assessment comprises a Stage 2 assessment under the current guidance. In order for a development to pass this stage the long-term process contribution (PC) must be less than 1% of the relevant long-term benchmark (EAL, critical level or critical load); therefore it can be concluded that the emission is 'not likely to have a significant effect alone or in combination irrespective of the background levels'. Where this criterion is exceeded; consideration of the predicted environmental concentration (PEC) is required and PEC must be less than 70% of the relevant long-term benchmark, for the emission to be considered 'not likely to have a significant effect'.

SO₂ and NO_x

- 12.155 For all receptors where the SO₂ and NO_x impacts have been mapped against critical levels, the PC from the EfW are less than 1% of the applied critical level for both NO_x and SO₂ and the PEC remains well below the critical level in all locations.

Ammonia

- 12.156 The peak annual impact of ammonia at a sensitive ecological receptor location is 0.007µg/m³; less than 1% of the critical level of 3µg/m³ for ammonia. Therefore it is considered that impacts would be insignificant.

Acid Deposition

- 12.157 The predicted PC from the proposed EfW are less than 1% of the applied critical load except for peak impacts on oak woodlands at Horseshoe Bend SSSI where predicted impacts are between 1.1 and 2.4% of the critical loads. According to current guidance, it is therefore necessary to consider whether these emissions are 'likely to have a significant effect alone or in combination irrespective of the background levels'.
- 12.158 The predicted deposition rates are based on a 'worst case scenario' for the facility; producing the upper limit for Waste Incineration Directive (WID) of acid gases with both lines operating continuously. The actual emission rates are likely to be significantly lower due to the abatement of acid gases prior to release from the EfW stack. Emission of NO_x and SO₂ are likely to be 80% and 30% of the WID Limits respectively, and emissions of HCl are typically less than 6mg/m³, or 60% of the WID emission limits. In addition, the lines would actually operate for nearer 95% of the year. The actual PC for acid deposition is therefore likely to be less than 1% of Critical Loads at Horseshoe Bend SSSI.

Eutrophication

- 12.159 The predicted process contribution from the EfW is less than 1% of the critical load with exception to oak woodlands at Aston Court SSSI (3.2%), Avon Gorge Woodlands SSSI (2%) and Horseshoe Bend SSSI (2.4%), and *Tilio-Acerion* forests in the Avon Gorge SAC (2%).

12.160 Please note that these predictions are based on the facility operating at the upper WID emission limits (for NO_x) and 6mg/m³ for NH₃ with both lines operating continuously (actual operating hours will be nearer 95% of the year). Actual emission rates of NO_x would be significantly lower due to abatement; data indicates that emissions are typically less than 160mg/m³, or 80% of the WID emission limits. The actual PC for N deposition is therefore likely to be less than 1% of Critical Loads at these sites.

Noise and Visual Disturbance

12.161 Noise disturbance is unlikely to be significantly higher than background levels during the operational phase, and many bird species are likely to adapt to this over time.

12.162 Visual disturbance is unlikely to be significantly higher in this area during the operational phase of development.

Collision Risk

12.163 A chimney stack is already present at the site. While the proposed stack would be considerably higher than this, most birds fly below 20m, although some larger high flying species may fly up to 40-50m. The stack should therefore not create a significantly larger obstacle in the flight paths of birds in and out of the estuary than the current chimney stack. The new chimney stack will also be illuminated during the hours of darkness, helping to prevent night-time collisions and reducing the collision risk over the current baseline conditions.

MITIGATION

12.164 This section outlines the mitigation measures that have already been incorporated into the proposed scheme. Following this, recommendations for further mitigation measures are suggested. Recommendations for further mitigation are based upon what is practicable and 'reasonable' and would not affect the integrity of the proposed development. The methods described below are based on current best practice guidelines, however given the long lead in time before work commences some parts of the site e.g. the Spine, these methods may be adapted to take account of amended or updated best practice at the time of works.

Mitigation Incorporated into Scheme

Habitat Loss

12.165 The proposed landscape masterplan shows significant areas of scrub, grassland and wetland habitat to be re-created outside of the operational areas of the site, predominately around the eastern margins of the site. This would focus on the replacement of ephemeral and permanent wetland areas, reed beds, scrub, tall grassland and the ditch system which will compensate for the loss of these habitat types. The detailed design of these habitat features will be ecologically led, while a management plan would also be produced to maximise their long-term ecological benefits. The design and management of the habitat features will also be tailored to maximise benefits to specific species groups which currently use the site; namely invertebrates, breeding birds, grass snake and water vole. Details of how these

habitat features will be designed and managed for each of these species groups is detailed in the following sections (Further Recommended Mitigation).

Prevention of Contamination of Surface and Ground Water

- 12.166 In order to minimise the potential for accidental spills of potentially contaminating material during the construction phase of the project, the relevant Pollution Prevention Guidelines will be adhered to, to ensure construction works are undertaken in an environmentally responsible manner. Any environmentally hazardous material used during the operational phase of the site will be kept in dedicated stores and storage tanks will have appropriate secondary bunding. These will be adhered to, to ensure construction works are undertaken in an environmentally responsible manner. In addition, the demolition of the redundant plant and equipment at the site will include the need to safely remove and dispose of potential pollutants such as solidified feedstock oil and carbon black.
- 12.167 The potential for sediment erosion causing high sediment loading to surface watercourses in the vicinity of the site during all earthworks will also be managed by the implementation of surface water management measures such as trapped gullies, silt traps, and temporary settlement tanks prior to the commencement of earthworks onsite.
- 12.168 The potential for leachate generation and discharge to surface water from the waste reception and bottom ash recycling facility will be minimised by the design of the facility. The waste would be delivered to a dedicated handling area using bulk transfer and street refuse collection vehicles (RCV's). All vehicles delivering residual waste will be weighed when entering the site and proceed to a vehicle delivery and tipping hall where they would back up and discharge the waste directly into a pit or storage hopper. This will minimise the potential for the generation and discharge of leachate.

Inundation and Flooding

- 12.169 Elevation of the development platform will minimise potential impacts associated with rapid inundation of floodwater into the development site from tidal sources following a breach of the tidal defences coincident with a significant tidal event. Inherent mitigation will be built into the fabric of the main building structure, in the form of hydrostatic resistant design techniques, to further reduce the impact.
- 12.170 On-site surface water attenuation storage has been maximised within the constraints and limitations imposed by the development proposals. Attenuation storage may take the form of:
- Surface water attenuation ponds;
 - 'Fire' ponds;
 - Creation of new rhyne within the site boundary, linked to the off-site rhyne network;
 - 'Floodable' on-site areas, created by careful profiling of on-site car parking, hardstanding and landscape areas to promote the above-ground detention of excess floodwater;
 - Underground storage tanks or over-sized pipes;
- 12.171 In combination with the proposed on-site surface water attenuation scheme, the LSIDB have advised that supplementary attenuation may be provided in the form of off-line 'wet' storage comprising rhyne / wet ponds. Surface water could be

discharged freely from the site to a rhyne for events up to and including the 1:5 year storm. Surface water would overflow from the rhyne to the off-line storage area from the proposed connection point for events exceeding the 1:5 year storm. Where it is not possible to connect the site drainage to the nearest LSIDB managed rhyne, the LSIDB would permit the construction of new rhynes to allow a connection to be achieved.

Groundwater Levels and Flows

12.172 In order to minimise the impact on groundwater flow by the underground bunker, groundwater drainage will be developed. It is proposed that groundwater intercepted by the drains around the facility will be over-pumped to the surface water attenuation lagoons (via settlement tanks if appropriate) and discharged to the rhines thus mitigating any impact on flows in the local drainage network.

Air Quality

12.173 Use of pollution prevention control technologies will be used to reduce emissions to acceptable levels.

Further Recommended Mitigation and Enhancement

12.174 This section outlines measures which should be undertaken specifically for ecological mitigation. Many measures require specific timings of works and techniques to be applied during habitat removal, creation and management; these will need to be finalised on all timescales for works and landscaping schemes are known. The general principles to mitigation are outlined below, however a detailed mitigation and management plan should be prepared before commencing works to ensure that these are fully implemented.

Invertebrates

12.175 The main area of invertebrate interest is in the area of damp ephemeral vegetation associated with the remnant ditch system. It is understood that a similar feature will be created within an attenuation basin the final design scheme, therefore if the phase of works allows this new feature should be created prior removal of the existing ditch system in order that invertebrate might have a chance to colonise this prior to removal of the existing habitat.

12.176 The primary interest at the site is also flies, therefore it is recommended that stripped of surface substrates is carried out in mid summer when most of these species will be in their adult stages. These mobile adults are therefore less likely to be lost during the site stripping and should colonise other areas of suitable habitat within the site or vicinity.

12.177 Aquatic beetles are likely to persist in the surrounding ditch system which shall remain unaffected, and will re-colonise the new ditches and waterbodies once these are connected to the wider ditch network.

12.178 Piles of substrate removed from the damp remnant ditch system will also be transferred to the new ephemeral ditch system, as this may transfer some of the same flora which currently helps to support the rich invertebrate assemblage and may also create a similar micro-climate in these areas.

Water Vole

- 12.179 Proposed works may involve localised destruction of a small number of water vole burrows which would be excluded by displacement techniques prior to commencing works; no translocation exercise is considered likely to be necessary. Where necessary, displacement works will be carried out during early-spring and late-autumn when water voles are relatively active, but do not have dependant young.
- 12.180 Prior to engineering works in or adjacent to the perimeter ditches, these water courses will be resurveyed for water vole to establish the current distribution of burrows and territories. Scrub would be removed from the eastern section of this ditch prior to commencing works to ensure that this could be fully surveyed. Where burrows are recorded in the vicinity of proposed working areas, all burrows would be clearly marked and all vegetation from the working width and a 5m buffer on either side will be strimmed to ground level, and all arisings removed. This will be monitored for a period of three days, and where signs of activity (fresh droppings) continue to be recorded the need to extend the strimmed area, dewater the section of ditch (if possible) and use trapping will be reviewed. Trapped voles would be relocated to adjacent sections of ditch and released.
- 12.181 When it is considered that all voles have left or been removed, a destructive search of the burrows will be carried out by digging out the burrows by hand. Any voles discovered would be transferred to nearby sections of ditch and released. All displacement, trapping, relocation of voles and damage / destruction of burrows would be carried out under a licence issued by Natural England, following a detailed protocol.
- 12.182 The remnant ditch system and associated reed beds were not found to support any summer nests at the time of survey, however given the proximity of this area to a known population, the suitability of the habitat and the cryptic nature of these nests, as a precautionary measure this area would be strimmed during the winter months while water vole would be absent.
- 12.183 Although no evidence of water vole was recorded around the margins of the attenuation pond, as a precautionary measure prior to infilling, its margins would be strimmed to ground level, the arisings removed and the banks carefully checked for signs of water vole and their burrows, given its proximity to a known population and the dense nature of its margins.
- 12.184 All newly re-profiled sections of ditch and newly created ditches and waterbodies will have a profile suitable for habitation by water vole, with steep sides and a berm below the normal water level. These will be planted with tall emergent vegetation along the waters edge such as common reed and branched bur-reed to provide cover and foraging habitat, while the upper banks will be seeded with tussock forming grasses to provide further cover during periods of high flow and habitat for summer nesting. All waterbodies will be designed to retain some permanent water in their base, to remain suitable for water vole.
- 12.185 Vegetation management will be undertaken during late summer, cutting to a height of 10-15cm. Ditches should be cut every two years in 20m sections on alternate banks along their length to create a mosaic of vegetation types and structures.
- 12.186 Where de-silting is required this should be carried out working from one bank with long-armed diggers where possible to avoid interfering with banks, and leaving

approximately one third untouched. This may not be possible for IDB controlled ditches.

Grass Snake

- 12.187 Prior to stripping areas of habitat suitable for grass snake e.g. tall grassland, reed beds, refugia etc, a scheme of displacement through habitat manipulation and destructive searching shall be undertaken. Grass snakes are highly mobile and likely to move of their own accord during the active season, and given the low numbers of animals believed to be using the site, a translocation exercise is not considered to be necessary. This shall be reviewed during the destructive search, and should higher numbers (>10 animals) be discovered, the need for a translocation exercise will be reviewed. Suitable offsite habitat for displaced animals to move to is also abundant in the adjacent areas to the east of the site.
- 12.188 In order to ensure that the habitat manipulation is effective it should typically be carried out between late-March and late-September during suitable weather conditions; daytime temperatures >15°C, generally dry, not too windy when grass snake are likely to be active and mobile. Prior to commencing the displacement, the should be subject to a destructive search, lifting and removing all potential refugia from areas of suitable habitat such as sheets of metal and other debris. Animals recorded during this process should be carefully lifted, placed in a safe containers and removed from the site; these animals should then be re-released within areas of suitable habitat to the east of the site e.g. ditch banks.
- 12.189 Areas of tall or tussocky grassland within the site occur as linear strips; 20m section should be progressively strimmed to a height of approximately 10cm each day, working progressively north and east towards the perimeter of the site. If any grass snakes are observed during this process they should be allowed to move of their own accord, in order to avoid unnecessary stress and risk of injury, unless they are still torpid and can be safely removed from the site.
- 12.190 Once the vegetation has been cleared then the site should be stripped of all vegetated surfaces down to soil level, preventing the strimmed vegetation re-growing and becoming repopulated by grass snake. During this clearance any pile of logs or rubble should be checked by hand initially to ensure that no snakes are present, if they are found they should be allowed to leave on their own accord if possible.
- 12.191 Part of the current ditch resource and linear strips of rank grassland around the margins of the site will be lost during the construction phase, however proposed habitat creation should provide alternative habitat for grass snake. The enlargement of existing ditches will proved more extensive areas of ditch bank and more extensive areas of taller grassland within attenuation basins. The existing ditch bank on the eastern perimeter will benefit from scrub removal, creating more open areas for basking, while new and existing ditch banks will benefit from being seeded with tussock forming grasses and a long rotation of vegetation management which will create a mosaic of well established tall grassland habitats (see Water Vole above).
- 12.192 The arisings from vegetation management will also be retained and used to create a number of compost heaps along the tops of the ditch banks above the flood level; these also be covered by black plastic sheeting to help retain heat and will provide ideal egg-laying sites for grass snake.

- 12.193 The new ponds and waterbodies created as part of the surface water management scheme, will include reed beds and associated wet habitats which will provide ideal foraging habitat for grass snake. Once these ponds have become established they are likely to attract and support breeding amphibians which will in turn will provide prey species for grass snake.
- 12.194 At least two hibernacula will be created on the tops of ditch banks, above the level of winter flooding and in undisturbed areas of the site; these will be created using piles of concrete and brick rubble from the demolition of the existing buildings and other materials that are of a sufficient size to form gaps and crevices that extend below the frost layer. Ideally a hole will first be created to a depth of one metre, this should then be infilled with large pieces of masonry and then capped with finer materials and finally a light layer of soil on top, this final layer should only partially cover the rubble and still allow access to the structure.

Breeding Birds

- 12.195 In order to avoid the damage or destruction of active birds nests, all vegetation removal, particularly reed beds and scrub, will be carried out outside of the breeding bird season. If this is not possible for any reason, the vegetation would first be subject to a breeding bird check prior to removal. Should an active nest be detected, that area would be retained until such time as the breeding attempt was complete before removing the vegetation.
- 12.196 The site clearance works will require quite a significant loss of breeding bird habitat (in a site context), however the landscape masterplan will aim to replace this. Extensive areas of scrub will be planted around the margins of the site; this will have a primarily screening function, but will also provide continuous lines and dense thickets of scrub habitat suitable for a wide range of scrub nesting species which currently breed at the site. The proposed surface water scheme also includes areas of reed bed which shall help to compensate for the loss of reed bed habitat from the remnant ditch system which currently supports breeding birds.
- 12.197 Bird boxes shall also be erected on retained poplar trees on the southern boundary of the site and any other suitable specimens on the perimeter of the site in order to provide additional nesting opportunities for holes nesting species.

Local BAP Species

- 12.198 Other enhancements at the site would be focused on providing benefits for local BAP species and helping to achieve local targets for these species; namely bats, hedgehog, bees and species-rich grassland. The measures described above would already benefit a range of local BAP species (water vole, birds, grass snake) and habitats (reed beds and sedgebeds, watercourses and floodplain, and open standing water).
- 12.199 Bats would benefit from the scheme through the erection of twenty bat boxes on retained mature poplar trees along the southern boundary of the site. These would be of a range of designs likely to be suitable for the local BAP species most likely to be present; namely soprano pipistrelle and noctule, however these would also be suitable for use by a range of other species. Their location adjacent to a watercourse will increase their likelihood of being used, indeed pipistrelle bats have been observed flying along this tree line at dusk. Lighting would be restricted to low

level and low intensity lighting in the vicinity of this tree line and all other semi-natural habitat features which might be used by foraging bats.

- 12.200 Foraging opportunities across the site are also likely to be increased for bats due to the increase in open water and wetland features which will support an abundance of aquatic invertebrates. Planting schemes will also comprise predominately native species in order to maximise the volume and diversity of invertebrate prey which they will support.
- 12.201 Hedgehog boxes and or log piles will be installed on the scrubby margins, particularly were these are adjacent to areas of long grass; these will provide summer refuges for any local population of hedgehog which may colonise the site through the ditch network. Hedgehogs will also benefit from compost heaps created at intervals along the tops of the ditch banks; these will be created from onsite grass cuttings and covered with black plastic to help retain heat. Compost heaps provide an excellent source of food for hedgehogs and also provide them with safe places to hibernate.
- 12.202 Bee boxes will be installed in sheltered locations around the site; these provide several chambers in which solitary bees and mason wasps such as the local BAP species *Odynerus melanocephalus* can use as egg chambers.
- 12.203 Grassland areas will be seeded with species rich, neutral wildflower mixes. These will be comprised of native species with a high proportion of herbaceous species, providing a rich source of nectar for invertebrates. This will also be managed to encourage species diversity and provide structural diversity throughout the year.

ASSESSMENT OF RESIDUAL IMPACTS

- 12.204 To fully evaluate the effects of a predicted impact upon those valued ecological receptors it is necessary to assess the magnitude of the impact upon that feature (identified in Table 11). The predicted impacts of the proposed development, following mitigation, i.e. the residual impacts are assessed using the following criterion which is based upon guidance provided by the IEEM.

Table 11 - Criteria for Assessing the Magnitude of Impacts

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

12.205 The summary table of residual impacts and significance matrix (Table 12) provides a guide to aid the assessment of the significance of impacts. For example, negative impact on a site of national importance would be of minor through to major significance whereas a major negative impact upon a site of neighbourhood importance would be of minor to moderate.

12.206 The matrix, in many cases, provides a range of levels of significance that may occur; these can only be refined by the careful consideration of those factors at the site such as existing baseline, predicted trends, background level of impacts and the likely effectiveness of the proposed mitigation measures. Areas or features assessed as being of negligible value are excluded from this assessment.

Table 12 - Impact Significance Matrix

Magnitude of impact	Value of Ecological Receptor						
	International	National	Regional	County	District	Neighbourhood	
Major Negative	Critical	Critical	Critical - Moderate	Major - Moderate	Moderate - Minor	Minor - Moderate	
Negative	Major - Minor	Major - Minor	Major - Minor	Moderate - Minor	Moderate - Minor	Minor	
Neutral	Not Significant						
Positive	Major - Minor	Major - Minor	Major - Minor	Moderate - Minor	Moderate - Minor	Minor	
Major Positive	Critical	Critical	Critical - Moderate	Major - Moderate	Moderate - Minor	Minor - Moderate	

12.207 Table 12 characterises the valued ecological receptors affected and identifies the range of potential impacts, the magnitude and significance of the effect. This evaluation takes into account the range of mitigation measures discussed in earlier sections. This table also summarises any legal or policy implications that may result from the development proposals.

12.208 Table 13, below, identifies the range of identified ecological receptors that could potentially be subject to those potential impacts that could occur as a result of this development. When describing the nature of the impacts the descriptors set out in Table 11 are used.

Table 13 – Key Consideration When Charactering Impacts

Descriptor	Definition¹
Direction of impact	Positive or negative impact
Probability of occurring	Broadly defined on 3 levels: Certain, Probable or Unlikely
Complexity	Direct, Indirect or Cumulative
Extent and Context	Area/number effected and % of total
Magnitude	Describe severity of effect in words
Duration	Permanent or Temporary in ecological terms (e.g. within the lifetime of the species effected)
Reversibility	Whether or not the effect can be reversed in an ecological timescale
Area	Expressed as area or percentage of the study area.

CONCLUSIONS

12.109 The application site is dominated by a former chemical plant comprising hard standing, a network of pipe work, storage sheds and settling tanks. Land to the east of this plant includes a mature tree line, grassland, scrub, ephemeral vegetation and reed beds. The site is bounded to the south and east by a deep ditch which is connected to the wider Avonmouth ditch network, to the north by a car storage yard and to the east by warehouses.

12.110 The construction and operation of the SRRRC has the potential to impact on semi natural habitat, grass snake, water vole, invertebrates and birds. These impacts will arise due to habitat loss through land take, alterations to groundwater and surface water flow and quality, noise and dust deposition.

12.111 Mitigation measures have been identified and designed into the scheme wherever possible. Further mitigation measures include the timing of certain works and techniques for habitat removal. Bird, bat and bee boxes will be installed on trees around the site and the proposed open water and wetland features around the SRRRC will provide foraging opportunities for bats, and a habitat for aquatic invertebrates. Grassland areas will be seeded with species rich, neutral wildflower mixes and managed to increase species biodiversity.

12.112 In summary, it is considered that the development of the site will not have significant impacts on the existing ecology of the site and will lead to positive benefits for flora and fauna in the long term.

¹ Definitions for these terms and further information relating the methods of assessment are given in Guidelines for Ecological Impact Assessment (IEEM, 2005)

Table 10– Assessment of Potential Impacts and Mitigation

Important Feature	Ecological Importance	Description of Potential Impact	Characterisation of Impact	Ecological Significance of Impact if unmitigated	Mitigation and Compensation	Residual Impact following Mitigation and Significance
Internal Designations	-			Construction Impacts		
Severn Estuary SAC / SPA / SSSI		An internationally important estuary including extensive mudflat and saltmarsh habitats, supporting internationally important populations of winter birds	Temporary Negative Unlikely Direct Reversible Potentially spread along coastline	County level	<ul style="list-style-type: none"> • Use of Pollution Prevention Guidelines • Careful removal / disposal of onsite pollutants • Use of settlement tanks / silt traps 	Negligible

District Importance

Surround water network

A network of ditches, rhines and floodplain grassing marsh supporting a diversity of plant and animal species in the wider Avonmouth area

Pollution of surface water flows into the surrounding water network

Temporary
Negative
Unlikely
Direct
Reversible
Potentially spreading outwards in a flooding event

District Level

- Use of Pollution Prevention Guidelines
- Careful removal / disposal of onsite pollutants
- Use of settlement tanks / silt traps

Negligible

Invertebrate Assemblage

A diverse assemblage of invertebrates including Notable and RDB1 species

Loss of populations and habitats during site preparation works.

Negative
Likely
Direct
Temporary
Reversible
Will effect some groups more than others – rarest species should be retained

District

- Time of works to allow mobile species to disperse
- Retention of aquatic species in surrounding ditch network
- Recreation of suitable habitats for recolonisation (post-construction)

Minor negative

Parish Importance

Reed beds, remnant ditch network and attenuation pond

Provide a mosaic of ephemeral and permanent wetland habitats with dense vegetation support bird and invertebrate communities

Lost during site preparation works

Negative
Certain
Direct
Permanent
All areas

Parish level

- Recreation of similar habitat types in the landscape scheme
- Habitat areas likely to be larger than those lost
- Favourable long-term management of habitats for wildlife

Minor negative at in short-term.

Minor positive in long-term.

Perimeter ditches	Links adjoining ditch network. Supports population of water vole.	Localised engineering works – habitat damage / loss	Negative Certain Direct Permanent Localised where new access and drainage linkages required	Parish level	Habitat loss minimised through sensitive design Scrub removal from eastern ditch to encourage marginal vegetation Enlargement of ditch network to create additional habitat Favourable long-term management for wildlife	Minor negative in short-term Minor positive in long-term
Parish Importance - Species						
Breeding birds	Assemblage of breeding birds in reed bed / scrub habitats	Damage / destruction of nests	Negative Possible Direct Permanent Irreversible Individual nests	Parish level	Time works to avoid breeding bird season Breeding bird checks prior to vegetation removal Postpone works until breeding attempt is complete where necessary	Not significant
		Loss of breeding habitats	Negative Certain Direct Permanent Reversible Scrub and reed habitat in east of site	Parish level	Replacement of reed and scrub habitat in landscape scheme Favourable long-term management for breeding birds Erection of bird boxes on trees	Minor negative in short-term Minor positive in long-term
Water vole	Population of water vole in southern perimeter ditch	Killing / injury of water voles during engineering works	Negative Unlikely Direct Permanent Individual animals	Site context	Displacement of voles and destructive search prior to works	Not significant
		Loss of water vole habitat	Negative Certain Direct Permanent Localised areas for road	Site context	Creation of additional water features in landscape scheme Favourable long-term management for water vole	Minor negative in short-term Minor positive in long-term

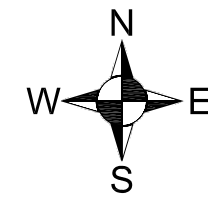
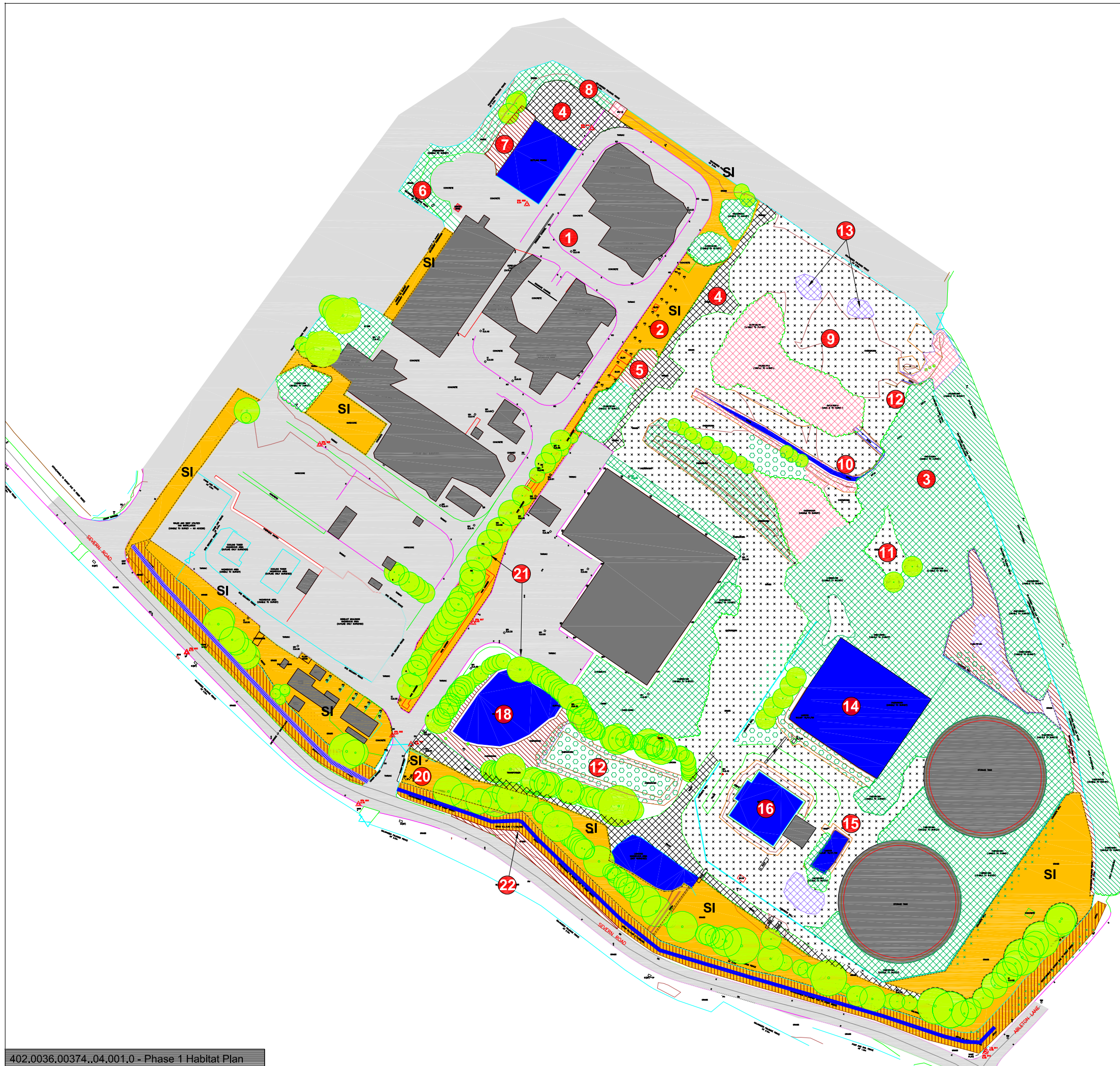
		crossings, drainage			
Grass snake Population of grass snake in marginal grass areas	Killing / injury of grass snake during site clearance	Negative Unlikely Direct Permanent Irreversible Individual animals	Site context	Timing site clearance during active season Destructive search Progressive strimming of suitable vegetation in 20m strips	Not significant
	Loss of grass snake habitat	Negative Certain Direct Temporary Reversible Small strips of tall grassland	Site context	Larger areas of tall grassland habitat to be recreated in the landscape scheme Favourable long-term management for grass snake	Minor negative in short-term Minor positive in long-term
	Loss of commuting route for horseshoe bats	Negative Probable Permanent Indirect The Spine woodland is used as a commuting feature by horseshoe bats.	Parish level	Alternative vegetated features to be created running through the site. Bats use alternative routes over time.	Not significant (in long term)
International Importance - Designated		Operational Impacts			
Severn Estuary SAC / SPA / SSSI An internationally important estuary including extensive mudflat and saltmarsh habitats, supporting internationally important populations of winter birds	Pollution of surface water flows into the estuary	Temporary Negative Unlikely Direct Reversible Potentially spread along coastline	County level	<ul style="list-style-type: none"> • Containment of waste and leachate • Elevation of development platform Onsite and off-line storage facilities	Not significant

Avon Gorge SAC <i>Tilio-Acerion</i> forests (Annex 1) on limestone cliffs and screes including endemic species	Eutrophication and acidification of sensitive woodland habitats through NO _x and SO ₂ deposition from aerial emissions	Negative Unlikely Indirect Permanent Irreversible Damage ground flora	National	<ul style="list-style-type: none"> • Use of Pollution Prevention Control technologies to reduce emissions to safe levels
--	--	--	----------	---

National Importance – Designated Sites

Aston Court SSSI, Horseshoe Bend SSSI, Avon Gorge SSSI Nationally important ancient oak woodland sites	Eutrophication / acidification of sensitive woodland habitats through NO _x and SO ₂ deposition from aerial emissions	Negative Unlikely Indirect Permanent Irreversible Damage ground flora	National	<ul style="list-style-type: none"> • Use of Pollution Prevention Control technologies to reduce emissions to safe levels
--	--	--	----------	---

Local Importance – Habitats					
Newly created ponds, ditches / rhines, grassland and scrub.	Creation and favourable management of new ecologically valuable habitats	Positive Certain Direct Permanent Reversible	Local	<ul style="list-style-type: none"> • Habitat creation as part of landscaping • Ecologically led management 	Minor positive



NOTES
 1. SURVEY DATA SUPPLIED BY SLR CONSULTING LTD.
 DRAWING FILE REFERENCE:
 0036-00374-19-SS0961150, DATED SEPTEMBER 2009.

LEGEND

- BUILDINGS AND INFRASTRUCTURE
- TARMAC AND CONCRETE
- BRAMBLE SCRUB
- HARDCORE
- SEMI-IMPROVED GRASSLAND
- TREE
- WATERBODY
- SCRUB
- REED BED
- CONTIGUOUS SCRUB
- EPHEMERAL WATERBODY
- SHORT EPHEMERAL GRASSLAND
- TALL HERB
- TARGET NOTE

Viridor
 WASTE MANAGEMENT

SLR
 GREENWOOD HOUSE
 ROWDEN LANE
 BRADFORD-ON-AVON
 WILTS. BA15 2AU
 T: 01225 309400
 F: 01225 309401
 www.slrconsulting.com

AVONMOUTH EfW
 ECOLOGY
 PHASE 1 HABITAT PLAN
 12-1

Scale 1:1,500 @ A3 Date SEPTEMBER 2009