6 BIODIVERSITY

This chapter identifies, describes and assesses the impact of the proposed housing development project in Kishoge (hereafter referred to as 'the proposed development') on biodiversity during the construction and operation stages.

This chapter provides an overview of the assessment and field methodologies; receiving ecological environment; a description of the nature and scale of any potential significant direct or indirect impacts; and any necessary mitigation and biodiversity enhancement measures recommended as part of this EIAR.

The design of the proposed development has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the proposed development are attained.

This Biodiversity Chapter should be read in conjunction with the below chapters and their respective appendices, which provide further detail on related impacts and the proposed mitigation measures for topics discussed within this chapter:

- Chapter 7 Land, Soils and Geology;
- Chapter 8 Water;
- Chapter 9 Air (Noise and Vibration);
- Chapter 10 Climate (Air Quality);
- Chapter 11 Climate (Climate Change);
- Chapter 12 Landscape and Visual Impact Assessment;
- Chapter 13 Material Assets: Transport;
- Chapter 14 Material Assets: Waste;
- Chapter 15 Material Assets: Utilities; and
- Chapter 16 Cultural Heritage (Archaeological & Architectural).

6.2.1 Proposed Development – Site 3

6.2.1.1 Summary Description of Development

The proposed development at Site 3 of the Application Site comprises:

580no. residential units in a mix of house, apartment, duplex and triplex units comprising 1-bedroom, 2-bedroom and 3-bedroom typologies;

a 2-storey childcare facility; and,

all associated and ancillary site development and infrastructural works including: surface level car parking, bicycle parking, hard and soft landscaping and boundary treatment works, including public, communal and private open space, public lighting, bin stores and foul and water services.

Vehicular, pedestrian and cycle access to the site is proposed from Adamstown Avenue and the Northern Link Street (permitted under Reg. Ref. SDZ24A/0033W). Pedestrian, cycle and vehicular access is also provided from the existing entrance at Tullyhall Rise.

A pedestrian and cycle access is provided from the permitted green link under Reg. Ref. SDZ24A/0033W, located adjacent to Lucan East Educate Together National School.

A new pedestrian access is proposed from Rossberry Park.

6.2.2 Proposed Development – Site 4

6.2.2.1 Summary Description of Development

The proposed development at Site 4 of the Application Site comprises:

436no. residential units in a mix of house, apartment, duplex and triplex units comprising 1-bedroom, 2-bedroom, 3-bedroom and 4-bedroom typologies;

a childcare facility and a retail unit on the ground floor of Block F;

a community pavilion building at the edge of Griffeen Valley Park;

reuse of Grange House for future employment uses; and,

all associated and ancillary site development and infrastructural works including: surface level car parking, bicycle parking, hard and soft landscaping and boundary treatment works, including public, communal and private open space, public lighting, bin stores and foul and water services.

Vehicular access to the site will be via the Southern Link Street (SLS) permitted under SDZ20A/0021.

6.2.3 Proposed Development – Site 5

6.2.3.1 Summary Description of Development

The proposed development at Site 5 of the Application Site comprises:

236 no. residential units, including 55 no. social housing units, 113 no. affordable purchase units and 68 no. cost rental units. The scheme provides for a mix of 1, 2 and 3-bedroom units in a range of dwelling typologies, as follows:

a) 35 no. houses

b) 110 no. duplex units

c) 33 no. triplex units, and

d) 58 no. apartments

The proposal also includes all associated and ancillary site development and infrastructural works including: a total of 219 no. car parking spaces at undercroft and surface level, bicycle parking, hard and soft landscaping and boundary treatment works, public, communal and private open space, public lighting, waste storage areas and foul and water services.

Vehicular access to the site will be from Thoms Omer Way and the Northern Link Street (NLS) proposed under concurrent application Reg. Ref. SDZ24A/0033W.

6.3.1 Study Area

The study area of the proposed development sites was defined by the findings of the desk study presence/absence of protected habitats, flora or fauna within the Zone of Influence (ZoI) and best practice methodology referenced below for assessing effects on those ecological features. In general, surveys were conducted for each of the key ecological receptors (KERs) within specific geographical areas; and focussed on assessing potential impacts within the ZoI of the proposed development.

6.3.2 Relevant Guidelines, Policy and Legislation

The biodiversity assessment included a comprehensive policy, plan and strategy review of the following documents:

- The Planning and Development Act 2000 (as amended) hereafter referred to as the Planning Acts;

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Birds Directive);
- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 on the assessment of the effects of certain public and private projects on the environment;
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) (as amended);
- EU Water Framework Directive (2000/60/EC) and European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003);
- OPR Practice Note PN02 Environmental Impact Assessment Screening (OPR, 2021);
- Guidelines for planning authorities and An Board Pleanála on carrying out environmental impact assessment (Department of Housing, Planning and Local Governments, August 2018);
- Guidelines on the information to be contained in Environmental Impact Assessment Reports Environmental Protection Agency (EPA, 2022);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009);
- Wildlife Acts (and amendments) 1976 and subsequent amendments;
- Flora (Protection) Order, 2022 (S.I. No. 235 of 2022);
- Inland Fisheries Acts 1959 to 2017;
- National Biodiversity Plan 2023-2030, Department of Culture, Heritage and the Gaeltacht (DCHG, 2023);
- South Dublin County Council Biodiversity Action Plan 2020-2026;
- Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes, NRA 2006;
- Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes, NRA 2006;
- Guidelines for the Treatment of Bats during the Construction of National Road Schemes, NRA 2006;
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes, NRA 2006;
- Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub prior to, during and post Construction of National Road Schemes, NRA 2006;
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EU 2013);
- Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, (CIEEM, 2018);
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition) (Collins (ed.), Bat Conservation Trust 2023;
- Bat Mitigation Guidelines for Ireland (Marnell et al., 2022);
- Guidance Note 08/18. Bats and Artificial Lighting in the UK - Bats and the Built Environment series (ILP, 2018);

- The Bat Workers' Manual, 3rd Edition (Mitchell-Jones and McLeish), Joint Nature Conservation Committee 2004;
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (2008), NRA 2008;
- Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads, NRA 2010;
- The Management of Invasive Alien Plant Species on National Roads – Standard (GE-ENV-01104), TII 2020;
- The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (GE-ENV- 01105), TII 2020;
- Guide to Freshwater Invertebrates (Dobson et al, 2012);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters, IFI 2016; and
- Planning for Watercourses in the Urban Environment. A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning, IFI 2020.

6.3.3 Data Collection & Collation

This ecological assessment is based on a combination of desk-based research and a number of ecological field surveys targeting select groups of protected fauna likely to be impacted by the construction and operation of the proposed scheme. The desk-based research includes a data search for protected and notable species using the National Biodiversity Data Centre (NBDC) Mapping System (NBDC, 2025). A customised polygon was produced to extract all the species data from the set ZoI for this proposed development.

6.3.3.1 Data Sources

Reviewed data sources included relevant published biodiversity data; collation of existing information on the ecological environment; and consultation with relevant statutory bodies. Accessed data sources include:

- The Status of EU Protected Habitats and Species in Ireland Volume 1: Summary Overview, NPWS 2019;
- The Status of EU Protected Habitats and Species in Ireland Volume 2: Habitats Assessment, NPWS 2019;
- The Status of EU Protected Habitats and Species in Ireland Volume 3: Species Assessment, NPWS 2019;
- EPA Online databases on water quality and WFD maps;
- Aerial photography available from www.osi.ie and Google Maps;
- National Biodiversity Data Centre (NBDC) - Species Distribution Maps;
- NBDC All Ireland Red Data lists for vascular flora, mammals, butterflies, non-marine molluscs, dragonflies & damselflies, amphibians, and fish;
- International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species;
- Online data available on Natura 2000 network of sites and on Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHAs) as held by the National Parks and Wildlife Service (NPWS);

- Habitat and species GIS datasets provided by the NPWS;
- Bat records from Bat Conservation Ireland's (BCI) database;
- Environmental Impact Statements for any developments located in the locality;
- Clonburris SDZ Strategic Environmental Assessment (SDCC, 2017);
- Environmental information/data for the area available from the EPA website;
- Records from the Botanical Society of Britain & Ireland (BSBI);
- Any additional existing environmental or ecological reports examining the local areas

The following organisations with relevance to biodiversity have had their respective available data reviewed:

- National Parks and Wildlife Service;
- Inland Fisheries Ireland;
- Bat Conservation Ireland;
- BirdWatch Ireland (BWI);
- Botanical Society of Britain & Ireland; and
- Other members of the public with local knowledge/ records (e.g., relating to bat roosts).

6.3.4 Field Surveys

An initial ecological site walkover, including habitat mapping and species-specific surveys, was conducted on 26 August 2022 by JBA Consulting Ecologists to inform the ecological baseline of the site. Additional habitat surveys were conducted JBA Ecologists on 7 July 2023 and 23 May 2024, when floral growth was well established within the site, given the occurrence of minor scrub fires in the summer of 2022.

Aerial photographs and site maps assisted the habitat survey. Habitats have been named and described following A Guide to Habitats in Ireland by Fossitt (2000). Identification for higher plants principally follows that given in Webb's An Irish Flora (Parnell and Curtis, 2012); while contemporary nomenclature is in line with The New Flora of the British Isles 4th Edition (Stace, 2019).

The Survey methods were in general accordance with those outlined in the following documents:

- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009);
- Best Practice Guidance for habitat Survey and Mapping. The Heritage Council. (Smith et al., 2011); and
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition) (Collins, 2023).

Additional species-specific surveys were also conducted on-site on the following dates as outlined in Table 6-1 below.

Ecological Survey	Survey Date(s)
Habitats (Fossitt)	26/08/2022; 07/07/2023; and 23/05/2024
Non-volant Mammals	27/01/2023; and 08/02/2023
Protected Flora Survey	23/05/2024; and 18/07/2024
Amphibian Surveys	22/02/2023; and 22/03/2023
Freshwater Invertebrate Kick-sampling Survey	22/05/2023
Preliminary Bat Roost Assessment	26/08/2022 and 22/02/2023
Bat Transect Activity Surveys	10/05/2023; 22/06/2023; and 16/08/2023

Ecological Survey	Survey Date(s)
Wintering Bird Surveys	27/01/2023; 09/02/2023; 22/02/2023; 10/12/2024; 06/02/2025; and 25/02/2025
Breeding Bird Surveys	25/04/2023; 16/05/2023; and 22/06/2023
Terrestrial Invertebrate Survey	26/08/2022; and 18/07/2024

Table 6-1: Ecological surveys and survey dates

6.3.5 Habitats & Invasive Species Surveys

All habitats located within the survey area of the proposed development were mapped to level three of the Heritage Council's Fossitt (2000) habitat codes, and in accordance with Best Practice Guidance for Habitat Survey and Mapping (Smith et al., 2011). Floral species present that were either representative of a habitat or considered to be of conservation interest were recorded. The habitat's extent was mapped onto an aerial photograph within the QField GIS Android application, with GPS points taken where any ecological features of note were observed. Any non-native invasive plant species listed on the Third Schedule of the Birds and Habitats Regulations were also recorded during the habitat surveys. Identification for higher plants principally follows that given in Webb's An Irish Flora (Parnell and Curtis, 2012); while contemporary nomenclature is in line with The New Flora of the British Isles 4th Edition (Stace, 2019).

6.3.6 Rare & Protected Flora

Given the potential presence of a number or rare or protected flora (Flora Protection Order, 2022), targeted flora surveys were conducted to record any uncommon, rare or protected floral species. Identification for higher plants principally follows that given in Webb's An Irish Flora (Parnell and Curtis, 2012); while contemporary nomenclature is in line with The New Flora of the British Isles 4th Edition (Stace, 2019).

6.3.7 Non-volant Mammals

Recent data from the NBDC have recordings of Badger *Meles meles*; Pine Marten *Martes martes;* and Hedgehog *Erinaceus europaeus* within the vicinity of the proposed development they will be considered within the scope of the EIAR Biodiversity Chapter. The non-volant mammal surveys examined the suitable areas within the footprint of the proposed development for evidence of the above including scat/ droppings, setts/ dens and any mammal tracks.

Two surveys were carried out by ecologists to cover the extent of the proposed development sites, as well as a ZoI disturbance buffer for the sites. Signs of non-volant mammal habitation will be recorded, photographed and mapped via the QField GIS Android application. Surveying techniques were in line with those outlined in the Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (2006); and Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (2008).

6.3.8 Bats – Preliminary Roost and Activity Surveys

Given the presence of a number of trees and structures (to be cleared / demolished) within the site boundary, there was the potential for bat roosts to be present within or adjacent to the proposed developments sites. During August 2022 and February 2023, preliminary bat roost and habitat suitability surveys were conducted during daylight hours in order to identify the location of potential roosts features (PRFs) and access points within natural and artificial structures.

Surveyors carried out these surveys in line with the best practice methods outlines in the Bat Conservation Trust's "Bat Surveys for Professional Ecologists" (Collins, 2023).

6.3.9 Transect Bat Activity Surveys

A total of three transect bat activity surveys were conducted at Sites 3 and 5. Site 4 was excluded from transect survey as the largely dense woodland setting did not allow for clear observations of bats in flight, one of the main purposes for conducting a transect survey. The surveys were conducted by two teams of two ecologists walking set transect routes within targeted survey areas. Surveyors used a combination of Magenta 5 and Elekon Batscanner listening devices to record the bats observed during the survey. The location of individual bats and their flight paths were recorded within the QField GIS Android application. The data collected provided information on the flight paths of bat species within the proposed development areas.

6.3.10 Static Bat Activity Surveys

Static (in situ) bat detectors [Anabat Express & Anabat Chorus – Titley Scientific] were installed within each of the three sites, between the months of May and September during the 2022 and 2023 activity periods. These static detectors allowed for the collection of bat echolocation information over 5+ day time periods. One static survey was conducted late in the 2022 activity season, with a further three static surveys conducted during the 2023 activity period. The data collected provided information on the frequency of use by individual bat species within the proposed development sites.

6.3.11 Wintering Bird Surveys

The standard wintering bird survey methodology set out within Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2008), which draws on elements of the British Trust for Ornithology's (BTO) Wetland Bird Survey methodology, was used by JBA Ecologists to conduct the wintering bird surveys during the 2022/2023 and 2024/2025 winter periods.

6.3.12 Breeding Bird Surveys

Breeding bird surveys were conducted across three visits during April, May and June 2023. All suitable breeding bird habitat located within approx. 50m of the proposed development sites were slowly walked in a manner allowing the ecological surveyors to come within 20m of all suitable habitats. Birds were identified by sight and song, and general location and activity were recorded within the QField GIS Android application. The conservation status of the bird species was later recorded as per:

- Birds of Conservation Concern in Ireland (BoCCI) lists which classify bird species into three categories:

  Red List – birds of high conservation concern; Amber List – birds of medium conservation concern; and Green List – birds not considered threatened (Gilbert et al., 2021);

- Bird species listed on Annex I of the EU Birds Directive (2009/147/EC); and
- KER species of designated sites within the ZoI of the proposed development sites.

Surveying techniques were in line with those outlined in the Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (2009) / Common Bird Census (CBC) methodology.

6.3.13 Amphibian Surveys

Recent data, including records from the NBDC, identified amphibian species, namely Common Frog and Smooth Newt, within the locality of the proposed development sites. During spring of 2023 and

2024, ecological surveyors examined the sites for the presence of individuals, as well as suitable waterbodies and wetlands to support breeding amphibian populations. Surveying techniques were in line with those outlined in the Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2008).

6.3.14 Terrestrial Invertebrate Surveys

The surveying of terrestrial invertebrates was conducted across two transect surveys by ecological surveyors during the summers of 2022 and 2024. Surveyors carried out walked daytime transects, identifying diurnal macro-invertebrate species along selected routes within and immediately adjacent to the site boundaries of the proposed development sites. Surveying techniques were in line with those outlined in the Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2008).

6.3.15 Fish Surveys

Electro-fishing surveys were deemed unnecessary given the quality of the watercourse (Kilmahuddrick Stream) present within Site 4. Nor was its necessary to electro-fish the Site 4-adjacent Grand Canal given the lack of hydrological connection with this artificial waterbody.

Incidental observations during the freshwater invertebrate kick-sampling confirmed the presence of Three-spined Stickleback within the Kilmahuddrick Stream; and the fish species within the Grand Canal are well documented, with Roach *Rutilus rutilus*, Tench *Tinca tinca*, Pike *Esox lucius*, Perch *Perca fluviatilis* and European Eel *Anguilla anguilla* all present.

6.3.16 Freshwater Invertebrate Kick-sampling Survey

Macro-invertebrate kick sampling was carried out at three sites along the Kilmahuddrick Stream by JBA Ecologists, with one sample site adjacent to the SDCC depot, and the other two sites in the north-east and north-west corners of the site. All kick-samples were conducted with a standard kick sampling net (i.e. 250mm in width and with a 500µm mesh size) from riffle/glide habitat, utilising a two minute per sample approach. Large cobbles were also washed at each site where present and samples were stored fixed in methylated spirits (containing ethanol) for laboratory identification. The samples were divided into sub-samples within the lab to get a representation of the species present within the sample, the methodology used for sub-sampling was randomised selection. All macro-invertebrate species were identified using Guide to Freshwater Invertebrates (Dobson et al, 2012). Macro-invertebrate samples were converted to Q-value ratings as per (Toner et al, 2005). The reference classes for Q-value rating are displayed below in Table 6-2.

Q-value	WFD Status	Pollution Status	Condition
Q5 or 4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly Polluted	Unsatisfactory
Q3 or 2-3	Poor	Moderately Polluted	Unsatisfactory
Q2, 1-2, 1	Bad	Seriously Polluted	Unsatisfactory

Table 6-2: Description of reference classes for EPA Q-value ratings (Toner et al., 2005)

6.3.17 Zone of Influence

The ZoI for the project is based on a judgement of the likely extent of the ecological impacts on key ecological receptors. This will vary for different ecological features, depending on their sensitivities to environmental change.

In relation to terrestrial habitats, impacts will be limited to the lands within the site boundary of the proposed development, as well as the immediate surrounding environs (e.g., overshading and soil; root compaction and changes to local hydrological regimes).

Hydrological connections (e.g., drainage ditches, canals, wetlands and rivers) are often the most far-reaching impacts due to their lotic or semi-lotic nature. It becomes increasingly difficult to precisely predict the likely significance of adverse water-borne pollutants as they travel downstream from the pollution point source, given potential dilution and retention factors along the course of the impacted watercourse. Under the precautionary principle any designated sites (Natura 2000 and proposed NHA sites), protected habitats or species (flora and fauna) located downstream of the local watercourses, namely the Liffey Valley pNHA, will be considered to be within the hydrological ZoI of this proposed development.

Regarding the groundwater-to-surface water impact pathway, the characteristics of the underlying aquifer mean it is likely to rapidly discharge to the nearby watercourses, i.e. the Kilmahuddrick Stream (GSI, 2025). Therefore, the groundwater-to-surface water ZoI will also be set to 300m, with the addition of downstream surface water hydrological connections.

In respect to ZoI for air pollution (emissions and dust), designated sites within a 250m buffer zone of the development sites, i.e. the Grand Canal pNHA, were considered as per the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2024), including ex-situ foraging habitats utilised by protected species associated with local designated sites.

In relation to physical (vibration and clearance works); audible and visual disturbance, faunal species will be considered on a species-by-species basis. Generally, smaller mammal species (e.g., Pygmy Shrew) will be given 100m disturbance zones, which is reflective of their relatively small territories. For larger mammals, such as Badger, a 150m disturbance zone can be established in the scenario where there is an active sett.

The ZoI for local bat species is centred around lighting impacts within and adjacent to footprint of the development sites, as well as the developments' proximity of known bat roosts within the locality. Impacts are likely to occur within a 3km radius sustenance zone around each of these known bat roosts.

The ZoI for bird species is generally linked with direct habitat loss within the footprint of the proposed development sites. Additional adverse impacts for these birds will likely arise from the disturbance from construction works, which can extend 400m (Cutts et al, 2013).

The ZoI for amphibians is linked to the wetland and freshwater aquatic habitats, which have the potential to be degraded as a result of the construction and operations of the proposed development sites. Therefore, the ZoI for these floral / faunal species will mirror that of the groundwater-to-surface water ZoI, i.e. 300m, with the addition of downstream surface water hydrological connections.

The ZoI for freshwater fish and aquatic invertebrates is linked to the wetland and aquatic habitats, which have the potential to be degraded as a result of the construction and operations of the proposed development sites. Therefore, the ZoI for these floral / faunal species will mirror that of the groundwater-to-surface water ZoI, i.e. 300m, with the addition of downstream surface water hydrological connections.

The ZoI for terrestrial invertebrates is generally linked with direct habitat loss and degradation, as well as construction and operational disturbances. As the furthest impact pathway that can affect terrestrial habitats is 300m, this will also be the ZoI distance for terrestrial invertebrate species.

6.4.1 General Approach

The KERs identified during the ecological walkover surveys and from desk-based assessments were reviewed. A summary of KERs to be examined within the impact assessment section is presented at the end of the baseline environment section to highlight the KERs that have been identified as being present within the ZoI of the proposed development sites.

6.4.2 Appropriate Assessment Process

The initial, screening stage of the Appropriate Assessment is to determine:

- Whether the proposed plan or project is directly connected with or necessary for the management of the European designated site for nature conservation.
- If it is likely to have a significant effect on the European designated site, either individually or in combination with other plans or projects.

For those sites where potential likely significant effects are identified, either alone or in combination with other plans or projects, further assessment is necessary to determine if the proposals will have an adverse impact on the integrity of a European designated Natura 2000 site, in view of the site's conservation objectives (i.e. the process proceeds to Stage 2).

A separate Screening for Appropriate Assessment (AA) report has been produced (Minogue Environmental Consulting, 2025), to assess the potential for likely significant effects on designated Natura 2000 sites. The Screening for Appropriate Assessment report concluded that adverse likely significant effects were not anticipated for Natura 2000 sites, including effects on ex-situ QI / SCI - supporting habitats outside the boundaries of the designated sites.

6.4.3 Valuation of Receptors

The value of designated sites, habitats and species populations is assessed with reference to:

- Their importance in terms of 'biodiversity conservation' value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations).
- Any social benefits that habitats and species deliver (e.g., relating to enjoyment of flora and fauna by the public).

The valuation of designated sites considers different levels of statutory and non-statutory protection. Assessment of habitat depends on several factors, including the size of the habitat, its conservation status and quality. The assessment also takes account of connected off-site habitat that has the potential to increase the value of the on-site habitat through association. Valuation of species depends on a number of factors including distribution, status, rarity, vulnerability, and the population size present.

Level of Value	Examples of Criteria
International	- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. - Proposed Special Protection Area (pSPA). - Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). - Features essential to maintaining the coherence of the Natura 2000 Network. - Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. - Resident or regularly occurring populations (assessed to be important at the national level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or

Level of Value	Examples of Criteria
	- Species of animal and plants listed in Annex II and/or IV of the Habitats Directive - Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971) - World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972) - Biosphere Reserve (UNESCO Man & The Biosphere Programme) - Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979) - Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979) - Biogenetic Reserve under the Council of Europe. - European Diploma Site under the Council of Europe. - Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988)
National	- Site designated or proposed as a Natural Heritage Area (NHA / pNHA) - Statutory Nature Reserve - Refuge for Fauna and Flora protected under the Wildlife Acts. - National Park - Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park. - Resident or regularly occurring populations (assessed to be important at the national level) of the following: - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list. - Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive
County	- Area of Special Amenity - Area subject to a Tree Preservation Order. - Area of High Amenity, or equivalent, designated under the County Development Plan. - Resident or regularly occurring populations (assessed to be important at the County level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list. - Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. - County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. - Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. - Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local (High)	- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; - Resident or regularly occurring populations (assessed to be important at the Local level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;

Level of Value	Examples of Criteria
	- Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list. - Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; - Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local (Low)	- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; - Sites or features containing non-native species that are of some importance in maintaining habitat links.
Less than local*	- Areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest. - Common and widespread species.
***** Not included within the original NRA table. Level of value added to address features with less than 'Local' value	

Table 6-3: Examples of criteria used to define the value of ecological features (NRA, 2009)

Guidance published by CIEEM (2018) recommends breaking down the importance of ecological features in a geographic context similar to the NRA guidance shown in Table 6-3 with the following frame of reference to be adapted to local circumstances.

- International and European
- National
- Regional
- Metropolitan, County, vice-county or other local authority-wide area
- River Basin District
- Estuarine system/Coastal cell
- Local

The NRA (2009) guidance is congruent with this CIEEM (2018) guidance and includes a 'Less than local' level. The NRA (2008, rev. 2009) guidance on geographic criteria for ecological valuation, as described in Table 6-3, is utilised as the primary means of habitat valuation assessment in this chapter, as only the NRA guidance provides a split of High and Low level valued local ecological features, which provides more flexibility in regard to assessment of low-valued habitats that still provide ecological services (e.g. monoculture non-native ornamental shrubbery providing nesting opportunities to local breeding bird species).

6.4.4 Descriptive Terminology & Significance of Impacts

The EPA Guidelines (EPA, 2022) provide guidance on determining significance and type of ecological effects. The assessment of effects of the proposed Kishoge development sites on biodiversity are assessed in terms of quality (positive, neutral or negative effects), significance (imperceptible, not significant, slight, moderate, significant, very significant or profound effects), extent, context, probability (likely, unlikely effects) and duration (momentary, brief, temporary, short term, medium term, long term, permanent or reversable effects) in line with the criteria set out in Table 3.4 'Description of Effects' of the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

Additionally, the NRA (2009) and CIEEM (2018) guidelines were followed (in conjunction with the EIA guidelines), which requires examination of the following two key elements:

- Impact on the integrity of the ecological feature.
- Impact on its conservation status within a given geographical area.

6.4.5 Ecological Integrity

Ecological integrity should be regarded as the coherence of ecological structure and function, across the entirety of a site that enables it to sustain all of the biodiversity or ecological resources for which it has been valued (NRA, 2009).

Ecological integrity is most often used when determining impact significance in relation to designated nature conservation areas (e.g., SACs, SPAs or pNHA/NHAs) but can often be the most appropriate method to use for non-designated areas of biodiversity value where the component habitats and/or species exist, with a defined ecosystem at a given geographic scale.

Any adverse impact on the integrity of an ecological site or ecosystem is considered to be significant if it moves the condition of the ecosystem away from a favourable condition: removing and/or changing the processes that support the sites' habitats and/or species; affects the nature, scale, structure, complexity and functioning of component habitats; and/or, affects the population size and viability of the inhabiting floral and faunal species therewithin.

6.4.6 Conservation Status

The definitions for conservation status given in the EU Habitats Directive 92/43/EEC, in relation to habitats and species, are also used in the CIEEM (2018) and NRA (2009) guidance:

- For natural habitats, conservation status means the sum of the influences acting on the natural habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species, at the appropriate geographical scale.
- For species, conservation status means the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations, at the appropriate geographical scale.

An impact on the conservation status of a habitat or species is considered to be significant if it will result in a change in conservation status.

After the definitions provided in the EU Habitats Directive 92/43/EEC, the conservation status of a habitat is favourable when:

- Its natural range and areas it covers within that range are stable or increasing;
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is favourable as defined below under species.

And the conservation status of a species is favourable when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

If it is determined that the ecological integrity and/or conservation status of a key ecological feature will be impacted on, then the level of significance of that impact is related to the geographical scale at which the impact will occur (i.e., local, county / regional, national, international). In some cases, an impact may not be significant at the geographic scale at which the ecological feature has been valued (e.g., national) but may be significant at a lower geographical level (e.g., local).

6.4.7 Residual Impacts

The proposed development is assessed, including relevant designed-in mitigation measures. This is done where mitigation is proven to be effective and will be implemented effectively with a high certainty. Where significant residual impacts are still identified, further mitigation measures will be proposed as part of the EIA process to avoid, reduce or minimise them. Each impact assessment section assigns a final significance level to the impact described, which considers and includes the implementation of any stated mitigation measures; these are the residual impacts.

6.4.8 Cumulative Impacts

Potential sources of cumulative impacts were identified based on the ecology of valued ecological features. Potential sources of cumulative impacts were sought within an area where there is the potential for a significant impact on a site or species. The plans and projects identified as potential sources of cumulative impacts are described in sub-section 6.6.

6.4.9 Constraints and Limitations

This Biodiversity Chapter is based on ecological site surveys and existing data from the above-mentioned sources. The chapter necessarily relies on some assumptions and is inevitably subject to some limitations as detailed below. These do not affect the conclusion, but the following points are recorded in order to ensure the basis of the assessment is clear:

- Information on the works and conditions on site is based on current knowledge at the time of writing. Changes to the site since surveys were undertaken cannot be accounted for. However, the site surveys have followed CIEEM (2019) Advice note on the lifespan of ecological reports and surveys.
- Where field data and desktop data are limited, the precautionary principle is utilised when determining potential ecological sensitivities within the proposed developments' ZoI.

This baseline environment section presents information gathered from existing reports and desk-based sources as detailed in sub-section 6.3.3 and a series of ecological site visits conducted on the dates listed in sub-section 6.3.4.

6.5.1 Designated Conservation Sites

A source-pathway-receptor model was used to identify all European (Natura 2000) and Natural Heritage Areas and proposed Natural Heritage Areas which are present within the ZoI, as per OPR Practice Note PN01 Appropriate Assessment Screening for Development Management (OPR, 2021).

Table 6-4 below lists these designated sites within the ZoI and their respective direct and hydrological distances (approximate) from the proposed development sites.

Site Name	Designation	Importance	Distance from Sites (3, 4, 5)	Direct hydrological distance from Site (4)
North Dublin Bay	SAC	International	16.7km, 17.3km, 16.0km	22.2km
South Dublin Bay	SAC	International	14.4km, 15.0km, 13.7km	21.5km
North Bull Island	SPA	International	16.7km, 17.3km, 16.0km	22.2km
South Dublin Bay and River Tolka Estuary	SPA	International	13.6km, 14.2km, 12.9km	19.9km
North-West Irish Sea	SPA	International	18.7km, 19.3km, 18.0km	22.6km

Site Name	Designation	Importance	Distance from Sites (3, 4, 5)	Direct hydrological distance from Site (4)
Grand Canal	pNHA	National	0.45km, 0.02km, 0.52km	No hydrological connection
Liffey Valley	pNHA	National	2.4km, 2.5km, 2.5km	3.35km
Dolphins, Dublin Docks	pNHA	National	15.5km, 16.1km, 14.8km	19.9km
North Dublin Bay	pNHA	National	13.6km, 14.2km, 12.9km	22.2km
South Dublin Bay	pNHA	National	14.4km, 15.0km, 13.7km	21.5km

Table 6-4: Site proximity and importance of designated sites within the ZoI pathway

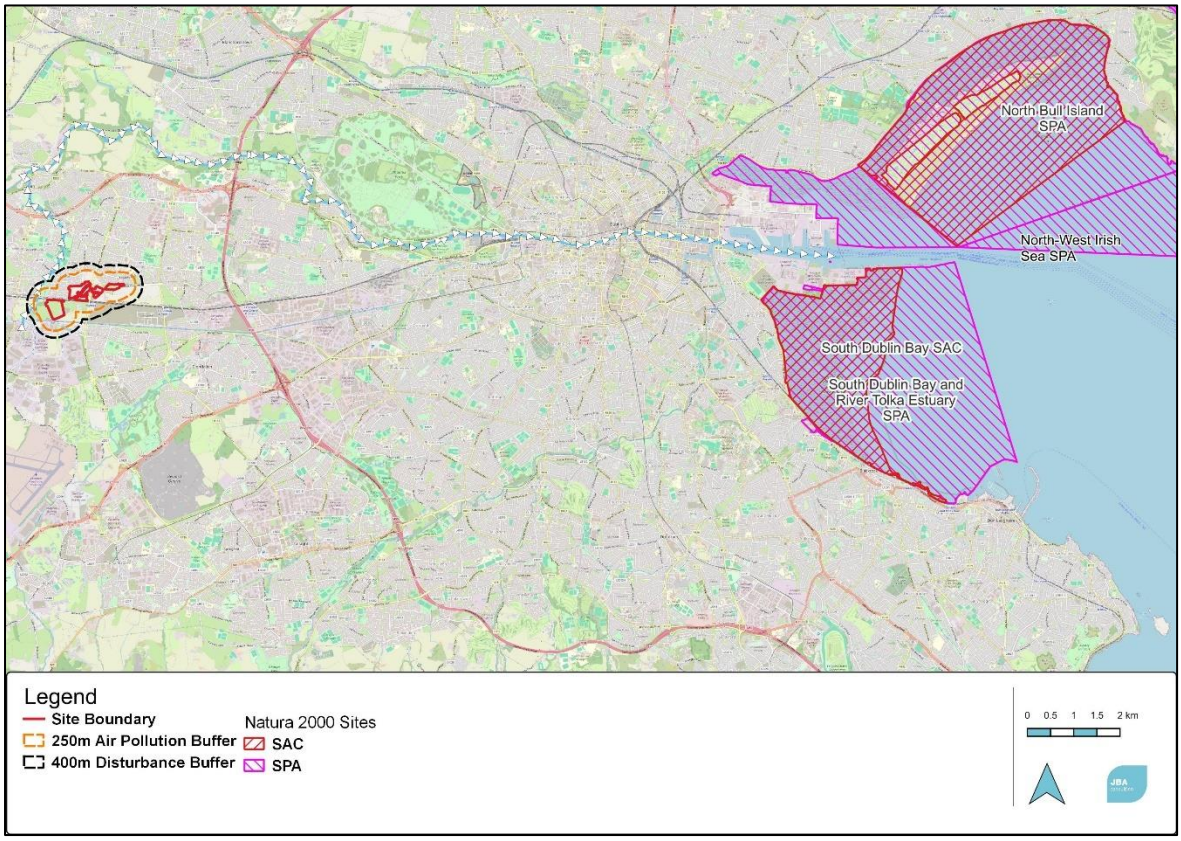

Figure 6-1: Natura 2000 sites within the ZoI of the development sites (OSM, 2025)

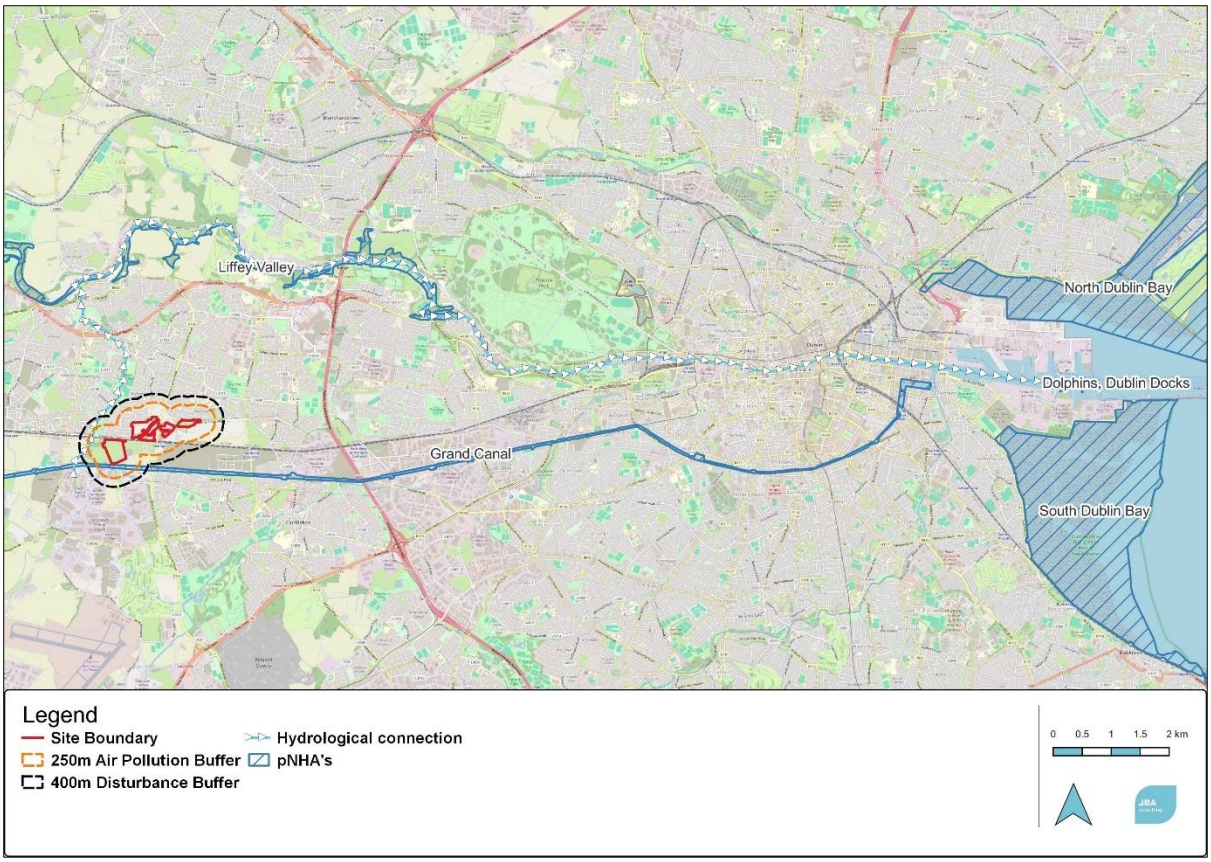

Figure 6-2: pNHA sites within the ZoI of the development sites (OSM, 2025

Site Name	Brief	KERs	Project-relevant Threats: Impact (Source)
North Dublin Bay SAC (000206)	The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port during the 18th and 19th centuries. The seaward side of the island has a fine sandy beach. A substantial area of shallow marine water is included in the site. The interior of the island is excluded from the site as it has been converted to golf courses. Nature conservation is a main land use within the site. The North Bull Island dune system is one of the most important systems on the east coast and is one of the few in Ireland that is actively accreting. It possesses extensive and mostly good quality examples of embryonic, shifting marram and fixed dunes, as well as excellent examples of humid dune slacks. Both Atlantic and Mediterranean salt marshes are well represented, and a particularly good marsh zonation is shown. The salt marshes grade into mudflats and sandflats, some of which are dominated by annual Salicornia species. Petalwort *Petalophyllum ralfsii* occurs at its only known station away from the western seaboard (NPWS, 2013a).	- Mudflats and sandflats not covered by seawater at low tide [1140] - Annual vegetation of drift lines [1210] - *Salicornia* and other annuals colonising mud and sand [1310] - Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] - Mediterranean salt meadows *Juncetalia maritimi* [1410] - Embryonic shifting dunes [2110] - Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] - Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] - Humid dune slacks [2190] - Petalwort *Petalophyllum ralfsii* [1395] (NPWS 2013b)	Discharges: High impact (inside) Diffuse pollution to surface waters due to other sources not listed: Medium impact (inside) Urbanised areas, human habitation: High impact (outside) (EEA, 2020a)
South Dublin Bay SAC (000210)	This intertidal site extends from the South Wall at Dublin Port to the West Pier at Dun Laoghaire, a distance of c. 5 km. Several permanent channels exist, the largest being Cockle Lake. A small sandy beach occurs at Merrion Gates, while some bedrock shore occurs near Dun Laoghaire. A number of small streams and drains flow into the site. The designated site possesses a fine and fairly extensive example of intertidal flats. Sediment type is predominantly sand, with muddy sands in the more sheltered areas. A typical macro-invertebrate faunal assemblage exists within the SAC. The SAC has the largest stand of Dwarf Eelgrass *Zostera nolti* on the east coast (NPWS, 2015a).	- Mudflats and sandflats not covered by seawater at low tide [1140] - Annual vegetation of drift lines [1210] - *Salicornia* and other annuals colonising mud and sand [1310] - Embryonic shifting dunes [2110] (NPWS 2013c)	Urbanised areas, human habitation: High impact (outside) Roads, motorways: Low impact (outside) Discharges: Moderate impact (both) Marine water pollution: Medium impact (both) (EEA, 2020b)

Site Name	Brief	KERs	Project-relevant Threats: Impact (Source)
North Bull Island SPA (004006)	The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port. The site is among the top ten sites for wintering waterfowl in the country. It supports internationally important populations of Brent Goose and Bar-tailed Godwit and is the top site in the country for both of these species. A further 14 species have populations of national importance, with particular notable numbers of Shelduck, Pintail, Grey Plover, and Red Knot. The SPA is a regular site for passage waders such as Ruff, Curlew Sandpiper and Spotted Redshank. The site supports Short-eared Owl in winter (NPWS, 2014a).	- Light-bellied Brent Goose *Branta bernicla hrota* [A046] - Shelduck *Tadorna tadorna* [A048] - Teal *Anas crecca* [A052] - Pintail *Anas acuta* [A054] - Shoveler *Anas clypeata* [A056] - Oystercatcher *Haematopus ostralegus* [A130] - Golden Plover *Pluvialis apricaria* [A140] - Grey Plover *Pluvialis squatarola* [A141] - Knot *Calidris canutus* [A143] - Sanderling *Calidris alba* [A144] - Dunlin *Calidris alpina* [A149] - Black-tailed Godwit *Limosa limosa* [A156] - Bar-tailed Godwit *Limosa lapponica* [A157] - Curlew *Numenius arquata* [A160] - Redshank *Tringa totanus* [A162] - Turnstone *Arenaria interpres* [A169] - Black-headed Gull *Chroicocephalus ridibundus* [A179] - Wetland and Waterbirds [A999] (NPWS, 2015b)	Continuous urbanisation: Medium impact (outside) Discharges: Medium impact (both) (EEA, 2020c)
South Dublin Bay and River Tolka Estuary SPA (004024)	This designated site comprises a substantial part of Dublin Bay. It includes virtually all of the intertidal area in the south bay, as well as much of the Tolka Estuary to the north of the River Liffey. A portion of the shallow bay waters is also included. The sediments are predominantly well-aerated sands. The sands support the largest stand of Dwarf Eelgrass on the east coast of Ireland. Sediments in the Tolka Estuary vary from soft thixotropic muds with a high organic content in the inner estuary to exposed, well aerated sands off the Bull Wall. The site possesses extensive intertidal flats which support wintering waterfowl which are part of the overall Dublin Bay population. It regularly has an internationally important population of Brent Geese, which feeds on Dwarf Eelgrass in the autumn. It has nationally important numbers	- Light-bellied Brent Goose *Branta bernicla hrota* [A046] - Oystercatcher *Haematopus ostralegus* [A130] - Ringed Plover *Charadrius hiaticula* [A137] - Grey Plover *Pluvialis squatarola* [A141] - Knot *Calidris canutus* [A143] - Sanderling *Calidris alba* [A144] - Dunlin *Calidris alpina* [A149] - Bar-tailed Godwit *Limosa lapponica* [A157] - Redshank *Tringa totanus* [A162] - Black-headed Gull *Chroicocephalus ridibundus* [A179] - Roseate Tern *Sterna dougallii* [A192] - Common Tern *Sterna hirundo* [A193]	Urbanised areas, human habitation: High impact (outside) (EEA, 2020d)

Site Name	Brief	KERs	Project-relevant Threats: Impact (Source)
	of a further 6 species including: Oystercatcher, Ringed Plover, Red Knot, Sanderling, Dunlin and Bar-tailed Godwit. It is an important site for wintering gulls, especially Black-headed Gull and Common Gull *Larus canus*. South Dublin Bay is the premier site in Ireland for Mediterranean Gull *Larus melanocephalus*, with up to 20 birds present at times. This site is also a regular autumn roosting ground for significant numbers of terns, including Roseate Terns, Common Tern and Artic Tern (NPWS, 2015c).	- Arctic Tern *Sterna paradisaea* [A194] - Wetland and Waterbirds [A999] (NPWS, 2015d)	
North-West Irish Sea SPA (004236)	The North-west Irish Sea SPA constitutes an important resource for marine birds. The estuaries and bays that open into it along with connecting coastal stretches of intertidal and shallow subtidal habitats, provide safe feeding and roosting habitats for waterbirds throughout the winter and migration periods. These areas, along with more pelagic marine waters further offshore, provide additional supporting habitats (for foraging and other maintenance behaviours) for those seabirds that breed at colonies on the north-west Irish Sea's islands and coastal headlands. These marine areas are also important for seabirds outside the breeding period. This SPA extends offshore along the coasts of counties Louth, Meath and Dublin, and is approximately 2,333km2 in area (NPWS, 2023a).	- Common Scoter *Melanitta nigra* [A065] - Red-throated Diver *Gavia stellata* [A001] - Great Northern Diver *Gavia immer* [A003] - Fulmar *Fulmarus glacialis* [A009] - Manx Shearwater *Puffinus puffinus* [A013] - Shag *Phalacrocorax aristotelis* [A018] - Cormorant *Phalacrocorax carbo* [A017] - Little Gull *Larus minutus* [A177] - Kittiwake *Rissa tridactyla* [A188] - Black-headed Gull *Chroicocephalus ridibundus* [A179] - Common Gull *Larus canus* [A182] - Lesser Black-backed Gull *Larus fuscus* [A183] - Herring Gull *Larus argentatus* [A184] - Great Black-backed Gull *Larus marinus* [A187] - Little Tern *Sterna albifrons* [A195] - Roseate Tern *Sterna dougallii* [A192] - Common Tern *Sterna hirundo* [A193] - Arctic Tern *Sterna paradisaea* [A194] - Puffin *Fratercula arctica* [A204] - Razorbill *Alca torda* [A200] - Guillemot *Uria aalge* [A199] (NPWS, 2023b)	Not currently listed by the European Environment Agency website given that the site has only recently confirmed its status as a fully designated Natura 2000 site.

Table 6-5: Internationally designated sites; site briefs; KERs; and project threats and their impacts and sources to the Natura 2000 sites within the ZoI

Site Name	Brief	KERs
Grand Canal pNHA (002104)	The Grand Canal is a man-made waterway linking the River Liffey at Dublin with the Shannon at Shannon Harbour and the Barrow at Athy. The Grand Canal proposed Natural Heritage Area (pNHA) comprises the canal channel and the banks on either side of it. The canal system is made up of a number of branches - the Main Line from Dublin to the Shannon, the Barrow Line from Lowtown to Athy, the Edenderry Branch, the Naas and Corbally Branch and the Milltown Feeder. The Kilbeggan Branch is dry at present, but it is hoped to restore it in the near future. Water is fed into the summit level of the canal at Lowtown from Pollardstown Fen, itself a pNHA. A stretch of diverse hedgerow with mature trees is present.	- Otter *Lutra lutra* - Kingfisher *Alcedo atthis* - Smooth Newt *Lissotritton vulgaris* - European Eel *Anguilla anguilla* - Opposite-leaved pondweed *Groenlandia densa*
Liffey Valley pNHA	The Liffey Valley site is situated along the River Liffey between Leixlip Bridge on the Kildare-Dublin border and downstream of the weir at Glenaulin, Palmerstown, Co. Dublin. The river is an Atlantic Salmon *Salmo salar* river and there are a series of weirs along the river between Palmerstown and Leixlip. The main terrestrial habitat included within the site is mixed deciduous woodland on fertile, limey alluvium and boulder clay. A wet marsh occurs on the strip of land between the Mill Race and the river east of the metal bridge and west of the paint factory. The threatened Green Figwort (*Scrophularia umbrosa*), a species listed in the Irish Red Data Book, is recorded from a number of stations along the river within the site. This stretch of the river Liffey has the greatest number of recently recorded populations of this species in Ireland. The rare and legally protected Hairy St. John's-wort *Hypericum hirsutum* (Flora Protection Order 2022) has been recorded from the woodlands in this site. The threatened Yellow Archangel *Lamiastrum galeobdolon*, listed in the Irish Red Data Book, is also recorded from these woodlands.	- Otter *Lutra lutra* - Kingfisher *Alcedo atthis* - Atlantic Salmon *Salmo salar* - Lamprey *Lampetra* spp. - European Eel *Anguilla anguilla* - Green Figwort *Scrophularia umbrosa* - Hairy St John's-wort *Hypericum hirsutum* - Yellow Archangel *Lamiastrum galeobdolon*
Dolphins, Dublin Docks (000201)	As per the relevant South Dublin Bay and River Tolka Estuary SPA description (Table 6-5).	Species associated with the docks as outlined in South Dublin Bay and River Tolka Estuary SPA description.
North Dublin Bay (000206)	As per North Dublin Bay SAC description (Table 6-5).	As per those outlined in North Dublin Bay SAC description.
South Dublin Bay (000210)	As per South Dublin Bay SAC description (Table 6-5).	As per those outlined in South Dublin Bay SAC description.

Table 6-6: Nationally designated sites, site briefs, and KERs of conservation concern of proposed Natural Heritage Areas within the ZoI

6.5.1.1 Other Designated Sites

A number of other designated sites are present within the ZoI of the proposed development sites, including two Ramsar wetland sites, one Special Amenity Area Order (SAAO) and the UNESCO Dublin Bay Biosphere. Biodiversity receptors in these other designated sites are assessed along with the Natura 2000 sites, where overlap occurs.

Ramsar Sites

The two Ramsar sites located within the proposed development's ZoI are as follows:

- Sandymount Strand/Tolka Estuary [Site code: 832]; and
- North Bull Island [Site code: 406].

The impact assessment of the above Ramsar sites, which are located within Natura 2000 sites and pNHAs, is examined thoroughly under the assessment of Natura 2000 sites and pNHAs in the impact assessment section and therefore will not be examined separately.

Special Amenity Area Orders (SAAO)

The Liffey Valley is the only SAAO area present within the ZoI of the proposed development. The SAAO looks to protect areas with noteworthy landscapes, nature and amenity. These areas were placed on a statutory footing under the Local Government (Planning and Development) Act 1963 [including amendments], re-enacted under section 202 of the Planning and Development Act 2000. These areas have been designated as a result of the remarkable aesthetics they present, as well as the need to conserve the nature contained within them.

The impact assessment of the SAAO area, which is located within a pNHA, is examined thoroughly under the assessment of the pNHAs in the impact assessment section and therefore will not be examined separately.

UNESCO Dublin Bay Biosphere

The UNESCO Dublin Bay Biosphere extends to over 300km^2 of marine and terrestrial habitat, including North Bull Island and other ecologically significant habitats, such as the Tolka and Baldoyle Estuaries, Howth Head, Dalkey Island, Killiney Hill and Booterstown Marsh.

The impact assessment of the UNESCO Dublin Bay Biosphere, which is located within Natura 2000 sites and pNHAs, is examined thoroughly under the assessment of Natura 2000 sites and pNHAs in the impact assessment section and therefore will not be examined separately.

6.5.2 Proposed Development - Site 3

Following the surveys listed above in Table 6-1, habitats and species of note recorded within site 3 are listed below.

6.5.2.1 Habitats

Habitats recorded during the initial ecological walkover and subsequent habitat surveys are listed in Table 6-7 below and are presented in detail in the following sub-sections. Other species noted in other surveys, but associated with the habitats are also detailed. A habitat map is seen in Figure 6-3.

Fossitt Habitat	Fossitt Code
Buildings and artificial surfaces	BL3
Bare ground	ED2
Recolonising bare ground	ED3
Reed and large sedge swamps	FS1
Drainage ditches	FW4
Dry meadows and grassy verges	GS2

Fossitt Habitat	Fossitt Code
Mixed broadleaved/ conifer woodland	WD2
Treeline	WL2
Scrub	WS1

Table 6-7: List of habitats (Fossitt Classification) recorded on site 3.

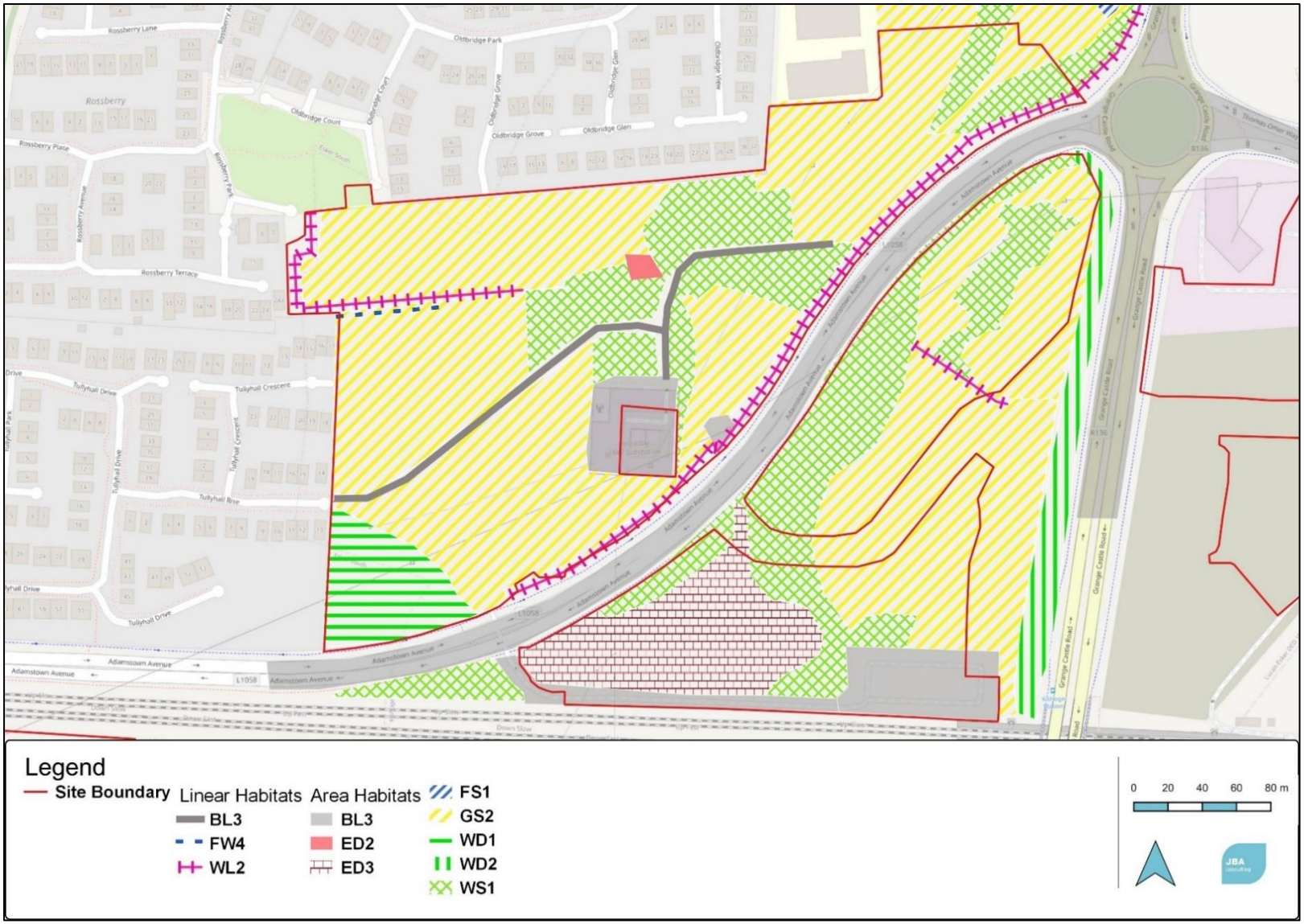

Figure 6-3: Map of habitats recorded in Site 3 (OSM, 2025)

Buildings and other artificial surfaces (BL3)

This habitat comprises roadways, car parking areas and a compound associated with the communications masts within the central southern section of the western half of Site 3.

These artificial habitats are considered to be of less than local ecological importance given the absence of flora, and their very limited capacity to support local fauna.

Spoil and bare Ground (ED2)

This habitat refers to a small earth mound, which is located within the centre of the western section of Site 3. This mound currently does not support any floral species.

This habitat is considered to be of less than local ecological importance given its lack of flora diversity and capacity to support local fauna.

Recolonising bare ground (ED3)

Located in the southern section of Site 3, this habitat comprises a large patch of previously artificial surface which has been colonised by a variety of vegetation which includes Cock's-foot *Dactylis glomerata,* Common Sedge *Carex nigra*, Soft Rush *Juncus effuses,* Creeping Cinquefoil *Potentilla reptans*, Dogwood *Cornus sanguinea*, Field Forget-me-not *Myosotis arvensis*, Ox-eye Daisy *Leucanthemum vulgare*, Greater Trefoil *Melilotus officinalis*, Common Centaury *Centaurium erythraea,* Hazel *Corylus avellana*, Blackthorn *Prunus spinosa*, Red Oak *Quercus rubra*, Ash *Fraxinus excelsior*, Spear Thistle *Cirsium vulgare*, Dog Rose *Rosa canina*, Teasel *Dipsacus fullonum*, Ribwort Plantain *Plantago lanceolata*, Dandelion *Taraxacum* spp. and the invasive Butterfly-bush *Buddleja davidii*.

Additionally, two species of Orchid were recorded within this habitat, Bee Orchid *Ophrys apifera* and Pyramidal Orchid *Anacamptis pyramidalis*.

Surveyors recorded Great Tit *Parus major*, Wren *Troglodytes troglodytes*, Snipe *Gallinago gallinago* and Wood Pigeon *Columba palumbus*, Common Blue butterfly *Polyommatus icarus*, White-tailed Bumblebee *Bombus lucorum* and Hoverfly *Heliophilus spp.* utilising this habitat.

This habitat is considered to be of high local ecological importance due to the presence of two Orchid species which are sensitive to environmental changes and are becoming less common in the Irish landscape.

Figure 6-4: Recolonising bare ground habitat within Site 3

Reed and large swamps (FS1)

There is a small patch of reed and large sedge swamp habitat, approximately 20m north-east of northern boundary of Site 3. This swamp was dominated by Bulrush *Typha latifolia* and Soft Rush *Juncus effusus*.

This habitat is considered to be of high local ecological importance as it is the only instance of wetland habitat within the surrounding landscape.

Drainage ditches (FW4)

An isolated drainage ditch is located adjacent to the western boundary of the Site 3. Surveyor observation noted that this ditch only contained standing water during the wetter winter-spring periods and was dry during the summer-autumn periods. The ditch was also largely infilled with detritus.

This habitat is considered to of high local ecological importance due to its role in providing landscape connectivity within the Site 3 landscape and refuge for local fauna.

Dry meadows and grassy verges (GS2)

Dry meadow habitat is the most common habitat type within Site 3. Floral species recorded within this habitat included Creeping Buttercup *Ranunculus repens*, Creeping Cinquefoil, Creeping Thistle *Cirsium arvense*, Bush Vetch *Vicia sepium*, Red Clover *Trifolium pratense*, False Oat-grass *Arrhenatherum elatius*, Ribwort Plantain, Teasel, Goat Willow *Salix caprea,* Dogrose, Bramble *Rubus fructicosus* agg., Rough Hawksbit *Leontodon hispidus*, Common Nettle *Urtica diocia*, Meadow Vetchling *Lathyrus pratensis*, Cock's-foot, Bird's-foot Trefoil *Lotus corniculatus*, Meadow Foxtail *Alopecurus pratensis*, Yorkshire Fog *Holcus lanatus*, Yarrow *Achillea millefolium*, Montbretia *Crocosmia x crocosmiiflora*, Red Bartsia *Odonites vernus*, Colts-foot *Tussilago farfara*, Marsh Woundwort *Stachys palustris*, Common Centaury, Selfheal *Prunella vulgaris*, Yellow-wort *Blackstonia perfoliata*, Hard Rush *Juncus inflexus*, Marsh Thistle *Cirsium palustre*, Soft Rush, and Pyramidal Orchid and Hairy Willowherb *Epilobium hirsutum*.

Additionally, Pyramidal Orchid and the protected Lesser Centaury *Centaurium pulchellum* were recorded within the western section of Site 3.

Through on-site observations and camera-trap surveys a number of non-volant mammals were recorded within Site 3, namely Badger (scat, snuffle holes and remains), Red Fox and Brown Rat. The data obtained from transect and static activity surveys conducted on-site highlighted the presence of Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus* and Leisler's Bat *Nyctalus leisleri* commuting and foraging within the dry meadows.

Recorded bird species within this habitat during surveys were Wood Pigeon *Columba palumbus*, Meadow Pipit *Anthus pratensis*, Wren *Troglodytes troglodytes*, House Sparrow *Passer domesticus*, Blackbird *Turdus merula*, Blackcap *Sylvia atricapilla*, Blue Tit *Cyanistes caeruleus*, Chaffinch *Fringilla coelebs*, Collared Dove *Streptopelia decaocto*, Dunnock *Prunella modularis*, Great Tit, Robin *Erithacus rubecula*, Goldfinch *Carduelis carduelis*, Long-tailed Tit *Aegithalus caudatus*, Hooded Crow *Corvus cornix*, Jay *Garrulus glandarius*, Linnet *Linaria cannabina*, Rook *Corvus frugilegus*, Magpie *Pica pica*, Greenfinch *Chloris chloris*, Starling *Sturnus vulgaris*, Song Thrush *Turdus philomelos*, Stonechat *Saxicola rubicola*, Pied Wagtail *Motacilla alba*, and Willow Warbler *Phylloscopus trochilus*.

Recorded invertebrate species within this habitat during surveys were Red-tailed Bumblebee *Bombus lapidarius*, White-tailed Bumblebee *Bombus lucorum*, 6-Spot Burnet *Zygaena filipendulae*, Honeybee *Apis* spp., Ringlet *Aphantopus hyperantus*, Red Admiral *Vanessa atalanta*, Small Tortoiseshell *Aglais urticae*, Dock Bug *Coreus marginatus*, Meadow Brown *Maniola jurtina*, Common Carder *Bombus pascuorum*, Large White *Pieris brassicae*, Common Blue Damselfly *Enallagma cyathigerum*, Ashy Mining Bee *Andrena cineraria*, Common Grasshopper *Omocestus viridulus*, 7-spot Ladybird *Coccinella septempunctata,* Red Soldier Beetle *Rhagonycha fulva*, and red-listed Gypsy Cuckoo-bee *Bombus (Psithyrus) bohemicus*.

The invasive non-native Butterfly-bush, Winter Heliotrope *Petasite pyrenaicus,* European Rabbit *Oryctolagus cuniculus* and Greater White-toothed Shrew *Crocidura russula* were recorded within this habitat.

This habitat is considered to be of high local ecological importance due to the diversity of floral species and the variety of protected and/or conservation concern faunal species recorded utilising the habitat.

Figure 6-5: Dry meadows and grassy verge habitat within Site 3

Mixed broadleaved / conifer woodland (WD2)

This woodland strip is located along the eastern boundary of the site. This planted section is comprised of semi-mature native species including Scot's Pine *Pinus sylvestris*, Ash, Wild Cherry *Prunus avium*, Silver Birch *Betula pendula* and Alder *Alnus glutinosa*. The woodland strip does not yet support a typical floral understorey composition and currently only supports a subset of the dry meadow floral species.

The data obtained from transect and static activity surveys conducted on-site highlighted the presence of Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus* and Leisler's Bat *Nyctalus leisleri* commuting and foraging along the western edge of this woodland strip.

Surveyors recorded several bird species within this habitat, namely Wood Pigeon, Blackbird, Magpie, Blue Tit, Rook and Jay.

This habitat is considered of high local ecological importance due to the refuge, foraging and connectivity it provides for local fauna.

Treelines (WL2)

A number of treelines were located throughout Site 3, with the habitat supporting tree species such as Hawthorn *Crataegus monogyna*, Pedunculate Oak *Quercus* robur, Ash and Elder *Sambucus nigra*; with their floral understorey composition mirror the dry meadow flora.

The transect and static activity surveys conducted on-site noted the presence of Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus* and Leisler's Bat *Nyctalus leisleri* commuting and foraging along the treeline habitats.

Wren, Reed Bunting *Embrezia schoeniclus*, Great Tit, Pied Wagtail, Jay, Hooded Crow, Willow Warbler, Wood Pigeon, House Sparrow, Robin, Magpie and Blackbird were recorded utilising these treeline habitats.

A Box-headed Mason Wasp *Gymnomerus laevipes* was recorded utilising one of the treeline habitats.

This habitat is considered to be of high local ecological importance due to the refuge, foraging and connectivity it provides for local fauna.

Scrub (WS1)

Scrub habitat was present throughout Site 3, with surveyors frequently noting dry meadows transitioning in scrub. The scrub habitat contained species such as Hawthorn, Bramble, Blackthorn, Dog Rose, Creeping Thistle, Dogwood, Rosebay Willowherb *Chamaenerion angustifolium*, Ivy *Hedera helix*, Ash, Hedge Bindweed *Calystegia sepium*, Common Nettle, Elder, Meadow Vetchling, Bush Vetch, Goat Willow, Hard Rush, Meadowsweet *Filipendula ulmaria*, Wild Angelica *Angelica sylvestris*, Creeping Cinquefoil, Red Clover, and Silverweed.

Blue Tit, Great Tit, Hooded Crow, Chaffinch, Reed Bunting, Blackbird, Wren, Song Thrush, Robin, Mistle Thrush, Whitethroat, Blackcap, Bullfinch, Dunnock, Goldfinch, Greenfinch, House Sparrow, Linnet, Magpie, Meadow Pipit, Skylark and Peacock *Aglais io* butterfly were all recorded utilising the scrub habitats.

A large patch of the invasive Japanese Knotweed *Reynoutria japonica* is present in the northern-eastern section of Site 3. Invasive Butterfly-bush is also present within the scrub habitat.

Species of note within this habitat were a singular potential Lesser Centaury and a large patch of Pyramidal Orchid underneath the cover of Dogwood (Figure 6-6).

This habitat is considered to be of national ecological importance due to the presence of rare and protected floral species as well as providing refuge and foraging potential for local fauna.

Figure 6-6: Pyramidal Orchids found underneath dense Dogwood cover.

6.5.2.2 Rare & Protected Flora

Three floral species of note were recorded within Site 3, two Orchid species and the Lesser Centaury.

Orchid Species

The two Orchid species present within site 3, Pyramid Orchid and Bee Orchid, are both listed as Least Concern in Ireland and, while not listed on the Flora Protection Order 2022, are orchid species which are sensitive to changes in their environment, which has led to a decline in their distribution in Ireland.

Site 3 is considered to be of high local ecological importance for local Pyramid Orchid and Bee Orchid populations.

Figure 6-7: One of the Bee Orchids within the recolonising habitat in the eastern section of Site 3

Lesser Centaury

Lesser Centaury was recorded within site 3. Lesser Centaury is a small, easily missed flowering plant that is currently listed on the Flora Protection Order 2022 and is listed as Near Threatened within the Irish Red List. While most commonly known to inhabit coastal habitats, Lesser Centaury is known to inhabit damp grassy patches inland, though its distribution can be quite localised (Clapham et al. 1987). The species is often overlooked as early-growth Common Centaury leading to element of data deficiency within inland locations.

Site 3 is considered to be of national ecological importance for Lesser Centaury given its protected status.

6.5.2.3 Rare & Protected Fauna

Non-volant Mammals

Badger

Evidence of Badger was recorded within Site 3. Although no setts were found on-site, two potential setts identified during the ecological walkover were surveyed with camera-traps and it was confirmed they were not currently in use by Badger and were instead occupied by Red Fox. The site is likely currently used for commuting and foraging purposes by local Bager populations, based on the evidence of scat, snuffle holes and remains.

Site 3 is considered to be of high local ecological importance for Badger due to the foraging and commuting potential the site provides for this species.

Pine Marten

No signs of Pine Marten individuals or habitation were recorded within Site 3 during the mammal surveys. However, the woodland patches and strips provide potential foraging, commuting and refuge for local Pine Marten; given the recent recording (NBDC, 2025) of a Pine Marten individual, approximately 970m south of Site 3, there is the potential for Pine Marten to establish within or immediately adjacent to Site 3.

Site 3 is considered to be of low local ecological importance for Pine Marten, as the site provides commuting and hunting opportunities for the local Pine Marten population.

Hedgehog

Signs of Hedgehog were not recorded during the surveys. However, NBDC has records of Hedgehog from 2020 in the vicinity of Site 3, indicating the site may occasionally be utilised by Hedgehog.

Site 3 is considered to be of high local ecological importance for Hedgehog as the site habitat provides valuable foraging, commuting, nesting and hibernation resources.

Irish Stoat

Irish Stoat *Mustela erminea subsp. hibernica* was recorded immediately adjacent to Site 3 within the NBDC records in 2024; the site provides foraging, commuting and refuge habitat for this species which is scarce in the wider urban landscape.

Site 3 is considered to be of high local ecological importance for Irish Stoat as the site provides a number of potential den sites (Rabbit burrows) and prey items (e.g. Rabbit and Brown Rat).

Pygmy Shrew

Signs of Pygmy Shrew individuals or habitation were not recorded during the surveys. However, NBDC records have placed Pygmy Shrew within the vicinity of Site 4, indicating that Site 3 may also be occasionally utilised by Pygmy Shrew.

Site 3 is considered to be of high local ecological importance for Pygmy Shrew as the site habitat provides valuable foraging, commuting and nesting resources.

Bats

A series of bat static detector surveys were carried out in all areas of the site. Site 3 was split into West and East sections. The results of the detector surveys for the East (Table 6-8, Table 6-9 and Table 6-9**:** Bat Static results for the east section of site 3 from 21st June 2023 to 28th June 2023

) and West (Table 6-11, Table 6-12 and Table 6-12**:** Bat Static results for the west section of site 3 from 21st June 2023 and 28th June 2023

) of the site are tabled below. During the deployment of the Eastern bat static in August 2023, the static on-site did not record any bats, with the exception of August 17th, as a result technical soft.

Species	09/05	10/05	11/05	12/05	13/05	14/05	15/05	Total
Common Pipistrelle	0	7	0	2	9	0	1	19

Leisler's Bat	0	0	0	0	1	1	1	3
Soprano Pipistrelle	0	13	4	4	17	5	4	47
Total	0	20	4	6	27	6	6	69

Table 6-8: Bat Static results for the east section of site 3 from 9th May 2023 to 15th May 2023

Species	21/06	22/06	23/06	24/06	25/06	26/06	27/06	28/06	Total
Common Pipistrelle	0	48	29	23	89	70	32	44	335
Leisler's Bat	0	4	1	3	3	2	3	2	18
Soprano Pipistrelle	1	47	19	18	73	99	57	55	369
Total	1	99	49	44	165	171	92	101	722

Table 6-9: Bat Static results for the east section of site 3 from 21st June 2023 to 28th June 2023

Species	16/08	17/08	18/08	19/08	20/08	21/08	Total
Common Pipistrelle	0	1	Technical Difficulties	Technical Difficulties	Technical Difficulties	Technical Difficulties	1
Leisler's Bat	0	9	Technical Difficulties	Technical Difficulties	Technical Difficulties	Technical Difficulties	9
Soprano Pipistrelle	0	2	Technical Difficulties	Technical Difficulties	Technical Difficulties	Technical Difficulties	2
Total	0	12	N/A	N/A	N/A	N/A	12

Table 6-10: Bat Static results for the east section of site 3 from 16th August 2023 to 21st August

Species	09/05	10/05	11/05	12/05	13/05	14/05	15/05	Total
Common Pipistrelle	1	0	3	20	17	0	1	42
Leisler's Bat	0	6	0	2	4	3	1	16
Soprano Pipistrelle	2	0	2	13	14	0	0	31
Total	3	6	5	35	35	3	2	89

Table 6-11: Bat Static results for the west section of site 3 from 9th May 2023 and 15th May 2023

Species	21/06	22/06	23/06	24/06	25/06	26/06	27/06	28/06	Total
Common Pipistrelle	0	0	1	3	0	0	0	0	4
Leisler's Bat	0	1	0	0	0	0	0	0	1
Soprano Pipistrelle	0	1	0	4	0	0	1	1	7
Total	0	2	1	7	0	0	1	1	12

Table 6-12: Bat Static results for the west section of site 3 from 21st June 2023 and 28th June 2023

Species	16/08	17/08	18/08	19/08	20/08	21/08	Total
Common Pipistrelle	1	1	4	2	3	0	11
Leisler's Bat	0	0	2	1	2	3	8
Soprano Pipistrelle	0	0	0	0	0	0	0
Total	1	1	6	3	5	3	19

Table 6-13: Bat Static results for the west section of site 3 from 16th August and 21st August 2023

Site 3 is considered to be of high local ecological importance for local bat populations due to the consistent use of the site by bat populations. Although the amount of activity recoded was relatively low, bar 21st June 2023 to 28th June 2023 in the eastern section, Site 3 is still important given the bats potentially utilising the site for commuting with opportunistic foraging while navigating to more favourable foraging grounds within the locality.

Wintering Birds

The results of the six wintering bird surveys, conducted during the 2022-2023 and 2024-2025 winter periods are presented in summary below.

The green-listed wintering birds recorded in Site 3 included Blackbird, Blue Tit, Buzzard, Chaffinch, Collared Dove, Dunnock, Goldfinch, Great Tit, Hooded Crow, House Sparrow, Jackdaw, Long-tailed Tit, Magpie, Robin, Stonechat, and Wren.

Snipe was the only protected species and/or species of conservation concern recorded within Site 3 during the 2022-2023 and 2024-2025 wintering bird surveys (**Figure 6-8**).

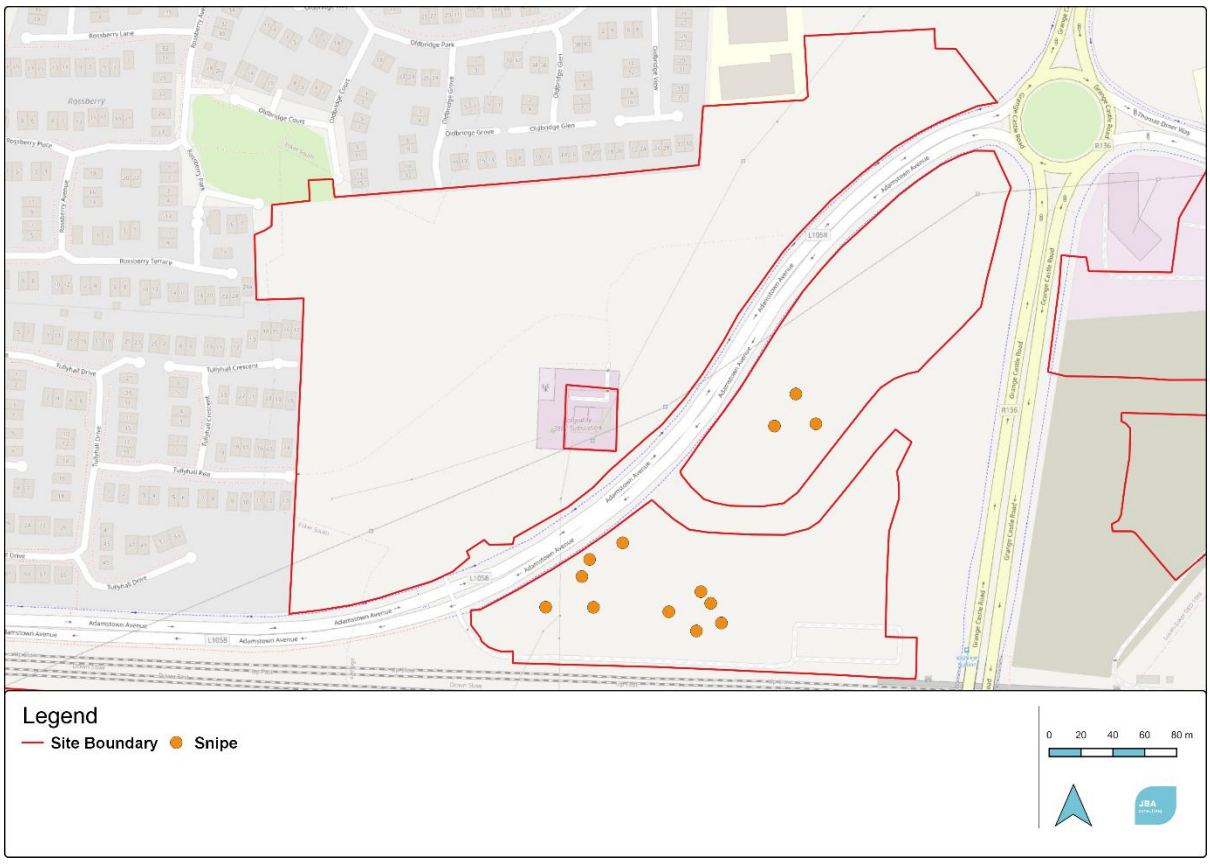

Figure 6-8: Wintering birds recorded within Site 3 during surveys (OSM, 2025)

Site 3 is considered to be of high local ecological importance due to the abundant long grass habitat for Snipe, which is an Annex species and red-listed bird of conservation concern within Ireland.

Breeding Birds

The results of the breeding bird surveys, three in total, conducted between April and June 2023, are presented in summary below.

Table 6-14 provides a summary of the findings of the breeding bird surveys with respect to those species which are of conservation concern and are considered to be KERs.

Bird Species	Annex (EU Birds Directive)	SCI Species of SPA	BoCCI – Breeding (B) & Breeding / Wintering (B/W)
Common Linnet *Carduelis cannabina*	N/A	N/A	Amber (B)
Common Pheasant *Phasianus colchicus*	II and III	N/A	N/A
Greenfinch *Chloris chloris*	N/A	N/A	Amber (B)
House Sparrow *Passer domesticus*	N/A	N/A	Amber (B)
Northern Lapwing *Vanellus vanellus*	II	N/A	Red (B/W)
Meadow Pipit *Anthus pratensis*	N/A	N/A	Red (B)
Skylark *Alauda arvensis*	II	N/A	Amber (B)
Starling *Sturnus vulgaris*	II	N/A	Amber (B)
Willow Warbler *Phylloscopus trochilus*	N/A	N/A	Amber (B)
Wood Pigeon *Columba palumbus*	II and III	N/A	N/A

Table 6-14: Breeding bird species of conservation concern recorded during surveys on Site 3

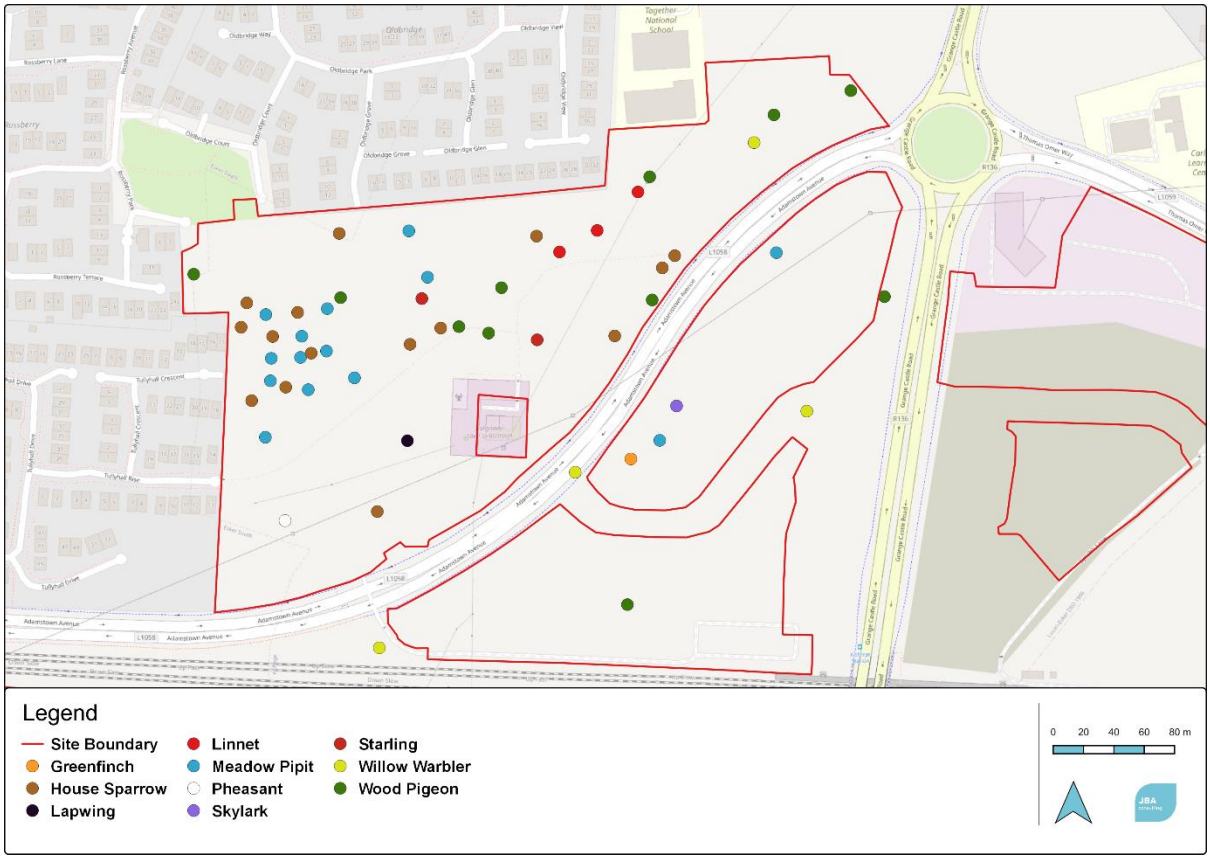

Figure 6-9: Protected and red/amber-listed breeding birds species within Site 3 (OSM, 2025)

The green-listed breeding birds recorded in Site 3 include Blackbird, Blackcap, Blue Tit, Bullfinch, Chaffinch, Collared Dove, Dunnock, Great Tit, Long-tailed Tit, Pied Wagtail, Reed Bunting, Robin, Song Thrush, Whitethroat, Buzzard, and Wren.

Site 3 is considered to be of high local ecological importance due to the multiple Red-listed and Amber-listed birds of conservation concern recorded within the site. The site provides suitable habitat for nesting, foraging and commuting habitats for these species.

Amphibians

Common Frog

Although no Common Frog was recorded on-site during the surveys, there is suitable habitat (reed swamp) just north-east of the northern boundary of the Site 3, for spawning, hibernation and foraging. Other terrestrial habitats within Site 3 also provide foraging opportunities and refuge.

Therefore, Site 3 is considered to be of high local ecological importance for Common Frog given the suitable habitats within and adjacent to the site.

Terrestrial Invertebrates

Surveyors noted 7-Spot Ladybird, Common Blue Damselfly, Red Soldier Bettle, Cinnabar Moth, Common Blue, Common Carder, Dock Bug, Common Grasshopper, Holly Blue, Hoverfly *Heliophilus spp.*, Little White Moth, Ringlet, Peacock, Large White, Red Admiral, Meadow Brown, 6-spot Burnet, Honeybee *Apis* spp., Red-tailed Bumblebee, Ashy Mining Bee, White-tailed Bumblebee and Gypsy Cuckoo-bee during the invertebrate transect survey, as well as incidentally during other spring and summer period surveys.

The red-listed (Near Threatened) Gypsy Cuckoo-bee individuals and the accompanying (parasitised) White-tailed Bumblebee hive were recorded within a dense grassy tussock area within the northern dry meadow within the western section of Site 3.

Additionally, 2-spot Ladybird *Adalia bipunctata*, 14-spot Ladybird *Propylea quattuordecimpuncata*, Oak Processionary *Thaumetopoea processionea*, and Brown Hawker *Aeshna grandis* have been recorded on NBDC within 1km of the site.

Site 3 is considered to be of high local ecological importance for terrestrial invertebrates, as the site provides a variety of foraging habitat, as well as refuge / hiving-building and commuting habitats for these green and red-listed terrestrial invertebrate species.

6.5.2.4 Invasive Non-Native Species (INNS)

Table 6-15 below provides a list of invasive non-native species recorded during the invasive species surveys and incidentally during other summer-period surveys. It includes species, their level of impact, and whether they are listed in the First and/or Second Schedule of S.I. No. 374/2024 – European Union (Invasive Alien Species) Regulations 2024.

Invasive Non-Native Species	Impact	S.I. No. 374/2024
Brown Rat *Rattus norvegicus*	High	Yes (islands only)
Butterfly-bush *Buddleja davidii*	Medium	No
European Rabbit *Oryctolagus cuniculus*	Medium	No
Greater White Toothed Shrew *Crocidura russula*	Medium	No
Japanese Knotweed *Fallopia japonica*	High	Yes
Winter Heliotrope *Petasites pyrenaicus*	Low	No

Table 6-15: INNS recorded within or adjacent to the proposed development's boundary

Figure 6-10: Japanese Knotweed recorded within the eastern section of Site 3

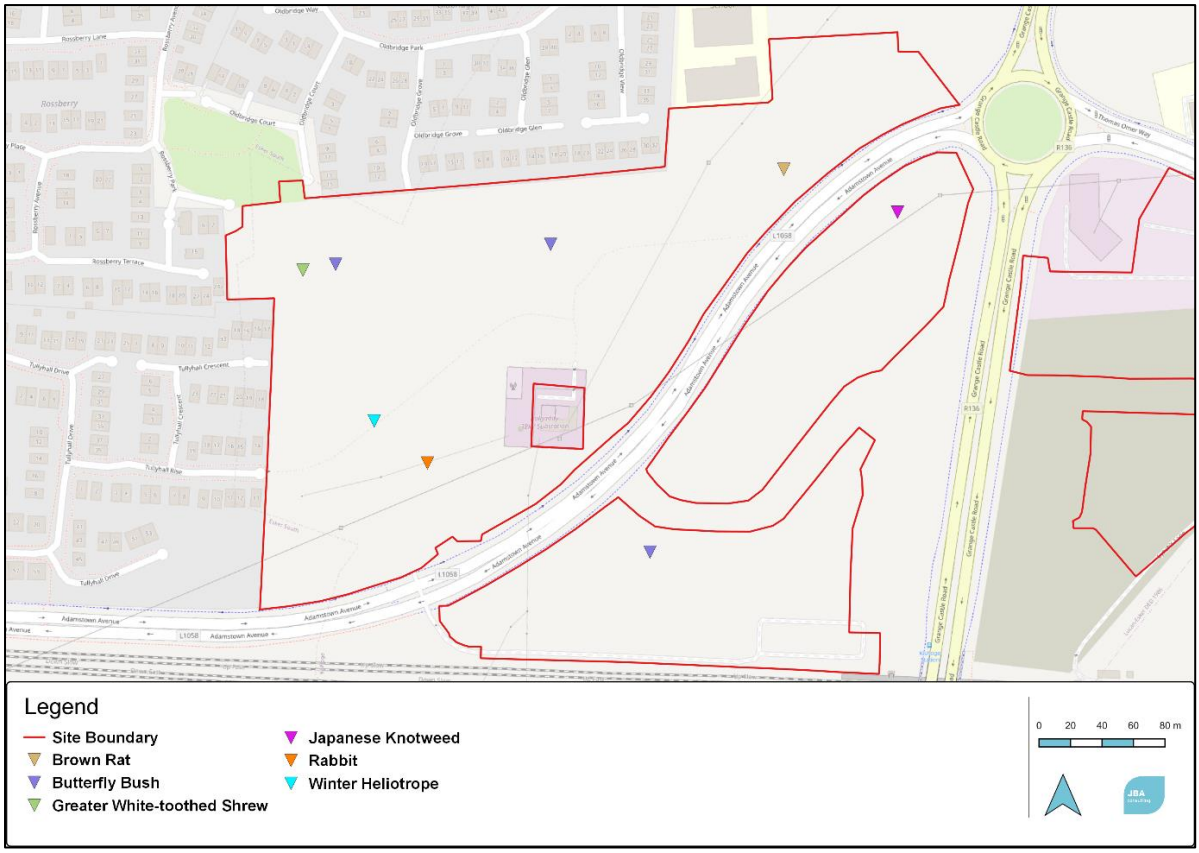

Figure 6-11: Invasive species recorded within Site 3 (OSM, 2025)

6.5.3 Proposed Development – Site 4

6.5.3.1 Habitats

Habitats recorded during the initial ecological walkover and subsequent habitat surveys are listed in Table 6-16 below and are presented in detail in the following sub-sections. Other species noted in other surveys, but associated with the habitats are also detailed. A habitat map is seen in Figure 6-12.

Fossitt Habitat	Fossitt Code
Buildings and artificial surfaces	BL3
Recolonising bare ground	ED3
Reed and large sedge swamps	FS1
Eroding / upland rivers	FW1
Canals	FW3
Drainage ditches	FW4
Improved agricultural grassland	GA1
Amenity grassland (improved)	GA2
Marsh	GM1
Dry meadows and grassy verges	GS2
Mosaic: Dry meadows and grassy verges / Scrub	GS2 / WS1
(Mixed) broadleaved woodland	WD1
Mixed broadleaved / conifer woodland	WD2
Hedgerow	WL1
Treelines	WL2
Scrub	WS1
Mosaic: Scrub / Recolonising bare ground	WS1 / ED3
Immature woodland	WS2

Table 6-16: List of habitats (Fossitt Classification) recorded on site 4.

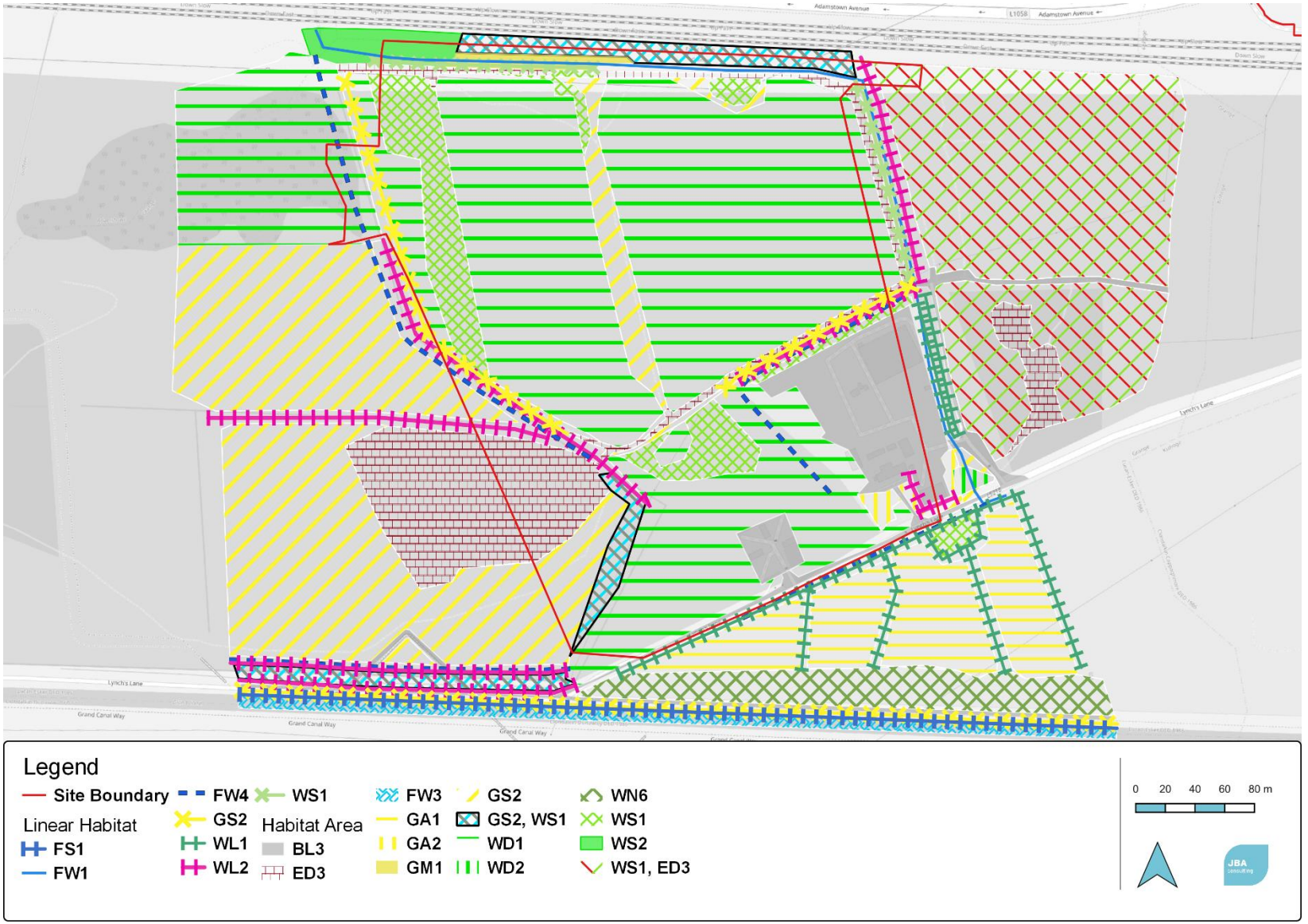

Figure 6-12: Map of habitats recorded in Site 4 (OSM, 2025)

Buildings and other artificial surfaces (BL3)

This artificial habitat is comprised of three areas of buildings, namely the SDCC Parks Depot, a residential property, and a set of small temporary residential buildings, all of which are accessed via Lynch's Lane. These buildings and associated hard-standing surfaces are along the southern boundary of Site 4.

Blackbird; Blackcap and Lesser Black-backed Gull *Larus fuscus* were recorded utilising the roofs of these artificial habitats.

These artificial habitats are considered to be of less than local ecological importance given the absence of flora, and their very limited capacity to support local fauna.

Recolonising Bare Ground (ED3)

This habitat type appears in patches and strips throughout much of Site 4. The limited floral species range is influenced by neighbouring grassland and scrub habitat, with floral records including Perennial Rye-grass; Cock's-foot; Smooth Sowthistle; Nettle; Field Mustard; Groundsel; Teasel *Dipsacus fullonum*; Creeping Thistle; Spear Thistle; Water Figwort *Scrophularia umbrosa*; Bramble; Daisy; Creeping Buttercup; and Dandelion spp.

Surveyors recorded numerous faunal species utilising this habitat, namely Badger (paw print); Robin; Wren; Blackcap; Blackbird; Hooded Crow; Blue Tit; Song Thrush; Chaffinch; Linnet; Great Tit; and Common Carder-bee.

This habitat is considered to be of less than local ecological importance given its lack of flora diversity and capacity to support local fauna.

Reed and large sedge swamps (FS1)

This linear habitat is present along the northern bank of the Grand Canal, located approximately 35m south of Site 4. This habitat is comprised of a thin strip of emergent vegetation that includes Common Reed; Common Horsetail; Yellow Iris; Branched Bur-reed *Sparganium erectum*; Unbranched Bur-reed *Sparganium emersum*; and Bulrush.

Mallard; Mute Swan and Moorhen were observed by surveyors foraging within this marginal aquatic habitat.

This habitat is considered to be of high local ecological importance given its association as a listed habitat with the Grand Canal pNHA; as well as the capacity to provide refuge for a range of wildlife, as well as providing nesting opportunities for local bird species.

Eroding / upland rivers (FW1)

The Kilmahuddrick Stream runs along the eastern and northern boundaries of Site 4. This eroding /upland stream habitat supports both bankside and instream flora. Floral species recorded by surveyors within this habitat included Watercress *Nasturtium officinale*, American Willowherb *Epilonium ciliatum*, Smooth Sowthistle, Common Nettle and Creeping Buttercup.

Surveyors observed Three-spined Stickleback *Gasterosteus aculeatus* within stream along the northern boundary. Additionally, the following freshwater invertebrate groups (ranging from family to species level) were recorded during the kick-sampling survey of the Kilmahuddrick Stream, namely *Hydrobiidae; Bithyniidae; Glossiphoniidae; Lumbriculidae; Asellus aquaticus; Acroloxidae; Hydroptilidae; Orthocladiinae; Hydropsychiidae; Simuliidae; Gammaridae; Sericostomatidae; Coenagrionidae; Hemerodromiinae; Baetiidae; Odontoceridae; Limnephilidae; Planoridae; Sphaeriidae; Dresseriidae;* and *Dendrocoelidae*.

Figure 6-13: The Kilmahuddrick Stream flowing west through the immature woodland to the north of Site 4

This habitat is considered to be of county level ecological importance due to the connectivity with the River Griffeen (370m downstream), as well as its capacity to support local fauna.

Canals (FW3)

The waterbody of the Grand Canal (pNHA) is located approximately 35m south of Site 4's southernmost boundary. This aquatic habitat supports a range of floating and emergent floral species including Yellow Water-lily *Nuphar lutea* and Waterweeds *Elodea* spp.

A range of fauna were recorded utilising this habitat including Mallard *Anas platyrhynchos*; Mute Swan *Cygnus olor*; Cormorant *Phalacrocorax carbo*; Moorhen *Gallinula chloropus*; and Grey Heron *Ardea cinerea*. Additionally, Otter *Lutra lutra* are known to inhabit the length of the Grand Canal network; however, no local latrine, couches or holts were noted in the canal stretch south of Site 4.

This habitat is considered to be of national ecological importance given the canal's status as a nationally designated site.

Figure 6-14: Female Mallard and ducklings foraging in the Grand Canal, 35m south of Site 4

Drainage ditches (FW4)

Drainage ditches are present along a number of boundaries within and adjacent to Site 4. Floral species recorded within these linear habitats included Yorkshire Fog; Soft Rush; Star Sedge *Carex echinata*; Creeping Buttercup; and Watercress, with Ivy; Lords-and-ladies; and Hart's-tongue Fern on the upper ditch banks. Surveyors recorded Common Frog utilising these drainage ditches, with the drainage ditch located immediately north of the SDCC Depot compound hosting a spawning grounds for local Common Frogs.

This habitat is considered of high local ecological importance given its role in providing landscape connectivity with the surrounding landscape and surface water network (i.e., the Kilmahuddrick Stream) and its capacity to host a breeding grounds for local Common Frog.

Figure 6-15: Drainage ditch habitat to north of the SDCC Depot compound

Improved agricultural grassland (GA1)

Pastural fields are located adjacent to Site 4's southern boundary. These improved grasslands are currently utilised for low frequency stock grazing. These fields were dominated by Perennial Ryegrass and Creeping Buttercup, with other species such as White Clover; Creeping Thistle; Broad-leaved Dock and Ribwort Plantain also being present.

These habitats are considered to be of less than local ecological importance due to the largely monoculture nature of these improved grassland habitats.

Amenity grassland (improved) (GA2)

Small patches of infrequently maintained grassland are located adjacent to the buildings and hard standing areas within the SDCC Parks Depot and the residential property, located to the south of Site 4. The floral assemblage of these habitats consisted of Perennial Rye-grass; Cock's-foot; Ragwort; Lesser Stitchwort; Hogweed; White Clover; Red Clover; Broad-leaved Dock; Self-heal; Nettles; Daisy; Creeping Buttercup; Cut-leaved Crane's-bill; and Dandelion spp.

This habitat is considered to be of less than local ecological importance due to the heavy maintenance, low sward height and lack of floral diversity.

Marsh (GM1)

A 100m (approx.) strip of marsh habitat is located along the Kilmahuddrick Stream along the northern boundary of Site 4. This marsh habitat supports floral species such as Great Willowherb; American Willowherb; Nettle; Creeping Nightshade *Solanum dulcamara*; Meadowsweet; Valerian

Valeriana officinalis; Marsh Thistle; Hedge Bindweed; Wild Angelica *Angelica sylvestris*; Marsh Marigold *Caltha palustris*; Purple Loosestrife *Lythrum salicaria*; Hedge Woundwort *Stachys sylvatica*; Water Mint *Mentha aquatica*; and Alder saplings.

Surveyors recorded Badger; Common Pipistrelle; Soprano Pipistrelle; Leisler's Bat; Willow Warbler; Robin; Great Tit; Blue Tit; Song Thrush and Comma butterfly, utilising this marsh habitat.

This habitat is considered to be of high local ecological importance given its rarity, and the associated flora, within the local landscape, as well as capacity to provide refuge and foraging opportunities for local fauna.

Figure 6-16: Marsh habitat within the riparian zone of the Kilmahuddrick Stream along the northern boundary of Site 4

Dry meadows and grassy verges (GS2)

Grassy verges are present north of the SDCC Parks Depot and between the sections of woodland in the northern section of the site. A large meadow is present in the western section of the site, stretching west beyond the boundary of Site 4. Floral species recorded within these verge and meadow habitats include False Oat-grass; Yorkshire Fog; Cock's-foot; Soft Rush; Red Clover; Silverweed; Ribwort Plantain; Rosebay Willowherb; Dogwood; Alder (saplings); Ash (saplings); Sycamore (saplings); Bramble; Meadowsweet; Rough Hawkbit *Leontodon hispidus*; Yarrow; Creeping Buttercup; Creeping Cinquefoil; Spear Thistle; Marsh Thistle; Hogweed; Germander Speedwell; Bistort; Square-stalked St John's Wort; Broad-leaved Dock; Butterbur *Petasites hybridus*; Selfheal; Wild Angelica; Creeping Thistle; Nettles; Smooth Sowthistle; Mullein; Common Plantain; Ribwort Plantain; Brooklime; Field Mustard; Pyramidal Orchid; and five Red-listed Lesser Centaury individuals (located within the grass verge adjacent to the marsh habitat).

Surveyors noted snuffle holes within these habitats, which indicate local Badgers are utilising these habitats for foraging activities. Three bat species were recorded foraging (static activity survey) in the grassy verge habitats to the north of Site 4, namely Common Pipistrelle; Soprano Pipistrelle; and

Leisler's Bat. Bird species that were recorded utilising these habitats include Goldcrest; Wren; Wood Pigeon; Great Tit; Magpie; Hooded Crow; Blackbird; Robin; Song Thrush; Blue Tit; Blackcap; Jack Snipe; Starling; and Jay. Terrestrial invertebrates recorded within these areas included Red Admiral; Ringlet; and Common Carder-bee.

This habitat is considered to be of high local ecological importance due to the variety of flora, including uncommon and rare red-listed flora as well as the variety of species utilising the habitat within the site.

Figure 6-17: Numerous Pyramidal Orchids are supported within the dry meadow and grassy verge habitats of Site 4

Mosaic: Dry meadows and grassy verges / Scrub (GS2 / WS1)

There are three transitional habitat areas within and adjacent to Site 4. These areas are where dry meadow strips are in the process of succession to scrub habitat, leading to a mosaic of the two habitat types. These are located to the north and south-west of Site 4. The floral species present within these areas are a subsect of those present within the dry meadow and grassy verges, and scrub habitats.

Surveyors recorded a number of faunal species utilising these mosaiced habitats, namely Common Pipistrelle; Soprano Pipistrelle; Leisler's Bat; Willow Warbler; Goldcrest; Wren; Blackcap; Large White butterfly; and Brown Hawker dragonfly.

These mosaic habitats are considered to be of high local ecological importance due to the connectivity they provide for local fauna between habitats and the surrounding landscape, as well as refuge and foraging opportunities.

(Mixed) broadleaved woodland (WD1)

The majority of this habitat, located within the northern section of Site 4, is a planted broadleaved woodland with notable segregation of species into linear sections. The floral assemblage of the woodland in this area was comprised of Silver Birch, Turky Oak *Quercus cerris*; Horse Chestnut *Aesculus hippocastanum*; Grey Willow; Ash; Alder; Hawthorn; and Sycamore, with a limited understorey of Ivy; Male-fern *Dryopteris filix-mas*; Bramble; and Elder saplings.

In the mixed broadleaved woodlands to the south of Site 4, the woodland has a more natural structure with typical floral understorey (field and ground) layers. These woodlands supported Black Poplar; Small-leaved Lime; Sycamore; Silver Birch; Ash; Hawthorn; Alder; Grey Willow; Cypress spp.; Hazel; Holly; and Elder, with an understorey of Ivy; Bramble; Hogweed; Bush Vetch; Pendulous Sedge; Rosebay Willowherb; Hedge Mustard; Nettle; Great Willowherb; Bramble; Dogwood; Hogweed; Hedge Bindweed; Wood Dock; Yarrow; Dog-rose; *Viburnum* spp.; Water Figwort; and Hedge Bindweed.

Invasive Japanese Knotweed is present in two separate stands along the southern edge of the woodland, adjacent to Lynch's Lane. There is a stand of invasive Cherry Laurel present adjacent to the south-eastern corner boundary. Stands of the invasive Butterfly-bush are also present along edges of the northern and southern sections of the mixed broadleaved woodland.

Fauna recorded utilising these woodland habitats included Common Pipistrelle; Soprano Pipistrelle; Leisler's Bat; Goldcrest; Willow Warbler; Wren; Blackbird; Robin; Magpie; Great Tit; Wood Pigeon; Collared Dove; Long-tailed Tit; Blackcap; Chaffinch; Blue Tit; Bullfinch; Jack Snipe; and Brown Hawker dragonfly.

Figure 6-18: Broad-leaved (plantation) woodland within Site 4

These broadleaved woodland habitats are considered to be of high local ecological importance given their capacity to provide foraging, nesting and refuge for local fauna.

Hedgerows (WL1)

Hedgerow habitats are located beyond but adjacent to the Site 4's southern and eastern boundaries. These habitats are comprised of tree species such as Ash; Sweet Chestnut; Elder; Blackthorn; Hawthorn; Sycamore; and Alder, with a understorey layer of Bramble; Dog-rose; Cleavers; Ivy; Lesser Trefoil; Red Bartsia; Pineapple Weed; Lords-and-ladies; Hogweed; False Brome; Silverweed; Spear Thistle; Hedge Bindweed; Rosebay Willowherb; Creeping Thistle; Nettle; Square-stalked St John's Wort; and invasive Cotoneaster spp.; Butterfly-bush and Cherry Laurel.

Within these linear habitats surveyors recorded faunal species including Robin; Wood Pigeon; Blue Tit; Wren; and Red Admiral butterfly.

This habitat is considered to be of high local ecological importance due to the refuge, nesting and foraging potential it provides for local fauna, as well as their status as wildlife corridors.

Treelines (WL2)

Treelines are present throughout the site along trackways and the western edge of the Site 4. Floral species recorded by surveyors included Ash; Sweet Chestnut *Castanea sativa*; Blackthorn; Black Poplar; Elder; Hawthorn; Sycamore; Dog-rose; Great Willowherb; Hart's Tongue Fern; Bush Vetch; Ragwort; Ivy; Hogweed; Hedge Mustard; Nettle; Nipplewort; Herb-Robert; Hollyhock *Alcea* spp.; and Bramble.

Buzzard; Willow Warbler; Collared Dove; Blackbird; Great Tit; Hooded Crow; Wood Pigeon; Chaffinch; Goldcrest; Wren; Long-tailed Tit; and Song Thrush were all observed utilising these linear treeline habitats.

These habitats are considered to be of high local ecological importance given their capacity to provide foraging, nesting and refuge for local fauna, whilst also acting as wildlife corridors within the local landscape.

Figure 6-19: Black Poplar treeline habitat present along the western boundary of Site 4

Wet willow-alder-ash woodland (WN6)

A large strip of wet willow-alder-ash woodland, that runs parallel to the Grand Canal, is located approximately 10m south of Site 4's southern boundary. This wet woodland habitat is comprised of Ash; Grey Willow; White Willow; Elder; Hawthorn; and Sycamore, with an understorey of Bramble; Hogweed; Cleavers; Nettle; Ivy; Creeping Buttercup; Meadow Buttercup; Meadowsweet; Ivy; Cock's-foot; Bush Vetch; Male Fern; Hart's-tongue Fern; Herb-Robert; False Oat-grass; Hedge Bindweed; and invasive Butterfly-bush.

Surveyors noted faunal species such as Wood Pigeon; Hooded Crow; Great Tit; Speckled Wood butterfly and Hoverfly *Parhelophilus* spp. utilising this woodland habitat.

This woodland habitat is considered to be of high local ecological importance given its capacity to provide refuge, foraging and nesting opportunities for local fauna.

Figure 6-20: Wet willow-alder-ash woodland adjacent to the southern boundary of Site 4

Scrub (WS1)

Large patches and strips of scrub are present throughout much of Site 4 and the adjacent lands. Floral assemblages within these scrub habitats are typically comprised of Hawthorn; Grey Willow; Bramble; Blackthorn; Dog-rose; Elder; Teasel; Creeping Thistle; Dogwood; Hogweed; Rosebay Willowherb; Ivy; Ash (immature / sapling); Hedge Bindweed; Cleavers; Nettle; Meadow Vetchling; Bush Vetch; and invasive Snowberry and Butterfly-bush.

Faunal species recorded utilising this scrubland habitat included Badger (scat); Common Pipistrelle; Soprano Pipistrelle; Leisler's Bat; Wood Pigeon; Blackcap; Chiffchaff; Blue Tit; Wren; and Common Blue Damselfly.

This habitat is considered to be of high local ecological importance given its capacity to provide refuge, foraging and nesting opportunities for local fauna.

Mosaic: Scrub / Recolonising bare ground (WS1/ED3)

The area to the immediate east of Site 4's eastern boundary is dominated by a mosaic of scrub and recent disturbed recolonising bare ground. The floral species present within these areas are a subsection of those present within the dry meadow and grassy verges, and scrub habitats.

Badger (scat); Chiffchaff; Robin; Blackcap; Hooded Crow; Wren; Wood Pigeon; Willow Warbler; Chaffinch and Red Admiral butterfly were recorded utilising these mosaic habitats.

This habitat is considered to be of high local ecological importance given its capacity to provide refuge, foraging and nesting opportunities for local fauna.

Immature woodland (WS2)

A small patch of immature (wet/riparian) woodland is present in the northwestern corner of Site 4. This young woodland habitat is comprised of Alder; Silver Birch; Sycamore and Italian Alder, with and understorey of Ivy; Ground-ivy; Dog Violet; Hogweed; Bramble; Pendulous Sedge; Nettle; and Great Willowherb.

Surveyors noted a number of faunal species utilising this young woodland, namely Common Pipistrelle; Soprano Pipistrelle; Leisler's Bat; Spotted Flycatcher; Blue Tit; Blackbird; Wren; Song Thrush; Chaffinch; Blackcap; Robin; Treecreeper; Great Tit; and Wood Pigeon.

This habitat is considered to be of local ecological importance due to it providing foraging and refuge potential for local fauna despite its limited size.

6.5.3.2 Rare, Uncommon & Protected Flora

A total of 35 Pyramidal Orchids and five Red-listed (Near Threatened) Lesser Centaury were recorded within and in close proximity to Site 4. Lesser Centaury is also protected under the Flora (Protection) Order 2022. The Lesser Centaury was recorded along the northern boundary of Site 4, within the grassy verge adjacent to the marsh habitat, in areas of thin soil. Lesser Centaury is known to inhabit damp grassy patches inland, though its distribution is quite localised (Clapham et al. 1987). Three Pyramidal Orchids were also recorded in proximity to these Lesser Centaury individuals further highlighting the floral value of this section of grassy verge / marsh. Additionally, Pyramidal Orchids were record in grass verges along pathways in the site and in high densities within the southern section of the large meadow habitat to the south-west of the Site 4 boundary.

The Lesser Centaury present within Site 4 are considered to be of national ecological importance given their conservation status and legal protections; while the high frequency of Pyramidal Orchid within the site is considered to be high local ecological importance.

Figure 6-21: Lesser Centaury individual within Site 4

6.5.3.3 Rare & Protected Fauna

Non-volant Mammals

Badger

Evidence of Badger habitation within Site 4 was recorded on multiple occasions, with camera-trap footage of individuals (Figure 6-22), paw prints, scat and foraging snuffle-holes noted across the site. No setts (active or inactive) were recorded within or immediately adjacent to Site 4. Therefore, the local Badger population is only utilising the proposed development site for foraging and commuting purposes.

Site 4 is considered to be of high local ecological importance for the local Badger population given its capacity to support their foraging needs and provide safe commuting passages throughout the wider landscape.

Figure 6-22: Badger recorded commuting between the marsh and grassy verge habitat

Otter

While surveyors did not record any signs of habitation (latrine, slides, couches or holts) along the canal stretch located south of Site 4, Otter are known to inhabit the length of the Grand Canal network. Under the precautionary principle it will be assumed that Otter are feeding and commuting within and adjacent to this stretch of the Grand Canal. Furthermore, given the presence of Common Frog and Three-spined Stickleback within the drainage and stream network within Site 4, there is the possibility for Otter to enter the site on occasion for foraging purposes. Moreover, local Otters may potentially utilise the Kilmahuddrick Stream for commuting purposes to navigate between the Grand Canal and the River Griffeen located 370m downstream of Site 4.

Therefore, Site 4 is considered to be of county level ecological importance for the local Otter population given Site 4's capacity to provide foraging resources, refuge and a commuting route between two major pNHA associated waterbodies.

Pine Marten

No signs of Pine Marten *Martes martes* habitation or individuals were recorded within Site 4 during the mammals surveys. However, the woodlands on-site provide potential foraging, commuting and refuge for local Pine Marten; and given the recent recording (NBDC, 2025) of a Pine Marten individual, approximately 420m south of Site 4, there is the potential for Pine Marten to establish within or immediately adjacent to Site 4.

Therefore, Site 4 is considered to be of high local ecological importance for Pine Marten, given the presence of suitable habitats for foraging, commuting and refuge for the local Pine Marten population.

Irish Stoat

Surveyors did not recorded any sightings or signs of Irish Stoat *Mustela erminea* subsp. *hibernica* habitation within or adjacent to Site 4 during the mammal surveys. However, recent records (NBDC, 2025) place Irish Stoat within approximately 85m of Site 4's northern boundary; and given the recorded presence (camera-trap footage) of European Rabbit, a favoured prey item of Irish Stoat, within the northern section of Site 4, it is highly likely that the local Irish Stoat population does hunt, commute and find refuge (known to den with Rabbit burrows) within boundaries of Site 4.

Therefore, Site 4 is considered to be of high local ecological importance for Irish Stoat, given the capacity of Site 4's habitats to provide foraging, commuting and refuge for the local Irish Stoat population.

Hedgehog

No signs of Hedgehog habitation, nor direct sightings of individuals were recorded by surveyors within or adjacent to Site 4. Recent records (NBDC, 2025) do however place Hedgehog 250m north-east of Site 4, within Griffen Park; and given that Site 4 hosts a range of suitable habitats for Hedgehog commuting, foraging and hibernation it is likely that Hedgehog do frequent the lands within and adjacent to Site 4.

Therefore, Site 4 is considered to be of high local ecological importance, given the suitability of the site for Hedgehog foraging, refuge and commuting.

Pygmy Shrew

No signs of Pygmy Shrew habitation, nor direct sightings of individuals were recorded by surveyors within or adjacent to Site 4. Records (NBDC, 2025) do highlight the past presence of Pygmy Shrew 180m west of Site 4; and given that Site 4 hosts a range of suitable habitats for Pygmy Shrew commuting, foraging and refuge it is likely that Pygmy Shrew do frequent the lands within and adjacent to Site 4.

Therefore, Site 4 is considered to be of high local ecological importance, given the suitability of the site for providing foraging, commuting and refuge for the local Pygmy Shrew population.

Bats

Preliminary Bat Roost and Habitat Suitability Assessment

Surveyors examined the semi-mature and mature trees and structures within and adjacent to Site 4 and recorded no potential roost features (PRFs) with a status higher than that of Negligible status, i.e. any PRFs present had one or more flaws, e.g. not water-tight or lacking in insulative properties.

Bat Activity Assessment

A total of three bat species were recorded utilising the habitats within Site 4's boundaries, namely Common Pipistrelle; Soprano Pipistrelle; and Leisler's Bat.

Species	09/05	10/05	11/05	12/05	13/05	14/05	15/05	Total
Common Pipistrelle	15	6	2	2	4	6	5	40
Leisler's Bat	8	15	1	5	2	0	1	32
Soprano Pipistrelle	17	2	6	11	10	4	5	55
Total	40	23	9	18	16	10	11	127

Table 6-17: Bat Static results for site 4 from 9th May 2023 to 15th May 2023

Species	22/06	23/06	24/06	25/06	26/06	27/06	28/06	Total
Common Pipistrelle	9	4	6	8	24	13	13	77
Leisler's Bat	1	6	2	5	5	3	2	24
Soprano Pipistrelle	14	9	20	9	22	18	9	101
Total	24	19	28	22	51	34	24	202

Table 6-18: Bat Static results for site 4 from 22nd June 2023 to 28th June 2023

Species	17/08	18/08	19/08	20/08	21/08	22/08	Total
Common Pipistrelle	12	0	2	3	0	1	18
Leisler's Bat	112	17	4	7	3	29	172
Soprano Pipistrelle	33	3	9	0	2	5	52
Total	157	20	15	10	5	35	242

Table 6-19: Bat Static results for site 4 from 17th August 2023 to 22nd August

Site 4 is considered to be of high local ecological importance for the local bat population. This site is one of the few remaining areas in the local area that is not yet subject to high levels of light pollution, this site is likely part of a key commuting corridor for local bat populations to navigate between green spaces on the edge of the surrounding urban areas.

Wintering Birds

The results of the six wintering bird surveys are detailed below. Three were conducted between December 2022 and February 2023, with an additional three surveys conducted between December 2024 and February 2025; as well as incidental recordings during follow-up site visits, which took place during the wintering bird season.

Table 6-20 provides a summary of the findings of the wintering bird surveys with respect to species of conservation concern and/or listed Annex species under the EU Birds Directive, totalling at 11 species. The location of these species is displayed in

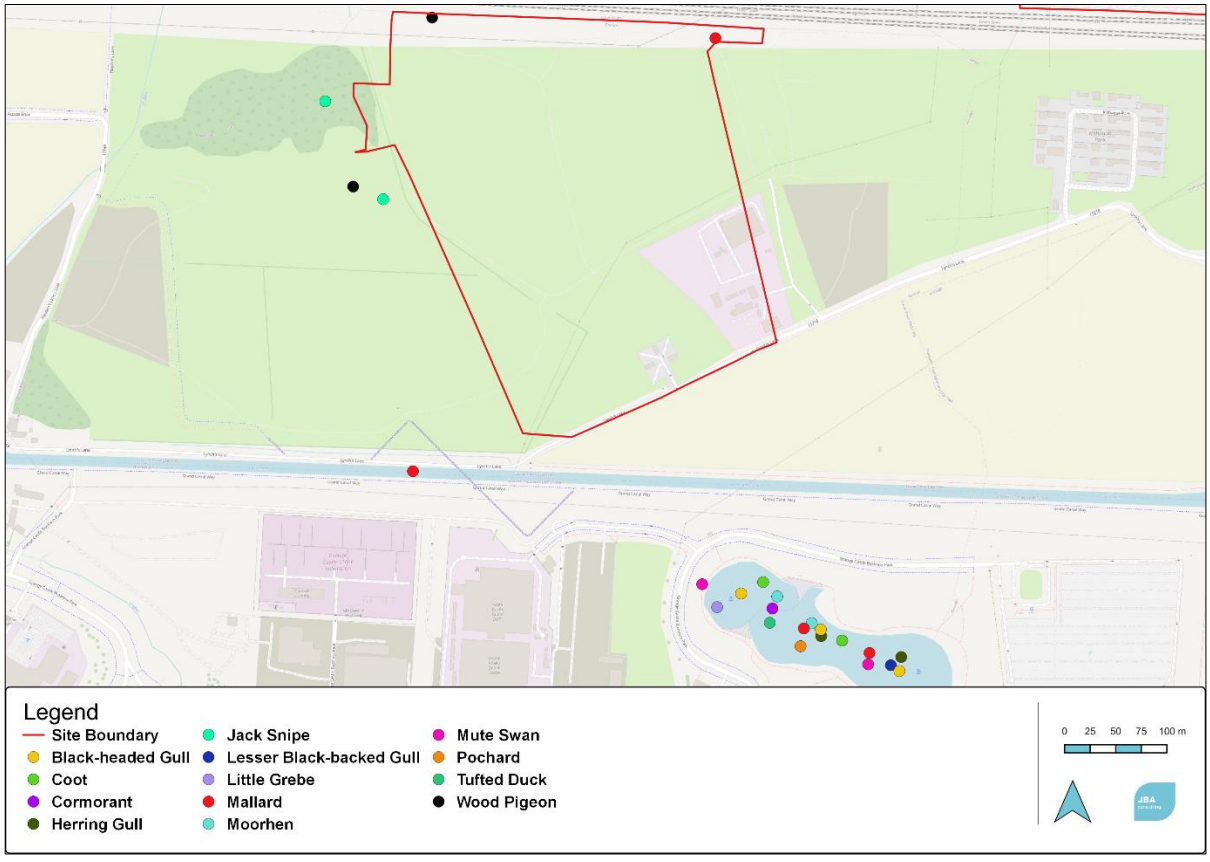

Figure **6-23**.

The 11 green-listed wintering birds recorded in Site 4 include Blackbird; Blue Tit; Hooded Crow; Little Grebe; Long-tailed Tit; Magpie; Robin; Song Thrush; Jack Snipe; Wood Pigeon; and Wren.

Bird Species	Annex (EU Birds Directive)	BoCCI – Breeding (B) & Breeding / Wintering (B/W)
Black-headed Gull *Larus ridibundus*	-	Amber (B/W)
Coot *Fulica atra*	II & III	Amber (B/W)
Cormorant *Phalacrocorax carbo*	-	Amber (B/W)
Herring Gull *Larus argentatus*	-	Amber (B/W)
Jack Snipe *Lymnocryptes minimus*	II & III	Green-listed
Lesser Black-backed Gull *Larus fuscus*	-	Amber (B/W)
Mallard *Anas platyrhynchos*	II & III	Amber (B/W)
Mute Swan *Cygnus olor*	-	Amber (B/W)
Pochard *Aythya ferina*	II & III	Red-listed (B/W)
Tufted Duck *Aythya fuligula*	II & III	Amber (B/W)

Table 6-20: Wintering bird species of conservation concern (Annex and/or listed) recorded within and adjacent to Site 4

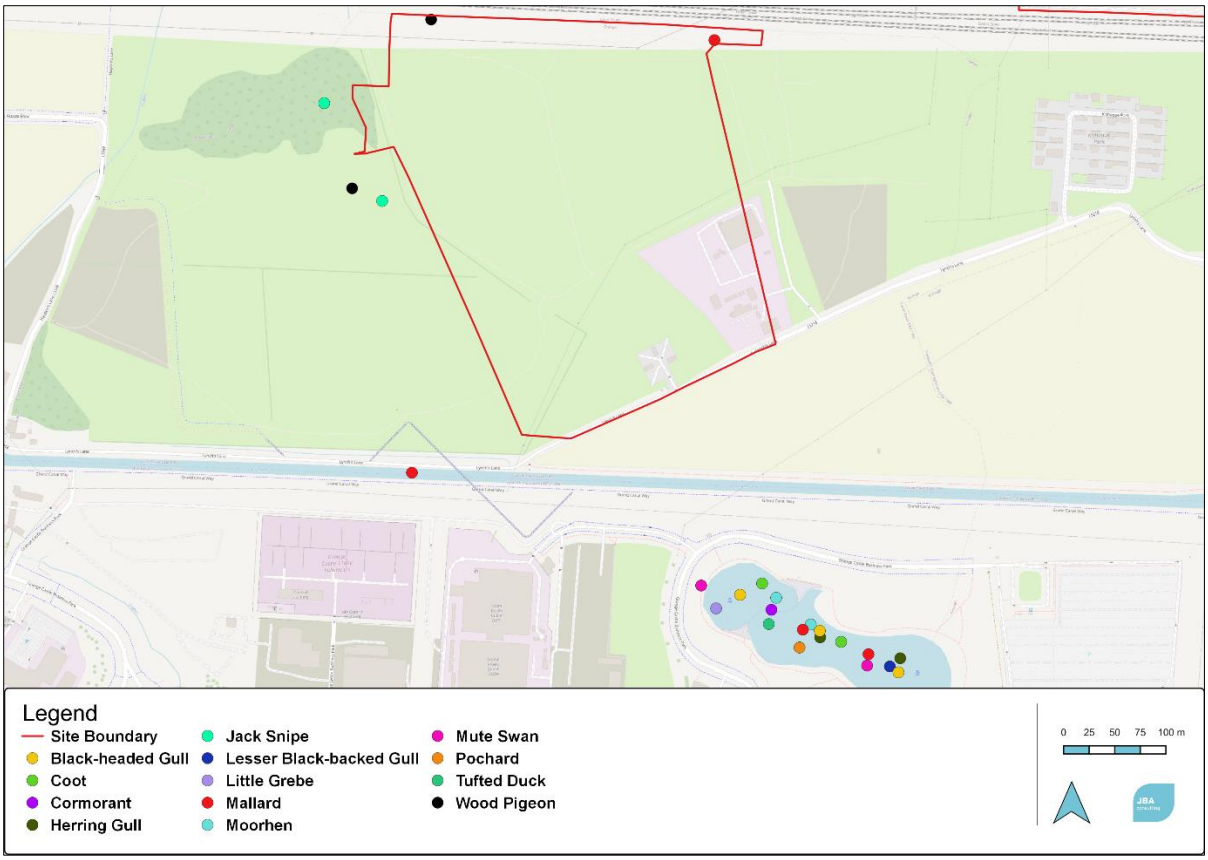

Figure 6-23: Wintering birds of conservation concern recorded within the locality of Site 4 (OSM, 2025)

The locality of Site 4 is considered to be of high local ecological importance for wintering bird populations given the presence of ten Annex protected and/or amber-listed (Wintering and Breeding/Wintering) bird species during the winter months.

Breeding Birds

The results of the breeding bird surveys, three in total, conducted between April and June 2023, along with subsequent incidental recordings during follow-up site visits, which took place during the breeding bird season, are presented in summary below.

The 13 green-listed breeding birds recorded utilising Site 4 and its surrounds include Blackbird; Blackcap; Blue Tit; Bullfinch; Buzzard; Chaffinch; Collared Dove; Hooded Crow; Jay; Magpie; Robin; Song Thrush; and Wren. The recorded locations of these species are displayed in Figure 6-24. provides a summary of the findings of the breeding bird surveys, with eight bird species of conservation concern and/or Annex listed being recorded within the locality of Site 4. The recorded locations of these species are displayed in Figure 6-24.

Bird Species	Annex (EU Birds Directive)	BoCCI – Breeding (B) & Breeding / Wintering (B/W)
Common Linnet *Linaria cannabina*	-	Amber (B)
Goldcrest *Regulus regulus*	-	Amber (B)
Lesser Black Backed Gull *Larus fuscus*	-	Amber (B/W)
Mallard *Anas platyrhynchos*	II & III	Amber (B/W)
Spotted Flycatcher *Musciapa striata*	-	Amber (B)
Starling *Sturnus vulgaris*	II	Amber (B)
Willow Warbler *Phylloscopus trochilus*	-	Am§ber (B)
Wood Pigeon *Columba palumbus*	II & III	Green-listed

Table 6-21: Breeding bird species of conservation concern and/or Annex-listed recorded within and adjacent to Site 4

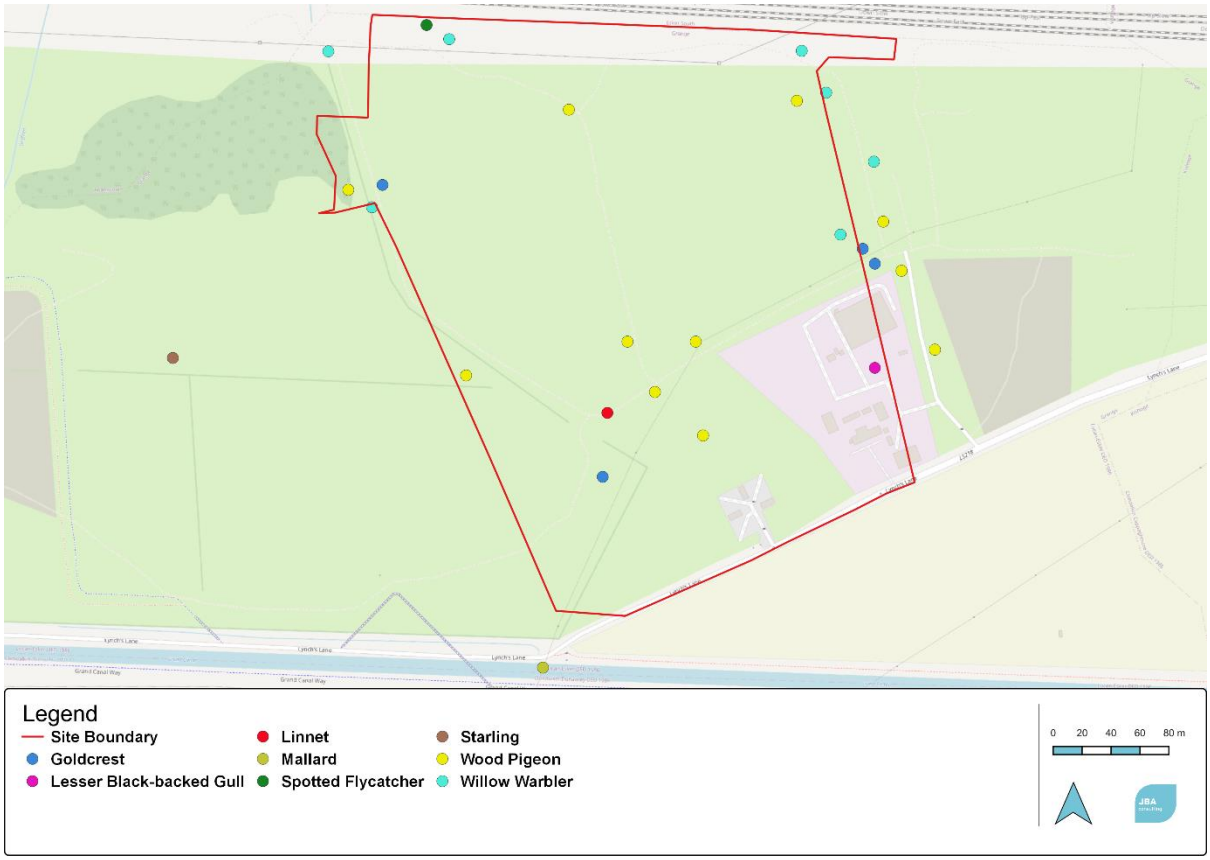

Figure 6-24: Breeding birds of conservation concern recorded within the locality of Site 4 (OSM, 2025)

The locality of Site 4 is considered to be of high local ecological importance for breeding bird species, given the presence of amber-listed (Breeding) birds utilising the site and the adjacent lands.

Amphibians

Smooth Newt

Surveyors did not record any sighting of Smooth Newt or spawn within the wetland / aquatic habitats within Site 4 during surveys conducted during the mid to late spring of 2023. However, Smooth Newt are known to inhabit the Grand Canal (NBDC, 2025) within the locality of Site 4. Given their presence in the locality, and the range of suitable habitats present within and adjacent to Site 4, this amphibian species must be considered within the impact assessment of Site 4 under the precautionary principle.

Therefore, Site 4 and its surrounds are considered to be of high local ecological importance given the site's capacity to support the local population of Smooth Newt.

Common Frog

An adult Common Frog (Figure 6-25) and spawn were recorded on 22/02/2023 within the drainage ditch immediate north of the SDCC Depot compound during the dedicated amphibian survey of Site 4.

Therefore, Site 4 is considered to be of high local ecological importance for the local Common Frog population, given its capacity to support commuting, foraging, spawning and hibernation activities.

Figure 6-25: Common Frog recorded adjacent to spawn within the drainage ditch north of the SDCC compound

Therefore, Site 4 is considered to be of high local ecological importance for the local Common Frog population, given its capacity to support commuting, foraging, spawning and hibernation activities.

Fish

Surveyors took note of fish species present within the Kilmahuddrick Stream, when conducting Otter and freshwater invertebrate surveys. Small shoals of Three-spined Stickleback were recorded within

the stream during both surveys. Surveyors also noted that the stream characteristics would be suitable for supporting juvenile European Eel. Both European Eel and Brown Trout have been recorded approximately 830m downstream of Site 4, within the River Griffeen (IFI, 2024). Additionally, Atlantic Salmon and Lamprey spp. have been recorded by IFI (2024) within the River Liffey, located km downstream of Site 4.

Therefore, Site 4 is considered to be of county level ecological importance for Atlantic Salmon, Lamprey spp. and European Eel; while Site 4 is considered to be high local ecological importance for local fish populations, i.e., Three-spined Stickleback, given their respective position within the local food chain.

Terrestrial Invertebrates

Terrestrial invertebrate surveying was conducted via visual transects of the habitats within and adjacent to Site 4. Ecological surveyors recorded a total of nine terrestrial invertebrate species, namely Common Blue Damselfly, Brown Hawker dragonfly; Common Carder-bee; Common Grasshopper, Hoverfly *Parhelophilus* spp.*;* Red Admiral; Ringlet; Speckled Wood; and Comma butterflies (Figure 6-26). While none of these species are of conservation concern, they provide pollination for local flora and are a food source for local bird populations.

Therefore, Site 4 and its locality is considered to be of high local ecological importance given its capacity to host a range of terrestrial invertebrates, which provide essential ecosystem services (pollination) and a prey base for the higher trophic levels within the local food chain.

Figure 6-26: Comma butterfly recorded within the marsh habitat to the north of Site 4

Freshwater Indicator Invertebrate Species

Kick-sampling of freshwater invertebrates was conducted at three sites along the Kilmahuddrick Stream (Figure 6-27). Freshwater invertebrate specimens were identified to at least the level of Family, and to Genus or Species level where possible. All macro-invertebrate species were identified using Guide to Freshwater Invertebrates (Dobson et al. 2012). The invertebrates identified during

the survey of the Kilmahuddrick Stream are listed along with their respective presence or absence for each sample, in Table 6-22.

Family	Genus	Species	Site 1	Site 2	Site 3
Hydrobiidae	-	-	✓	✓	✓
Bithyniidae	-	-	✓	✓	-
Glossiphoniidae	-	-	✓	-	-
Lumbriculidae	-	-	✓	✓	-
Acroloxidae	-	-	✓	✓	-
Hydroptilidae	-	-	✓	-	✓
Acroloxidae	-	-	✓	✓	-
Orthocladiinae	-	-	✓	✓	✓
Hydropsychiidae	-	-	✓	✓	✓
Simuliidae	-	-	✓	-	✓
Gammaridae	*Gammarus*	-	✓	-	-
Sericostomatidae	*Sericostoma*	-	✓	✓	-
Coenagrionidae	-	-	✓	-	-
Hemerodromiinae	-	-	✓	-	-
Baetiidae	-	-	✓	-	✓
Limnephilidae	-	-	-	✓	-
Planoridae	-	-	-	✓	-
Sphaeriidae	-	-	-	✓	✓
Dresseriidae	-	-	-	✓	
Dendrocoelidae	-	-	-	✓	-
Asellidae	*Asellus*	*aquaticus*	✓	✓	✓

Table 6-22: Invertebrate identification of Family, Genus and Species levels for each site sample

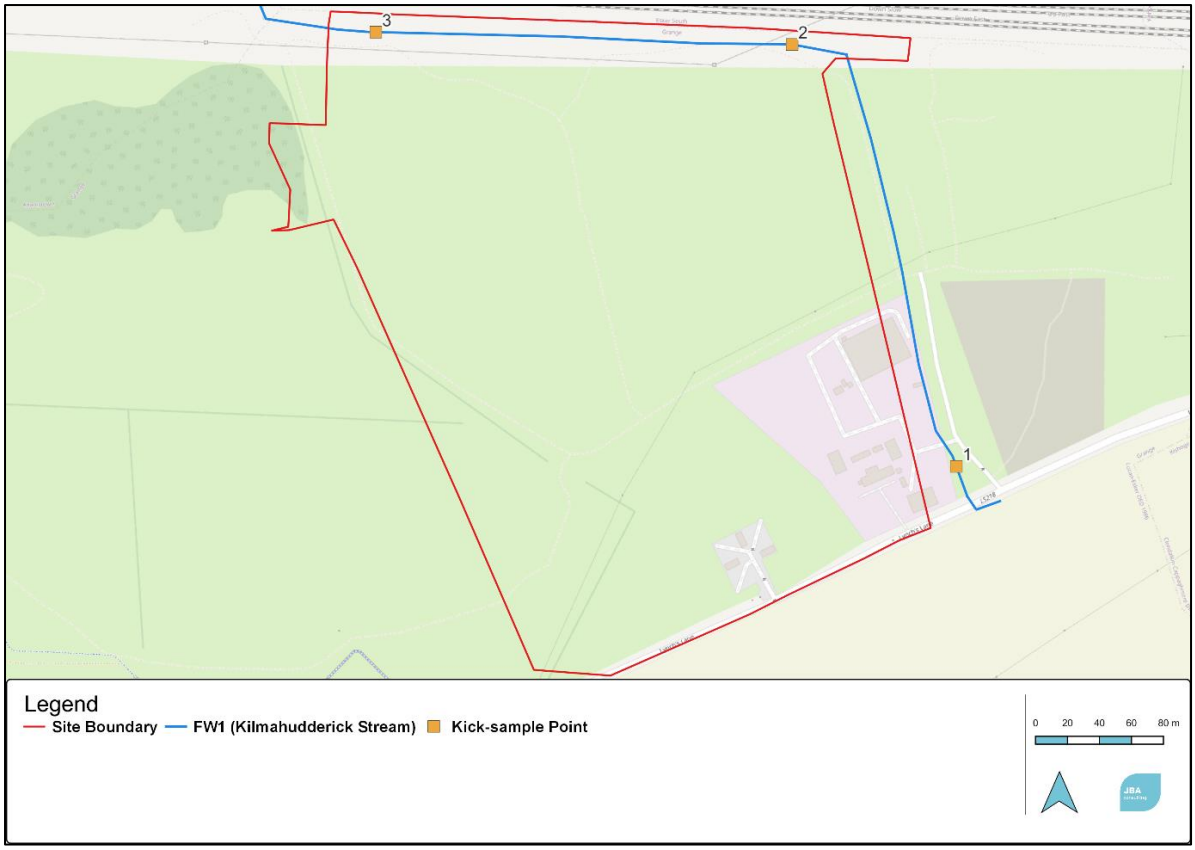

Figure 6-27: Kick-sample locations along the Kilmahuddrick Stream within and adjacent to Site 4

Q-value and Small Stream Risk Score (SSRS)

While many biological assemblages (e.g. bacteria, algae and fish) are used for assessing the ecological conditions of rivers and streams, freshwater benthic macroinvertebrates are the most widely utilised bioindicator; given that they are sensitive to ecological impacts whilst being a relatively simple, efficient and cost-effective faunal group to sample and analyse (Buss, et al., 2015) The above led to the development of the EPA's scheme of Biotic Indices or Quality (Q) Values to monitor environmental water quality.

Macro-invertebrate samples from Kilmahuddrick Stream were converted to Q-value ratings as per Toner et al. (2005). The Q-value calculation is based on the relative number of Group A & B invertebrates to Group C, D & E invertebrates, with Group A being most sensitive to pollution and Group E being most tolerant of pollution. All three sites had small numbers of Group B invertebrates, but no Group A were present. Further to this, Sites 1 and 2 had a few Group B taxa, while all three sites had small numbers of Group C and dominant numbers of Group D, with Group E being absent and with Filamentous Algae somewhat present throughout. Therefore, Sites 1 and 2 were allocated a Q-value of 2-3, while Site 3 was allocated a Q-value of 2.

The Small Stream Risk Score enables further characterisation of catchments in terms of improving the risk assessments for river waterbodies at smaller scales than those examined under WFD. The SSRS is based on the diversity and abundance of certain freshwater macroinvertebrate groups; Group 1 consisting of the 3-tailed Ephemeropterans (mayflies); Group 2 the 2-tailed Plecopterans (stoneflies); Group 3 the Trichopterans (caddisflies); Group 4 is a combination of Gastropods (snails and bivalves), Oligochaetes (worms) and Dipterans (true flies); and Group 5 the Asellus genus (water louse). Scores are divided into three categories - Probably not at Risk (= >8); Probably at Risk (= 6.5 - 8); and At Risk (= <6.5). The Kilmahuddrick Stream, under the SSRS system, is a watercourse 'At Risk', with all three sites receiving an 'At Risk' rating (Sites 1 score: 4, Site 2 score: 1.6, Site 3 score: 1.6).

Site 4 is considered to be of high local ecological importance for aquatic invertebrates, given their respective position within the local food chain (prey items of local birds and fish).

6.5.3.4 Invasive Non-native Species (INNS)

Table 6-23 below provides a list of invasive non-native species recorded during the ecological surveys. It includes species, their level of impact, and whether they are listed on the First and/or Second Schedule of S.I. No. 374/2024 - European Union (Invasive Alien Species) Regulations 2024. The locations of these invasive species are displayed in

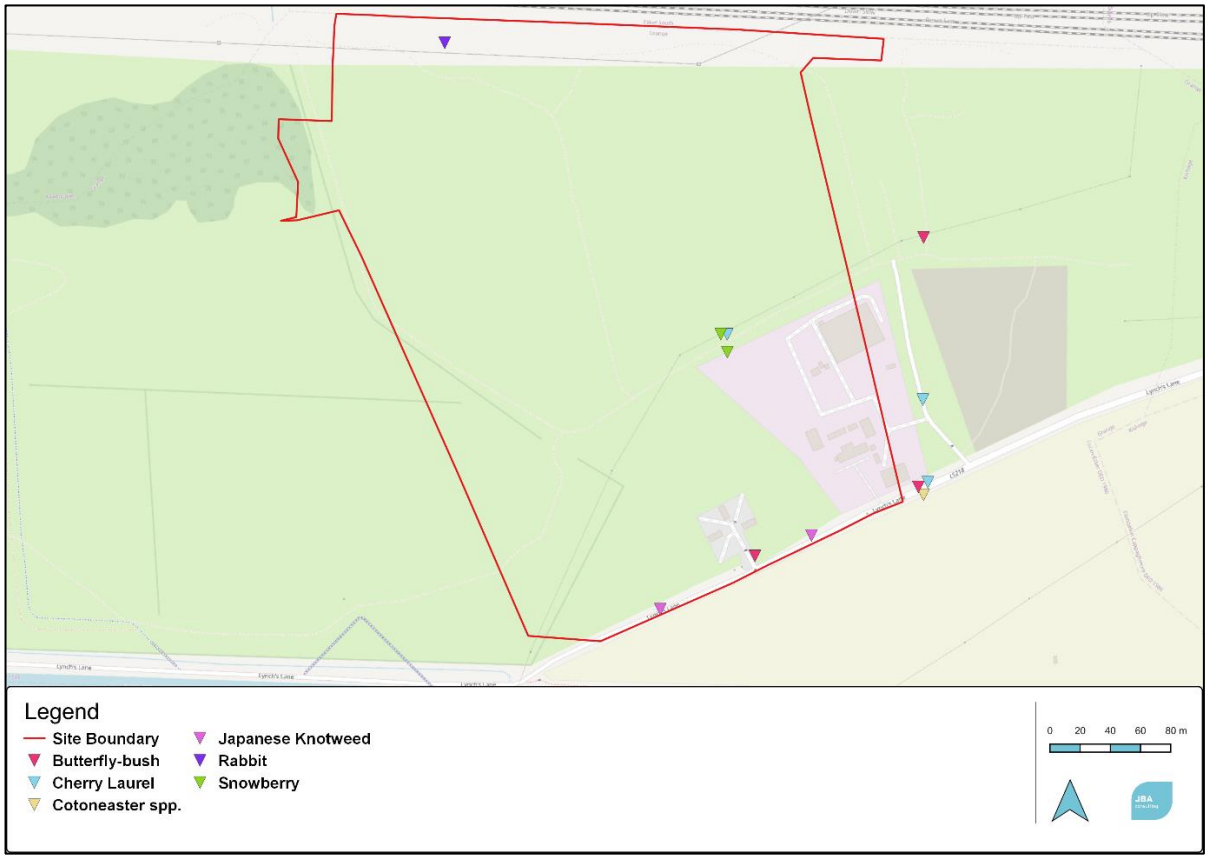

Figure **6-28**.

Invasive Non-Native Species	Impact	S.I. No. 374/2024
Butterfly-bush *Buddleja davidii*	Medium	No
Cherry Laurel *Prunus laurocerasus*	High	No
Cotoneaster spp.	Medium	No
Eastern Grey Squirrel *Sciurus carolinensis*	High	Yes
European Rabbit *Oryctolagus cuniculus*	Medium	No
Japanese Knotweed *Reynoutria japonica*	High	Yes
Snowberry *Symphoricarpos albus*	Low	No

Table 6-23: INNS recorded within or adjacent to Site 4

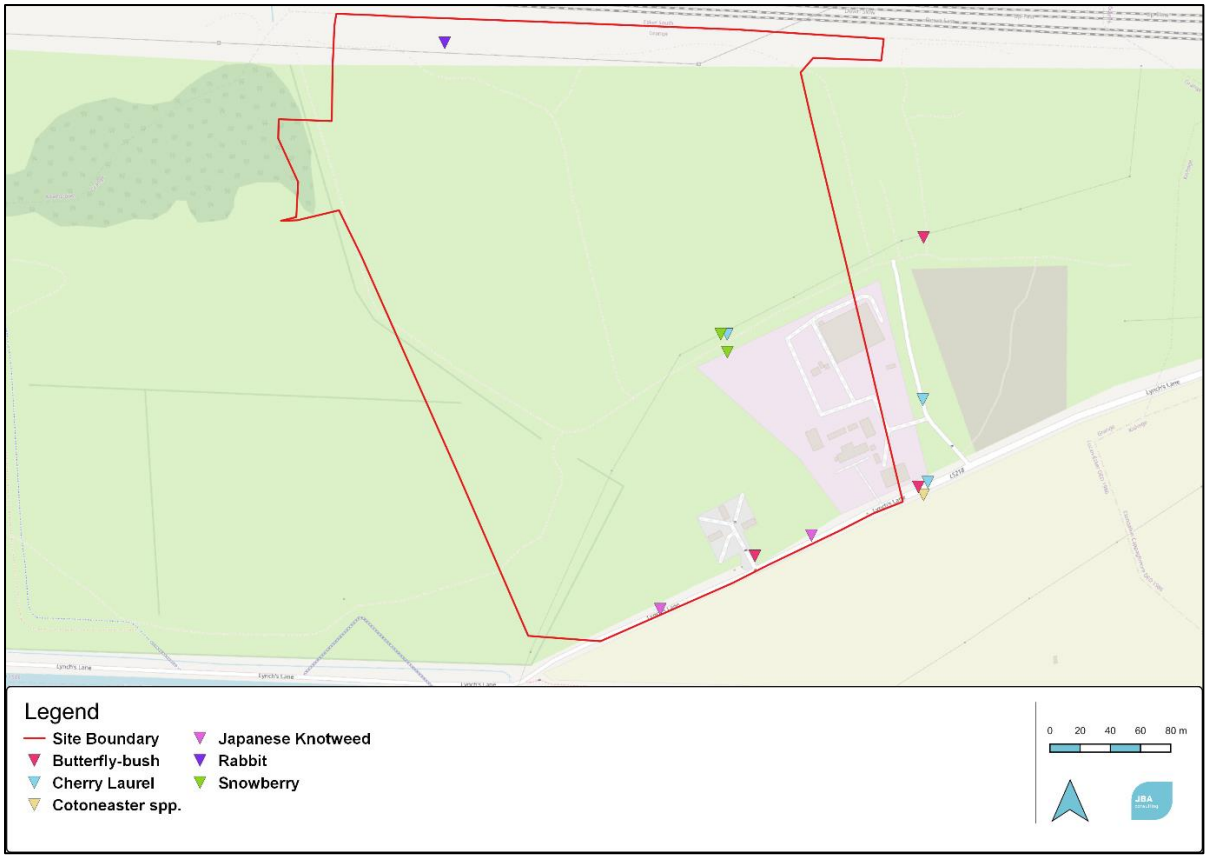

Figure 6-28: Invasive non-native species recorded within and/or adjacent to Site 4 (OSM, 2025)

6.5.4 Proposed Development – Site 5

6.5.4.1 Habitats

Habitats recorded during the initial ecological walkover and subsequent habitat surveys are listed in Table 6-24 below and are presented in detail in the following sub-sections. Other species noted in other surveys, but associated with the habitats are also detailed. A habitat map is seen in Figure 6-29. Site 5 is split into a north section and a south section. The habitat map shows 3 subsites for Site 5, one north of the main road (Thomas Omer Way), and two smaller sites south of the road The north section contains an area predominantly of meadow grasses, with the Carline Learning Centre to the west, and housing estates to the north. The south section contains an area of derelict housing, and an area with low vegetation coverage near to an existing electrical pylon. Between the north and south section is the main roadway and paths that segregate the two sections of Site 5.

Fossitt Habitat	Fossitt Code
Flower beds and borders	BC4
Buildings and artificial surfaces	BL3
Bare ground	ED2
Recolonising bare ground	ED3
Drainage ditches	FW4
Amenity grassland (improved)	GA2
Dry meadows and grassy verges	GS2
(Mixed) broadleaved woodland	WD1
Scattered trees and parkland	WD5
Hedgerow	WL1
Treelines	WL2
Scrub	WS1
Ornamental / non-native shrub	WS3

Table 6-24: List of habitats (Fossitt Classification) recorded on site

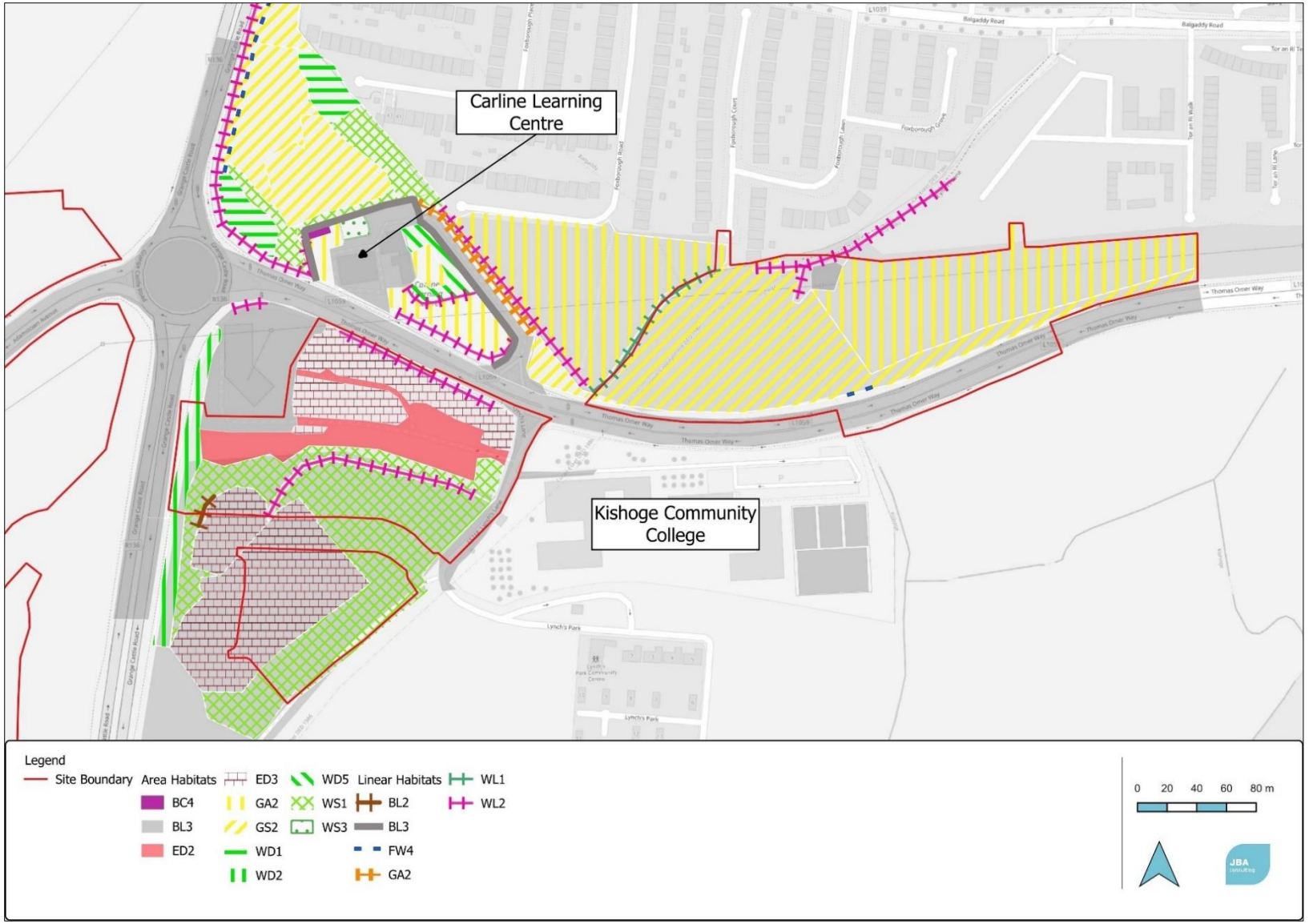

Figure 6-29: Map of habitats recorded in Site 5 (OSM, 2025)

Flower beds and borders (BC4)

A small flower bed section is located within the area of the Carline Learning Centre, to the west of the Site 5 boundary. This habitat had no native species present.

In the context of the site and the lands adjacent, this habitat is considered to be of less than local ecological importance due to the small size and ornamental nature of the plants within the habitat.

Buildings and other artificial surfaces (BL3)

With Site 5 being split into north and south sections, there is a major road that runs in between the sections, in addition to the buildings and pathways that are in the vicinity. These roads and pathways did not have any vegetative species growing in them. The buildings of the area did not have any bat roosting or bird nesting features present within them either.

In the context of the site and the lands immediately adjacent, this habitat type is considered to be of less than local ecological importance given its lack of ecological resources available.

Spoil and bare ground (ED2)

The area surrounding the pylon in the southern section of Site 5 had areas of cleared ground for roadway access to the location and for material storage. Due to the fencing and obstructions in the way, these areas could not be thoroughly surveyed. Given the visual appearance of this section of the site (**Figure 6-30**), it is not anticipated that there were any ecological features of note present.

This habitat is considered to be of less than local ecological importance, given its overall absence of features of ecological note present.

Figure 6-30: The cleared construction land in the southern section of Site 5

Recolonising bare ground (ED3)

Areas near to the pylon and to the derelict buildings in the southern section of Site 5 have begun to be recolonised after previously being cleared. Species include Spear Thistle, Field Mustard *Brassica rapa*, Butterfly Bush, Broad-leaved Dock, Ribwort Plantain, Rosebay Willowherb, Rough Hawkbit, Teasel, Creeping Cinquefoil.

Surveyors observed Blackbird, Robin, Herring Gull and invasive European Rabbit utilising this recolonising habitat.

Figure 6-31: Example of recolonising bare ground habitat found in Site 5

This habitat is considered to be of less than local ecological importance given its overall low availability of vegetative communities and the overall low source of resources for invertebrates or other faunal groups.

Drainage ditches (FW4)

There was one drainage ditch located within the northern section of Site 5, located along the south of this section of the Site. This drainage ditch was dry at the time of surveying and is culverted under the main body of this section of the site.

A second drainage ditch at the north western boundary of Site 5 has been colonised by Great Willowherb, False Oat-grass, Common Nettle, Creeping Cinquefoil, Common Couch *Elymus repens*, Vetch *Vicia* spp., Brome *Bromus* spp. and Meadow Fox-tail.

Figure 6-32: Drainage ditch recorded on Site 5

This habitat is considered to be of low local ecological importance given its capacity to act as a partially sheltered, short wildlife corridor for local fauna.

Amenity grassland (improved) (GA2)

The east of the northern section of Site 5 is currently a large area of amenity grassland, with no notable species present. Outside of the site boundary, west of the north section of Site 5, another area of amenity grassland exists between Site 5 and an existing house estate to the north. There are additional small sections of amenity grassland within lands surrounding the Learning Centre to the west of Site 5. These sections are heavily mown and have no species of ecological value.

The ecological surveyors noted the presence Starling, Chaffinch, Song Thrush, Collared Dove, Great Tit and Wren within the amenity grasslands.

This habitat is considered to be of less than local ecological importance due to the heavily managed nature and lack of flowering species.

Dry meadows and grassy verges (GS2)

The north section of Site 5 is predominantly a meadow area that in some places is developing towards scrub due to low maintenance. The species in this habitat include; Brome spp., Rosebay Willowherb, False Oat-grass, Common Bent *Agrostis capillaris*, Creeping Bent *Agrostis stolonifera*, Common Couch, Red Fescue *Festuca rubr*a, Bush Vetch, Herb Robert, Crested Dogs-tail *Cynosurus cristatus*, Perennial Ryegrass, Meadow Foxtail, Yorkshire Fog, Meadow Buttercup, Creeping Buttercup, Dandelion spp., Hedge Bindweed, Timothy-grass *Phleum pratense*, Ribwort Plantain, Red Clover, Creeping Cinquefoil, Silverweed, Red Bartsia, Common Poppy *Papaver rhoes*, Field Mustard, Common Nettle, Cock's-foot, Groundsel, Hogweed and Smooth Hawksbeard *Crepis capillaris*.

Fauna recorded within the dry meadow included Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Brandt's *Myotis brandti* or Whiskered Bat *Myotis mystacinus*, Stonechat, Starling, Blackbird, Meadow Pipit, Wren, Song Thrush, Bullfinch, Reed Bunting, Linnet, Goldfinch, Dunnock Chaffinch, Willow Warbler, House Sparrow, White-tailed Bumblebee, Common Carder-bee, 7-spot Ladybird, Brown Hawker and invasive European Rabbit utilising this habitat.

This habitat extends west of the boundary of Site 5 and behind the Learning Centre, with a continuation of the existing species and a higher succession of the habitat into a scrubland.

This habitat is considered to be of high local ecological importance given the availability of foraging, commuting and nesting resources for local faunal populations.

Figure 6-33: Dry meadow habitat within Site 5

(Mixed) broadleaved woodland (WD1)

There are some small areas of establishing mixed broadleaved woodland located north-west of the boundary of the northern part of Site 5. While this section is beyond the footprint of the development, it has been included in this project's assessment as it is in within close proximity to the site. This area is dominated by Hawthorn, Ash and Goat Willow, with thick Ivy cover on the trees and an understorey of mostly Bramble.

Fauna noted utilising this mixed woodland habitat include Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Rook, Long-tailed Tit, Hooded Crow, Willow Warbler, Jackdaw, Blackbird and Robin.

In the context of Site 5 and its surrounds, this habitat is considered to be of high local ecological importance given its capacity to provide refuge, foraging and nesting opportunities.

Mixed broadleaved / conifer woodland (WD2)

A woodland strip along the western boundary of the site, species within this habitat include Scot's Pine, Ash, Hawthorn, Goat Willow, Wild Cherry, Silver Birch, Alder and an understorey dominated by Bramble.

Surveyors noted the utilisation of this woodland habitat by Hooded Crow, Jackdaw, Blackbird and Robin.

This habitat is considered to be of high local ecological importance given its value as an ecological wildlife corridor and its capacity to provide refuge, foraging and nesting opportunities .

Scattered trees and parkland (WD5)

There is a section of scattered trees within the grassland areas of the Learning Centre to the west of the site. Tree species include Ash, Beech *Fagus sylvatica* and Alder. While this section is beyond the footprint of the development, it has been included in this project's assessment as it is in within close proximity to the site.

This habitat is considered to be of low local ecological importance given its restricted size and ability to support nesting birds.

Hedgerows (WL1)

Hedgerows are located along the western boundary of the north section of the site. Species in the hedgerow include Guelder Rose *Viburnum opulus*, Field Maple *Acer campestre*, Ash and invasive Butterfly-bush.

Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Starling, Wood Pigeon, Blue Tit, Wren and Song Thrush were recorded utilising the hedgerow habitat along the north-western boundary.

This habitat is considered to be of high local ecological importance, acting as an ecological corridor as well as providing foraging and refuge potential for local fauna.

Treelines (WL2)

Various treelines of varying maturity were recorded throughout the site, one borders an area of scrub on the southern edge of the site. Species within the treelines include Wild Cherry, Pedunculate Oak, Ash, Silver Birch, Alder, Scots Pine, Hazel, Hawthorn, Goat Willow, Red Cedar *Thuja plicata* and Holly. The understorey of the treeline includes Hairy Willowherb, Broad-leaved dock, White Clover, Herb Robert, Yarrow, Bramble and Ivy.

Numerous faunal species were recorded utilising the treelines throughout Site 5, namely Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Blue Tit, Goldfinch, Wren, Wood Pigeon, Great Tit, Chaffinch, Blackbird, Starling, Blackcap, Song Thrush, Stonechat and White-tailed Bumblebee.

This habitat is considered to be of high local ecological importance; it has value as an ecological corridor and provides foraging and refuge potential for local fauna.

Scrub (WS1)

There are dense patches of scrub in the southern area of Site 5 (Figure 6-34), and some transitional scrubby patches within the meadow areas in the north. These scrubby patches mostly consist of Butterfly-bush, while there is also some Hawthorn, Goat Willow and Bramble throughout with large stands of Rosebay Willowherb and False Oat-grass.

Surveyors recorded the numerous bat, bird and invertebrate species utilising the scrub habitats within Site 5, namely Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Brandt's or Whiskered Bat, Blue Tit, Great Tit, House Sparrow, Bullfinch, Wren, Goldcrest, Chaffinch, Collared Dove, Blackbird, Magpie, Robin, Willow Warbler, Barn Swallow *Hirundo rustica*, Stonechat, Common Carder-bee, White-tailed Bumblebee and Large White.

This habitat is considered to be of high local ecological importance, providing foraging and shelter for local bird, mammal and terrestrial invertebrate populations.

Figure 6-34: Scrub amongst the meadow habitat within Site 5

Ornamental / non-native shrub (WS3)

There is a small area of planted ornamental species within the Learning Centre boundary. Planted species within this area include Elm *Ulmus glabra*, Turkey Oak *Quercus cerris* and Red Cedar.

This habit is considered to be of less than local ecological importance in the context of the size and surrounding area given the low cover of native species and the overall low area of the habitat.

6.5.4.2 Rare & Protected Flora

NBDC records

There are no records of rare or protected floral species within the area of Site 5 or the lands immediately adjacent.

On-site Surveys

No floral species of note were recorded on or adjacent to the site during the habitat and protected flora species surveys.

6.5.4.3 Rare & Protected Fauna

Mammals

Badger

No signs of Badger were recorded on-site during the surveys of site 5 and nor are there any past records (NBDC, 2025) of Badger being present within or adjacent to Site 5, over the last 10 years.

Site 5 is considered to be of low local ecological importance due to the presence of suitable foraging and commuting habitat for Badger, and their known presence within Site 3 and Site 4.

Pine Marten

No signs of Pine Marten individuals or habitation were recorded within Site 5 during the mammal surveys. However, the woodland patches and strips provide potential foraging, commuting and refuge for local Pine Marten; and given the recent recording (NBDC, 2025) of a Pine Marten

individual, approximately 1.3m south-west of Site 5, there is the potential for Pine Marten to establish commuting routes through Site 5's western woodland strip.

Site 5 is considered to be of low local ecological importance for Pine Marten as the site provides an arboreal commuting habitat.

Irish Stoat

No Irish Stoat individuals nor signs of habitation were recorded within Site 5 during the mammal surveys. However, the site contains its favoured prey item, European Rabbit; and given the recent recording (NBDC, 2025) of an Irish Stoat individual within 100m of Site 3's western border, there is the potential for Irish Stoat commuting to Site 5 to hunt for prey.

Therefore, Site 5 is considered to be of high local ecological importance for Irish Stoat as the site provides its favoured prey.

Hedgehog

Signs of Hedgehog were not recorded during the surveys of Site 5. The site may occasionally be used by Hedgehog for commuting and foraging due to the suitability of the site; there have been records of Hedgehog on NBDC within 2km of the site in the last 10 years.

Site 5 is considered to be of high local ecological importance due to the suitability of the site for commuting, forage and refuge potential for local Hedgehog populations.

Pygmy Shrew

Signs of Pygmy Shrew individuals or habitation were not recorded during the surveys. However, NBDC records have placed Pygmy Shrew within the vicinity of Site 4, indicating that Site 5 may also be occasionally utilised by Pygmy Shrew.

Site 5 is considered to be of high local ecological importance for Pygmy Shrew as the site provides habitat valuable foraging, commuting and nesting resources.

Bats

Three bat transect activity surveys were carried out during the summer of 2023, with only Common Pipistrelle being recorded foraging and commuting through the site. Overall, bat activity during the surveys was low.

A series of bat static detector surveys were installed within the treeline habitats present within Site 5, in order to gauge the activity frequency of bat species within the site. These static detectors were deployed during the 2022 and 2023 summer-early autumn activity periods.

Species	26/08	27/08	28/08	29/08	30/08	31/08	Total
Common Pipistrelle	8	12	12	7	11	12	62
Leisler's Bat	1	1	1	1	1	0	5
Soprano Pipistrelle	6	4	1	3	8	2	24
Total	15	17	14	11	20	14	91

Table 6-25: Bat Static results for site 5 from 26th August and 31st August 2022

Species	01/09	02/09	03/09	04/09	05/09	06/09	Total
Common Pipistrelle	25	27	4	17	31	14	118
Leisler's Bat	0	0	0	1	6	0	7
Soprano Pipistrelle	8	3	1	4	6	5	27

Total	33	30	5	22	43	19	152

Table 6-26: Bat Static results for site 5 from 1st September to 6th September 2022

Species	09/05	10/05	11/05	12/05	13/05	14/05	15/05	Total
Common Pipistrelle	0	1	1	1	3	2	4	12
Leisler's Bat	1	1	5	0	3	2	1	13
Soprano Pipistrelle	0	0	1	0	0	0	0	1
Total	1	2	7	1	6	4	5	26

Table 6-27: Bat Static results for site 5 from 9th May 2023 to 15th May 2023

Species	21/06	22/06	23/06	24/06	25/06	26/06	27/06	28/06	Total
Common Pipistrelle	0	38	3	31	4	6	9	5	96
Leisler's Bat	0	43	12	20	6	15	17	0	113
Soprano Pipistrelle	0	20	2	9	0	18	3	0	52
Total	0	101	17	60	10	39	29	5	261

Table 6-28: Bat Static results for site 5 from 21st June 2023 to 28th June 2023

Species	16/05	17/05	18/05	19/05	20/05	21/05	22/05	Total
Common Pipistrelle	1	5	0	4	4	1	7	22
Leisler's Bat	0	4	0	5	2	1	11	23
Soprano Pipistrelle	0	3	0	2	2	1	5	13
Brandt / Whiskered Bat	0	1	0	0	0	0	0	1
Total	1	13	0	11	8	3	23	59

Table 6-29: Bat Static results for site 5 from 16th August 2023 to 22nd August 2023

Overall, site 5 is considered to be of high local ecological importance for bat populations. Although the level of activity recorded on site was relatively low, the potential for foraging within the habitats present is high. The site is also a valuable ecological corridor. As it is surrounded by built up areas which are subject to light pollution, local bat populations may use the site to navigate between these built-up areas and avoid the associated lighting.

Wintering Birds

The results of the six wintering bird surveys are detailed below. Three were conducted between December 2022 and February 2023, with an additional three surveys conducted between December 2024 and February 2025; as well as incidental recordings during follow-up site visits, which took place during the wintering bird season.

The green-listed wintering birds recorded in Site 5 across the two winter periods included Blue Tit, Stonechat, Robin, Jackdaw, Magpie, Starling, Hooded Crow, Wood Pigeon, Goldfinch, Blackbird, House Sparrow, Pied Wagtail, and Wren. Herring Gull was the wintering bird species of conservation concern (Amber-listed) recorded within Site 5.

Site 5 is considered to be of low local ecological importance for wintering birds due to the low frequency of migrant wintering birds that was observed during the wintering bird surveys.

Breeding Birds

The results of the breeding bird surveys, three in total, conducted between April and June 2023, are presented in summary below. Table 6-30 provides a summary of the findings of the breeding bird surveys with respect to those species which are of conservation concern and are considered to be KERs.

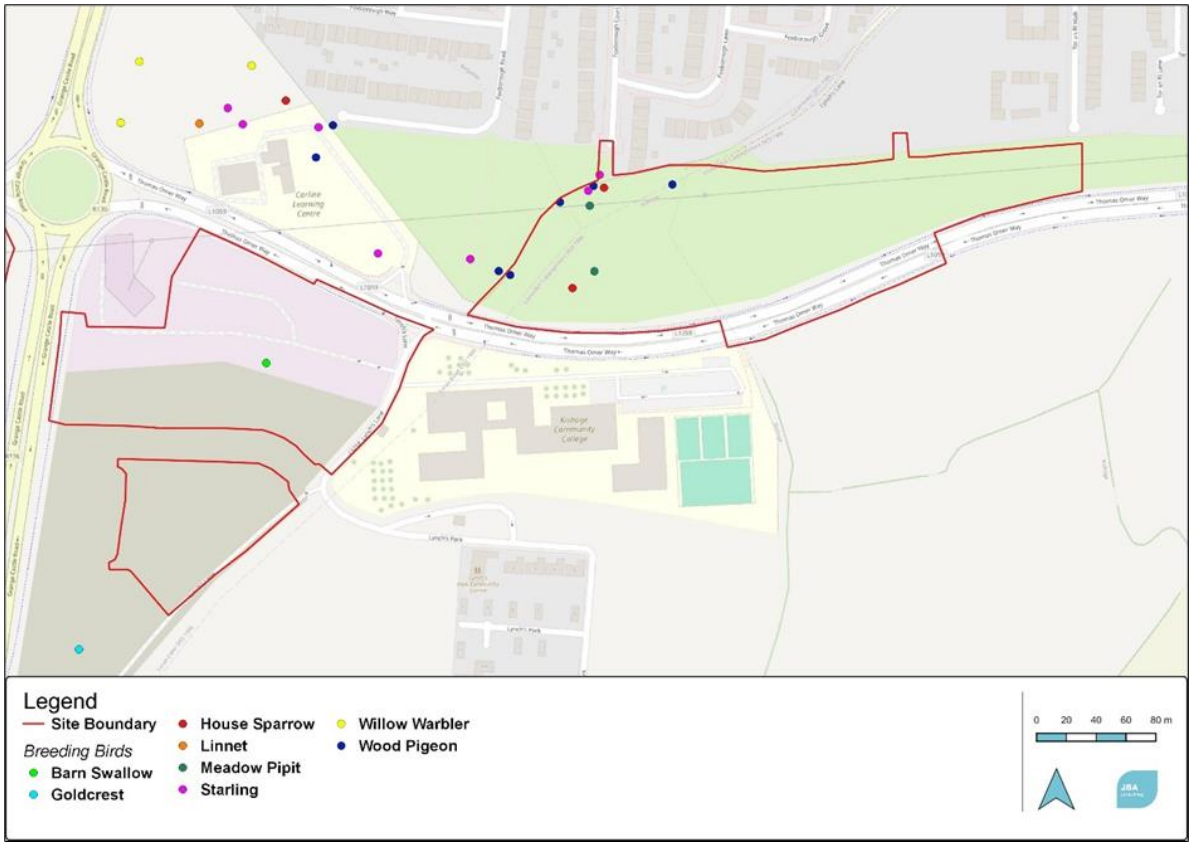

Figure 6-35: Protected and/or breeding birds of conservation concern recorded within Site 5 (OSM, 2025)

Bird Species	Annex (EU Birds Directive)	SCI Species of SPA	BoCCI – Breeding (B) & Breeding / Wintering (B/W)
Barn Swallow *Hirundo rustica*	N/A	N/A	Amber (B)
House Sparrow *Passer domesticus*	N/A	N/A	Amber (B)
Goldcrest *Regulus regulus*	N/A	N/A	Amber (B)
Linnet *Linaria cannabina*	N/A	N/A	Amber (B)
Meadow Pipit *Anthus pratensis*	N/A	N/A	Red (B)
Starling *Sturnus vulgaris*	N/A	N/A	Amber (B)
Willow Warbler *Phylloscopus trochilus*	N/A	N/A	Amber (B)
Wood Pigeon *Columba palumbus*	II & III	N/A	Green-listed

Table 6-30: Breeding bird species of conservation concern recorded during surveys on Site 5

The green-listed breeding birds recorded in site 4 include Blackbird, Blackcap, Blue Tit, Bullfinch, Chaffinch, Collared Dover, Dunnock, Goldfinch, Great Tit, Jackdaw, Long-tailed Tit, Magpie, Reed Bunting, Robin, Rook, Song Thrush, Stonechat, and Wren.

The proposed site is considered to be of high local ecological importance for breeding birds, due to the presence of birds of conservation concern in notable populations and the presence of potential foraging and breeding grounds for species of conservation concern.

Amphibians

Common Frog

Although no Common Frog was recorded on-site during the surveys, there are suitable habitats present for hibernation, refuge and foraging.

Therefore, Site 5 is considered to be of low local ecological importance for Common Frog given the presence of some suitable habitats within the site.

Terrestrial Invertebrates

During the terrestrial invertebrates surveys White-tailed Bumblebee, Common Carder-bee, 7-spot Ladybird, Large White and Brown Hawker were recorded. NBDC records also notes Migrant Hawker and the invasive Oak Processionary Moth *Thaumetopoea processionea* were recorded within 1km of Site 5. The habitats on site provide suitable foraging, refuge and commuting habitat for terrestrial invertebrates.

Site 5 is considered to be of high local ecological importance given availability of forage, refuge and commuting habitats for these invertebrate species.

6.5.4.4 Invasive Non-native Species

Table 6-31 below provides a list of invasive non-native species recorded during the ecological surveys. It includes species, their level of impact, and whether they are listed on the First and/or Second Schedule of S.I. No. 374/2024 - European Union (Invasive Alien Species) Regulations 2024.

Invasive Non-Native Species	Impact	S.I. No. 374/2024
European Rabbit *Oryctolagus cuniculus*	Medium	No
Butterfly-bush *Buddleja davidii*	Medium	No

Table 6-31: INNS recorded within or adjacent to Site 5's boundary

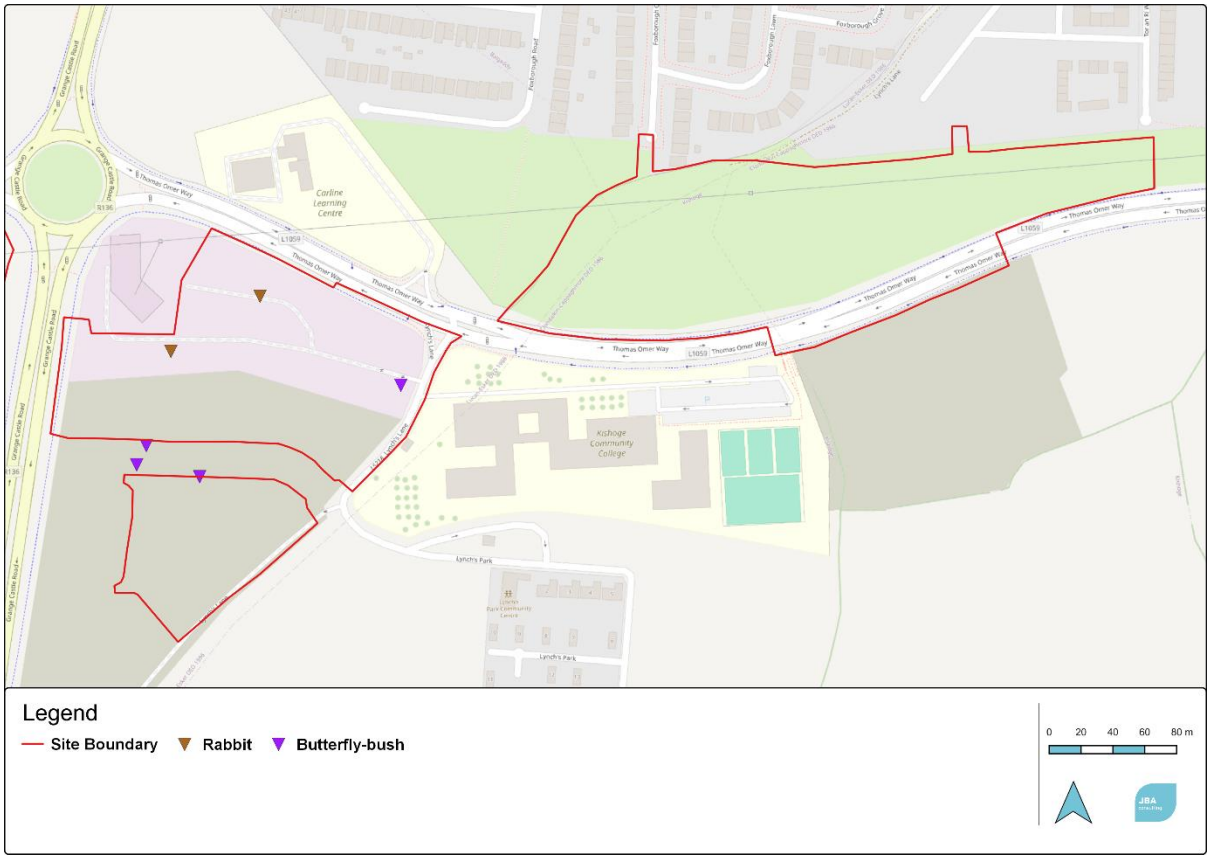

Figure 6-36: Map of invasive species recorded during the surveys of Site 5 (OSM, 2025)

6.5.5 Summary of Ecological Valuation and Rationale for Inclusion and Exclusion within the Impact Assessment

The KERs identified during the desktop study and ecological survey are given in Table 6-32. Sites and features screened out are not considered further in this assessment. Ecological features carried forward are assessed for potential impact during construction and operation in the following sections.

Designated Sites / Habitats / Flora & Fauna (KERs)	Valuation	Site 3	Site 4	Site 5
North Dublin Bay SAC [000206]	International	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Excluded from impact assessment: - Distance from proposed site	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
North Bull Island SPA [004006]	International	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Excluded from impact assessment: - Distance from proposed site	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
South Dublin Bay SAC [000210]	International	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Excluded from impact assessment: - Distance from proposed site	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
South Dublin Bay and River Tolka Estuary SPA [004024]	International	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Excluded from impact assessment: - Distance from proposed site	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
North-West Irish Sea SPA [004236]	International	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Excluded from impact assessment: - Distance from proposed site	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
Grand Canal pNHA [002104]	National	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Included within impact assessment: - Northern boundary of pNHA located 22m south of Site 4, placing the pNHA within the air and disturbance impact buffers (ZoI) - Designated site of national ecological importance	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
Liffey Valley pNHA [000128]	National	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Included within impact assessment: - Located 3.35km downstream of Site 4, via the Kilmahuddrick Stream and River Griffeen - Designated site of national ecological importance	Excluded from impact assessment: - Distance from proposed site - No hydrological connection

Designated Sites / Habitats / Flora & Fauna (KERs)	Valuation	Site 3	Site 4	Site 5
Dolphins, Dublin Docks pNHA [000201]	National	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Excluded from impact assessment: - Distance from proposed site	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
North Dublin Bay pNHA [000206]	National	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Excluded from impact assessment: - Distance from proposed site	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
South Dublin Bay pNHA [(000210]	National	Excluded from impact assessment: - Distance from proposed site - No hydrological connection	Excluded from impact assessment: - Distance from proposed site	Excluded from impact assessment: - Distance from proposed site - No hydrological connection
Flower beds and borders	Less than Local	Excluded from impact assessment: - Low ecological value	Excluded from impact assessment: - Low ecological value	Excluded from impact assessment: - Low ecological value
Buildings and artificial surfaces	Less than Local	Excluded from impact assessment: - No ecological value	Excluded from impact assessment: - No ecological value	Excluded from impact assessment: - No ecological value
Bare ground	Less than Local	Excluded from impact assessment: - No ecological value	Excluded from impact assessment: - No ecological value	Excluded from impact assessment: - No ecological value
Recolonising bare ground	High Local (Site 3) Less than Local (Site 4 & 5)	Included within impact assessment: - To be significantly altered for proposed development	Excluded from impact assessment: - Very limited ecological value	Included within impact assessment: - To be significantly altered for proposed development
Reed and large sedge swamps	High Local	Included within impact assessment: - Adjacent habitat present within the ZoI impact pathways buffers of Site 3	Included within impact assessment: - Associated with the Grand Canal pNHA - High local ecological importance for local wildlife	Included within impact assessment: - Habitat present in Site 3 is within Site 5's air impact pathway buffer (ZoI)
Eroding / upland rivers (Kilmahuddrick Stream)	County	Included within impact assessment: - Habitat present within Site 3's air impact pathway buffer (ZoI)	Included within impact assessment: - County level ecological impact - Hydrological connection to the River Griffeen and Liffey Valley pNHA	Excluded within impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers
Canals (Grand Canal)	National	Excluded from impact assessment: - Not present within any of Site 3's ZoI impact pathways buffers	Included within impact assessment: - 35m south of Site 4, placing habitat within the air and disturbance impact	Excluded from impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers

Designated Sites / Habitats / Flora & Fauna (KERs)	Valuation	Site 3	Site 4	Site 5
			buffers (ZoI) - Designated site of national ecological importance	
Drainage ditches	High Local (Site 4) Low Local (Site 3 & 5)	Included within impact assessment: - Local ecological importance for local wildlife	Included within impact assessment: - High local ecological importance for local wildlife - Hydrological connection to the Kilmahuddrick Stream, River Griffeen and Liffey Valley pNHA	Included within impact assessment: - Local ecological importance for local wildlife
Improved agricultural grassland	Less than Local	Excluded from impact assessment: - Low ecological value	Excluded from impact assessment: - Low ecological value	Excluded from impact assessment: - Low ecological value
Amenity grassland (improved)	Less than Local	Excluded from impact assessment: - Low ecological value	Excluded from impact assessment: - Low ecological value	Excluded from impact assessment: - Low ecological value
Marsh	High Local	Excluded from impact assessment: - Not present within any of Site 3's ZoI impact pathways buffers	Included within impact assessment: - High local ecological importance for local wildlife	Excluded from impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers
Dry meadow and grassy verges	High Local	Included within impact assessment: - High local ecological importance for local wildlife	Included within impact assessment: - High local ecological importance for local wildlife	Included within impact assessment: - High local ecological importance for local wildlife
Dry meadows and grassy verges / Scrub mosaic	High Local	Included within impact assessment: - Habitat present within Site 4, and the air impact buffer of Site 3's ZoI	Included within impact assessment: - High local ecological importance for local wildlife	Excluded from impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers
(Mixed) broadleaved woodland	High Local	Included within impact assessment: - High local ecological importance for local wildlife	Included within impact assessment: - High local ecological importance for local wildlife	Included within impact assessment: - Habitat present within locality, and the air impact buffer of Site 5's ZoI
Mixed broadleaved / conifer woodland	High Local	Included within impact assessment: - High local ecological importance for local wildlife	Excluded from impact assessment: - Not present within any of Site 4's ZoI impact pathways buffers	Included within impact assessment: - High local ecological importance for local wildlife
Scattered trees and parkland	Low Local	Included within impact assessment: - Habitat present within Site 3's air impact pathway buffer (ZoI)	Excluded from impact assessment: - Not present within any of Site 4's ZoI impact pathways buffers	Included within impact assessment: - Habitat present within Site 5's air impact pathway buffer (ZoI)
Hedgerows	High Local	Included within impact assessment:	Included within impact assessment:	Included within impact assessment:

Designated Sites / Habitats / Flora & Fauna (KERs)	Valuation	Site 3	Site 4	Site 5
		- Habitat present within Site 3's air impact pathway buffer (ZoI)	- High local ecological importance for local wildlife	- Within the footprint of the site
Treelines	High Local	Included within impact assessment: - High local ecological importance for local wildlife	Included within impact assessment: - High local ecological importance for local wildlife	Included within impact assessment: - High local ecological importance for local wildlife
Wet willow-alder-ash woodland	High Local	Excluded from impact assessment: - Not present within any of Site 3's ZoI impact pathways buffers	Included within impact assessment: - High local ecological importance for local wildlife	Excluded from impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers
Scrub	High Local	Included within impact assessment: - High local ecological importance for local wildlife - Supports uncommon and red-listed flora	Included within impact assessment: - High local ecological importance for local wildlife	Included within impact assessment: - High local ecological importance for local wildlife
Immature woodland	High Local	Excluded from impact assessment: - Not present within any of Site 3's ZoI impact pathways buffers	Included within impact assessment: - High local ecological importance for local wildlife	Excluded from impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers
Ornamental / non-native shrub	Less than Local	Excluded from impact assessment: - Low ecological value	Excluded from impact assessment: - Not present within any of Site 4's ZoI impact pathways buffers	Excluded from impact assessment: - Low ecological value
Rare & Protected Flora	National High Local	Included within impact assessment: - Uncommon and Red-listed flora species	Included within impact assessment: - Uncommon and Red-listed floral species	Excluded from impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers
Badger	High Local (Sites 3 & 4) Low Local (Site 5)	Included within impact assessment: - Local Badger population utilises Site 3 for commuting and foraging	Included within impact assessment: - Local Badger population utilises Site 4 for commuting and foraging	Included within impact assessment: - Local Badger population utilises Site 5 for commuting and foraging
Otter	County	Excluded from impact assessment: - Not present within any of Site 3's ZoI impact pathways buffers	Included within impact assessment: - The on-site stream, drainage ditches and adjacent Grand Canal all provide foraging and commuting corridors for the local Otter population	Excluded from impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers
Pine Marten	High Local	Included within impact assessment:	Included within impact assessment:	Included within impact assessment:

Designated Sites / Habitats / Flora & Fauna (KERs)	Valuation	Site 3	Site 4	Site 5
	(Sites 3 & 4) Low Local (Site 5)	- A range of habitats and prey species within Site 3 are suitable for the local Pine Marten population	- A range of habitats and prey species within Site 4 are suitable for the local Pine Marten population	- A range of habitats and prey species within Site 5 are suitable for the local Pine Marten population
Irish Stoat	High Local	Included within impact assessment: - A range of habitats and prey species within Site 3 are suitable for the local Irish Stoat population	Included within impact assessment: - A range of habitats and prey species within Site 4 are suitable for the local Irish Stoat population	Included within impact assessment: - A range of habitats and prey species within Site 5 are suitable for the local Irish Stoat population
Hedgehog	High Local	Included within impact assessment: - A range of habitats within Site 3 are suitable for the commuting, foraging and hibernation of the local Hedgehog population	Included within impact assessment: - A range of habitats within Site 4 are suitable for the commuting, foraging and hibernation of the local Hedgehog population	Included within impact assessment: - A range of habitats within Site 5 are suitable for the commuting, foraging and hibernation of the local Hedgehog population
Pygmy Shrew	High Local	Included within impact assessment: - A range of habitats within Site 3 are suitable for refuge, commuting, foraging of the local Pygmy Shrew population	Included within impact assessment: - A range of habitats within Site 4 are suitable for refuge, commuting, foraging of the local Pygmy Shrew population	Included within impact assessment: - A range of habitats within Site 5 are suitable for refuge, commuting, foraging of the local Pygmy Shrew population
Bats	High Local	Included within impact assessment: - Site 3 is utilised by the local bat populations for commuting and foraging	Included within impact assessment: - Site 4 is utilised by the local bat populations for commuting and foraging	Included within impact assessment: - Site 5 is utilised by the local bat populations for commuting and foraging
Wintering Birds	High Local (Site 3 & 4) Low Local (Site 5)	Included within impact assessment: - Site 3 is utilised by wintering bird species of conservation concern	Included within impact assessment: - Site 4 is utilised by wintering bird species of conservation concern	Included within impact assessment: - Wintering bird species of conservation concern recorded within disturbance impact ZoI of Site 5
Breeding Birds	High Local	Included within impact assessment: - Site 3 is utilised by breeding bird species of conservation concern	Included within impact assessment: - Site 4 is utilised by breeding bird species of conservation concern	Included within impact assessment: - Site 5 is utilised by breeding bird species of conservation concern
Amphibians	High Local (Site 3 & 4) Low Local (Site 5)	Included within impact assessment: - Suitable habitat for Common Frog commuting and foraging within Site 3; and spawning within the impact	Included within impact assessment: - Supports Common Frog commuting, foraging, spawning and hibernation within Site 4	Included within impact assessment: - Suitable habitat for Common Frog commuting and foraging within Site 5

Designated Sites / Habitats / Flora & Fauna (KERs)	Valuation	Site 3	Site 4	Site 5
		ZoI	- Suitable to support the local Smooth Newt population for commuting, foraging, spawning and hibernation	
Fish	County (Atlantic Salmon, Lamprey spp. & European Eel) High Local (Other fish species)	Included within impact assessment: - Kilmahuddrick Stream within Site 3's air impact pathway buffer (ZoI)	Included within impact assessment: - Kilmahuddrick Stream links to protected fish species downstream - Kilmahuddrick Stream is utilised by the local Three-spined Stickleback population	Excluded from impact assessment: - Not present within any of Site 5's ZoI impact pathways buffers
Terrestrial Invertebrates	High Local	Included within impact assessment: - Site 3 supports the Red-listed Gypsy Cuckoo-bee and other terrestrial invertebrate populations	Included within impact assessment: - Site 4 is utilised by a range of terrestrial invertebrates, including pollinator species	Included within impact assessment: - Site 5 is utilised by a range of terrestrial invertebrates, including pollinator species
Freshwater Invertebrates	High Local	Excluded from impact assessment: - No suitable habitat within the site - No connection to habitats associated with these species	Included within impact assessment: - Recorded within the site boundary - Potential to be significantly impacted from proposed development	Excluded from impact assessment: - No suitable habitat within the site - No connection to habitats associated with these species
Invasive Non-native Species	N/A	Must be examined further in the assessment for biosecurity / mitigation purposes	Must be examined further in the assessment for biosecurity / mitigation purposes	Must be examined further in the assessment for biosecurity / mitigation purposes

Table 6-32: Summary of KER valuations and rationale for inclusion and exclusion within the impact assessment

6.6.1 Cumulative Impacts

As part of the impact assessment process, in addition to the proposed works, other relevant projects and plans in the region that may induce cumulative impacts must also be considered.

The following projects or plans were identified as potential sources of cumulative impacts:

- South Dublin County Development Plan 2022-2028;
- Greater Dublin Drainage Strategy 2005;
- Transport Strategy for Greater Dublin Area 2022-2042;
- Third Cycle River Basin Management Plan for Ireland 2022-2027; and
- Planning Applications (retrieved from Data.gov.ie – Planning Application Sites).

6.6.2 Plans

6.6.2.1 South Dublin County Development Plan 2022-2028

The proposed development is in line with the South Dublin County Development Plan 2022-2028. It is an objective of the Plan to ensure that all development within the County conforms to key design principles which include the promotion of sustainable energy and environmental services. These goals include the requirement that the planning system will 'be responsive to our national environmental challenges and ensure that development occurs within environmental limits, having regard to the requirements of all relevant environmental legislation and the sustainable management of our natural capital'.

The Plan also aims to protect and enhance surface water quality, to support, improve and protect Natura 2000 sites, and to develop an integrated Green Infrastructure network to enhance biodiversity, provide accessible parks, open spaces and recreational facilities (SDCC, 2022a). The plan also states that work will be in conjunction with Irish Water to protect existing water and drainage infrastructure, to promote investments aiming to support environmental protection and facilitate the sustainable growth of the county.

A Screening for Appropriate Assessment was carried out on the plan, which concluded that an Appropriate Assessment was necessary for this project. The associated Natura Impact Report concluded that there are no likely significant direct, indirect or secondary impacts of the project on any Natura 2000 sites (SDCC, 2022b).

6.6.2.2 Greater Dublin Drainage Strategy 2005

The Greater Dublin Drainage Strategy sets out the strategic planning for the development of waste water treatment in the Greater Dublin Area in relation to the Ringsend WWTP Upgrade, Greater Dublin Drainage Project and associated wastewater network drainage projects (Irish Water 2018). The Ringsend WWTP Upgrade includes plans to expand the WWTP to its ultimate capacity, together with associated network upgrades required. The Greater Dublin Drainage (GDD) project is planned to relieve both the Ringsend WWTP and network loading by construction of a new WWTP at Clonshaugh, an orbital sewer and provision of an outfall pipe discharging 1km northeast of Ireland's Eye.

The GDD project is strategically important to the Dublin Region in that it will provide capacity for residential and commercial growth and will provide long term sustainable wastewater drainage and treatment for the Greater Dublin Area. The GDD project is necessary to meet the Water Framework Directive (WFD) requirements and other relevant EU Directives and National Regulations related to water quality (Uisce Éireann, 2025).

6.6.2.3 Transport Strategy for Greater Dublin Area 2022-2042 – Natura Impact Statement (CAAS, 2021)

A Stage 2 Appropriate Assessment of the Transport Strategy for the Greater Dublin Area has identified that the implementation of the Strategy has the potential to result in effects to the integrity of 66 Natura 2000 sites, if unmitigated.

The risks to the safeguarding and integrity of the qualifying interests, special conservation interests and conservation objectives of the Natura 2000 sites have been addressed by the inclusion of mitigation measures that will prioritise the avoidance of effects in the first place and mitigate effects where these cannot be avoided. In addition, all lower-level plans and projects arising through the implementation of the Strategy will be subject to the Appropriate Assessment process when further details of design and location are known.

In-combination effects from interactions with other plans and projects were considered in the assessment and the mitigation measures incorporated into the Strategy are seen to be suitably robust to ensure there will be no significant adverse effects as a result of the implementation of the Strategy either alone or in combination with other plans/projects.

6.6.2.4 Third Cycle River Basin Management Plan for Ireland 2022-2027 (DHLGH, 2022)

The first cycle of River Basin Management Plans included the Eastern River Basin District – River Basin Management Plan (ERBDMP) 2009 – 2015 (WFD, 2010). The plans summarised the waterbodies that may not meet the environmental objectives of the WFD by 2015 and identified which pressures are contributing to the environmental objectives not being achieved. The plans described the classification results and identified measures that can be introduced in order to safeguard waters and meet the environmental objectives of the WFD:

- Prevent deterioration of water body status;
- Restore good status to water bodies;
- Achieve protected areas objectives; and
- Reduce chemical pollution of water bodies.

The second cycle River Basin Management Plan (RBMP) for Ireland 2018-2021 sets out the actions that Ireland will take to improve water quality and achieve 'good' ecological status in water bodies (rivers, lakes, estuaries and coastal waters) by 2021 (DHLHG, 2018). A change from previous River Basin Management Plans is that all River Basin Districts are merged as one national River Basin District. The Plan provides a more coordinated framework for improving the quality of our waters – to protect public health, the environment, water amenities and to sustain water-intensive industries, including agri-food and tourism, particularly in rural Ireland.

The third and current cycle aims to build on the initiatives of the second cycle, particularly the governance and implementation structures, and to improve the establishment of Uisce Éireann, An Fóram Uisce, the Local Authority Waters Programme and the Agricultural Sustainability Support and Advisory Programme.

The third cycle draft Catchment Report for Liffey and Dublin Bay Catchment (EPA, 2021) identified that between Cycles 2 and 3 there has been an overall small improvement in the catchment's status. The overall change in quality between Cycles 2 and 3 includes 2 waterbodies that have achieved High Status, which is an increase of one; 56 which achieve Good Status, an increase of four; 23 achieving Moderate Status, a decrease of four; and 24 achieving Poor Status, increase of one between cycles. There are no Bad Status waterbodies as of Cycle 3, which is a decrease of one from Cycle 2. The main significant pressures are aquaculture, anthropogenic, atmospheric, historically polluted sites and waste pressures followed by agriculture, urban run-off and forestry.

6.6.3 Other Projects

Other recently approved and pending application projects are listed overleaf (Table 6-33), which are not retention applications, home extension and/or internal alterations, and have been granted planning permission within the locality of the proposed development.

Application Reg. Ref	Applicant	Development Proposal Summary	Decision	Site 3 ZoI Overlap	Site 4 ZoI Overlap	Site 5 ZoI Overlap
SDZ24A/0032W	Department of Education	The retention and completion of revisions to a section of the northern site boundary comprising the omission of the pedestrian/cycle access off Thomas Omer Way.	At further information stage (requested 24/01/2025)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 4.	Immediately adjacent site boundaries will result in an overlap of all ZoI impact pathways. Potential for cumulative and in-combination impacts with Site 5.
SDZ24A/0033W	Clonburris Infrastructure Limited	Stage 2 Roads – The construction of c. 2.3km of a new Link Street Clonburris Northern Link Street (CNLS) and approximately 800m of side streets. Provision/upgrade of 12 signalised junctions. Approximately 2km of upgrade of existing streets. Provision of 2 main public parks centrally and drainage infrastructure works.	Awaiting decision (Due 10-Feb-2025)	Immediately adjacent site boundaries will result in an overlap of all ZoI impact pathways. Potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 4.	Immediately adjacent site boundaries will result in an overlap of all ZoI impact pathways. Potential for cumulative and in-combination impacts with Site 5.

Application Reg. Ref	Applicant	Development Proposal Summary	Decision	Site 3 ZoI Overlap	Site 4 ZoI Overlap	Site 5 ZoI Overlap
SDZ23A/0043	Cairn Homes Properties Limited	Kishoge Urban Centre- construction of a mixed-use development arranged in 11 no. blocks, ranging between 3 & 7 storeys, comprising: 495 no. residential units, including 449 no. apartments. Additional space for 2,502 sq.m of retail floorspace and 483 sq.m creche	Granted Permission (17-Apr-2024)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 4.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 5.
SDZ23A/0018	Cairn Homes Properties Limited	Clonburris SW- construction of 565 dwellings (mixture of apartments, duplex apartments and houses)	Granted Permission (11-Dec-23)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of disturbance ZoI buffer. Potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 4.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 5.

Application Reg. Ref	Applicant	Development Proposal Summary	Decision	Site 3 ZoI Overlap	Site 4 ZoI Overlap	Site 5 ZoI Overlap
SDZ23A/0004	Clear Real Estate Holdings Limited	Adamstown Extension- 385 dwelling units (139 houses, 70 Build-to Rent duplex / apartments, 72 duplex / apartments and 104 apartments), ranging between two to six storeys in height. This permission was amended under SDZ24A/0018W	Granted Permission (15-Dec-23)	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4, and is adjacent to the River Griffeen; therefore, there is a potential for cumulative and/or in-combination surface water impacts. Underlying aquifer characteristics will likely result in groundwater recharge to local watercourse, i.e., River Griffeen; therefore, there is a potential for cumulative and/or in-combination groundwater to surface water impacts. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 4.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 5.
SDZ22A/0018	Cairn Homes Properties Ltd.	Clonburris UC & SW- mixed-use development comprising 594 apartments, office floorspace, 4 retail units, a creche and urban square.	Granted Permission (31-Oct-23)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network

Application Reg. Ref	Applicant	Development Proposal Summary	Decision	Site 3 ZoI Overlap	Site 4 ZoI Overlap	Site 5 ZoI Overlap
		This permission was amended under SDZ24A/0019W.		to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 3.	to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 4.	to act in a cumulative or in-combination manner. Overlap of disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 5.
SDZ22A/0017	Cairn Homes Properties Ltd.	Clonburris SW- Construction of 157 dwellings	Granted Permission (16-May-23)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 4.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 5.
SDZ22A/0011	Department of Education	Proposed 2-storey primary school comprising 16 no. classrooms with an additional 2 classroom Special Educational Needs Unit	Granted Permission (16-Feb-23)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative	Immediately adjacent site boundaries will result in an overlap of all ZoI impact pathways.

Application Reg. Ref	Applicant	Development Proposal Summary	Decision	Site 3 ZoI Overlap	Site 4 ZoI Overlap	Site 5 ZoI Overlap
				or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 3.	or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 4.	Potential for cumulative and in-combination impacts with Site 5.
SDZ22A/0010	Kelland Homes Ltd.	Clonburris UC & SE- construction of 294 no. dwellings, creche and retail / commercial unit. This permission was amended under SDZ24A/0030W.	Granted Permission (02-May-23) Commenced August 2023	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 4.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 5.
SD228/0003	SDCC	Kishogue SW- 263 residential units	Part 8 Approved by SDCC (11-Jul-22)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative	Immediately adjacent site boundaries will result in an overlap of all ZoI impact pathways.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative

Application Reg. Ref	Applicant	Development Proposal Summary	Decision	Site 3 ZoI Overlap	Site 4 ZoI Overlap	Site 5 ZoI Overlap
				or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 3.	Potential for cumulative and in-combination impacts with Site 4.	or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 5.
SD228/0001	SDCC	Canal Extension- 118 residential units made up of houses, duplexes, triplexes, an apartment building	Part 8 Approved by SDCC (13-Jun-21)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 4.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. No other overlap of impact ZoI pathways. No potential for cumulative and in-combination impacts with Site 5.
SDZ21A/0022	Cairn Homes Properties Ltd.	Clonburris SW- The construction of 569 dwellings, a creche, innovation hub and open space. This permission was amended under	Granted Permission (23-Aug-22) Commenced Jan-2023	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative

Application Reg. Ref	Applicant	Development Proposal Summary	Decision	Site 3 ZoI Overlap	Site 4 ZoI Overlap	Site 5 ZoI Overlap
		SDZ22A/0029 resulting in 2 no. additional units. This permission was amended again under SDZ24A/0028W		or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 3.	or in-combination manner. Overlap of disturbance ZoI buffer. Potential for cumulative and in-combination impacts with Site 4.	or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 5.
SDZ21A/0013	Department of Education	Kishoge Cross- A 3 storey, 1,000 pupil post primary school including a 4 classroom Species Educational Needs Unit with a gross floor area of 11,443 sq.m including sports hall	Granted Permission (21-Feb-22)	Immediately adjacent site boundaries will result in an overlap of all ZoI impact pathways. Potential for cumulative and in-combination impacts with Site 3.	Shares surface water sub-catchment with the Site 4 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of disturbance ZoI buffer. Potential for cumulative and in-combination impacts with Site 4.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 5.
SDZ20A/0021	Clonburris Infrastructure Ltd	Southern Link Street- construction c. 4.0k of a new road, known as Clonburris Southern Link Street	10-year Permission (12-Aug-21)	Shares surface water sub-catchment with the Site 3 but lacks direct connection to the local surface water network to act in a cumulative	Immediately adjacent site boundaries will result in an overlap of all ZoI impact pathways.	Shares surface water sub-catchment with the Site 5 but lacks direct connection to the local surface water network to act in a cumulative

Application Reg. Ref	Applicant	Development Proposal Summary	Decision	Site 3 ZoI Overlap	Site 4 ZoI Overlap	Site 5 ZoI Overlap
				or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 3.	Potential for cumulative and in-combination impacts with Site 4.	or in-combination manner. Overlap of air pollution and disturbance ZoI buffers. Potential for cumulative and in-combination impacts with Site 5.

Table 6-33: Recent planning applications in the vicinity of the proposed development

6.6.4 Summary

The developments permitted and those that are pending have the potential to have overlapping construction phases with the proposed development and therefore, in the absence of mitigation measures, may result in potential cumulative and/or in-combination effects on Natura 2000 sites.

The County Development Plan; Greater Dublin Drainage Strategy; Transport Strategy for Greater Dublin Area; and River Basin Management Plan and permitted projects and pending planning applications with overlapping ZoIs with the proposed development are considered in combination with the currently proposed development in the following impact assessment section.

6.7.1 Introduction

The potential impacts on the valued designated sites and ecological features, i.e. KERs, are assessed within this section. The initial assessment considers the potential impact pathways and whether these apply to the ecological features. The impact assessment considers the construction and operational stages of the proposed development and the predicted effects in the absence of any mitigation. The descriptive terminology used to describe the characteristics (effects and significance) of these impacts is based on the terms provided within the EPA Guidelines (EPA, 2022).

6.7.2 Proposed Development – Site 3

6.7.2.1 Construction Stage

Habitats

Recolonising bare ground [High Local]

Recolonising bare ground will be entirely lost during the construction phase as the area will be cleared for the proposed development, including establishment of artificial structure and surfaces in the form of residential units, as well as vehicular and pedestrian infrastructure and communal spaces. This habitat supports a population of Pyramidal Orchid and Bee Orchid which are vulnerable to habitat loss and change due to the partnership of mycorrhizal fungi partner often required for germination of seeds. The mycorrhizal fungi will likely be lost during the clearance of this habitat.

Therefore, in the absence of mitigation during the construction stage, a long-term profound negative impact is anticipated for this habitat.

Reed and large sedge swamps [High Local]

This habitat is situated beyond the boundary of Site 3 for this proposed development; however, it is within the surface water, groundwater and air pollution buffers for the construction works. The proximity of this habitat to the site of works renders it at risk of being impacted by dust-based pollution during the construction phase, or the spillage of deleterious materials (such as oils and cement) which has the potential to cause degradation of the flora associated with the habitat.

Therefore, in the absence of mitigation during the construction stage, a short-term negative impact of slight significance is anticipated for this habitat.

Drainage ditches [High Local]

The drainage ditch habitat will be entirely lost during the construction phase as the area will be cleared for the physical footprint of the proposed development. The loss of this linear habitat will also have knock-on effects for local fauna, which use it for refuge.

Therefore, in the absence of mitigation during the construction stage, a long-term profound negative impact is anticipated for this habitat.

Dry meadow and grassy verges [High Local]

The majority of this habitat recorded within and surrounding Site 3 will be removed during construction of the proposed development. Physical removal of the habitat will be required to construct the housing units and communal spaces for the proposed development. Areas of dry

meadow and grassy verges habitat that are to be retained within the site and lay beyond the site boundary are at risk of physical disruption from machinery and works during the construction, as well as dust-based pollution events (e.g. cement dust), spread of invasive species, and chemical pollution (e.g. spill of hydrocarbons).

Lesser Centaury was recorded within this habitat on banks along the edges between this habitat and the tarmac paths through the site. This creates a well-draining, nutrient poor soil which allows this species to persist amongst other more competitive flora. These sections of habitat are also to be removed during the construction clearance of the site; these plants will not survive the clearance or disturbance from construction.

Therefore, in the absence of mitigation during the construction stage, a long-term significant negative impact is anticipated for the dry meadow habitat.

(Mixed) broadleaved woodland [High Local]

This mixed broadleaved woodland is located within the south-west of the northern section of Site 3 and is anticipated to be largely removed during the construction phase to facilitate the housing development. Functionally this habitat will no longer be a woodland due to the level of clearance. However, a small section of this habitat will be retained on the western boundary, this would functionally become a hedgerow but will allow any ground flora that has developed beneath the canopy of this habitat to remain.

Therefore, in the absence of mitigation during the construction stage, a long-term significant negative impact is anticipated for this mixed broadleaved woodland habitat.

Mixed broadleaved / conifer woodland [High Local]

This mixed broadleaved / conifer woodland habitat is not anticipated to be directly impacted during the proposed works as it is beyond the site boundary for Site 3 to the east. However, it will potentially be impacted from construction activities due to the generation of dust and use of heavy machinery during construction. Dust-based pollution from the construction can have negative impacts on the remaining habitat beyond the site boundary; cement-based dust will cause the degradation of vegetation within this habitat.

In addition to the release of pollutants within the air, this habitat will also be at risk of mechanical damage from construction vehicles which enter the root protection zones of trees; this causes root compaction resulting in lowered survivability of the vegetation. The presence of invasive species on-site creates the risk of spreading of invasives species by the construction works into the habitat which would negatively impact this habitat.

There is the potential for accidental spills of deleterious substances, which have the potential to come in contact with and negatively impact the physiological health of the floral species within the wet woodland. If a notable volume of these deleterious substances is spilled, they have the potential to seep into the sub-surface / groundwater, leading to the degradation of the root systems of these flora, potentially resulting in death, thus lowering overall health and biodiversity value of this important wildlife corridor habitat.

Therefore, in the absence of mitigation during the construction stage, a short-term negative impact of slight significance is anticipated for this woodland habitat bordering Site 3.

Treelines [High Local]

Small sections of this treeline habitat will be removed to facilitate the proposed development. A section of this habitat lies within the air pollution buffer will be impacted during the construction. Dust-based pollution from the construction can have negative impacts on the habitat within and beyond the site boundary, causing the degradation of species within this habitat.

The root protection zones of trees within and outside the site boundary will be at risk of construction vehicles encroaching, this would cause root compaction and lead to the degradation of the vegetation within the habitat.

Furthermore, there is the potential for accidental spills of deleterious substances, which have the potential to come in contact with and negatively impact the physiological health of the floral species

within these treeline habitats. If a notable volume of these deleterious substances is spilled, they have the potential to seep into the sub-surface / groundwater, leading to the degradation of the root systems of these flora, potentially resulting in death, thus lowering overall health and biodiversity value of these important wildlife corridor habitats.

Additionally, due to the presence of invasive species on-site there is the potential for spreading of invasive species into this habitat by the construction works, which would negatively impact the remaining areas of this habitat.

Therefore, in the absence of mitigation during the construction stage, a long-term significant negative impact is anticipated for the treeline habitats.

Scrub [High Local]

A significant proportion of the existing scrub will be removed within the site as part of the clearance works for the Site 3 development.

In addition to the direct removal of this habitat, the retained scrub sections will be at risk of damage and disruption due to the generation of airborne pollutants (e.g. dust and emissions) and the risk of run-off pollutants (e.g. hydrocarbons) that will arise from heavy machinery during the construction phase. Furthermore, the bodies of scrub are at risk of mechanical damage during the movement of machinery, or the storage of materials in the rooting zones of these scrub areas that will compress and damage local vegetation.

Furthermore, the potential spread of invasive floral species has the potential to result in the displacement of native flora via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground within the scrub.

Therefore, in the absence of mitigation during the construction stage, a long-term significant negative impact is anticipated for the scrub habitat.

Rare and Protected Flora

Pyramidal Orchids and Bee Orchids [High Local]

The habitats where these species were recorded during surveys will be significantly altered during the construction phase of the proposed development on Site 3. Orchids are particularly sensitive to habitat change and loss due to being non-competitive flora as well as relying on mycorrhizal partnership for successful germination that will be disrupted during the construction phase.

Therefore, in the absence of mitigation during construction stage, a long-term very significant negative impact is anticipated for these orchid species.

Lesser Centaury [National]

The areas of dry meadow and grassy verge habitat that this species was recorded in during surveys of Site 3 will be physically removed during the construction phase of the proposed development. Lesser Centaury is sensitive to physical degradation and the removal of the habitat supporting the few individuals within the site will have a significant impact on this small population, resulting in the potential local extinction of the species from the site.

Therefore, in the absence of mitigation during the construction stage, a long-term profound negative impact is anticipated for this species of national importance.

Protected Fauna

Non-volant Mammals: Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew [High Local]

The local Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew populations will potentially be exposed to a range of construction emissions (groundwater, air and disturbance impacts) which will be generated within the proposed development's works area.

- Physiological and Habitat Degradation via Pollutants

All local mammal species are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the construction stage. In the event that a mammal were to

drink from a waterbody, which had been accidentally contaminated with polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), this can potentially result in damaged lungs and/or carcinogenic effects for affected individual.

Moreover, groundwater and air (dust)-based pollution impacts have the potential to indirectly impact these mammal species via the deterioration in quality and population decline (availability) of prey items in their respective food webs. This impact also has a knock-on effect as the consumption of contaminated prey items may lead to bioaccumulation of toxic substances within the local populations of these protected mammal species.

- Habitat Loss and Fragmentation

There will be a short-term fragmentation / loss of habitats, as result of the construction works that will take place within Site 3. The only mostly intact habitat will be the treeline along the southern boundary of the northern section of Site 3.

- Disturbance

Adverse impacts to these non-volant mammals may also arise in the form of visual and audible disturbance to foraging and commuting activities. Additionally, disturbance to existing may lead to potential loss of life in the case of accidents (e.g. accidental trappings) within the construction site containing existing commuting and foraging habitats, after failure to exclude entry.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term negative impact of slight significance for these non-volant mammal species.

Bats [High Local]

- Roost Disturbance

Given the absence of bat roosts amongst the semi-mature / mature trees and artificial structures within and immediately adjacent to the boundaries of Site 3, adverse impacts on current bat roosting activities are not predicted during the construction stage; therefore, no derogation licences are required for the disturbance of bat roosts as a result of the construction works. However, the construction of the development will also result in the loss of a large number of immature / semi-mature /mature trees within Site 3. This will ultimately result in a short- to medium-term loss of potential roosting features that may form within these trees in the next several years.

- Lighting Disturbance of Foraging and Commuting Activities

Direct and indirect impacts are likely to occur on foraging and commuting identified bat species frequenting the habitats within and adjacent to Site 3's boundaries, as a result of the introduction of additional artificial lighting during the construction stage. Direct lighting impacts refers to compound or works areas lighting spilling into adjacent habitats that support the foraging and movements of nocturnal animals, such as the local bat species. This light spillage will cause local bats to avoid these excessively lit habitats, which effectively reduces the total habitat available to them for both foraging and commuting within and adjacent to the boundaries of Site 3. In some potential cases, such light spillage may cut-off commuting routes along linear habitat features, i.e., retained site border vegetation.

The indirect lighting impacts have the potential to arise through influencing the distribution and frequency of the local bats prey items within habitats adjacent to areas within additional construction- / compound-based lighting, resulting in a negative impact on foraging activity. As these additional lights will attract nocturnal winged-invertebrates towards them out of the usual host habitat (van Langevelde et al., 2018), the local bat species will be left with the option to commute to new foraging grounds or pursue their prey and in turn enter the light impacted area. For some bat species who have adapted relatively well to urban landscapes, namely Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat, the pursuit of prey items into light impacted areas is less impactful (Russ and Montgomery, 2002; Russ et al., 2003). Moreover, studies have shown that pipistrelle species and Leisler's Bat can congregate around urban street lighting feeding on the nocturnal winged-insects attracted to the lower impact lighting (Rydell et al., 1993, Blake et al., 1994; Stone et al., 2015; Spoelstra et al., 2015; 2017).

- Habitat Loss and Fragmentation

Short-term habitat fragmentation / loss will occur as a result of the construction work, the foraging and commuting that the open green space currently provides will be removed during construction, reducing the foraging for local terrestrial invertebrates and therefore lowering the foraging for local bat populations. The removal of linear habitat features will also impact the known commuting routes for local bats.

- Physiological and Habitat Degradation via Pollutants

Additionally, and air (dust)-based construction emissions have the potential to lead to pollution impacts that will indirectly impact all local bat species via degradation of local habitats resulting in the deterioration of quality and decreased frequency of their prey items in the food chain. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local bat populations, resulting in physiological stress and potential reduced fecundity.

Therefore, in the absence of mitigation during the construction stage, a long-term negative impact of moderate significance is anticipated for the local bat populations.

Wintering Birds [High Local]

- Habitat Loss, Fragmentation and Degradation

The majority of the vegetation that is utilised as ground cover for wintering birds is to be removed from Site 3 during construction; this will make the site unsuitable for this protected bird population recorded on-site. Furthermore, surface water, groundwater or air-based pollutants have the potential to reduce and/or degrade the retained foraging grounds for wintering bird populations.

- Physiological Degradation

In the event that hydrocarbon pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, wintering bird species may come in contact with the substance whilst navigating, drinking from, foraging in or washing within a wetland, resulting in degraded feathers, which will notably impact their feathers' insulative qualities, resulting in physiological stress for any affected individuals. Furthermore, these hydrocarbons can potentially be ingested by bird species as they preen their affected feathers, leading to further physiological stress.

Wintering bird species are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the construction stage of the proposed Site 3 development. If a wintering bird were to drink from a temporary waterbody which had been accidentally contaminated with polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), the bird would consume water from the upper (polluted) layers of the water column. The consumption of such water can potentially result in reduced egg production and hatching; increased clutch or brood abandonment; reduced growth and increased organ weights (Albers, 2006).

- Disturbance

The Snipe associated vegetation that is to be retained within Site 3 will be within the disturbance zone during the construction stage. In the event Snipe attempt to utilise this habitat during the construction stage, individuals will likely vacate the site as result of physical, visual and/or noise disturbance. These impacts in combination are enough to consider the site no longer viable for Snipe during the construction stage, as this species is particular about the vegetation it utilises for ground cover and is sensitive to disturbance.

Therefore, in the absence of mitigation during the construction stage, a long-term negative impact of moderate significance is anticipated for wintering bird populations within the site.

Breeding Birds [High Local]

The local breeding bird populations will potentially be exposed to a series of construction-based emissions (surface water, groundwater and air-based pollutants) and land-take (habitat loss), which will be generated / occur within the proposed Site 3 development.

- Reduction of Nesting Sites

Local breeding bird species will experience a significant reduction in current and potential nesting sites as result of the general vegetation clearance and tree felling required to allow for the construction of the Site 3 development. A total of nine bird species (i.e. Linnet; Pheasant; Greenfinch; House Sparrow; Meadow Pipit; Skylark; Sarling; Willow Warbler; and Wood Pigeon) which are protected (Annex) and/or of conservation concern (Amber-listed and Red-listed), will have their preferred nesting habitats negatively impacted (significantly reduced) as result of the temporary and/or permanent loss of grassland; hedgerow; treeline; scrub; and woodland. The other 15 Green-listed breeding bird species recorded within or adjacent to the boundaries of Site 3 will also be impacted from the habitat loss outlined above. Ultimately, 25 local breeding bird populations will experience a short-term to long-term loss of potential nesting sites as a result of the construction of Site 3.

- Habitat Loss, Fragmentation and Degradation

Large areas of foraging, refuge and commuting habitat will be lost during construction. This will severely reduce the available resources for local breeding bird populations, which is likely to make the site unsuitable for the majority of the breeding bird species that utilise the site. Some habitat will be retained during construction to be incorporated into the landscape design; this will allow for smaller populations of breeding bird populations to continue to utilise the site for foraging, refuge and commuting purposes.

Additionally, habitat loss and the general deterioration of retained habitats through surface water, groundwater or air-based pollutants have the potential to reduce and/or degrade the foraging grounds of local breeding bird species. The degradation of floral species in these habitats has the potential to negatively impact seed- and frugivorous or fruit/berry-eating protected bird species (i.e., Wood Pigeon), which will be adversely impacted if pollutant-affected flora are unable to produce these reproductive products or only produce low-quality and/or below average quantities of these food sources. A number of omnivorous bird species of conservation concern will be negatively impact by both of the above scenarios, namely Starling and Linnet.

The temporary and long-term habitat loss, as well as potential habitat degradation, have the potential to result in habitat fragmentation within the boundaries of Site 3. Potential degradation of habitats to be retained, through direct physical or pollutant-based impacts, also has the potential to increase the degree of fragmentation and loss. While the level of fragmentation in regard to movement / distance travelled is within acceptable range for standard commuting purposes for the local breeding bird species, the lack of cover / refuge is problematic for any bird species which can be hunted by local predators, such as Buzzard and Sparrowhawk *Accipiter nisus* (both Green-listed species), thus increasing the likelihood of being predated and reducing the local populations of breeding bird species of conservation concern. The potential loss of juvenile and/or adult birds of conservation concern will result in short-term impact for local breeding bird species.

- Physiological Degradation

All local breeding bird species are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the construction stage. In the event that a bird were to enter a temporary waterbody, which had been accidentally contaminated with a polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), the bird could consume water from the upper (polluted) layers of the water column. The consumption of such water can potentially result in reduced egg production and hatching; increased clutch or brood abandonment; reduced growth and increased organ weights (Albers, 2006).

Moreover, surface water, groundwater, and air (dust)-based pollution impacts have the potential to indirectly impact breeding bird species via the deterioration of food / prey items in the food chain for the local bird species. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local breeding bird populations (Costa et al., 2013; Idan and Jazza, 2022; and Ding et al., 2023).

- Disturbance

Additionally, breeding bird species that utilise the site for commuting or foraging purposes may also be visually and/or audibly disturbed by the construction works and workers entering /exiting the works area, causing these breeding bird species to vacate the site during active work periods. Additionally, the clearance of vegetation within and adjacent to the works area will increase local breeding bird species alert distances as there will be less vegetation available for refuge (Fernández-Juricic et al., 2001).

Noise generated by the construction works has the potential to effect egg production, incubation, brooding, predators, brood parasites, and abandonment, as well as the ability to find or attract a mate and the ability of parents to hear and respond to begging calls of their offspring. Any bird species that regularly experience fright–flight responses or failure to attract mates and defend territories (Slabbekoorn and Ripmeester, 2008) as a result of the excessive noise, will likely suffer from decreased fecundity of their local respective populations (Ortega, 2012). Given the projected length of the construction stage, a temporary to short-term disturbance impact is predicted for local breeding bird populations.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a range of temporary to long-term adverse impacts of slight significance for these breeding bird species of conservation concern.

Amphibians – Common Frog [High Local]

- Degradation of Potential Spawning Habitat

The reed and swamp area just north of the site is currently the most suitable habitat for Common Frog spawning. In the event deleterious pollutants are introduced to this habitat via surface water run-off, groundwater seepage and/or air (dust) pathways, this will reduce the capacity of this habitat to support the foraging and spawning activities of the local Common Frog population.

- Disturbance

Additionally, the Common Frog population may be subjected to disturbance-based impacts, which have the potential to negatively impact their foraging, spawning, commuting and hibernation activities, as well as potential loss of life for individuals within the construction site (e.g. accidental trappings), after failure to exclude entry.

- Habitat Loss and Fragmentation

The supporting habitats for Common Frog within Site 3 are to be largely removed during construction. Small areas of scrub and treelines are to be retained; however, the connectivity of these habitats will be lost and create a risk for local Common Frog populations to predation from local birds, or accidental trampling by construction vehicles or workers.

Therefore, in the absence of mitigation during the construction stage, a long-term negative impact of moderate significance is anticipated for Common Frog populations within the site.

Terrestrial Invertebrates [High Local]

- Physiological and Habitat Degradation via Pollutants

In the event that construction-based environmental pollutants are accidentally introduced, via surface water, groundwater and air (dust) pathways, into the habitats present within and adjacent to Site 3, local terrestrial invertebrates' foraging resources may be notably degraded, potentially reducing their quality and frequency of occurrence within the affected habitat(s). Furthermore, a number of invertebrate groups (e.g. Lumbricina – earthworms) are known to bioaccumulate pollutants within the soils of these polluted habitats, damaging their physiological health, as well as introducing the toxin into the lowest trophic level of the local food web.

- Disturbance

Additionally, negative impacts may arise for local terrestrial invertebrates in the form of disturbance to foraging and commuting activities via temporary and long-term habitat loss and fragmentation during the construction stage.

- Habitat Loss and Fragmentation

Site 3 will experience short- to long-term habitat loss and fragmentation, which will notably reduce the total habitat available for foraging and hive sites for tree-based hives, dense-grass tussock hives and subterranean hives. This will adversely impact the local populations of White-tailed Bumblebee and Gypsy Cuckoo-bee. Additionally, the loss of the meadow habitats will reduce the total available host plants for butterfly species laying their eggs, with species such as Meadow Brown; Red Admiral; Large White; Ringlet and Comma having their reproductive cycles negatively impacted.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term adverse impact of slight significance for the green-listed invertebrates species, and of moderate significance for the red-listed Gypsy Cuckoo-bee.

6.7.2.2 Operational Stage

Habitats

Recolonising bare ground [High Local -> Low Local]

This habitat decreases in operational stage ecological value due to the relocation of the sensitive floral species associated with this habitat, into a different habitat type. Recolonising bare ground habitat will be removed in full during the operational stage of the Site 3 development.

Therefore, in the absence of mitigation during the operational phase, a long-term negative impact of profound significance is anticipated for this habitat.

Reed and large sedge swamps [High Local]

As the reed and large sedge swamp habitat is located north of the Site 3 boundary, it will not be subject to any long-term operational habitat loss as a result of the physical footprint of the development. However, this wetland habitat will potentially be subjected to increased physical disturbances as a result of the increased local populace, as well as associated pets, e.g., dog. These disturbances generated by human and/or pet have the potential to negatively impact swamp flora through trampling and the opportunistic creation of access points to the edge of the canal waterbody. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation during the operational phase, a long-term negative impact that is not significant is anticipated for this habitat.

Drainage ditches [High Local]

The loss of the drainage ditch habitat within the boundaries of Site 3 during the construction stage will be alleviated through the site's landscape / drainage designs, which includes the creation of new drainage ditches, in the form numerous swales, which will provide and support a subsection of the ecological services and floral composition of a fully established drainage ditch habitat. As a result, there will be no long-term habitat loss of drainage ditch habitat within Site 3.

Regarding Site 3's operational emissions, groundwater and air operational emissions are not predicted to negatively impact the new drainage ditch habitats. However, given that the site drainage ditches are incorporated into the operational surface water design as SuDS features, this role within the SuDS has the potential to lower the water quality within these drainage ditches, with potential knock-on effects for the ditch flora.

Additionally, these drainage ditch habitats will be subjected to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the flora associated with the drainage ditches through trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of Site 3, it is anticipated that the drainage ditch habitats will experience an initial long-term negative impact of slight significance.

Dry meadow and grassy verges [High Local]

Only a small section of the existing dry meadow and grassy verges habitat will remain within Site 3 during the operational stage of the development. New operational areas, that are designated as 'Meadow grass' or 'Grassy habitat' within the Site 3 landscape plan, have the potential to preserve the existing meadow seedbank (and the genetic integrity of local floral species) through the reuse of existing site topsoil.

To manage the surface water run-off from hardstanding areas within Site 3, a series of SuDS features are proposed including permeable paving; tree pits; conveyance swales; and bioswales / attenuation basins, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016). These SuDS features will ensure that localised flooding during heavy rainfall events does not lead to habitats, such as the retained and new dry meadows, being subjected to potentially harmful urban run-off.

Additionally, these new and existing meadows will be subjected to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the flora associated with the dry meadows through trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation during the operational phase, a long-term negative impact of moderate significance is anticipated for this dry meadow habitat.

(Mixed) broadleaved woodland [High Local]

The clearing of the majority of this mixed broadleaved woodland habitat from Site 3 during the construction stage (with the remnants forming a hedgerow) is only partially remedied by the landscape design plan for Site 3, which contains a small area of new mixed broadleaved woodland planting.

Surface water, groundwater and air operational emissions are not predicted to impact the small retained section of broadleaved woodland within Site 3. The management of the surface water run-off from hardstanding areas within Site 3, will involve a range of SuDS features, including permeable paving; tree pits; conveyance swales; and bioswales / attenuation basins, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding this retained woodland habitat from potential impactful urban run-off.

Additionally, these new and existing broadleaved woodland aligned habitats will be subjected to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the flora associated with the broadleaved woodland through trampling and digging of ground flora, as well as the breakage of shrub and tree limbs. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of the Site 3 development, it is anticipated that the mixed broadleaved woodland will experience an initial long-term negative impact that is of moderate significance, given that vast majority of mixed broadleaved woodland will either be lost or reestablished as a different tree-based habitat.

Mixed broadleaved / conifer woodland [High Local]

This habitat lies beyond the physical foot print of the Site 3 boundary and is not anticipated to be impacted by operational surface water, groundwater and air emissions given its location and the local topography.

However, this mixed broadleaved / conifer woodland will be subjected to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the flora associated with the

woodland through the breaking of tree limbs, and the trampling and digging of ground flora. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation during the operational phase, a long-term negative impact that is not significant is anticipated for this woodland habitat.

Treelines [High Local]

Site 3 will see an increase of immature treeline (and street tree) habitat in strips throughout the development. However, not all these treelines will be able to support typical treeline understorey flora, i.e., the street trees along the main access roads. Furthermore, a number of these treelines will be unable to form continuous canopies due to the spacing distance between trees. Therefore, while the overall coverage of treelines within Site 4 will be similar to those currently present, the structural and floral quality of the existing treelines will not be replicated in the majority of these habitats.

Site 3's retained and new treelines are not predicted to be negatively impacted by the development's surface water, groundwater and air-based emissions. The management of the surface water run-off from hardstanding areas within Site 3, will involve a range of SuDS features, including permeable paving; tree pits; conveyance swales; and bioswales / attenuation basins, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding the new treelines within and neighbouring Site 4. This does not apply to street trees with tree pits, as these trees will be subject to a degree of surface water run-off as they are a part of the SuDS network.

The retained and newly planted treeline aligned habitats will be subjected to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the flora associated with the treelines (which possess understorey layers) through trampling and digging of ground flora, as well as the breakage of shrub and tree limbs. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of Site 3, it is anticipated that the treeline habitat will experience an initial long-term negative impact that is of slight significance.

Scrub [High Local]

Only a small portion of the existing scrub habitat will remain within Site 3 during the operational stage. However, the landscape design plan for the site will see the planting of new shrub areas in strips and patches throughout the site, which will help remedy the loss of existing scrub habitats. While the floral species composition will notably shift (e.g., the removal of Bramble), the structural functions of the lost scrub will be reestablished within these shrub-based habitats, i.e., these shrubs will be able to provide refuge to local wildlife, as well as nest / hive-building opportunities for local breeding birds and bee / wasp species.

The new shrub and retained scrub habitats will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the scrub and shrub habitats through breakages of plant limbs when navigating the habitat. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of operational mitigation measures, it is predicted that there will be an initial long-term negative operational impact of slight significance for the scrub habitat present within Site 3.

Rare and Protected Flora

Pyramidal Orchids and Bee Orchids [High Local]

The specific recolonising bare ground and dry meadow habitats that currently support the Pyramidal and Bee Orchid populations within Site 3 will not be present during the operational phase; however, these orchid populations will be relocated, prior to site clearance, to a suitable habitat within Site 4.

These orchid species will be largely lost from Site 3 but will persist within the locality (Site 4). Therefore, in the absence of operational mitigation measures, a long-term neutral impact that is not significant is anticipated for the Pyramidal Orchid and Bee Orchid populations.

Lesser Centaury [National]

The specific dry meadow habitats that currently support the Lesser Centaury individuals within Site 3 will not be present during the operational phase; however, the Lesser Centaury individuals will be relocated to a suitable habitat within Site 4, prior to site clearance.

The Lesser Centaury will be lost from Site 3 but will persist within the locality (Site 4). Therefore, in the absence of operational mitigation measures, a long-term neutral impact that is not significant is anticipated for the Lesser Centaury population.

Protected Fauna

Non-volant Mammals: Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew [High Local]

- Disturbance

Local non-volant mammals will be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of non-volant mammals. In the case of the smaller non-volant mammals, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Site 3's operational emission of ecological concern for the habitats (and foraging resources contained within) utilised by the local Badger, Pine Marten, Irish Stoat, Hedgehog, and Pygmy Shrew populations, will be that of polluted surface water run-off from hardstanding areas. However, the proposed series of SuDS features to be installed within Site 3, including permeable paving; tree pits; conveyance swales; and bioswales / attenuation basins will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the habitats from deleterious urban run-off. Therefore, the foraging resources and habitats associated with these non-volant mammal populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces. Therefore, the foraging resources and habitats associated with these protected mammal populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape and lighting designs ensure that the eastern boundary of the southern section of Site 3 will remain a mammal commuting corridor. There will be creation of smaller corridors throughout the site; however, given the increased traffic associated with proposed development these corridors will only be likely utilised when the residents of the development are inactive (night). The installation of swales and attenuation basins, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland habitat will create these new corridors. Therefore, the operational stage of Site 3 will not result in any notable long-term habitat fragmentation for the local non-volant mammal populations. The remedial tree and shrub planting will help cushion the loss of the large number of trees and scrub that will be cleared during the construction stage, providing replacement refuge for mammals within Site 3. However, the overall increased frequency of artificial surfaces throughout Site 3 will ultimately result in a loss of available foraging, commuting and refuge habitat for the local non-volant mammal populations.

- Collision Mortality

Collision mortality risk for the non-volant mammal populations is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where drainage ditches, treelines and the stream are present currently.

Therefore, in the absence of targeted terrestrial mammal mitigation during the operational stage, it is predicted that there will be a long-term negative operational impact of slight significance for Badger, Pine Marten, Irish Stoat, Hedgehog, and Pygmy Shrew populations.

Bats [High Local]

- Habitat Loss and Fragmentation

The operational landscape design will ensure the commuting corridor that is present east of Site 3 remains; this is the largest commuting corridor present within/adjacent to Site 3 and will allow local bat populations access to key foraging habitats such as the Grand Canal to the south of the proposed development. However, areas of foraging and commuting within Site 3 will be removed which has the potential to reduce the viability of the site for local bat populations. The remedial tree and shrub planting will help remedy the loss of these foraging and commuting areas, the ecological lag of this removal and subsequent remedial plantings will be felt by the local bat populations. Once the remedial plantings are established, they will provide commuting corridors for local bat populations, specifically those which are resistance to light disturbance. However, the overall increased frequency of artificial surfaces throughout Site 3 will result in long-term negative impacts.

- Lighting Disturbance

Site 3's proposed lighting design (with minimum lux levels for health and safety requirements) will illuminate the vast majority of the site, which facilitates a north-south dark corridor within the local landscape. This corridor links with the current dark space to the south of the site which gives local bat populations access to the foraging habitat that the Grand Canal provides. The installation of Site 3's lighting design will create further bottlenecks that are created by the surrounding residential landscape. Overall, the increased frequency of artificial lighting throughout Site 3 will result in long-term negative impacts for local bat populations.

- Collision Mortality

Given that bat species typically commute within / along dark areas / corridors (i.e. away from illuminated pedestrian and road infrastructure), bat species collision mortality risk is predicted to be negligible (not significant) during the operational stage of the Site 3 development.

Therefore, in the absence of mitigation during the operational phase, a long-term negative impact of moderate significance is anticipated for the local bat populations.

Wintering Birds [High Local]

- Habitat Loss and Fragmentation

The habitat that is utilised by Snipe is to be removed for the proposed development. Snipe typically are not that adaptable to sub-urban landscapes and will most likely not utilise Site 3 during its operational stage. However, for other wintering bird species that frequent the locality during the winter period, the operational landscape design incorporates new habitat in the form of swales and attenuation basins, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland habitat. Therefore, the operational stage of Site 3 will not result in any long-term habitat fragmentation for other wintering bird populations that may make use of the site's new habitats. While the site will offer a greater diversity of habitats, the overall increased frequency of artificial surfaces throughout Site 3 will ultimately result in a loss of available foraging, commuting and refuge habitat for the migrant wintering bird populations. Therefore, it is predicted that there will be a long-term negative operational impact on wintering birds.

- Disturbance

As Site 3 is located adjacent to an education facility, active railway line, and roadways (Adamstown Avenue and R136), the cumulative noise levels of the existing baseline and the operational noise from

the development will not be significant for the migrant wintering bird populations. However, wintering bird species will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of these winter migrant populations. Moreover, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Surface water run-off from hardstanding areas into on-site and adjacent terrestrial and wetland habitats (and foraging resources contained within) utilised by the migrant wintering bird populations. However, the proposed series of SuDS elements to be installed within Site 3, including permeable paving; tree pits; conveyance swales; and bioswales / attenuation basins will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the habitats from damaging urban run-off. Therefore, the foraging resources and habitats associated with these wintering bird populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Collision Mortality

Collision mortality risk for the migrant wintering bird populations is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where scrub, treelines and woodland exist presently.

Therefore, in the absence of targeted wintering bird mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for migrant wintering bird populations.

Breeding Birds [High Local]

- Disturbance

As Site 3 is located adjacent to an education facility, active railway line, and roadways (Adamstown Avenue and R136), the cumulative noise levels of the existing baseline and the operational noise from the development will not be significant for the breeding bird populations. However, breeding bird species will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of these breeding bird populations. Furthermore, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Of particular concern is the surface water run-off from hardstanding areas into the on-site and adjacent terrestrial habitats (and foraging resources contained within) utilised by the local breeding bird populations. However, the proposed series of SuDS features installed within Site 3, including permeable paving; tree pits; conveyance swales; and bioswales / attenuation basins will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the terrestrial habitats from harmful urban run-off. Therefore, the foraging resources and habitats associated with these breeding bird populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape design of Site 3 incorporates new habitat in the form of swales and attenuation basins, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland habitat. Therefore, the operational stage of Site 3 will not result in any notable long-term habitat fragmentation for breeding bird populations that utilise Site 3. While the site will offer a greater diversity of habitats, the overall increased frequency of artificial surfaces throughout Site 3 will ultimately result in a loss of available foraging, commuting and refuge habitat for the local breeding bird populations. Additionally, species such as Meadow Pipit and Skylark will not regain any nesting

potential within the proposed development due to their specific nesting requirements. Therefore, it is predicted that there will be a long-term negative operational impact on breeding birds.

- Collision Mortality

Collision mortality risk for local breeding bird populations is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where woodland, scrub and treelines currently exist.

Therefore, in the absence of targeted breeding bird mitigation during the operation stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for local breeding bird populations within Site 3.

Amphibians – Common Frog [High Local]

- Disturbance

Site 3 is located adjacent to a railway and a major roadway (Adamstown Avenue and R136); therefore, a minor increase in localised noise disturbance within Site 3 will not be significant for the resident Common Frog population. Common Frog frequently reside within residential areas and are accustomed to baseline urban noise levels. However, Common Frog populations will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of these Common Frog populations. Furthermore, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Of particular concern is the surface water run-off from hardstanding areas into the on-site terrestrial habitats utilised by the local Common Frog populations. However, the proposed series of SuDS features installed within and adjacent to Site 3, including permeable paving; tree pits; conveyance swales; and bioswales will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the terrestrial habitats from deleterious urban run-off. Therefore, the foraging resources and aquatic and terrestrial habitats associated with the local Common Frog populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape and lighting design will ensure that the existing Common Frog commuting corridors will be retained; as well as improving / creating new corridor structures (complexity of the commuting habitat) through the installation of swales and attenuation basins, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland strips. Therefore, the operational stage of Site 3 will not result in any long-term habitat fragmentation for the local Common Frog populations. However, the increased frequency of artificial surfaces throughout Site 3 will ultimately result in an overall loss of available foraging, commuting and hibernation habitat for local amphibian populations. Therefore, in the absence of targeted Common Frog mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact that is not significant for the local Common Frog populations.

- Wetland Habitat Creation

The new wetland habitats (swales etc.) incorporated into Site 3's landscape and drainage designs, will provide potential spawning habitat for Common Frog during the wetter periods in early spring. These habitats are also very suitable for Common Frog activities such as commuting, foraging and potentially hibernation. The creation of these habitats adds a long-term positive impact for Common Frog within Site 3.

- Collision Mortality

Collision mortality risk for Common Frog is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where drainage ditches currently exist.

Therefore, in the absence of targeted amphibian mitigations during the operational stage, it is predicted that there will be an initial long-term negative operational impact that is not significant for local Common Frog populations.

Therefore, in the absence of mitigation during the operational phase, a long-term negative impact that is not significant is predicted for the local Common Frog population.

Terrestrial Invertebrates [High Local]

- Physiological and Habitat Degradation via Pollutants

The proposed development's main operational emission of concern for the habitats (and foraging resources contained within) utilised by the local terrestrial invertebrate populations, will be that of contaminated surface water run-off from hardstanding areas. However, a range of SuDS features proposed throughout Site 3, including permeable paving; tree pits; conveyance swales; and bioswales, will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016). Therefore, the foraging resources and habitats associated with the local terrestrial invertebrate populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape design will ensure that the largest commuting corridor to the east of the site will be retained; as well as improving / creating new corridor structures (complexity of the commuting habitat) through the planting of new meadow, shrub, hedgerow, treeline and woodland patches. Therefore, the operational stage of Site 3 will not result in any long-term habitat fragmentation for the local terrestrial invertebrate populations. While the planting plan will help provide new hive-supporting habitat, the increased frequency of artificial surfaces throughout Site 3 will result in an overall loss of available foraging and refuge habitat for local terrestrial invertebrate populations.

Therefore, in the absence of targeted terrestrial invertebrate mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for local terrestrial invertebrate populations.

Therefore, in the absence of mitigation during the operational phase, a long-term negative impact of slight significance is anticipated for local terrestrial invertebrates.

6.7.2.3 Do-Nothing Impact

If the proposed development were not to go ahead and the present land management continues as is, the ecological value of the Sites 3, 4 and 5 would remain largely unchanged given that the majority of the sites' areas are currently under the management of SDCC. Furthermore, Waterways Ireland will continue to maintain the Grand Canal section south of Site 4.

There are large areas within the development's boundaries which do not undergo regular maintenance. These areas contain recolonising bare ground, dry meadow and scrub habitats. In the short-term, the recolonising areas will develop into dry meadow habitat, while the dry meadows will develop into scrub, and scrub into immature woodland where tree species are present.

Overall, these minor changes to the habitats within the proposed development's boundaries will result in slight positive impacts for specific faunal groups including:

- Non-volant Mammals – increased scrub cover provides more refuges for local mammals;
- Breeding Birds – increased scrub cover provides increased nesting opportunities for local birds; and
- Terrestrial Invertebrates – an increase in dry meadow cover will provide increased foraging opportunities for local terrestrial invertebrates and subsequently their predators (birds & bats).

The above scenario does not account for the other permitted or pending local developments.

6.7.3 Proposed Development – Site 4

6.7.3.1 Construction Stage

Designated Sites

Proposed Natural Heritage Areas

Listed below are the pNHA sites within the proposed development's ZoI, that will be vulnerable to the potential impacts of the proposed construction activities, in a scenario where mitigations measures are absent:

- Grand Canal pNHA [002104]; and
- Liffey Valley pNHA [000128].

Of the two pNHA sites, the Grand Canal pNHA is the more susceptible to potential adverse impacts (air, air to surface water and disturbance pathways) given that the designated site is located within 25m of the southern boundary of Site 4, while the Liffey Valley pNHA is located 3.35km downstream, and is vulnerable to surface water; groundwater to surface water; and air to surface water-based impacts.

Following a surface water or groundwater to surface water pollution event, the Kilmahuddrick Stream, and connecting drainage ditches, have the potential to transport pollutants (e.g. hydrocarbons) downstream to the Liffey Valley pNHA. Potential direct impacts include the degradation of overall water quality as a result of hydrocarbon and/or solvent pollution, which have the potential to adversely affect protected fish species associated within the River Liffey, namely Atlantic Salmon, Lamprey spp., and European Eel; as well as those that consume these fish, i.e., Otter and Cormorant. Hydrocarbon pollutants are also known to degrade the plumage of bird species associated with the pNHA, such as Kingfisher and Grey Wagtail. Moreover, water pollution impacts have the potential to indirectly impact pNHA associated bird and mammal species by negatively impacting the populations of lower tropic levels of the food chain e.g. floral and freshwater invertebrate species. In addition, the consumption of food items containing polluting elements will impact the health of mammal and bird populations.

The unintended introduction of sediment, via surface water run-off or dust settlement, has the potential to degrade the water quality of the local surface water network, i.e., Grand Canal pNHA and Liffey Valley pNHA via the Kilmahuddrick Stream and River Griffeen. There are a range of aquatic flora, protected fish species and aquatic invertebrate groups associated with the two pNHAs, that will be vulnerable to excessive nutrient-based pollution (eutrophication) generated through the introduction of sediment, bound with nitrogen and phosphorus. Furthermore, regarding salmonid and lamprey species, excessive siltation can notably impact the quality of spawning grounds, which can have knock-on adverse effects on local population dynamics within the river systems (Griffeen and Liffey) downstream of the site.

The construction works may generate dust-based pollutants (e.g. cement-based dust), which have the potential to settle within the Kilmahuddrick Stream and the Grand Canal pNHA. During long dry periods dust can coat plant foliage adversely affecting photosynthesis and other biological functions. Furthermore, cement-based dust deposited on leaves can increase the surface alkalinity, which in turn can hydrolyse lipid and wax components, penetrate the cuticle, and denature proteins, finally causing the leaf to wilt. The Grand Canal pNHA associated habitats will be vulnerable to cement-based dust deposition impacts during the construction stage. This impact on floating, emergence and terrestrial flora will have a knock-on impact for protected bird species, particularly herbivorous species, which are supported by these aquatic, wetland and grassland habitats. Moreover, cement-based dust has the potential to be accidentally ingested by local bird species when foraging and preening, when present within the air pollution buffer. Additionally, alkaline cement-based dusts have the potential to affect the pH levels, potentially impacting pH-sensitive aquatic flora and fauna.

Increased vehicular presence adjacent to the local waterbodies will lead to local increases in nitrogen oxides (NOx) potential resulting in the minor acidification / change of pH of the surface water network. Research has detailed how freshwater fish species have shown diminished abilities to

respond to damage-released chemical alarm cues from other fish of the same species under weakly acidic conditions. This group of fish species includes Three-spined Stickleback (Peterson et al., 1989) and Atlantic Salmon (Leduc et al., 2010), which will likely suffer an increased mortality predation rate within the Kilmahuddrick Stream (Three-spined Stickleback) and River Liffey downstream (Atlantic Salmon), in the event that the Kilmahuddrick Stream becomes slightly acidic (pH~ 6.0) during the construction stage. A short-term negative impact is predicted from potential impact of acidification of local surface water network. Additionally, acidification / low pH levels in combination with high metal concentrations, which can be introduced to the surface waterbody via a hydrocarbon or solvent spill, have the potential to increase the mortality of River Lamprey eggs and newly emerged larvae (Myllynen et al., 1997; and Lucas et al., 2021). The potential acidification of the drainage ditches and Kilmahuddrick Stream has the potential to cause knock-on acidification impacts for the River Griffen and the Liffey Valley pNHA downstream. However, within the Grand Canal pNHA, the aquatic flora and fauna are safeguarded by the mesotrophic to eutrophic conditions within the canal, which sufficiently buffer the potential adverse effects of acidification.

The construction works within Site 4 also have the potential to visually and audibly disturb Grand Canal pNHA associated protected bird species, such as Mallard; Mute Swan and Cormorant. These bird species utilise the canal habitats for foraging, commuting and roosting (daytime / short-term) activities within or adjacent to Site 4 year-round.

The spread of invasive species, such as Japanese Knotweed, from the construction site into the neighbouring Grand Canal pNHA, or downstream to the Liffey Valley pNHA, via the Kilmahuddrick Stream and River Griffeen, may lead to a series of adverse effects on the associated habitats within these two pNHA sites. Their establishment, within the terrestrial habitats of these sites, has the potential to result in the displacement of native species via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

The Grand Canal pNHA is vulnerable to physical degradation of its associated habitats, as well the disturbance to and accidental fatalities of associated fauna during the construction stage.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short- to medium-term adverse impact of moderate significance for the Grand Canal pNHA and Liffey Valley pNHA.

Habitats

Reed and large sedge swamp [High Local]

As the reed and large sedge swamp habitat of the Grand Canal is located 35m south of Site 4, and at a higher elevation, this habitat only has the potential to be impacted by dust-based pollution during the construction stage, with cement-based dusts being of particular concern given their capacity to degrade the structures of epidermal cells in floral species. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short-term adverse impact of slight significance for reed and large swamp habitat within Grand Canal.

Eroding / upland rivers (Kilmahuddrick Stream) [County]

The Kilmahuddrick Stream (eroding / upland river habitat) will be potentially exposed to a range of construction emissions via surface water, groundwater and air-based pollutant pathways. The surface water pathway is of most concern, given that the unintended introduction of pollutants (e.g. hydrocarbon, solvents and cement leachate) and excess sediment into the stream has the potential to notably degrade the water quality and influence its pH levels (beyond its normal range), with knock-on impacts for local flora and fauna, as well as the Liffey Valley pNHA located downstream. The stream will be particularly vulnerable to these impacts during the installation of the culvert and the associated regrading of the stream, as well as the establishment of the proposed flood compensatory storage area.

Furthermore, the Kilmahuddrick Stream may also experience similar polluting impacts through the groundwater-to-surface water pollution pathway given the underlying aquifer's characteristics, i.e.,

groundwater recharge of local watercourses within a few hundred metres. Groundwater-to-surface water pollution events (e.g. hydrocarbon, solvents and cement leachate) have the potential to negatively impact the water quality of the Kilmahuddrick Stream, and the River Griffeen and River Liffey downstream, as well as its associated flora and fauna. Therefore, there is the potential for groundwater-to-surface water impacts for this aquatic habitat.

Additionally, the Kilmahuddrick Stream has the potential to be impacted by dust-based pollution during the construction stage, with cement-based dusts being of particular concern given their capacity to degrade the structures of epidermal cells of flora, which will damage instream and bankside flora. Moreover, alkaline cement-based dusts have the potential to affect the stream's pH levels, potentially harming pH-sensitive aquatic flora and fauna.

Moreover, the accidental introduction of sediment, via surface water run-off or dust settlement, has the potential to degrade the water quality of the Kilmahuddrick Stream. There is a range of aquatic flora, fish species and aquatic invertebrate groups within and downstream of Site 4, that will be vulnerable to excessive nutrient-based pollution (eutrophication), generated through the introduction of sediment, bound with nitrogen and phosphorus. The stream will be particularly vulnerable to sediment-based impacts during the installation of the culvert and the associated regrading of the stream, as well as the creation of the proposed flood compensatory storage area.

Also, the potential spread of invasive non-native floral species, in particular the nearby Japanese Knotweed, from its current locations along Lynch's Lane, has the potential to result in the displacement of native species via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground along the banks of the Kilmahuddrick Stream.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short-term negative impact of moderate significance for the Kilmahuddrick Stream.

Canals (Grand Canal) [National]

The canal habitat will potentially be exposed to a range of construction-based emissions (groundwater and air-based pollutants) which will be generated within the development's works area.

While there is the potential for groundwater / groundwater-to-surface water pollution for other aquatic habitats within the ZoI, the Grand Canal is entirely sealed and it is not susceptible to impacts associated with polluted groundwater recharge. Therefore, this canal habitat will not be negatively impacted via the groundwater pathways.

Additionally, this canal habitat has the potential to be adversely impacted by dust-based pollution during the construction stage, with cement-based dusts being of particular concern given their capacity to degrade the structures of epidermal cells in floral species, which will harm the floating and emergent flora within the canal. Moreover, alkaline cement-based dusts have the potential to affect the canal's pH levels in localised areas, potentially degrading the health of pH-sensitive aquatic flora and fauna. Furthermore, the accidental introduction of sediment, via dust settlement, has the potential to degrade the water quality of the canal. There is a range of aquatic flora, fish species and aquatic invertebrate groups within the canal, that will be vulnerable to excessive nutrient-based pollution (eutrophication), generated through the introduction of sediment, bound with nitrogen and phosphorus.

Increased vehicular presence adjacent to the canal will lead to local increases in nitrogen oxides (NOx), potentially resulting in the minor acidification / change of pH of the surface water network. However, aquatic flora and fauna within the Grand Canal are safeguarded by the mesotrophic to eutrophic conditions within the canal, which sufficiently buffer the potential adverse effects of acidification.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a significant temporary to short-term negative impact for the aquatic canal habitat.

Drainage ditches [High Local]

The drainage ditches within and adjacent to Site 4 will potentially be exposed to a range of construction emissions via surface water, groundwater and air-based pollutant pathways, as well as short-term habitat loss.

The unintended introduction of pollutants (e.g. hydrocarbon, solvents and cement leachate) and excess sediment into the drainage ditches has the potential to notably degrade these habitats and their respective water quality conditions, as well as influencing their pH levels (beyond its normal range), with knock-on impacts for local flora and fauna within these ditches.

Furthermore, these drainage ditches may also experience similar polluting impacts through the groundwater-to-surface water pollution pathway given the underlying aquifer's characteristics. Groundwater-to-surface water pollution events have the potential to negatively impact the water quality of these ditches. Therefore, there is the potential for groundwater-to-surface water impacts for these drainage ditch habitats.

Moreover, the drainage ditches of Site 4 have the potential to be impacted by dust-based pollution during the construction stage, with cement-based dusts degrading the structures of epidermal cells of the associated ditch flora, which will damage instream and bankside flora. Also, alkaline cement-based dusts have the potential to affect the drainage ditches' pH levels, potentially harming pH-sensitive aquatic flora and fauna.

Additionally, the accidental introduction of sediment, via surface water run-off or dust settlement, has the potential to degrade the water quality of these drainage ditch habitats. There is a range of aquatic flora and fauna groups within and downstream of Site 4 drainage ditches, that will be vulnerable to excessive nutrient-based pollution (eutrophication), generated through the introduction of sediment, bound with nitrogen and phosphorus.

The drainage ditch habitats will also undergo short-term habitat loss as a result of the physical footprint of the Site 4 development, which will reconfigure the natural drainage ditch network within the site.

Also, the potential spread of invasive non-native floral species, in particular the nearby Japanese Knotweed, from its current locations along Lynch's Lane, has the potential to result in the displacement of native species via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground along the banks of the Site 4 drainage ditches.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short-term negative impact of moderate significance for the drainage ditch habitats.

Marsh [High Local]

While the marsh habitat is to be retained within the site's landscape plan as part of the Kilmahuddrick Stream's riparian buffer, this wetland habitat will still be vulnerable to a range of potential adverse impacts generated by construction activities within Site 4. Scenarios may arise where accidental spills of deleterious substances (e.g. hydrocarbons and solvents) come in contact with and negatively impact the physiological health of marsh flora, as well as seeping into the sub-surface / groundwater and degrading the root layers of these flora, potentially resulting in death, and thus lowering the overall health and biodiversity value of the habitat.

Additionally, this marsh habitat also has the potential to be impacted by dust-based pollution during the construction stage, with cement-based dusts degrading the structures of epidermal cells in floral species. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

Moreover, construction works immediately south (road and pedestrian infrastructure) and east (flood compensatory storage area) of the marsh habitat have the potential to result in the physical degradation of the marsh flora, via compaction from trampling underfoot by the site personnel and machinery, as well as temporary stockpiling.

Furthermore, the potential spread of invasive non-native floral species, in particular the nearby Japanese Knotweed, from its current locations along Lynch's Lane, has the potential to result in the displacement of native species via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground within the marsh habitat.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short-term adverse impact of slight significance for this marsh habitat.

Dry meadow and grassy verges [High Local]

As a result of the proposed development's pedestrian walkways, roadways, structures and other artificial surfaces, the dry meadow and grassy verges habitats will almost be lost in their entirety (>95%) within a short-term period, bar the small sections within the riparian zone of the Kilmahuddrick Stream, as well as those located adjacent to Site 4.

The retained and neighbouring dry meadows will still be vulnerable to an array of potentially damaging impacts generated by construction activities within Site 4. The accidental spillages of harmful substances (e.g. hydrocarbons and solvents), have the potential to come into direct contact with and negatively impact the physiological health of grassland flora; as well as penetrating into the sub-surface / groundwater and degrading the grassland flora's root systems, resulting in further degradation and the potential death of less resilient species, thus lowering overall health and biodiversity value of these grassland habitats.

Additionally, these dry meadow habitats have the potential to be physically damaged from excessive footfall from workers present on-site, compaction from light and heavy machinery and temporary material stock-piling. Such damage to the habitat may result in an increased frequency of disturbed bare ground within the grassland habitat, which in turn has the potential to result in the establishment of invasive species present within the locality (e.g. Butterfly-bush).

Furthermore, the potential spread of high impact invasive non-native floral species, in particular Japanese Knotweed, from its current locations along Lynch's Lane into disturbed dry meadows, has the potential to result in the displacement of native flora via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Moreover, these dry meadow and grassy verge habitats also have the potential to be impacted by dust-based pollution during the construction stage, with cement-based dusts degrading the epidermis layers of floral species. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a very significant short-term adverse impact for the dry meadow and grassy verge habitats located within Site 4.

(Mixed) broadleaved woodland [High Local]

A small section of mixed woodland habitat is set to be retained within the proposed development's landscape plan. These retained mixed broadleaved woodland habitats will still be exposed to a range of potentially adverse impacts generated by construction activities. Negative impacts will arise in scenarios where the accidental spillage of deleterious substances comes into direct contact with and negatively impacts the physiological health of trees and associated understorey flora; as well as seeping into the sub-surface / groundwater and degrading the root systems of the woodland flora, resulting in further degradation and potentially death. Such impacts will lower the overall health and biodiversity value of the retained broadleaved woodland habitat.

Additionally, the root systems of the woodland trees species within these habitats will be at risk of root compaction from heavy-machinery. Likewise, machinery used adjacent to the trees in the broadleaved woodland habitat has the potential to result in accidental damage of tree limbs, degrading the health of these tree species.

The mixed broadleaved woodland habitats also have the potential to be adversely impacted by dust-based pollution during the construction stage, with degradation of the epidermis layer of floral species through contact with cement-based dusts. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

The above negative impacts, acting either alone or cumulatively, have the potential to result in the degradation and death of tree and understorey floral species within these mixed broadleaved woodland habitats, ultimately resulting in the fragmentation of these important woodland wildlife corridors, which currently provide dense understorey refuge and canopy cover.

Moreover, the potential spread of invasive non-native floral species, in particular Japanese Knotweed, from its current locations along Lynch's Lane into the adjacent mixed broadleaved woodland, will

result in the displacement of native species via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a very significant short- to long-term adverse impact for the mixed broadleaved woodland habitats within Site 4.

Hedgerows [High Local]

While the hedgerow habitats are not located within the physical footprint of the Site 4 development, they will still be exposed to a range of potentially adverse impacts generated by construction activities. There is the potential for accidental spills of deleterious substances, which have the potential to come in contact with and negatively impact the physiological health of the floral species within these hedgerow habitats. If a notable volume of these deleterious substances is spilled, they have the potential to seep into the sub-surface / groundwater, leading to the degradation of the root systems of these flora, potentially resulting in death, thus lowering overall health and biodiversity value of these important wildlife corridor habitats.

Moreover, the spreading root systems of immature and semi-mature tree species, located along the edge of the hedgerow, will be vulnerable to root compaction from heavy-machinery and/or temporary material stock-piling. In addition, machinery used adjacent to the hedgerow may lead to the accidental damage of tree limbs, degrading the health of hedgerow tree species.

Additionally, these hedgerow habitats also have the potential to be negatively impacted by dust-based pollution during construction activities, with cement-based dusts being of particular concern given their ability to degrade the epidermis structure of floral species. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

The above negative impacts, acting either alone or cumulatively, have the potential to result in the degradation and death of tree and understorey floral species along the length of these treeline habitats, ultimately resulting in the fragmentation of this important wildlife corridor habitat, which currently provides dense understorey refuge and a linear canopy.

Furthermore, the potential spread of high impact invasive non-native floral species, in particular Japanese Knotweed, from its current locations along Lynch's Lane into the hedgerows, has the potential to result in the displacement of native flora via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short-term adverse impact of slight significance for the hedgerow habitats located adjacent to Site 4.

Treelines [High Local]

The treelines habitats within the boundaries of Site 4 are to be removed in full as part of the construction works, while the other adjacent treeline habitats will still be exposed to a range of potentially adverse impacts generated by construction activities. There is the potential for accidental spills of deleterious substances, which have the potential to come in contact with and negatively impact the physiological health of the floral species within these treeline habitats. If a notable volume of these deleterious substances is spilled, they have the potential to seep into the sub-surface / groundwater, leading to the degradation of the root systems of these flora, potentially resulting in death, thus lowering overall health and biodiversity value of these important wildlife corridor habitats.

Moreover, the spreading root systems of tree species will be vulnerable to root compaction from heavy-machinery and/or temporary material stock-piling. In addition, machinery used adjacent to these treelines may lead to the accidental damage of tree limbs, degrading the health of hedgerow tree species.

Furthermore, these treeline habitats also have the potential to be negatively impacted by dust-based pollution during construction activities, with cement-based dusts degrading the epidermis structure of flora. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

The above negative impacts, acting either alone or cumulatively, have the potential to result in the degradation and death of tree and understorey floral species along the length of these treeline habitats, ultimately resulting in the fragmentation of this important wildlife corridor habitat, which currently provides dense understorey refuge and a linear canopy.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a very significant long-term adverse impact for the treeline habitats located within Site 4; and a short-term adverse impact of slight significance for the treelines located adjacent to Site 4.

Wet willow-alder-ash woodland [High Local]

While the wet willow-alder-ash woodland is not located within the physical footprint of the development, it will still be exposed to a range of potentially negative impacts generated by construction activities at Site 4. There is the potential for accidental spills of deleterious substances, which have the potential to come in contact with and negatively impact the physiological health of the floral species within the wet woodland. If a notable volume of these deleterious substances is spilled, they have the potential to seep into the sub-surface / groundwater, leading to the degradation of the root systems of these flora, potentially resulting in death, thus lowering overall health and biodiversity value of this important wildlife corridor habitat.

Furthermore, the spreading root systems along the north-western edge of the woodland will be vulnerable to root compaction from heavy-machinery and/or temporary material stock-piling. In addition, machinery used adjacent to the wet woodland may lead to the accidental damage of tree limbs, degrading the health of hedgerow tree species.

Additionally, this woodland also has the potential to be negatively impacted by dust-based pollution during construction activities, with particularly deleterious cement-based dusts degrading the epidermis structure of floral species. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

The above negative impacts, acting either alone or cumulatively, have the potential to result in the degradation and death of tree and understorey floral species within the woodland, ultimately resulting in the fragmentation of this important wildlife corridor habitat, which currently provides dense understorey refuge and a linear canopy.

Furthermore, the potential spread of high impact invasive non-native floral species, in particular Japanese Knotweed, from its current locations along Lynch's Lane into the wet woodland, has the potential to result in the displacement of native flora via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short-term adverse impact of slight significance for the wet woodland habitat located adjacent to Site 4.

Scrub [High Local]

As a result of the proposed development's pedestrian walkways, roadways, structures and other artificial surfaces, the scrub habitats will almost be lost in their entirety (>90%) within a short-term period, bar the small sections within the riparian zone of the Kilmahuddrick Stream, as well as those located adjacent to Site 4.

The retained and neighbouring scrub will still be vulnerable to an array of potentially damaging impacts generated by construction activities within Site 4. Accidental spillages of harmful substances (e.g. hydrocarbons and solvents), which may come in direct contact with and negatively impact the physiological health of the scrub flora; as well as penetrating into the sub-surface / groundwater and degrading the scrub floras' root systems, resulting in further degradation and the potential death of less resilient species, thus lowering overall health and biodiversity value of these scrub habitats.

Additionally, these scrub habitats have the potential to be physically damaged from excessive footfall from workers present on-site, compaction from light and heavy machinery and temporary material stock-piling. Such damage to the habitat may result in an increased frequency of disturbed bare ground within the scrub habitat, which in turn has the potential to result in the establishment of invasive species present within the locality (e.g. Butterfly-bush).

Furthermore, the potential spread of high impact invasive non-native floral species, in particular Japanese Knotweed, from its current locations along Lynch's Lane into disturbed scrubland, has the potential to result in the displacement of native flora via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Moreover, these scrub habitats also have the potential to be impacted by dust-based pollution during the construction stage, with cement-based dusts degrading the epidermis layers of floral species. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a very significant short-term adverse impact for the scrub habitats located within Site 4.

Immature woodland [High Local]

The immature woodland within the Site 4 boundary (approximately one-third of the total habitat) is set to be retained within the landscape design as part of the Kilmahuddrick Stream riparian zone. This is also true for the remainder of the immature woodland as it is to be protected within the riparian zone of Kilmahuddrick Stream.

Both immature woodland sections within and adjacent to Site 4 will still be exposed to a series of potentially adverse impacts as result of the construction activities. There is the potential for accidental spills of deleterious substances, which have the potential to come in contact with and negatively impact the physiological health of the floral species within the immature woodland. If a notable volume of these deleterious substances is spilled, they have the potential to seep into the sub-surface / groundwater, leading to the degradation of the root systems of these flora, potentially resulting in death, thus lowering overall health and biodiversity value of this important riparian corridor habitat.

Moreover, the spreading root systems of immature and semi-mature tree species, located on the south bank of the Kilmahuddrick Stream, will be vulnerable to root compaction from heavy-machinery and/or temporary material stock-piling. In addition, machinery used adjacent to the immature woodland may lead to the accidental damage of tree limbs, degrading the health of hedgerow tree species.

Furthermore, the immature woodland also has the potential to be adversely impacted by dust-based pollution during the construction works, with cement-based dusts being of particular concern given their ability to degrade the epidermis structure of floral species. General dust settlement may also lead to negative impacts on the photosynthesis of flora within the habitat.

The above negative impacts, acting either alone or cumulatively, have the potential to result in the degradation and death of tree and understorey floral species along the length of this hedgerow habitat, ultimately resulting in the fragmentation of this important wildlife corridor habitat, which currently provides dense understorey refuge and a sheltering canopy.

Additionally, the potential spread of high impact invasive non-native floral species, in particular Japanese Knotweed, from its current locations along Lynch's Lane into the north western section of Site 4, has the potential to result in the displacement of native flora via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short-term adverse impact of slight significance for the immature woodland habitat.

Rare and Protected Flora

Uncommon Flora – Pyramidal Orchid [High Local]

Pyramidal Orchid occurs relatively frequently within sections of Site 4, with several of the plants to be potentially lost as a result of the physical footprint of the proposed development. The remainder of the Pyramidal Orchids and their supporting habitat are to be retained within the riparian zone of the Kilmahuddrick Stream. However, their retained status will not safeguard them from potential accidents on-site which may result in these uncommon flora being trampled underfoot and/or their root systems being compacted by machinery or temporary stockpiles.

Pyramidal Orchid population within and adjacent to the site will also be vulnerable to surface water, groundwater and air pollution pathways. There is potential for degradation of root systems through unintended pollutant spills (surface water run-off and groundwater sub-soil infiltration) on-site within the dry meadow and grassy strip habitats.

Additionally, Pyramidal Orchid has the potential to be impacted by dust-based pollution, with cement-based dusts being of particular concern given their capacity to degrade the orchids' epidermal structures, degrading the health of the flora, and potentially resulting in death. General dust settlement may also lead to negative impacts on the flora's photosynthesis and pollination.

Furthermore, the potential spread of invasive non-native floral species into the riparian zone, has the potential to result in the displacement of Pyramidal Orchid via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term, adverse impact of slight significance for the local Pyramidal Orchid population.

Protected Flora – Lesser Centaury [National]

Five Red-listed Lesser Centaury individuals are present within grassy verge habitat that borders the marsh habitat of Site 4, which places these individuals within the retained riparian zone of the Kilmahuddrick Stream. However, their location within the southern riparian zone is vulnerable to potential accidents on-site which may result in these protected flora being trampled underfoot and/or their root systems being compacted by machinery or temporary stockpiles.

Furthermore, this small local population of Lesser Century may potential be impacted by surface water, groundwater and air pollution pathways. There is potential for degradation of root systems through unintended pollutant spills (surface water run-off and groundwater sub-soil infiltration) on-site within the grassy strip bordering the marsh.

Additionally, the Lesser Century has the potential to be impacted by dust-based pollution, with cement-based dusts degrading the epidermal structures, degrading the health of this protected floral species, and potentially resulting in death. General dust settlement may also lead to negative impacts on the flora's photosynthesis and pollination.

Furthermore, the potential spread of invasive non-native floral species into the riparian zone, has the potential to result in the displacement of Lesser Centaury via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a significant short-term, adverse impact for the local Lesser Centaury population.

Protected Fauna

Otter [County]

The local Otter population will potentially be exposed to a range of construction-based emissions (surface water, groundwater, air and disturbance impacts), as well as short-term habitat loss and fragmentation, which will be generated within the development's work area.

- Physiological and Habitat Degradation via Pollutants

In the event that hydrocarbon and solvent pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, local Otters may suffer from degraded furs notably impacting the furs' insulative qualities as result of a disruption to fur's natural water-proofing oils and its capacity to trap warm air close to the body, resulting in physiological stress for any affected Otters. In addition, these hydrocarbons can potentially be ingested by Otters as they groom their affected furs, leading to haemorrhagic gastroenteropathy, which will likely result in Otter mortalities (Baker et al., 1981). Moreover, surface water and groundwater-to-surface water-based pollution impacts have the potential to indirectly impact Otter via the deterioration of prey items in the food chain for Otter. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local Otter

population. Accumulation of such toxic substances is known to result in pulmonary distress in the lungs of mammals, in addition to the general carcinogenic effects.

- Disturbance

At present there are no Otter holts or couches within the physical footprint of the Site 4 development; however, it cannot be predicted whether the local Otters will establish new holts or couches (protected resting sites) in the time prior to the commencement of the construction stage along the Grand Canal section south of Site 4 and/or Kilmahuddrick Stream. In the event such resting spots become established within 150m upstream and/or downstream of Site 4 (along the Kilmahuddrick Stream or Grand Canal), then there is potential for disturbance to resting location. Additionally, disturbance to existing commuting corridors and hunting grounds may lead to potential loss of life in the case of accidents (e.g. accidental trappings) within the construction site containing existing commuting and foraging habitats, after failure to exclude entry.

- Habitat Loss and Fragmentation

The works within Site 4 will result in temporary habitat loss and fragmentation for local Otters, with both their foraging and commuting activities being negatively impacted during work hours. This temporary habitat fragmentation impact will also occur as result of the construction works that will take place within the Kilmahuddrick Stream riparian zone; and while the stream itself will still be open for foraging and commuting, the banks will undergo a degree of vegetation removal, which in turn removes the safe commuting corridor for Otter on the stream banks. Additionally, works within the riparian corridor may lead to potential loss of life for individual Otters in the case of accidents within the construction site (e.g. accidental trappings), after failure to exclude entry.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term adverse impact of moderate significance for the local Otter population.

Badger; Pine Marten; Irish Stoat; Hedgehog; and Pygmy Shrew [High Local]

The local Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew populations will potentially be exposed to a range of construction emissions (surface water, groundwater, air and disturbance impacts) which will be generated within the proposed development's works area.

- Physiological and Habitat Degradation via Pollutants

In the event that hydrocarbon pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew individuals may come in contact with the substance whilst navigating a waterway or wetland, resulting in degraded furs, which will notably impact their furs' insulative qualities, resulting in physiological stress for any affected individuals. Additionally, these hydrocarbons can potentially be ingested by these protected mammal species as they groom their affected furs, leading to further physiological stress.

All local mammal species are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the construction stage. In the event that a mammal were to drink from a waterbody, which had been accidentally contaminated with polluting substance (in particular a pollutant which floats on top of the water's surface, e.g. hydrocarbons), this can potentially result in damaged lungs and/or carcinogenic effects for affected individual.

Moreover, surface water, groundwater and air (dust)-based pollution impacts have the potential to indirectly impact these mammal species via the deterioration in quality and population decline (availability) of prey items in their respective food webs. This impact also has a knock-on effect as the consumption of contaminated prey items may lead to bioaccumulation of toxic substances within the local populations of these protected mammal species.

- Habitat Loss and Fragmentation

There will be a short-term fragmentation / loss of habitats, as result of the construction works that will take place within Site 4. The only unfragmented habitats will be those along the northern boundary of the site, along the northern banks of the Kilmahuddrick Stream.

- Disturbance

Adverse impacts to these terrestrial mammals may also arise in the form of visual and audible disturbance to foraging and commuting activities. Additionally, disturbance may lead to potential loss of life in the case of accidents (e.g. accidental trappings) within the construction site containing existing commuting and foraging habitats, after failure to exclude entry.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term adverse impact of slight significance for these mammal species, as a result of potential impacts.

Bats [High Local]

- Roost Disturbance

Given the absence of bat roosts amongst the semi-mature / mature trees and artificial structures within and immediately adjacent to the boundaries of Site 4, adverse impacts on current bat roosting activities are not predicted during the construction stage; therefore, no derogation licences are currently required for the disturbance of bat roosts as a result of the construction works. However, it cannot be predicted whether the local bats will establish new roosts in the time prior to the commencement of the construction stage. In the event a bat roost becomes established within Site 4, then there will be the potential for disturbance to a bat roost. Furthermore, the construction of the development will also result in the loss of a large number of immature / semi-mature /mature trees within Site 4. This will ultimately result in a short- to medium-term loss of potential roosting features that may form within these trees in the next several years.

- Lighting Disturbance of Foraging and Commuting Activities

Direct and indirect impacts are likely to occur on the foraging and commuting activities of bat species frequenting the habitats within and adjacent to Site 4's boundaries, as a result of the introduction of additional artificial lighting during the construction stage. Direct lighting impacts refers to compound or works areas lighting spilling into adjacent habitats that support the foraging and movements of nocturnal animals, such as the local bat species. This light spillage will cause local bats to avoid these excessively lit habitats, which effectively reduces the total habitat available to them for both foraging and commuting within and adjacent to the boundaries of Site 4. In some potential cases, such light spillage may cut-off commuting routes along linear habitat features, i.e., light spillage into the Kilmahuddrick Stream riparian corridor.

The indirect lighting impacts have the potential to arise through influencing the distribution and frequency of the local bats prey items within habitats adjacent to areas within additional construction- / compound-based lighting, resulting in a negative impact on foraging activity. As these additional lights will attract nocturnal winged-invertebrates towards them out of the usual host habitat (van Langevelde et al., 2018), the local bat species will be left with the option to commute to new foraging grounds or pursue their prey and in turn enter the light impacted area. For some bat species who have adapted relatively well to urban landscapes, namely Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat, the pursuit of prey items into light impacted areas is less impactful (Russ and Montgomery, 2002; Russ et al., 2003). Moreover, studies have shown that pipistrelle species and Leisler's Bat can congregate around urban street lighting feeding on the nocturnal winged-insects attracted to the lower impact lighting (Rydell et al., 1993, Blake et al., 1994; Stone et al., 2015; Spoelstra et al., 2015; 2017).

- Habitat Loss and Fragmentation

Short-term habitat fragmentation / loss impact will occur as result of the construction works that will take place; and while the Kilmahuddrick Stream itself will still be open for foraging and commuting, the banks will undergo a degree of vegetation removal, which will in turn remove a section of the local bats' known commuting corridor along the stream banks. Additionally, the large-scale removal of trees across the site will impact the existing commuting corridors of the local bat species.

- Physiological and Habitat Degradation via Pollutants

All identified bat species (Common Pipistrelle; Soprano Pipistrelle; and Leisler's Bat) are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the

construction stage. In the event a bat was to drink from a waterbody which had been accidentally contaminated with polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), the bat has the potential to fly over a slick of contaminated water with its mouth open, consuming water from the top of the waterbody's surface. The consumption of such water can potentially result in damaged lungs and/or carcinogenic effects for the affected individual.

Additionally, surface water, groundwater and air (dust)-based construction emissions have the potential to lead to pollution impacts that will indirectly impact all local bat species via degradation of local habitats resulting in the deterioration of quality and decreased frequency of their terrestrial-and/or aquatic-based prey items in the food chain. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local bat populations, resulting in physiological stress and potential reduced fecundity.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to medium-term adverse impact of moderate significance for the local bat species.

Wintering Birds [High Local]

Environmental impacts via the surface water, groundwater, air and disturbance impact pathways into the habitats within and adjacent to Site 4 during the construction stage, have the capacity to generate negative impacts for wintering bird species which utilise these habitats.

- Habitat Loss, Fragmentation and Degradation

The temporary and permanent habitat loss associated with the construction stage, as well as the potential deterioration of retained habitats through surface water, groundwater or air-based pollutants have the potential to reduce and/or degrade the foraging grounds of wintering bird species. The degradation of floral species in these habitats has the potential to negatively impact insectivorous bird species of conservation concern (i.e. Black-headed Gull; Herring Gull; Lesser Black-backed Gull; Jack Snipe; and Tufted Duck), which are reliant on healthy host flora supporting a range of invertebrate species, which feed on or frequent these flora for foraging purposes. Similarly, a number of omnivorous bird species of conservation concern will be negatively impact by the above scenarios, namely Mallard, Coot and Mute Swan. Additionally, Pochard; Mallard and Mute Swan will also be negatively impacted by the reduction in quantity and quality of their preferred grazing flora species. Also, the polluting of the local waterbodies has the potential to negatively affect the local fish populations, which will in turn adversely impact piscivorous species of conservation concern, such as Cormorant. Such impacts on foraging grounds and diet will range from temporary to short-term in regard to impact longevity.

The temporary and long-term habitat loss, as well as potential habitat degradation, have the potential to result in habitat fragmentation within the boundaries of Site 4. While the level of fragmentation in regard to movement / distance travelled is within an acceptable range for standard commuting purposes for bird species, the lack of cover / refuge is problematic for smaller bird species, which can be hunted by local predators, such as Buzzard and Red Fox, thus increasingly the likelihood of being predated and reducing the affected wintering bird population (short-term impact).

- Physiological Degradation

In the event that hydrocarbon pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, wintering bird species may come in contact with the substance whilst navigating, drinking from, foraging in or washing within a waterbody or wetland, resulting in degraded feathers, which will notably impact their feathers' insulative qualities, resulting in physiological stress for any affected individuals. Furthermore, these hydrocarbons can potentially be ingested by bird species as they preen their affected feathers, leading to further physiological stress.

Wintering bird species are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the construction stage of the proposed Site 4 development. If a wintering bird were to drink from a waterbody which had been accidentally contaminated with polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), the bird would consume water from the upper (polluted) layers of the water column.

The consumption of such water can potentially result in reduced egg production and hatching; increased clutch or brood abandonment; reduced growth and increased organ weights (Albers 2006).

Moreover, surface water, groundwater, and air (dust)-based pollution impacts have the potential to indirectly impact wintering bird species via the deterioration of food / prey items. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the insectivorous and omnivorous wintering bird populations, such as Black-headed Gull; Herring Gull; Lesser Black-backed Gull; Mallard; Mute Swan; Coot and Tufted Duck (Costa et al. 2013; Idan and Jazza 2022; and Ding et al. 2023).

- Disturbance

Additionally, wintering bird species that utilise the site for commuting or foraging purposes may also be visually and/or audibly disturbed by the construction works and workers entering /exiting the works area, causing these wintering bird species to vacate the site during active work periods. Furthermore, the clearance of vegetation within and adjacent to the works area will increase wintering bird species alert distances.

Additionally, wintering bird species that utilise the meadows, canal and artificial pond (south of the canal) habitats adjacent to Site 4 for foraging, refuge and commuting purposes may also be visually and/or audibly disturbed by the construction works, causing wintering bird species such as Black-headed Gull; Herring Gull; Lesser Black-backed Gull; Mallard; Mute Swan; Cormorant; Pochard; and Tufted Duck to vacate these foraging habitats during active work periods. Visual and noise disturbance-based impacts are predicted to range from temporary to short-term in regard to longevity.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term adverse impact of slight significance for wintering bird populations.

<u>Breeding Birds [High Local]</u>

The local breeding bird populations will potentially be exposed to a series of construction-based emissions (surface water, groundwater and air-based pollutants) and land-take (habitat loss), which will be generated / occur within the proposed Site 4 development.

- Reduction of Nesting Sites

Local breeding bird species will experience a significant reduction in current and potential nesting sites as result of the general vegetation clearance and tree felling required to allow for the construction of the Site 4 development. A total of six bird species (i.e. Goldcrest; Spotted Flycatcher; Starling; Wood Pigeon; Linnet; and Willow Warbler) which are protected (Annex) and/or of conservation concern (Amber-listed), will have their preferred nesting habitats negatively impacted (reduced) as result of the temporary and/or permanent loss of grassland; hedgerow; treeline; scrub; and woodland. The remaining protected / Amber-listed breeding bird species of conservation concern, namely Mallard, will not lose any nesting habitats as result of the construction stage. The other 13 Green-listed breeding bird species recorded within or adjacent to the boundaries of Site 4 will also be impacted from the habitat loss outlined above. Ultimately, 19 local breeding bird populations will experience a short-term to long-term loss of potential nesting sites as a result of the construction of Site 4.

- Habitat Loss, Fragmentation and Degradation

Additionally, habitat loss and the general deterioration of retained habitats through surface water, groundwater or air-based pollutants have the potential to reduce and/or degrade the foraging grounds of local breeding bird species. The degradation of floral species in these habitats has the potential to negatively impact insectivorous bird species of conservation concern (i.e. Goldcrest; Black-headed Gull; Herring Gull; Lesser Black-backed Gull; Spotted Flycatcher; and Tufted Duck), who are reliant on healthy host flora supporting a range of invertebrate species, which feed on or frequent these flora for foraging purposes. Similarly, seed- and frugivorous or fruit/berry-eating protected bird species (i.e., Wood Pigeon) will be adversely impacted if pollutant-affected flora were unable to produce these reproductive products, or only produce low-quality and/or below average quantities of these food sources. A number of omnivorous bird species of conservation concern will be

negatively impact by both of the above scenarios, namely Mallard; Mute Swan; Coot; Starling; and Linnet. Mallard and Mute Swan will also be negatively impacted by the reduction in quantity and quality of their preferred grazing flora species. The polluting of the local waterbodies also has the potential to negatively affect the local fish populations, which will in turn adversely impact piscivorous species of conservation concern, such as Cormorant. Such impacts on foraging grounds and diet will range from temporary to short-term in regard to impact length.

The temporary and long-term habitat loss, as well as potential habitat degradation, have the potential to result in habitat fragmentation within the boundaries of Site 4. Potential degradation of habitats to be retained, through direct physical or pollutant-based impacts, also has the potential to increase the degree the fragmentation and loss. While the level of fragmentation in regard to movement / distance travelled is within acceptable range for standard commuting purposes for the local breeding bird species, the lack of cover / refuge is problematic for any bird species which can be hunted by local predators, such as Buzzard and Sparrowhawk *Accipiter nisus* (both Green-listed species), thus increasingly the likelihood of being predated and reducing the local populations of breeding bird species of conservation concern. The potential loss of juvenile and/or adult birds of conservation concern will result in short-term impact for local breeding bird species.

- Physiological Degradation

In a scenario where hydrocarbon pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, breeding birds may come in contact with the substance whilst navigating, drinking from, foraging in or washing within a waterbody or wetland, resulting in degraded feathers, which will notably impact their feathers' insulative qualities, resulting in physiological stress for any affected individuals. Also, these hydrocarbons can potentially be ingested by bird species as they preen their affected feathers, leading to further physiological stress.

All local breeding bird species are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the construction stage. In the event that a bird were to enter a waterbody, which had been accidentally contaminated with a polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), the bird could consume water from the upper (polluted) layers of the water column. The consumption of such water can potentially result in reduced egg production and hatching; increased clutch or brood abandonment; reduced growth and increased organ weights (Albers, 2006).

Moreover, surface water, groundwater, and air (dust)-based pollution impacts have the potential to indirectly impact breeding bird species via the deterioration of food / prey items in the food chain for the local bird species. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local breeding bird populations (Costa et al., 2013; Idan and Jazza, 2022; and Ding et al., 2023).

- Disturbance

Additionally, breeding bird species that utilise the site for commuting or foraging purposes may also be visually and/or audibly disturbed by the construction works and workers entering /exiting the works area, causing these breeding bird species to vacate the site during active work periods. Additionally, the clearance of vegetation within and adjacent to the works area will increase local breeding bird species alert distances as there will be less vegetation available for refuge (Fernández-Juricic et al., 2001).

Noise generated by the construction works has the potential to effect egg production, incubation, brooding, predators, brood parasites, and abandonment, as well as the ability to find or attract a mate and the ability of parents to hear and respond to begging calls of their offspring. Any bird species that regularly experience fright–flight responses or failure to attract mates and defend territories (Slabbekoorn and Ripmeester, 2008) as a result of the excessive noise, will likely suffer from decreased fecundity of their local respective populations (Ortega, 2012). Given the projected length of the construction stage, a temporary to short-term disturbance impact is predicted for local breeding bird populations.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a range of temporary to long-term adverse impacts of slight significance for these breeding bird species of conservation concern, as a result of the above impacts.

Amphibians [High Local]

- Physiological and Habitat Degradation via Pollutants

Deleterious pollutants accidentally introduced via surface water, groundwater and air (dust) pathways into the habitats located on-site and adjacent, during the construction stage, will reduce the capacity of these habitats to support the foraging, spawning and hibernation activities of both Common Frog and Smooth Newt.

This of particular concern within wetland and aquatic habitats given the osmotic physiological nature of amphibians' dermal layers, leaving them especially vulnerable to water-based pollutants. Moreover, if a polluting event were to occur whilst spawn was present within these aquatic environments, it has the potential to lead to deformities in the Common Frog and Smooth Newt tadpoles, therefore, impacting the next generation of the local amphibian populations, leading to the minimum of a short-term adverse impact for these species.

Moreover, surface water- and groundwater- and air (dust)-based pollution impacts have the potential to indirectly impact these two amphibian species via the deterioration of food / prey items in the food chain for the local amphibian species. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local Common Frog and Smooth Newt population.

- Disturbance

Additionally, these two amphibian species may also be subjected to disturbance-based impacts, which have the potential to negatively impact their foraging, spawning, commuting and hibernation activities, as well as potential loss of life for individuals within the construction site (e.g. accidental trappings), after failure to exclude entry.

- Habitat Loss and Fragmentation

Short-term habitat fragmentation / loss impact will occur as result of the construction works that will take place; and while the Kilmahuddrick Stream itself will still be open for foraging and commuting, the banks will undergo a degree of vegetation removal, which will in turn remove a section of the local amphibians' known commuting corridor along the stream banks. Additionally, the short-term removal of a number of drainage ditches across the site will impact the existing commuting corridors and spawning activity of the local amphibian species.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term adverse impact of slight significance for these amphibian species.

Fish [County / High Local]

- Physiological and Habitat Degradation via Pollutants

For local fish populations, adverse impacts may arise during the construction in the form of accidental introduction of pollutants, such as hydrocarbons, or excessive sediment into the local surface water network (i.e. Kilmahuddrick Stream, River Griffeen and River Liffey). Such uncontrolled discharges into Kilmahuddrick Stream have the potential to directly impact fish species through substance toxicity or in the case of sediment input, the degradation of spawning habitat downstream. These polluting events also have the potential to indirectly impact local fish species through the depletion and/or degradation of the invertebrate trophic level (food supply).

In a scenario where hydrocarbons, solvents or lubricants have been accidentally introduced into a waterbody, the heavy metals within these substances have the potential to pass through the gills of local fish species. These metals may also enter fish through their digestive tract via ingestion of metal accumulated prey items. Metals such as cadmium, chromium, nickel, arsenic, copper, mercury, lead and zinc are the most notable metals that cause severe toxicity in fish species. The exposure to these metals results in the development of oxidative stress by affected fish, which weakens the immune system, causing tissue and organ degradation, as well as growth defects and a reduced fecundity

(Garai et al., 2021). The longevity of this type of impact will vary depending on the quantity of the pollutant entering the waterbody. Therefore, in the absence of mitigation measures, it is predicted that metal toxicity impacts have the potential to result in temporary to medium-term adverse impacts for local fish species. Fish species will be most vulnerable to these impacts during the installation of the culvert and the associated stream regrading, as well as the construction of the proposed flood compensatory storage area.

Increased vehicular presence adjacent to the local waterbodies will lead to local increases in nitrogen oxides (NOx) potentially resulting in the minor acidification / change of pH of the surface water network. Research has detailed how freshwater fish species have shown diminished abilities to respond to damage-released chemical alarm cues from other fish of the same species under weakly acidic conditions. This group of fish species includes Three-spined Stickleback (Peterson et al., 1989) and Atlantic Salmon (Leduc et al., 2010), which will likely suffer an increased mortality predation rate within the Kilmahuddrick Stream (Three-spined Stickleback) and River Liffey downstream (Atlantic Salmon), in the event that the Kilmahuddrick Stream becomes slightly acidic (pH~ 6.0) during the construction stage. A short-term negative impact is predicted from potential impact of acidification of local surface water network. Additionally, acidification / low pH levels in combination high metal concentrations, which can be introduced to the surface waterbody via a hydrocarbon or solvent spill, have the potential to increase the mortality of River Lamprey eggs and newly emerged larvae (Myllynen et al., 1997; and Lucas et al., 2021) within the River Liffey downstream. The fish species within the Grand Canal are safeguarded by the mesotrophic to eutrophic conditions within the canal, which are sufficient to buffer the potential adverse effects of acidification.

- Habitat Loss and Fragmentation

Short to long-term habitat fragmentation / loss impact will occur as result of the construction works that will take place. The length of Kilmahuddrick Stream will be open for fish foraging and commuting during periods of the construction stage but will be split into upstream and downstream sections by a dry cell section, which will allow for the installation of the proposed culvert section.

- Disturbance and Accidental Fatalities

A number of fish species are sensitive to both noise and associated vibrations so there is the potential for high decibel / vibration activities located adjacent to the Kilmahuddrick Stream and Grand Canal to cause adverse behaviour of local fish species. European Eel have been deemed to be less sensitive to noise when compared to other fish species. This is due to their specific hearing mechanisms and it has been observed that these two species do not display avoidance behaviour in response to noise production (e.g. construction piling activities) (Hawkins and Johnstone, 1978). Therefore, noise and vibration impacts are not predicted for European Eel during the construction stage.

European Eel, Three-spined Stickleback and other potential fish species inhabiting the Kilmahuddrick Stream will potentially be subjected to the physical disturbance of their aquatic habitat during the regrading of the stream as part of the culvert installation works. These instream works have the potential to result in accidental fatalities to local fish via physical trauma to individuals and/or displacement from the aquatic environment.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be temporary to short-term adverse impacts ranging from slight (Brown Trout and Three-spined Stickleback) to moderate (Atlantic Salmon, Lamprey spp. and European Eel) significance for these fish species.

<u>Terrestrial Invertebrates [High Local]</u>

- Physiological and Habitat Degradation via Pollutants

In the event that construction-based environmental pollutants accidentally introduced, via surface water, groundwater and air (dust) pathways, into the terrestrial and semi-aquatic / wetland habitats present within and adjacent to Site 4, local terrestrial invertebrates' foraging resources may be notably degraded, potentially reducing their quality and frequency of occurrence within the affected habitat(s). Furthermore, a number of invertebrate groups (e.g. Lumbricina – earthworms) are known to bioaccumulate pollutants within the soils of these polluted habitats, damaging their physiological health, as well as introducing the toxin into the lowest trophic level of the local food web.

- Disturbance

Additionally, negative impacts may arise for local terrestrial invertebrates in the form of disturbance to foraging and commuting activities via temporary and long-term habitat loss and fragmentation during the construction stage. The only habitats safeguarded from large-scale disturbance are those within the Kilmahuddrick Stream riparian zone along the northern boundary of the site.

- Habitat Loss and Fragmentation

Excluding the Kilmahuddrick Stream riparian zone along the northern boundary of the site and small section of woodland to the south of the site, the remainder of Site 4 will experience short- to long-term habitat loss and fragmentation, which will notably reduce the total habitat available for foraging and hive sites for tree-based hives, dense-grass tussock hives and subterranean hives. This will adversely impact the local populations of White-tailed Bumblebee and Common Carder-bee. Additionally, the loss of these grassland habitats will reduce the total available host plants for butterfly species laying their eggs, with species such as Meadow Brown; Red Admiral; Large White; Ringlet; Comma; and Speckled Wood having their reproductive cycle negatively impacted.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term adverse impact of slight significance for these terrestrial invertebrate species.

Freshwater Aquatic Invertebrates [High Local]

- Physiological and Habitat Degradation via Pollutants

Aquatic invertebrates may also be subject to degraded foraging habitats as result of pollutants and excess sediments; toxicity issues due to bioaccumulation in the freshwater environment; and disturbance to foraging and commuting activities during construction. Further to this, a number of invertebrate groups are known to bioaccumulate pollutants within the waterbodies of these polluted habitats (Spehar et al., 1978), damaging their physiological health, as well as introducing the toxin into the lowest trophic level of the local food web. These freshwater aquatic invertebrate species will be most vulnerable to these polluting impacts during the installation of the culvert and the associated stream regrading, as well as the creation of the proposed flood compensatory storage area.

- Habitat Loss and Fragmentation

Short to long-term habitat fragmentation / loss impact will occur as result of the construction works that will take place. The length of Kilmahuddrick Stream will be open for freshwater invertebrate foraging and commuting during periods of the construction stage but will be split into upstream and downstream sections by a dry cell section, which will allow for the installation of the proposed culvert section.

- Disturbance and Accidental Fatalities

Freshwater aquatic invertebrate species inhabiting the Kilmahuddrick Stream will potentially be subjected to the physical disturbance of their aquatic habitat during the regrading of the stream as part of the culvert installation works. These instream works have the potential to result in accidental fatalities via physical trauma to individuals and/or displacement from the aquatic environment.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term adverse impact of slight significance for these aquatic invertebrate species, as a result of the above adverse impacts.

6.7.3.2 Operational Stage

Designated Sites

Proposed Natural Heritage Areas

Listed below are the pNHA sites within the proposed development's ZoI, that will be vulnerable to the potential impacts of the development's operational activities, in a scenario where mitigations measures are absent:

- Grand Canal pNHA [002104]; and
- Liffey Valley pNHA [000128].

Surface water, groundwater and air operational emissions are not predicted to impact the KER habitats and species of Grand Canal pNHA, given the location of Site 4's surface water outfalls and the previously mentioned acidification resilience.

However, the Grand Canal pNHA will be subject to increased physical, audible and visual disturbances as a result of the increased local populace, as well as associated pets, e.g., Domestic Cat *Felis catus* and Dog *Canis familiaris*, including exotic pets such as terrapin species (e.g., invasive Yellow-bellied Slider *Trachemys scripta scripta*), which are on occasion illegally released into canal and pond habitats. These disturbances generated by human and/or pet have the potential to negatively impact canal flora through trampling, soil/root compaction and digging, and canal associated fauna through causing increased vigilance behaviour and subsequent increased frequency of flight away from the disturbance source. There is also the potential for increased predator pressures on all fauna, as a result of free-roaming domestic cats and dogs.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the Grand Canal pNHA will experience an initial long-term negative impact of slight significance.

Groundwater, air and disturbance-based operational emissions are not predicted to impact the KER habitats and species of Liffey Valley pNHA, given the designated site's location in respect to Site 4.

The Liffey Valley pNHA will be subject to operational surface water emissions from Site 4. However, there will be a series of SuDS elements installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds. These SuDS features will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), before they exit the site via outfalls into the Kilmahuddrick Stream. Additionally, for surface water run-off that travels into the neighbouring pond / bioswale west of Site 4, the water will also be treated by a full retention interceptor [Klargester NSFA210 or equivalent approved]. Therefore, the Kilmahuddrick Stream, which hydrologically connects the proposed development with the Liffey Valley pNHA, will not experience any operational contamination from surface water run-off of hardstanding surfaces within the boundaries of Site 4.

Therefore, in the absence of operational mitigations, it is predicted that there will be an initial long-term neutral operational impact that is not significant for the Liffey Valley pNHA and its associated KERs, given the proposed drainage design and associated SuDS.

Habitats

Reed and large sedge swamp [High Local]

As the reed and large sedge swamp is located outside of Site 4's boundary, it will not be subject to any long-term operational habitat loss as a result of the physical footprint of the development. However, this wetland habitat will potentially be subject to increased physical disturbances as a result of the increased local populace, as well as associated pets, e.g., dog. These disturbances generated by human and/or pet have the potential to negatively impact swamp flora through trampling and the opportunistic creation of access points to the edge of the canal waterbody. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the reed and large sedge swamp will experience an initial long-term negative impact that is not significant.

Eroding / upland rivers (Kilmahuddrick Stream) [County]

The eroding / upland river habitat will not experience any aquatic habitat loss as a result of Site 4's operations. The only environmental change this waterbody will experience will be increased shading as a result of the physical structure of the site's main access road and secondary access road in the

north-east corner of the development. Given the lack of floating and emergent aquatic flora within the Kilmahuddrick Stream, the increased shading will not result in any decreased floral growth within the stream habitat during the operational stage. The increased shading as a result of the roads and riparian zone planting plan will help stabilise local water temperatures within this section of the Kilmahuddrick Stream, which will be beneficial for the aquatic fauna it supports, assisting in the mitigation of increased temperatures as a result of climate change.

A series of SuDS features installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), before they enter the Kilmahuddrick Stream, safeguarding this aquatic habitat from deleterious urban run-off. Additionally, for surface water run-off that travels into the neighbouring pond / bioswale west of Site 4, the water will also be treated by a full retention interceptor [Klargester NSFA210 or equivalent approved].

Additionally, there will be an increased potential for the introduction of invasive non-native flora and fauna into the Kilmahuddrick Stream as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the eroding / upland river habitat, will experience an initial long-term negative impact that is not significant.

Canals (Grand Canal) [National]

Surface water, groundwater and air operational emissions are not predicted to impact the Grand Canal waterbody, given the location of Site 4's surface water outfalls and the previously mentioned acidification resilience of canal waterbody.

However, this canal habitat will potentially be subjected to increased physical disturbances as a result of the increased local populace, as well as associated pets, e.g., dog. These disturbances generated by human and/or pet have the potential to negatively impact floating, emergent and submerged macrophytes through physical degradation of plant structures as a result of direct contact with human and/or dog activity. Additionally, there will be an increased potential for the introduction of invasive non-native flora and fauna into the canal habitat as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the canal habitat section south of Site 4, will experience an initial long-term negative impact of slight significance.

Drainage ditches [High Local]

The loss of drainage ditch habitat within the boundaries of Site 4 during the construction stage will be remedied through the landscape / drainage design of the development, which includes the creation of new drainage ditches, as well as numerous swales, which will provide and support a subsection of the ecological services and floral composition of a fully established drainage ditch habitat. As a result, there will be no long-term habitat loss of drainage ditch habitat within Site 4.

In regard to Site 4's operational emissions, groundwater and air operational emissions are not predicted to negatively impact the new drainage ditch habitats. However, given that the site drainage ditches are incorporated into the operational surface water design as SuDS features, this role within the SuDS has the potential to lower the water quality within these drainage ditches, with potential knock-on effects for the instream flora.

Additionally, these ditch habitats will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the flora associated with the drainage ditches through trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the drainage ditch habitats will experience an initial long-term negative impact of slight significance.

Marsh [High Local]

The marsh habitat is to be retained within the proposed landscape design, given its presence within the protected riparian zone of the Kilmahuddrick Stream, along the northern boundary of Site 4.

To manage the surface water run-off from hardstanding areas within Site 4, a range of SuDS features are proposed including permeable paving; tree pits; conveyance swales; and bioswales / ponds, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), before they enter the Kilmahuddrick Stream, safeguarding this marsh habitat from urban run-off at periods of high flow (small-scale flooding of riparian zone) within the Kilmahuddrick Stream. Additionally, for surface water run-off that travels into the neighbouring pond / bioswale west of Site 4, the water will also be treated by a full retention interceptor [Klargester NSFA210 or equivalent approved].

Additionally, the marsh will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the flora associated with the marsh through trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of operational mitigation measures, it is predicted that there will be an initial long-term negative operational impact that is not significant for the marsh habitat present within Site 4.

Dry meadow and grassy verges [High Local]

Only a small section of the existing dry meadow and grassy verges habitat will remain within Site 4 during the operational stage. However, the landscape design for the site will see the creation of new dry meadow habitat in strips and patches throughout Site 4, which will aid in remedying the loss of existing dry grassland habitats.

The new and retained dry meadow habitats will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the dry meadow flora through trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

To manage the surface water run-off from hardstanding areas within Site 3, a series of SuDS features are proposed including permeable paving; tree pits; conveyance swales; and bioswales / attenuation basins, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016). These SuDS features will ensure that localised flooding during heavy rainfall events does not lead to habitats, such as the retained and new dry meadows, being subjected to potentially harmful urban run-off.

Therefore, in the absence of operational mitigation measures, it is predicted that there will be an initial long-term negative operational impact that is of slight significance for the dry meadow habitat present within Site 4.

(Mixed) broadleaved woodland [High Local]

The habitat loss experience by the mixed broadleaved woodland habitat during the construction stage will largely not be remedied by the landscape plan for Site 4, as it does not contain any new areas of mixed broadleaved woodland planting. While new tree planting is notably present within the proposed landscape design, these new trees more accurately align with street-based treelines / scattered trees and parkland habitat. The retained mixed woodland section will have controlled gated access, notably reducing physical disturbance from members of the public.

Surface water, groundwater and air operational emissions are not predicted to impact the small retained section of broadleaved woodland to the south of Site 4. The management of the surface water run-off from hardstanding areas within Site 4 will involve a range of SuDS features, including permeable paving; tree pits; conveyance swales; and bioswales / ponds, which will collectively

provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding this retained woodland habitat from potential impactful urban run-off.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the mixed broadleaved woodland will experience an initial long-term negative impact that is significant, given that majority of mixed broadleaved woodland will either be lost or reestablished as a different tree-based habitat.

Hedgerows [High Local]

Following the construction stage, Site 4 will see a notable increase of native immature hedgerow habitat in strips throughout the development.

The new hedgerows within the site and existing hedgerow habitats located adjacent to Site 4, are not predicted to be negatively impacted by the development's surface water, groundwater and air-based emissions. The management of the surface water run-off from hardstanding areas within Site 4, will involve a range of SuDS features including permeable paving; tree pits; conveyance swales; and bioswales / ponds, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding the new and existing hedgerows within the locality of Site 4.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the hedgerow habitat will experience an initial long-term positive impact that is of slight significance.

Treelines [High Local]

Following the construction stage, Site 4 will see an increase of immature treeline (and street tree) habitat in strips throughout the development. However, not all these treelines will be able to support typical treeline understorey flora, for example, the street trees along the main access road will have mowed grass beneath them. Furthermore, a number of these treelines will be unable to form continuous canopies due to the spacing distance between trees. Therefore, while the overall coverage of treelines within Site 4 has increased, the structural and floral quality of the existing treelines will not be replicated in the majority of these habitats.

The new treelines within Site 4 are not predicted to be negatively impacted by the development's surface water, groundwater and air-based emissions. The management of the surface water run-off from hardstanding areas within Site 4 will involve a range of SuDS features, including permeable paving; tree pits; conveyance swales; and bioswales / ponds, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding the new treelines within and neighbouring Site 4. This does not apply to street trees with tree pits, as these trees will be subject to a degree or surface water run-off as they are a part of the SuDS network.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the treeline habitat will experience an initial long-term negative impact that is of slight significance.

Wet willow-alder-ash woodland [High Local]

As the wet willow-alder-ash woodland is located outside of Site 4's boundary, it will not be subject to any long-term operational habitat loss as a result of the physical footprint of the development. However, this woodland habitat will potentially be subject to increased physical disturbances as a result of the increased local populace, as well as associated pets, e.g., dog. These disturbances generated by human and/or pet have the potential to negatively impact woodland flora through trampling, limb breakages and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the wet willow-alder-ash woodland will experience an initial long-term negative impact that is not significant.

Scrub [High Local]

Only a small section of the existing scrub habitat will remain within Site 4 during the operational stage. However, the landscape design for the site will see the creation of new shrub areas in strips and patches throughout Site 4, which will aid in remedying the loss of existing scrub habitats. While the floral species composition will notably shift (e.g., the removal of Bramble), the structural functions of the lost scrub will be reestablished within these shrub-based habitats, i.e., these shrubs will be able to provide refuge to local wildlife, as well as nest / hive-building opportunities for local breeding birds and bee / wasp species.

The new shrub and retained scrub habitats will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the scrub and shrub habitats through breakages of plant limbs when navigating the habitat. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of operational mitigation measures, it is predicted that there will be an initial long-term negative operational impact of slight significance for the scrub habitat present within Site 4.

Immature woodland [High Local]

As the section of immature woodland is located outside of Site 4's boundary, it will not be subject to any long-term operational habitat loss as a result of the physical footprint of the development. However, this woodland habitat will potentially be subject to increased physical disturbances as a result of the increased local populace, as well as associated pets, e.g., Dog. These disturbances generated by human and/or pet have the potential to negatively impact woodland flora through trampling, limb breakages and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

The proposed landscape design for the site will see the supplementary planting of Birch species along the Kilmahuddrick Stream, which will add to, and match the tree composition of the existing immature woodland.

Surface water, groundwater and air operational emissions are not predicted to impact the retained section of immature woodland. The management of the surface water run-off from hardstanding areas within Site 4 will involve a series of SuDS features, including permeable paving; tree pits; conveyance swales; and bioswales / ponds, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding this retained woodland habitat from potential impactful urban run-off.

Therefore, in the absence of mitigation measures during the operational stage of the Site 4 development, it is predicted that the immature woodland will experience an initial long-term positive impact that is not significant.

Rare and Protected Flora

Pyramidal Orchid [High Local]

Pyramidal Orchid are present both within and adjacent to the operational Site 4 development. Those located adjacent (outside) of the development will be safeguarded from direct physical impacts within their respective retained habitats during the operational stage of the Site 4 development.

Pyramidal Orchids will be vulnerable to polluted surface water run-off from hardstanding surfaces during operational stage of Site 4. However, a series of SuDS features are proposed including permeable paving; tree pits; conveyance swales; and bioswales / ponds, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high

rainfall events, safeguarding the local Pyramidal Orchid population during the operational stage. Therefore, the local Pyramidal Orchid population will not experience any operational contamination impacts from surface water run-off.

The habitats containing the Pyramidal Orchid will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the Pyramidal Orchid population through trampling and digging.

Therefore, in the absence of specific Pyramidal Orchid targeted mitigation, it is predicted that there will be an initial long-term negative impact of slight significance for the local Pyramidal Orchid population.

Lesser Centaury [National]

The Lesser Centaury within the riparian zone of the Kilmahuddrick Stream, to the north of Site 4, will be safeguarded from proposed physical removal given the physical footprint of the proposed development and its precise location within the retained riparian zone habitats (marsh / grassy verges) during the operational stage of the Site 4 development.

Despite the being located within a retained habitat area, the Lesser Centaury will still be vulnerable to polluted surface water run-off from hardstanding surfaces during operational stage of Site 4. However, a series of SuDS features are proposed including permeable paving; tree pits; conveyance swales; and bioswales / ponds, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, protecting the local Lesser Centaury population from surface water pollution during the operational stage.

The habitats containing the Lesser Centaury will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the Lesser Centaury population through trampling and digging, potentially leading to the local extinction of the species given the small population size.

Therefore, in the absence of specific Lesser Centaury targeted mitigation, it is predicted that there will be an initial long-term negative impact of moderate significance for the protected Lesser Centaury population.

Protected Fauna

Otter [County]

- Disturbance

As Site 4 is located adjacent to an active works depot and an active railway line; and roadways (Adamstown Avenue), the cumulative noise levels of the existing baseline and the operational noise from the development will not be significant for the local Otter population. Local Otters will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact Otter activities within and adjacent to Site 4.

Additionally, Otters are more nocturnally active than diurnally; therefore, the length of time they will spend in proximity to these mainly day-time activities will be notably reduced, with a degree of seasonal variance.

- Habitat Loss and Fragmentation

The operational landscape and lighting designs will ensure that the most essential existing mammal commuting corridors (Kilmahuddrick Stream riparian corridor) will be retained; as well as the creation of the new corridors in several sections of Site 4, including the installation of swales and ponds, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland strips. Therefore, the operational stage of Site 4 will not result in any notable long-term habitat fragmentation for the local Otter population. The remedial tree and shrub planting will help cushion the loss of the large number of trees and scrub that will be cleared during the construction stage, providing replacement refuge

for Otter within the riparian zone of the Kilmahuddrick Stream. However, the overall increased frequency of artificial surfaces throughout Site 4, in particular the proposed access road to the north-east of the site, which will culvert approximately 20m of the stream habitat. Therefore, it is predicted that there will be a long-term negative operational impact on the local Otter population.

- Physiological and Habitat Degradation

The proposed development's main operational emission of concern for the habitats (and prey items contained within) utilised by the local Otter population will be the surface water run-off from hardstanding areas within the locality of the Kilmahuddrick Stream, Grand Canal and new flood compensatory storage area. However, a series of SuDS features are proposed throughout the development, including grass tracks; rain gardens; permeable paving; tree pits; roadside beds; and roadside directional beds. These SuDS features will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016). Therefore, the prey items and habitats associated with the local Otter population will not experience any operational contamination from the surface water run-off of hardstanding surfaces within the Site 4.

- Collision Mortality

Collision mortality risk for the local Otter population is predicted to increase during the operational stage of the Site 4 development, given the increased vehicular presence and the bisecting of existing commuting corridors, in particular the Kilmahuddrick Stream, given that Otters typically commute within or along the banks of waterbodies.

Therefore, in the absence of specific Otter-targeted mitigation measures during the operational stage, it is predicted that there will be an initial long-term negative impact of slight significance for the local Otter population.

<u>Non-volant Mammals – Badger; Pine Marten; Irish Stoat; Hedgehog; and Pygmy Shrew [High Local]</u>

- Disturbance

As Site 4 is located adjacent to an active works depot, an active railway line, and roadways (Adamstown Avenue), the cumulative noise levels of the existing baseline and the operational noise from the development will not be significant for the local mammal populations. Local non-volant mammals will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of non-volant mammals. In the case of the smaller non-volant mammals, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

The proposed development's main operational emission of concern for the habitats (and foraging resources contained within) utilised by the local Badger, Pine Marten, Irish Stoat, Hedgehog, and Pygmy Shrew populations, will be that of polluted surface water run-off from hardstanding areas. However, the proposed range of SuDS features to be installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the terrestrial and the more sensitive aquatic habitats (i.e., the Kilmahuddrick Stream) from deleterious urban run-off. Therefore, the foraging resources and habitats associated with these non-volant mammal populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces. Therefore, the foraging resources and habitats associated with these protected mammal populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape and lighting designs will ensure that the most essential existing mammal commuting corridors (Kilmahuddrick Stream riparian corridor) will be retained; as well as the creation of the new corridors in several sections of Site 4, including the installation of swales and ponds, as

well as the planting of new meadow, shrub, hedgerow, treeline and woodland strips. Therefore, the operational stage of Site 4 will not result in any notable long-term habitat fragmentation for the local mammal populations. The remedial tree and shrub planting will help cushion the loss of the large number of trees and scrub that will be cleared during the construction stage, providing replacement refuge for mammals within Site 4. However, the overall increased frequency of artificial surfaces throughout Site 4 will ultimately result in a loss of available foraging, commuting and refuge habitat for the local mammal populations. Therefore, it is predicted that there will be a long-term negative operational impact on the local protected mammal species.

- Collision Mortality

Collision mortality risk for the non-volant mammal populations is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where drainage ditches, treelines and the stream are present currently.

Therefore, in the absence of targeted terrestrial mammal mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for Badger, Pine Marten, Irish Stoat, Hedgehog, and Pygmy Shrew populations.

Bats [High Local]

- Habitat Loss and Fragmentation

The operational landscape design will ensure that the most essential existing bat commuting corridors (Kilmahuddrick Stream riparian corridor) will be retained; as well as the creation of the new corridors in several sections of Site 4, including the installation of swales and ponds, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland strips, which will also provide increased prey diversity and frequency. Therefore, the operational stage of Site 4 will not result in any notable long-term habitat fragmentation for the local bat populations. The remedial tree and shrub planting will help remedy the loss of the large number of trees and scrub that will be cleared during the construction stage, providing replacement roosting opportunities in the future for local bat species within the riparian zone of the Kilmahuddrick Stream. However, the overall increased frequency of artificial surfaces throughout Site 4 will result in long-term negative impacts, in particular the proposed access road to the north-east of the site, which will culvert approximately 20m of the stream habitat to allow for the installation of a pedestrian and vehicular infrastructure, and associated lighting. Therefore, it is predicted that there will be a long-term negative operational impact on the local bat populations.

- Lighting Disturbance

Site 4's proposed lighting design (with minimum lux levels for health and safety requirements) will illuminate the vast majority of the site, which is part of a large east-west dark corridor within the local landscape, south of residential and roadways to the north and the Grange Castle Business Park to the south. The installation of the Site 4 lighting design will result in a notable bottle-neck effect in this area, that local bat species currently utilise for commuting and foraging purposes, in particular light-sensitive species such as Daubenton's Bat, which is associated with the Grand Canal to the south of Site 4. It is important to note that there will still be smaller dark corridors within Site 4, which will partially alleviate the negative impact of the site, though only after a period of medium-term ecological lag, as newly landscaped trees and habitats will take time to mature and provide the necessary shading to create high functioning dark corridors. Overall, the increased frequency of artificial lighting throughout Site 4 will result in long-term negative impacts for local bats, in particular the proposed access road to the north-east of the site, which will culvert approximately 20m of the Kilmahuddrick Stream and illuminate the associated dark corridor, in order to accommodate pedestrian and vehicular infrastructure. Therefore, it is predicted that there will be a long-term negative operational impact on the local bat populations.

- Physiological and Habitat Degradation via Pollutants

Site 4's main operational emission of concern for the habitats (and prey items contained within) utilised by the local bat populations will be the surface water run-off from hardstanding areas. The proposed range of SuDS features to be installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water

run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the terrestrial and the more sensitive aquatic habitats (i.e., the Kilmahuddrick Stream) from deleterious urban run-off. Therefore, the prey items and habitats associated with the local bat populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces within the proposed Site 4 development.

- Collision Mortality

Given that bat species typically commute within / along dark areas / corridors (i.e. away from illuminated pedestrian and road infrastructure), bat species collision mortality risk is predicted to be negligible (not significant) during the operational stage of the Site 4 development.

Therefore, in the absence of targeted bat mitigation during the operational stage, it is predicted that there will be an initial long-term adverse impact of moderate significance for bat species, as a result of additional lighting and the bottle-necking of dark corridors and partial loss of other dark zones negatively impacting foraging and commuting habitats.

Wintering Birds [High Local]

- Disturbance

As Site 4 is located adjacent to an active works depot, an active railway line, and roadways (Adamstown Avenue), the cumulative noise levels of the existing baseline and the operational noise from the development will not be significant for the migrant wintering bird populations. However, wintering bird species will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of these winter migrant populations. Moreover, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Surface water run-off from hardstanding areas into on-site and adjacent terrestrial and aquatic habitats (and foraging resources contained within) has the potential to degrade these habitats that are utilised by the migrant wintering bird populations. However, the proposed range of SuDS features to be installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), will safeguard the terrestrial and the more sensitive aquatic habitats (i.e., the Kilmahuddrick Stream) from deleterious urban run-off. Therefore, the foraging resources and habitats associated with these wintering bird populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape design will ensure that the most essential existing wintering bird commuting corridors (Kilmahuddrick Stream riparian corridor) will be retained; as well as the creation of the new corridors throughout Site 4, including the installation of swales and ponds, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland strips. Therefore, the operational stage of Site 4 will not result in any long-term habitat fragmentation for the wintering bird populations. The landscape planting will help remedy the loss of the large number of trees and scrub to be cleared, which currently provide refuge to wintering bird species such as Jack Snipe. However, the overall increased frequency of artificial surfaces throughout Site 4 will ultimately result in a loss of available foraging, commuting and refuge habitat for the migrant wintering bird populations. Therefore, it is predicted that there will be a long-term negative operational impact on wintering birds.

- Collision Mortality

Collision mortality risk for the migrant wintering bird populations is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where drainage ditches, treelines and the stream are present currently.

Therefore, in the absence of targeted wintering bird mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for migrant wintering bird populations.

Breeding Birds [High Local]

- Disturbance

As Site 4 is located adjacent to an active works depot, an active railway line, and roadways (Adamstown Avenue), the cumulative noise levels of the existing baseline and the operational noise from the development will not be significant for resident breeding bird populations. However, breeding bird species will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of these breeding bird populations. Furthermore, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Of particular concern is the surface water run-off from hardstanding areas into the on-site and adjacent terrestrial and aquatic habitats (and foraging resources contained within) utilised by the local breeding bird populations. However, the proposed series of SuDS features installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the terrestrial and the more sensitive aquatic habitats (i.e., the Kilmahuddrick Stream) from deleterious urban run-off. Therefore, the foraging resources and habitats associated with these breeding bird populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape and lighting design will ensure that the most essential existing breeding bird commuting corridors (Kilmahuddrick Stream riparian corridor) will be retained; as well as the creation of the new corridors throughout Site 4, including the installation of swales and ponds, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland strips. Therefore, the operational stage of Site 4 will not result in any long-term habitat fragmentation for the local breeding bird populations. The remedial tree planting will help cushion the loss of the large number of trees and scrub that will be cleared during the construction stage, providing replacement nesting opportunities for birds on-site. However, the overall increased frequency of artificial surfaces throughout Site 4 will ultimately result in a loss of available foraging, commuting and nesting habitat for the local breeding bird populations. Therefore, it is predicted that there will be a long-term negative operational impact on breeding birds.

- Collision Mortality

Collision mortality risk for local breeding bird populations is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where drainage ditches and treelines currently exist.

Therefore, in the absence of targeted breeding bird mitigation during the operation stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for local breeding bird populations.

Amphibians [High Local]

- Disturbance

As Site 4 is located adjacent to an active works depot, an active railway line, and roadways (Adamstown Avenue), the cumulative noise levels of the existing baseline and the operational noise from the development will not be significant for resident amphibian populations. However, amphibian species will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or

pet have the potential to negatively impact the on-site activities of these amphibian populations. Furthermore, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Of particular concern is the surface water run-off from hardstanding areas into the on-site terrestrial and aquatic habitats utilised by the local Common Frog and Smooth Newt populations. However, the proposed series of SuDS features installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), will safeguard the terrestrial and the more sensitive aquatic habitats (i.e., the Kilmahuddrick Stream) from deleterious urban run-off. However, the swale and drainage ditch habitats that will be frequented by amphibians and are a part of the SuDS system, will experience urban surface water run-off and a degree of pollution as result, which will have potential knock-on impacts for the amphibians present within the habitats, as well as their prey items.

Therefore, the foraging resources and aquatic and terrestrial habitats associated with the local Common Frog and Smooth Newt populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape and lighting design will ensure that the most essential existing amphibian commuting corridors (Kilmahuddrick Stream riparian corridor) will be retained; as well as improving / creating new corridor structures (complexity of the commuting habitat) through the installation of swales and ponds, as well as the planting of new meadow, shrub, hedgerow, treeline and woodland strips. Therefore, the operational stage of Site 4 will not result in any long-term habitat fragmentation for the local amphibian populations. The creation of new pond habitats will remedy the loss of the drainage ditch that supported Common Frog spawning, and the increased water depths will likely encourage local Smooth Newt to begin spawning within Site 4. However, the increased frequency of artificial surfaces throughout Site 4 will ultimately result in an overall loss of available foraging, commuting and hibernation habitat for local amphibian populations. Therefore, in the absence of targeted amphibian mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of that is not significant for the local amphibian populations.

- Collision Mortality

Collision mortality risk for Common Frog and Smooth Newt is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where drainage ditches currently exist.

Therefore, in the absence of targeted amphibian mitigations during the operational stage, it is predicted that there will be an initial long-term negative operational impact that is not significant for local Common Frog and Smooth Newt populations.

<u>Fish [County / High Local]</u>

- Physiological and Habitat Degradation via Pollutants

The proposed development's main operational emission of concern for the aquatic fauna (and foraging resources contained within) utilised by the local fish populations in the Kilmahuddrick Stream, and River Griffeen and River Liffey downstream, will be the surface water run-off from hardstanding areas within Site 4. However, the proposed series of SuDS features installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), before they enter the Kilmahuddrick Stream, safeguarding this aquatic habitat from deleterious urban run-off. Additionally, for surface water run-off that travels into the neighbouring pond / bioswale west of Site 4, the water will also be treated by a full retention interceptor [Klargester NSFA210 or equivalent approved].

Therefore, the foraging resources and aquatic habitats associated with the local and downstream fish populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces within Site 4.

- Alteration of Habitat Characteristics (Shading)

The increased shading of the Kilmahuddrick Stream as result of the two access roads and riparian tree planting will help stabilise local water temperatures within this section, which will create a slight positive impact for the local fish populations, in particular those sensitive to higher water temperatures, as climate change will result in unshaded waterbodies experiencing more extreme temperature fluctuations.

Therefore, in the absence of fish-specific mitigations during the operational stage, it is predicted that there will be an initial long-term positive impact that is not significant for the fish population within and downstream of the Kilmahuddrick Stream.

Terrestrial Invertebrates [High Local]

- Physiological and Habitat Degradation via Pollutants

The proposed development's main operational emission of concern for the habitats (and foraging resources contained within) utilised by the local terrestrial invertebrate populations, will be that of contaminated surface water run-off from hardstanding areas. However, a range of SuDS features are proposed throughout Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016). Therefore, the foraging resources and habitats associated with the local terrestrial invertebrate populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape design will ensure that the most essential existing terrestrial invertebrate commuting corridors (Kilmahuddrick Stream riparian corridor) will be retained; as well as improving / creating new corridor structures (complexity of the commuting habitat) through the planting of new meadow, shrub, hedgerow, treeline and woodland strips. Therefore, the operational stage of Site 4 will not result in any long-term habitat fragmentation for the local terrestrial invertebrate populations. While the planting plan will help provide new hive-supporting habitat, the increased frequency of artificial surfaces throughout Site 4 will result in an overall loss of available foraging and refuge habitat for local terrestrial invertebrate populations.

Therefore, in the absence of targeted terrestrial invertebrate mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for local terrestrial invertebrate populations.

Freshwater Aquatic Invertebrates [High Local]

- Physiological and Habitat Degradation via Pollutants

The proposed development's main operational emission of concern for the aquatic fauna (and foraging resources contained within) utilised by the freshwater invertebrate populations in the Kilmahuddrick Stream, and River Griffeen and River Liffey downstream, will be the surface water run-off from hardstanding areas within Site 4. However, the proposed range of SuDS features installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), before they enter the Kilmahuddrick Stream, safeguarding this aquatic habitat and its inhabitants from deleterious urban run-off. Additionally, for surface water run-off that travels into the neighbouring pond / bioswale west of Site 4, the water will also be treated by a full retention interceptor [Klargester NSFA210 or equivalent approved] before entering the Kilmahuddrick Stream. Therefore, the foraging resources and aquatic habitats associated with the local and downstream freshwater invertebrate populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces within Site 4.

- Lentic Habitat Creation

The diversity of freshwater aquatic invertebrate species is predicted to increase within Site 4, given the proposed pond SuDS features within the drainage and landscape operational designs.

Therefore, in the absence of specific freshwater aquatic invertebrate mitigation during the operational stage, it is predicted that there will be an initial long-term positive impact that is not significant for the freshwater invertebrate population within and downstream of the Kilmahuddrick Stream.

6.7.3.3 Do-Nothing Impact

If the proposed development were not to go ahead and the present land management continues as is, the ecological value of the Sites 3, 4 and 5 would remain largely unchanged given that the majority of the sites' areas are currently under the management of SDCC. Furthermore, Waterways Ireland will continue to maintain the Grand Canal section south of Site 4.

There are large areas within the development's boundaries which do not undergo regular maintenance. These areas contain recolonising bare ground, dry meadow and scrub habitats. In the short-term, the recolonising areas will develop into dry meadow habitat, while the dry meadows will develop into scrub, and scrub into immature woodland where tree species are present.

Overall, these minor changes to the habitats within the proposed development's boundaries will result in slight positive impacts for specific faunal groups including:

- Non-volant Mammals – increased scrub cover provides more refuges for local mammals;
- Breeding Birds – increased scrub cover provides increased nesting opportunities for local birds; and
- Terrestrial Invertebrates – an increase in dry meadow cover will provide increased foraging opportunities for local terrestrial invertebrates and subsequently their predators (birds & bats).

The above scenario does not account for the other permitted or pending local developments.

6.7.4 Proposed Development – Site 5

6.7.4.1 Construction Stage

Habitats

Drainage ditches [Low Local]

The drainage ditch habitat will undergo complete but short-term habitat loss as a result of the physical footprint of the Site 5 development, which will reconfigure the natural surface water drainage channels within the site.

Therefore, in the absence of mitigation, during the construction phase, it is anticipated that the drainage ditch habitat will experience a profound short-term negative impact.

Dry meadow and grassy verges [High Local]

The majority of this habitat type will be removed to facilitate the installation of residential units and their associated road and pedestrian infrastructure. Additionally, dry meadow will also be transformed into other habitat types as part of the Site 5 landscape design.

The dry meadow habitat, along the northern border of the site, that will be partially retained within the landscape design, and neighbouring dry meadows within the locality, will be vulnerable to a range of potentially harmful impacts generated by construction activities within Site 5. Unintentional spillages of deleterious substances (e.g. hydrocarbons and solvents), which may come in direct contact with and negatively impact the physiological health of grassland flora; as well as penetrating into the sub-surface / groundwater and degrading the grassland flora's root systems, resulting in

further degradation and the potential death of less resilient species, thus lowering overall health and biodiversity value of these grassland habitats.

Additionally, these dry meadow habitats have the potential to be physically damaged from excessive footfall from workers present on-site, compaction from light and heavy machinery and temporary material stock-piling. Such damage to the habitat may result in an increased frequency of disturbed bare ground within the grassland habitat, which in turn has the potential to result in the establishment of invasive species present within the locality (e.g. Butterfly-bush).

Furthermore, these dry meadow and grassy verge habitats also have the potential to be negatively impacted by dust-based pollution during the construction stage, with general dust settlement reducing photosynthesis and cement-based dusts degrading the epidermis layers of meadow flora.

Therefore, in the absence of mitigation, during the construction phase, a temporary to long-term negative impact of slight to moderate significance is anticipated for the dry meadow and grassy verges habitat.

(Mixed) broadleaved woodland [High Local]

While just beyond the footprint of the site, the broadleaved woodland strip north-west of the site's boundary is not anticipated to be impacted by any polluting spillage events; however, given its proximity it will be vulnerable to the dust emissions generated during the construction stage. General dust settlement within this woodland habitat may reduce photosynthesis, while cement-based dusts may lead to the degradation of the epidermis layers of woodland canopy, potentially impacting the foraging resources provided by the tree and shrub species for the local fauna.

Therefore, in the absence of mitigation, during the construction phase, a short-term negative impact of slight significance is anticipated for the mixed broadleaved woodland.

Mixed broadleaved / conifer woodland [High Local]

The mixed broadleaved and conifer woodland is located along the western boundary of the southern section of Site 5. There will be direct loss of habitat due to partial removal of trees in this area to facilitate the construction of residential units and their associated road and pedestrian infrastructure.

These retained mixed conifer / broadleaved woodland will still be exposed to a range of potentially adverse impacts generated by construction activities. Scenarios where accidental spillages of deleterious substances come in direct contact with and negatively impact the physiological health of the trees and understorey flora; as well as seeping into the sub-surface / groundwater and degrading the root systems of the woodland flora, resulting in further degradation and potentially death. Such impacts will lower the overall health and biodiversity value of the retained woodland habitat.

Additionally, the root systems of the woodland tree species within these habitats will be at risk of root compaction from heavy-machinery. Likewise, machinery used adjacent to the trees in the woodland habitat has the potential to result in accidental damage of tree limbs, degrading the health of these tree species.

The mixed broadleaved /conifer woodland also has the potential to be adversely impacted by dust-based pollution during the construction stage, with degradation of the epidermis layer of floral species through contact with cement-based dusts, while general dust settlement may also lead to negative impacts on the photosynthesis levels of flora within the habitat.

The above negative impacts, acting either alone or cumulatively, have the potential to result in the degradation and death of tree and understorey floral species within this woodland habitat, ultimately resulting in the fragmentation of this woodland wildlife corridor, which currently provides understorey refuge and canopy cover.

Moreover, the potential spread of invasive non-native floral species, such as Butterfly-bush, into disturbed woodland habitat will result in the displacement of native species via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation, during the construction stage, a temporary to long-term negative impact of slight to moderate significance is anticipated for the mixed broadleaved and conifer woodland within and adjacent to Site 5.

Hedgerows [High Local]

There will be a partial direct loss of hedgerow habitat as a result of the physical footprint Site 5's operational stage structures and artificial surfaces.

The retained hedgerow sections will still be exposed to a series of potentially adverse impacts generated by construction activities. In scenarios where accidental spillages of deleterious substances come into direct contact with trees and associated understorey flora, negative impacts on the affected flora will occur. Furthermore, the seepage of these substances into the sub-surface / groundwater will potentially degrade the root systems of the hedgerow flora, resulting in further degradation and potentially death. Such impacts will lower the overall health and biodiversity value of the retained hedgerow habitats.

Additionally, the root systems of the tree species within these hedgerows will be at risk of root compaction from heavy-machinery. Likewise, machinery used adjacent to the trees in the hedgerow habitats has the potential to result in accidental damage of tree limbs, degrading the health of these tree species.

The retained hedgerow sections also have the potential to be adversely impacted by dust-based pollution generated by construction activities, with degradation of the epidermis layer of floral species through contact with cement-based dusts, while general dust settlement may also lead to negative impacts on the photosynthesis levels of flora within the habitat.

The above adverse impacts, acting either alone or cumulatively, have the potential to result in the degradation and death of tree and understorey floral species within the hedgerow sections, ultimately resulting in the fragmentation of these hedgerows, which currently provide understorey commuting, refuge and canopy cover.

Moreover, the potential spread of invasive floral species, such as Butterfly-bush, into disturbed hedgerow habitat will result in the displacement of native species via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation, during the construction phase, temporary to long-term negative impact of slight significance is anticipated for the hedgerow habitat within and adjacent to Site 5.

Treelines [High Local]

The treelines habitat will undergo partial habitat loss as result of the physical footprint Site 5's operational stage structures and artificial surfaces.

The retained treelines will be subjected to a range of potentially negative impacts generated by construction activities. Scenarios where accidental spillages of deleterious substances come in direct contact with and negatively impact the physiological health of the trees and understorey flora; as well as seeping into the sub-surface / groundwater and degrading the root systems of the treeline flora, resulting in further degradation and potentially death. Such impacts will decrease the overall condition and biodiversity value of the retained treeline habitats.

Additionally, the root systems of these treelines will be at risk of root compaction from heavy-machinery. Likewise, machinery used adjacent to the treelines has the potential to result in accidental damage of tree limbs, degrading the health of these tree species.

The retained hedgerow sections also have the potential to be adversely impacted by dust-based pollution generated by construction works, with degradation of the epidermis layer of floral species through contact with cement-based dusts, while general dust settlement will also likely lead to decreased photosynthesis levels of flora within the habitat.

The above harmful impacts, acting either alone or cumulatively, have the potential to result in the degradation and death of tree and understorey floral species within the retained treelines, ultimately resulting in the fragmentation of these treelines, which currently act as valuable wildlife corridors.

Moreover, the potential spread of locally present invasive floral species, such as Butterfly-bush, into disturbed hedgerow habitat will result in the displacement of native species via shading impacts and higher rates of colonisation within areas of open and/or disturbed ground.

Therefore, in the absence of mitigation, during the construction phase, temporary to long-term negative impact of slight significance is predicted for the treeline habitats within and adjacent to Site 5.

Scrub [High Local]

There will be significant large-scale short-term removal of scrub habitat (>95%) in order to facilitate the construction of Site 5's operational residential units and associated infrastructure.

The small percentage of retained and neighbouring scrub habitat will be vulnerable to an array of potentially damaging impacts generated by construction activities within Site 5. Accidental spillages of harmful substances (e.g. hydrocarbons and solvents) may come in direct contact with and negatively impact the physiological health of the scrub flora; as well as penetrating into the sub-surface / groundwater and degrading the scrub floras' root systems, resulting in further degradation and the potential death of less resilient species, thus lowering overall health and biodiversity value of these scrub habitats.

Additionally, these scrub habitats have the potential to be physically damaged from excessive footfall from workers present on-site, compaction from light and heavy machinery and temporary material stock-piling. Such damage to the habitat may result in an increased frequency of disturbed bare ground within the scrub habitat, which in turn has the potential to result in the establishment of invasive species present within the locality (e.g. Butterfly-bush).

Furthermore, these scrub habitats also have the potential to be impacted by dust-based pollution during the construction stage, with cement-based dusts degrading the epidermis layers of floral species. Also, general dust settlement may also lead to negative impacts on the photosynthesis of floral species within the habitat.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a short to long-term negative impact of moderate significance for the scrub habitats located within and adjacent to Site 5.

Protected Fauna

Non-volant Mammals [Low-High Local]

The local Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew populations will potentially be subjected to a range of construction emissions (surface water, groundwater, air and disturbance impacts) which will be generated within Site 5's works area.

- Physiological and Habitat Degradation via Pollutants

In the event that hydrocarbon pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew individuals may come in contact with the substance whilst navigating the site, resulting in degraded furs, which will notably impact their furs' insulative qualities, resulting in physiological stress for any affected individuals. Additionally, these hydrocarbons can potentially be ingested by these protected non-volant mammal species as they groom their affected furs, leading to further physiological stress.

All local mammal species are at risk of potentially being negatively impacted through the direct ingestion of contaminated water during the construction stage. In the event that a mammal were to drink from a waterbody, which had been accidentally contaminated with polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), this can potentially result in damaged lungs and/or carcinogenic effects for affected individual.

Furthermore, surface water, groundwater and air (dust)-based pollution impacts have the potential to indirectly impact these non-volant mammal species via the deterioration in quality and population decline (availability) of prey items in their respective food webs. This impact also has a knock-on effect

as the consumption of contaminated prey items may lead to bioaccumulation of toxic substances within the local populations of these protected mammal species.

- Habitat Loss and Fragmentation

There will be a short-term fragmentation and loss of habitats, as result of the construction activities that will occur within Site 5. The only unfragmented habitats will be those along the northern boundary of the eastern section of Site 5.

- Disturbance

Negative impacts to these non-volant mammal populations may also arise in the form of physical, visual and audible disturbance to foraging and commuting activities. Additionally, disturbance to existing wildlife corridors may lead to potential loss of life in the case of accidents (e.g. accidental trappings) within the construction site, after failure to exclude entry.

Therefore, in the absence of mitigation during the construction stage, it is anticipated that there will be a temporary to short-term negative impact of slight significance for these non-volant mammal species, as a result of the above potential impacts.

Bats [High Local]

- Roost Disturbance

Given the absence of bat roosts amongst the semi-mature / mature trees within and immediately adjacent to Site 5, negative impacts on current bat roosting activities are not predicted during the construction stage; therefore, no derogation licences are required for the disturbance of bat roosts as a result of the construction of the Site 5 development. However, the construction of the development will also result in the loss of a small number of immature / semi-mature /mature trees within Site 5, which will result in a short- to medium-term loss of potential roosting features that may form within these trees following future storm damage and trunk / limb rot.

- Lighting Disturbance of Foraging and Commuting Activities

Direct and indirect impacts are likely to occur on the foraging and commuting activities of bat species frequenting the habitats within and adjacent to Site 5, as a result of the additional artificial lighting associated with the construction stage. Direct lighting impacts refers to compound or works areas lighting spilling into adjacent habitats that support the foraging and movements of the local bats. This light spillage will cause bats to avoid these excessively illuminated habitats, which effectively reduces the total habitat available to them for both foraging and commuting within and adjacent to the boundaries of Site 5. In some scenarios, such light spillage may cut-off commuting routes along linear habitat features, i.e., light spillage into the site boundary hedgerows.

Indirect lighting impacts have the potential to arise through the influencing of the distribution and frequency of the prey items within habitats adjacent to areas within additional construction- / compound-based lighting, resulting in a negative impact on bat foraging activity. As these additional lights will attract nocturnal winged-invertebrates towards them out of their usual host habitat (van Langevelde et al., 2018), the local bat species will be left with the option to commute to new foraging grounds or pursue their prey and in turn enter the light impacted area. For some bat species who have adapted relatively well to urban landscapes, namely Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat, the pursuit of prey items into light impacted areas is less impactful (Russ and Montgomery, 2002; Russ et al., 2003). Moreover, studies have shown that pipistrelle species and Leisler's Bat can congregate around urban street lighting feeding on the nocturnal winged-insects attracted to the lower impact lighting (Rydell et al., 1993, Blake et al., 1994; Stone et al., 2015; Spoelstra et al., 2015; 2017). However, for the Brandt's Bats or Whiskered Bats that frequent Site 5, this level of lighting impact will most likely cause the *Myotis* species to avoid the site in its entirety during the construction stage.

- Habitat Loss and Fragmentation

Short-term habitat fragmentation and loss impacts will occur across the majority of Site 5 as result of the construction works. This will ultimately impact the local bats' ability to commute and forage within the site, given the loss of linear landscape features (e.g., hedgerows) that bats use for commuting,

and reduction in prey availability following the clearing of suitable habitats (e.g. dry meadow and scrub).

- Physiological and Habitat Degradation via Pollutants

All identified bat species (Common Pipistrelle; Soprano Pipistrelle; Leisler's Bat; and Brandt's Bat or Whiskered Bat) are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the construction stage. In the event a bat was to drink from a temporary waterbody (rain-filled excavations) which had been accidentally contaminated with polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), the bat has the potential to fly over a slick of contaminated water with its mouth open, consuming water from the top of the waterbody's surface. The consumption of such water can potentially result in damaged lungs and/or carcinogenic effects for affected individual.

Additionally, surface water, groundwater and air (dust)-based construction emissions have the potential to lead to pollution impacts that will indirectly impact all local bat species via degradation of local habitats resulting in the deterioration of quality and decreased frequency of their prey items in the food chain. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local bat populations, resulting in physiological stress and potential reduced fecundity.

Therefore, in the absence of mitigation during the construction stage, it is anticipated that there will be a temporary to medium-term adverse impact of moderate significance for the local bat populations.

Wintering Birds [High Local]

- Habitat Loss, Fragmentation and Degradation

The temporary and permanent habitat loss associated with the construction stage of Site 5, as well as the potential deterioration of retained habitats through surface water, groundwater or air-based pollutants have the potential to reduce and/or degrade the foraging grounds of wintering bird species. The degradation of floral species in these habitats has the potential to negatively impact omnivorous bird species of conservation concern (i.e. Herring Gull), which are reliant on healthy host flora supporting a range of invertebrate species.

The temporary and long-term habitat loss, as well as potential habitat degradation, have the potential to result in habitat fragmentation within the boundaries of Site 5. While the level of fragmentation in regard to movement / distance travelled is within an acceptable range for standard commuting purposes for bird species, the lack of cover / refuge is problematic for smaller bird species, which can be hunted by local predators, such as Buzzard and Red Fox, thus increasingly the likelihood of being predated and reducing the affected wintering bird population (short-term impact).

- Physiological Degradation

In the event that hydrocarbon pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, wintering bird species may come in contact with the substance whilst navigating, drinking from, foraging in or washing within a temporary waterbody (e.g. rain-filled excavations), resulting in degraded feathers, which will notably impact their feathers' insulative qualities, resulting in physiological stress for any affected individuals. Furthermore, these hydrocarbons can potentially be ingested by bird species as they preen their affected feathers, leading to further physiological stress.

Wintering bird species are at risk of potentially being negatively impacted through the direct ingestion of contaminated water during the construction stage. If a wintering bird were to drink from a temporary waterbody which had been accidentally contaminated with polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), the bird would consume water from the upper (polluted) layers of the water column. The consumption of such water can potentially result in reduced egg production and hatching; increased clutch or brood abandonment; reduced growth and increased organ weights (Albers, 2006).

Furthermore, surface water, groundwater, and air (dust)-based pollution impacts have the potential to indirectly impact wintering bird species via the deterioration of food / prey items. This impact also

has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the omnivorous wintering bird populations, such as Herring Gull (Costa et al. 2013; Idan and Jazza 2022; and Ding et al. 2023).

- Disturbance

Additionally, wintering bird species that utilise the site for commuting or foraging purposes may also be visually and/or audibly disturbed by the construction works and workers entering /exiting the works area, causing these wintering bird species to vacate the site during active work periods. Furthermore, the clearance of vegetation within and adjacent to the works area will increase wintering bird species alert distances.

Therefore, in the absence of mitigation during the construction stage, it is anticipated that there will be a temporary to short-term adverse impact of slight significance for the wintering bird populations within and adjacent to Site 5.

Breeding Birds [High Local]

- Reduction of Nesting Sites

Local breeding bird species will experience a reduction in current and potential nesting sites as result of the general vegetation clearance and tree felling required to allow for the construction of Site 5. A total of six bird species (i.e. Meadow Pipit, Goldcrest; Starling; Wood Pigeon; Linnet; and Willow Warbler) which are protected (Annex) and/or of conservation concern (Red/Amber-listed), will have their preferred nesting habitats negatively impacted (reduced) as result of the temporary and/or permanent loss of grassland; hedgerow; treeline; scrub; and woodland. The remaining protected / Amber-listed breeding bird species of conservation concern, namely House Sparrow and Barn Swallow, will not lose any nesting habitats as result of the construction stage. The other Green-listed breeding bird species recorded within or adjacent to the boundaries of Site 5 will also be negatively impacted from this nesting habitat loss. With the exceptions of Barn Swallow and House Sparrow, all local breeding bird populations will experience a short-term to long-term loss of potential nesting sites as a result of the construction of the Site 5.

- Habitat Loss, Fragmentation and Degradation

Additionally, habitat loss and the general deterioration of retained habitats through surface water, groundwater or air-based pollutants have the potential to reduce and/or degrade the foraging grounds of local breeding bird species. The degradation of floral species in these habitats has the potential to negatively impact insectivorous bird species of conservation concern (e.g. Goldcrest), who are reliant on healthy host flora supporting a range of terrestrial invertebrate species, which feed on or frequent these flora for foraging purposes. Similarly, seed- and frugivorous or fruit/berry-eating protected bird species (i.e., Wood Pigeon) will be adversely impacted if pollutant-affected flora are unable to produce these reproductive products, or only produce low-quality and/or below average quantities of these food sources. A number of omnivorous bird species of conservation concern will be negatively impact by both of the above scenarios, namely Herring Gull; Starling; and Linnet.

The temporary and long-term habitat loss, as well as potential habitat degradation, have the potential to result in habitat fragmentation within Site 5. Potential degradation of habitats to be retained, through direct physical or pollutant-based impacts, also has the potential to increase the degree the fragmentation and loss. While the level of fragmentation in regard to movement / distance travelled is within acceptable range for standard commuting purposes for the local breeding bird species, the lack of cover / refuge is problematic for any bird species which can be hunted by local predators, such as Buzzard (Green-listed species), thus increasingly the likelihood of being predated and reducing the local populations of breeding bird species of conservation concern. The potential loss of juvenile and/or adult birds of conservation concern will result in short-term impact for local breeding bird species.

- Physiological Degradation

In a case where hydrocarbon pollutants are accidentally introduced into the local surface water and groundwater (surface water recharge) networks, breeding birds may come in contact with the substance whilst navigating, drinking from, foraging in or washing within a temporary waterbody on-

site, resulting in degraded feathers, which will notably impact their feathers' insulative qualities, resulting in physiological stress for any affected individuals. Also, these hydrocarbons can potentially be ingested by bird species as they preen their affected feathers, leading to further physiological stress.

All local breeding bird species are at risk of potentially being adversely impacted through the direct ingestion of contaminated water during the construction stage. In the event that a bird were to enter a waterbody, which had been accidentally contaminated with a polluting substance (in particular a pollutant which floats on top of the water's surface e.g. hydrocarbons), the bird could consume water from the upper (polluted) layers of the water column. The consumption of such water can potentially result in reduced egg production and hatching; increased clutch or brood abandonment; reduced growth and increased organ weights (Albers, 2006).

Moreover, surface water, groundwater, and air (dust)-based pollution impacts have the potential to indirectly impact breeding bird species via the deterioration of food / prey items in the food chain for the local bird species. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local breeding bird populations (Costa et al., 2013; Idan and Jazza, 2022; and Ding et al., 2023).

- Disturbance

Additionally, breeding bird species that utilise the site for commuting or foraging purposes may also be visually and/or audibly disturbed by the construction works and workers entering /exiting the works area, causing these breeding bird species to vacate the site during active work periods. Additionally, the clearance of vegetation within and adjacent to the works area will increase local breeding bird species alert distances as there will be less vegetation available for refuge (Fernández-Juricic et al., 2001).

Noise generated by the construction works has the potential to effect egg production, incubation, brooding, predators, brood parasites, and abandonment, as well as the ability to find or attract a mate and the ability of parents to hear and respond to begging calls of their offspring. Any bird species that regularly experience fright–flight responses or failure to attract mates and defend territories (Slabbekoorn and Ripmeester, 2008) as a result of the excessive noise, will likely suffer from decreased fecundity of their local respective populations (Ortega, 2012). Given the projected length of the construction stage, a temporary to short-term disturbance impact is predicted for local breeding bird populations.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a range of temporary to long-term adverse impacts of slight significance for these breeding bird species of conservation concern, as a result of the above impacts.

<u>Amphibians [Low Local]</u>

- Physiological and Habitat Degradation via Pollutants

Deleterious pollutants accidentally introduced via surface water, groundwater and air (dust) pathways into the habitats located on-site and adjacent, during the construction stage, will reduce the capacity of these habitats to support the foraging and commuting activities of Common Frog.

Furthermore, surface water- and groundwater- and air (dust)-based pollution impacts have the potential to indirectly impact the local Common Frog population via the deterioration of food / prey items in the food chain. This impact also has a knock-on effect as the consumption of prey items containing polluting elements may lead to bioaccumulation of toxic substances within the local Common Frogs.

- Disturbance

Additionally, Common Frog may also be subjected to disturbance-based impacts, which have the potential to negatively impact their foraging and commuting activities, as well as potential loss of life for individuals within the construction site (e.g. accidental trappings), after failure to exclude entry.

- Habitat Loss and Fragmentation

Short-term habitat fragmentation and loss impact will occur as result of the construction works that will take place. Additionally, the short-term removal of the drainage ditch habitat, i.e., the existing sheltered commuting corridors, will negatively impact the Common Frogs which frequent Site 5 during the construction stage.

Therefore, in the absence of mitigation during the construction stage, it is predicted that there will be a temporary to short-term negative impact of slight significance for the local Common Frog population.

Terrestrial Invertebrates [High Local]

- Physiological and Habitat Degradation via Pollutants

In the event that construction-based environmental pollutants accidentally introduced, via surface water, groundwater and air (dust) pathways, into the terrestrial and semi-aquatic / wetland habitats present within and adjacent to Site 5, local terrestrial invertebrates' foraging resources may be notably degraded, potentially reducing their quality and frequency of occurrence within the affected habitat(s). Furthermore, a number of invertebrate groups are known to bioaccumulate pollutants within the soils of these polluted habitats, damaging their physiological health, as well as introducing the toxin into the lowest trophic level of the local food web.

- Disturbance

Additionally, negative impacts may arise for local terrestrial invertebrates in the form of disturbance to foraging and commuting activities via temporary and long-term habitat loss and fragmentation during the construction stage. The only habitats safeguarded from large-scale disturbance are those within retained habitats along the northern site boundary.

- Habitat Loss and Fragmentation

Site 5 will experience short- to long-term habitat loss and fragmentation, which will notably reduce the total habitat available for foraging and hive sites for tree-based hives, dense-grass tussock hives and subterranean hives. This will adversely impact the local populations of White-tailed Bumblebee and Common Carder-bee. Additionally, the loss of these grassland habitats will reduce the total available host plants for butterfly species laying their eggs, with species such as Large White, having their reproductive cycle negatively impacted.

Therefore, in the absence of mitigation during the construction stage, it is anticipated that there will be a temporary to short-term adverse impact of slight significance for these terrestrial invertebrate populations.

6.7.4.2 Operational Stage

Habitats

Drainage ditches [Low Local]

The loss of all drainage ditch habitat within Site 5 during the construction stage will be remedied through the development's operational landscape / drainage design, which includes the creation of new drainage ditches / swales, which will provide a similar ecological services and floral composition to the existing drainage ditch within Site 5. As a result, there will be long-term increase in drainage ditch habitat within Site 5.

Regarding Site 5's operational emissions, groundwater and air emissions are not predicted to negatively impact the new drainage ditch habitats. However, given that the site drainage ditches are incorporated into the operational surface water design as SuDS features, this role within the SuDS has the potential to lower the water quality within these drainage ditches, with potential knock-on effects for the ditch flora and fauna.

Additionally, these drainage ditch habitats will be subjected to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by

human and/or pet have the potential to negatively impact the flora associated with the drainage ditches through trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of Site 5, it is anticipated that the drainage ditch habitats will experience an initial long-term positive impact that is not significant.

Dry meadow and grassy verges [High Local]

Only a small section of the existing dry meadow and grassy verges habitat will remain within Site 5 during the operational stage. However, the landscape design will see the creation of new dry meadow habitat in strips and patches of various sizes within Site 5, which will aid in remedying the loss of existing dry meadow habitats.

The new and retained dry meadow habitats will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the dry meadow flora through trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Surface water, groundwater and air operational emissions are not predicted to impact the dry meadow habitat. The management of the surface water run-off from hardstanding areas within Site 5 will involve a range of SuDS features, including permeable paving; tree pits; conveyance swales; and bioswales, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding the operational dry meadow habitat from potential harmful urban run-off.

Therefore, in the absence of operational mitigation measures, it is predicted that there will be an initial long-term negative operational impact that is of slight significance for the Site 5 dry meadow habitat.

(Mixed) broadleaved woodland [High Local]

As the mixed broadleaved woodland is only adjacent to Site 5 and not within the site, and not accessible to the public during Site 5 operations, this woodland habitat is not anticipated to be negatively impacted by the operational stage of the Site 5 development.

Therefore, in the absence of operational mitigation measures, it is predicted that there will be an initial long-term neutral operational impact that is not significant for the neighbouring mixed broadleaved woodland.

Mixed broadleaved / conifer woodland [High Local]

Following the partial clearing of this mixed broadleaved / conifer woodland habitat within the construction stage, the landscape plan for Site 5 does not contain any new areas of mixed broadleaved / conifer woodland planting. While new tree planting is notably present within the proposed landscape design, these new trees more accurately align with street-based treelines / scattered trees and parkland habitat.

The retained dry mixed broadleaved / conifer woodland habitats will not be subject to potential physical disturbances as a result of the increased local populace, as the woodland will not be publicly accessible.

Surface water, groundwater and air operational emissions are not predicted to impact the mixed broadleaved / conifer woodland. The management of the surface water run-off from hardstanding areas within Site 5 will involve a range of SuDS features, including permeable paving; tree pits; conveyance swales; and bioswales, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding this retained woodland habitat from potential impactful urban run-off.

Therefore, in the absence of mitigation measures during the operational stage of the Site 5 development, it is predicted that the mixed broadleaved / conifer woodland habitat will experience an initial long-term negative impact that is of slight significance.

Hedgerows [High Local]

Following the construction stage, Site 5 will see an increase of native immature hedgerow habitat in strips throughout the development.

The new hedgerow and retained hedgerow habitats are not anticipated to be adversely impacted by the operational surface water, groundwater and air-based emissions. The management of the surface water run-off from hardstanding areas within Site 5 will involve a range of SuDS features including permeable paving; tree pits; conveyance swales; and bioswales, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding the new and existing hedgerows within Site 5.

The new and retained hedgerow habitats will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the hedgerow flora through the breaking of tree limbs, trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of the Site 5 development, it is predicted that the hedgerow habitat will experience an initial long-term neutral impact that is not significant.

Treelines [High Local]

Following the construction stage, there will be an increase of native treeline habitat throughout the Site 5 development.

The new and retained treeline habitats are not anticipated to be negatively impacted by the operational surface water, groundwater and air-based emissions. The management of the surface water run-off from hardstanding areas within Site 5, will involve a range of SuDS features including permeable paving; tree pits; conveyance swales; and bioswales, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), during high rainfall events, safeguarding the new and existing treelines within Site 5. This does not apply to street trees with tree pits, as these trees will be subject to a degree or surface water run-off as they are a part of the SuDS network.

The new and retained treeline habitats will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the treeline flora through the breaking of tree limbs, trampling and digging. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of mitigation measures during the operational stage of Site 5, it is anticipated that the treeline habitat will experience an initial long-term neutral impact that is not significant.

Scrub [High Local]

Only a small section of the existing scrub habitat will remain within the Site 5 development during operations. However, the landscape design and planting plan for the site will see the creation of new shrub areas in strips and patches throughout Site 5, which will aid in remedying the loss of existing scrub habitats. While the floral species composition will notably shift (e.g., the removal of Bramble), the structural functions of the lost scrub will be reestablished within these shrub-based habitats, i.e., these shrubs will be able to provide refuge to local wildlife, as well as nest / hive-building opportunities for local breeding birds and bee / wasp species.

The new shrub and retained scrub habitats will be subject to potential physical disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the scrub and shrub habitats through breakages of plant limbs when navigating the habitat. Additionally, the likelihood of the introduction of invasive non-native flora and fauna will increase, as a result of the increased local populace.

Therefore, in the absence of operational mitigation measures, it is anticipated that there will be an initial long-term negative operational impact of slight significance for the scrub habitat present within Site 5.

Protected Fauna

Non-volant Mammals – Badger; Pine Marten; Irish Stoat; Hedgehog; and Pygmy Shrew [High Local]

- Disturbance

As Site 5 is located adjacent to an active roadway (Thomas Omer Way), the cumulative noise levels of the existing baseline and the operational noise from the development will not be significant for the local non-volant mammal populations. Local non-volant mammals will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of non-volant mammals. In the case of the smaller non-volant mammals, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Site 5's main operational emission of concern for the habitats (and foraging resources contained within) to be utilised by the local Badger, Pine Marten, Irish Stoat, Hedgehog, and Pygmy Shrew populations, will be that of polluted surface water run-off from hardstanding areas. However, the proposed range of SuDS features to be installed within and adjacent to Site 5, including permeable paving; tree pits; conveyance swales; and bioswales will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), will safeguard the natural habitats from deleterious urban run-off. Therefore, the foraging resources and habitats associated with these non-volant mammal populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape and lighting designs will ensure that suitable mammal commuting corridors will be created in a number of sections of Site 5, including the installation of wetland swales, as well as the planting of new meadow, shrub, hedgerow, and treelines. Therefore, the operational stage of Site 5 will not result in any notable long-term habitat fragmentation for the local mammal populations. The remedial tree and shrub planting will help with the loss of the trees and scrub that will be cleared during the construction stage, providing replacement refuge for mammals within Site 5. However, the overall increased frequency of artificial surfaces throughout Site 5 will ultimately result in a loss of available foraging, commuting and refuge habitat for the local non-volant mammal populations. Therefore, it is predicted that there will be a long-term negative operational impact on the local protected non-volant mammal species.

- Collision Mortality

Collision mortality risk for the non-volant mammal populations is predicted to increase during the operational stage of the Site 5 development, given the increased vehicular presence and the bisecting of existing commuting corridors where scrub, treelines and hedgerows are present currently.

Therefore, in the absence of targeted non-volant mammal mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for Badger, Pine Marten, Irish Stoat, Hedgehog, and Pygmy Shrew populations.

Bats [High Local]

- Habitat Loss and Fragmentation

The operational landscape and lighting designs will ensure that suitable bat commuting corridors, while relatively narrow, will be present in a number of sections of Site 5, with the planting of wetlands, shrub, hedgerow, and treelines as linear commuting features for local bats to navigate along, as well as providing increased prey diversity and frequency. Therefore, the operational stage of Site 5 will not result in any notable long-term habitat fragmentation for the local bat populations. The remedial tree and shrub planting will help with the loss of the trees and scrub that will be cleared during the construction stage, providing potential future roosting features for bat populations within Site 5. However, the overall increased frequency of artificial surfaces throughout Site 5 will ultimately result in a loss of available foraging, commuting and refuge habitat for the local bat populations. Therefore, it is predicted that there will be a long-term negative operational impact on the local protected bat species.

- Lighting Disturbance

Site 5's proposed lighting design (with minimum lux levels for health and safety requirements) will illuminate the vast majority of the site, which is part of a large east-west dark corridor within the local landscape, south of residential areas and north / south of Thomas Omer Way. The installation of the Site 5 lighting design will result in a notable bottle-neck effect in this area, that local bat species currently utilise for commuting and foraging purposes, in particular bat species less adaptable to urban landscapes species such as Brandt's Bat or Whiskered Bat. It is important to note that there will still be smaller dark corridors within Site 5, which will partially alleviate the negative impact of the site, though only after a period of medium-term ecological lag, as newly landscaped trees and habitats will take time to mature and provide the necessary shading to create higher functioning dark corridors. Overall, the increased frequency of artificial lighting throughout Site 5 will result in long-term negative impacts for local bats. Therefore, it is predicted that there will be a long-term negative operational impact on the local bat populations.

- Physiological and Habitat Degradation via Pollutants

Site 4's main operational emission of concern for the habitats (and prey items contained within) utilised by the local bat populations will be the surface water run-off from hardstanding areas. The proposed range of SuDS features to be installed within and adjacent to Site 4, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), will safeguard the terrestrial and the more sensitive aquatic habitats (i.e., the Kilmahuddrick Stream) from deleterious urban run-off. Therefore, the prey items and habitats associated with the local bat populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces within the proposed Site 4 development.

- Collision Mortality

Given that bat species typically commute within / along dark areas / corridors (i.e. away from illuminated pedestrian and road infrastructure), bat species collision mortality risk is predicted to be negligible (not significant) during the operational stage of the Site 5 development.

Therefore, in the absence of targeted bat mitigation during the operational stage, it is anticipated that there will be an initial long-term negative impact of moderate significance for bat species, as a result of additional lighting and the bottle-necking of dark corridors and partial loss of other dark zones negatively impacting foraging and commuting habitats.

Wintering Birds [High Local]

- Disturbance

As Site 5 is located adjacent to an active roadway (Thomas Omer Way), the cumulative noise levels of the existing baseline and the operational noise from the Site 5 development will not be significant for wintering bird populations. Wintering birds will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances

generated by human and/or pet have the potential to negatively impact the on-site activities of non-volant mammals. In the case of the smaller non-volant mammals, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Surface water run-off from hardstanding areas into on-site and adjacent terrestrial and aquatic habitats (and foraging resources contained within) has the potential to degrade these habitats currently utilised by the migrant wintering bird populations. However, the proposed range of SuDS features to be installed within and adjacent to Site 5, including permeable paving; tree pits; conveyance swales; and bioswales will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), will safeguard the terrestrial habitats from deleterious urban run-off. Therefore, the foraging resources and habitats associated with these wintering bird populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape and lighting designs will ensure that suitable wintering bird foraging habitat will be created in a number of sections of Site 5, including the installation of wetlands, as well as the planting of new meadow, shrub, hedgerow, and treelines. Therefore, the operational stage of Site 5 will not result in any notable long-term habitat fragmentation for the wintering bird populations. The remedial tree and shrub planting will help with the loss of the trees and scrub that will be cleared during the construction stage, providing replacement screening and refuge for wintering birds within Site 5. However, the overall increased frequency of artificial surfaces within Site 5 will ultimately result in a loss of available foraging, commuting and refuge habitat for the migrant wintering bird populations. Therefore, it is predicted that there will be a long-term negative operational impact on the migrant wintering bird species.

- Collision Mortality

Collision mortality risk for the migrant wintering bird populations is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where drainage ditches, treelines, scrub and hedgerows are present currently.

Therefore, in the absence of targeted wintering bird mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for migrant wintering bird populations.

<u>Breeding Birds [High Local]</u>

- Disturbance

As Site 5 is located adjacent to an active roadway (Thomas Omer Way), the cumulative noise levels of the existing baseline and the operational noise from the Site 5 development will not be significant for the breeding bird populations. However, the breeding bird species will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of these breeding bird populations. Furthermore, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Of particular concern is the surface water run-off from hardstanding areas into the on-site and adjacent habitats (and foraging resources contained within) utilised by the local breeding bird populations. However, the proposed range of SuDS features installed within and adjacent to Site 5, including permeable paving; tree pits; conveyance swales; and bioswales will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the terrestrial habitats from deleterious urban run-off. Therefore, the foraging resources and habitats

associated with these breeding bird populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape and lighting design will provide commuting corridors along the borders of and through the site, including the installation of wetlands, as well as the planting of new meadow, shrub, hedgerows, and treelines. Therefore, the operational stage of Site 5 will not result in any long-term habitat fragmentation for the local breeding bird populations. The remedial tree planting will help cushion the loss of the trees and scrub that will be cleared during the construction stage, providing replacement nesting opportunities for birds on-site. However, the overall increased frequency of artificial surfaces throughout Site 5 will ultimately result in a loss of available foraging, commuting and nesting habitat for the local breeding bird populations. Therefore, it is predicted that there will be a long-term negative operational impact on breeding bird populations.

- Collision Mortality

Collision mortality risk for local breeding bird populations is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors where scrub, hedgerows and treelines currently exist.

Therefore, in the absence of targeted breeding bird mitigation during the operation stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for breeding bird populations.

Amphibians [High Local]

- Disturbance

Given that Site 5 is located adjacent to an active roadway (Thomas Omer Way), the cumulative noise levels of the existing baseline and the operational noise from the Site 5 development will not be significant for the resident amphibian populations. However, amphibian species will also be subject to potential physical and visual disturbances as a result of the increased local populace, as well as associated pets. These disturbances generated by human and/or pet have the potential to negatively impact the on-site activities of these amphibian populations. Furthermore, the introduction of pets to the area also has the potential to result in predation injuries and fatalities.

- Physiological and Habitat Degradation via Pollutants

Of particular concern is the surface water run-off from hardstanding areas into the on-site terrestrial habitats utilised by the local Common Frog populations. However, the proposed series of SuDS features installed within and adjacent to Site 5, including permeable paving; tree pits; conveyance swales; and bioswales will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the habitats from deleterious urban run-off. However, the swale and drainage ditch habitats that will be frequented by amphibians and are a part of the SuDS system, will experience urban surface water run-off and a degree of pollution as result, which will have potential knock-on impacts for the amphibians present within the habitats, as well as their prey items.

- Habitat Loss and Fragmentation

The operational landscape and lighting design will ensure the presence of commuting corridors; as well as the improving / creating new corridor structures (complexity of the commuting habitat) through the installation of wetlands, as well as the planting of new meadow, shrub, hedgerow, and treeline habitat. Therefore, the operational stage of Site 5 will not result in any long-term habitat fragmentation for the local amphibian populations. However, the increased frequency of artificial surfaces throughout Site 5 will ultimately result in an overall loss of available foraging, commuting and hibernation habitat for local amphibian populations. Therefore, in the absence of targeted amphibian mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of that is not significant for the local amphibian populations.

- Collision Mortality

Collision mortality risk for local Common Frog is predicted to increase during the operational stage of the development, given the increased vehicular presence and the bisecting of existing commuting corridors.

Therefore, in the absence of targeted amphibian mitigations during the operational stage, it is anticipated that there will be an initial long-term negative operational impact that is not significant for local amphibian populations.

Terrestrial Invertebrates [High Local]

- Physiological and Habitat Degradation via Pollutants

Site 5's operational emission of concern for the habitats (and foraging resources contained within) utilised by the local terrestrial invertebrate populations, will be that of contaminated surface water run-off from hardstanding areas. However, a range of SuDS features are proposed throughout Site 5, including permeable paving; tree pits; conveyance swales; and bioswales, which will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016). Therefore, the foraging resources and habitats associated with the local terrestrial invertebrate populations will not experience any operational contamination from the surface water run-off of hardstanding surfaces.

- Habitat Loss and Fragmentation

The operational landscape design will ensure that the most essential existing terrestrial invertebrate commuting corridors will be retained; as well as the creating of new corridor structures (complexity of the commuting habitat) through the planting of new wetland, meadow, shrub, hedgerow, treeline and woodland strips. Therefore, the operational stage of Site 5 will not result in any long-term habitat fragmentation for the local terrestrial invertebrate populations. While the planting plan will help provide new hive-supporting habitat, the increased frequency of artificial surfaces throughout Site 5 will result in an overall loss of available foraging and refuge habitat for local terrestrial invertebrate populations.

Therefore, in the absence of targeted terrestrial invertebrate mitigation during the operational stage, it is predicted that there will be an initial long-term negative operational impact of slight significance for local terrestrial invertebrate populations.

6.7.4.3 Do-Nothing Impact

If the proposed development were not to go ahead and the present land management continues as is, the ecological value of the Sites 3, 4 and 5 would remain largely unchanged given that the majority of the sites' areas are currently under the management of SDCC. Furthermore, Waterways Ireland will continue to maintain the Grand Canal section south of Site 4.

There are large areas within the development's boundaries which do not undergo regular maintenance. These areas contain recolonising bare ground, dry meadow and scrub habitats. In the short-term, the recolonising areas will develop into dry meadow habitat, while the dry meadows will develop into scrub, and scrub into immature woodland where tree species are present.

Overall, these minor changes to the habitats within the proposed development's boundaries will result in slight positive impacts for specific faunal groups including:

- Non-volant Mammals – increased scrub cover provides more refuges for local mammals;
- Breeding Birds – increased scrub cover provides increased nesting opportunities for local birds; and
- Terrestrial Invertebrates – an increase in dry meadow cover will provide increased foraging opportunities for local terrestrial invertebrates and subsequently their predators (birds & bats).

The above scenario does not account for the other permitted or pending local developments.

6.8.1 Introduction

This section describes the avoidance and mitigation measures required to prevent or reduce impacts generated during the construction and operation of the proposed Site 3, 4 and 5 developments on the following designated sites, and their respective protected habitats, protected flora and fauna; as well as local habitats, flora and fauna of ecological value.

All prescribed mitigation measures will be strictly adhered to throughout the length of the construction and operational stages.

The site-specific Construction and Environment Management Plan (CEMP), covering the three sites, incorporates the mitigation measures listed here. The proposed developments' principal contractor, as well as all other construction contractors, will be required to comply with all the mitigation details outlined within the CEMP. It is important to note that the CEMP, and management plans (Surface Water Management Plan, Pollution Control Plan, Dust Management Plan and Invasive Species Management Plan), may require a number of limited refinements in the event that the baseline environment changes during the pre-construction monitoring stage (e.g. the further spread of invasive non-native species prior to their respective treatments); and/or in the case that additional conditions are to be included within the CEMP, as set out by the competent authority.

6.8.2 Construction Stage Mitigations (All Sites)

The Construction Phase mitigation sections below will be divided into:

- Standard environmental best practice;
- Compound environmental management;
- Mitigation management plans ensuring the protection of surface water, groundwater and air quality and prevention of invasive species spread throughout the proposed sites; and
- Flora and Fauna mitigation measures.

6.8.2.1 Standard Environmental Best Practice

The activities required for the proposed developments' construction stage shall remain within the boundary of the proposed site, excluding select compound areas, which will be located in adjacent lands for mitigation control reasons. The prepared CEMP strictly adheres to best practice environmental guidance including but not limited to the following:

- BS (2012) – Trees in Relation to Design, Demolition and Construction. British Standard 5837;
- NRA (2006e): Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post-Construction of National Road Schemes. Dublin: National Roads Authority;
- CIRIA Guidance C532: Control of water pollution from construction sites. Guidance for consultants and contractors. (CIRIA 2019a);
- CIRIA Guidance C741: Environmental good practice on site guide (Charles & Edwards, 2015; CIRIA, 2023);
- CIRIA Guidance C750D: Groundwater control: design and practice (Preene et al., 2016; CIRIA, 2019b);
- CIRIA (C512): Environmental Handbook for Building and Civil Engineering Projects (CIRIA, 2000);
- CIRIA (C697): The SuDS Manual (CIRIA, 2015);
- Inland Fisheries Ireland: Guidance on Protection of Fisheries During Construction Works In and Adjacent to Waters (IFI, 2016); and

- Inland Fisheries Ireland: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning (IFI, 2020).

6.8.2.2 Environmental Management of Site Compounds

The principal contractor will be required to ensure good environmental management within the site compounds set up within the proposed development sites. A suitably qualified Ecological Clerk of Works (EcoW) will be required to regularly conduct site compound checks to ensure they are adhering to ecological safeguarding protocols The below list of measures will be incorporated into site compound environmental management:

- Site compounds will not be set up within Flood Zone A or B lands in accordance with the Office of Public Works (OPW) 'Planning System and Flood Risk Management Guidelines' (2009);
- Only plant and materials necessary for the construction of the works will be permitted to be stored at the compound locations;
- Site establishment by the Contractor will include the following;
    - Site offices;
    - Site facilities (canteen, toilets, drying rooms, etc.);
    - Office for construction management team;
    - Secure compounds for the storage of all on-site machinery and materials;
    - Temporary car parking facilities; and
    - Temporary fencing;
- Site Security to restrict unauthorized entry;
- All Subcontractors will be given induction toolbox talk so that they are aware of material storage arrangements;
- Construction materials within the compounds will be stored in a designated area in an organised manner so as to protect them from accidental damage and deterioration as a result of exposure;
- Bunded storage of fuels and refuelling area. Bunds shall be 110% capacity of the largest vessel contained within the bunded area;
- A separate container will be located in the Contractors compounds to store contaminated absorbents used to contain spillages of hazardous materials. The container will be clearly labelled, and the contents of the container will be disposed of by an appropriately licenced waste contractor at an appropriately licenced site. Waste disposal documentation of hazardous waste material taken off site for disposal will be retained by the Contractor;
- A maintenance programme for the bunded areas will be managed by the site environmental manager. The removal of rainwater from the bunded areas will be their responsibility. Records will be maintained of materials taken off site for disposal;
- The site environmental manger will be responsible for maintaining all training records and weekly environmental inspections;
- Drainage collection system for washing area to prevent run-off into surface water system;
- Stockpiling of spoil and spoil-like materials will be appropriately located within the compounds to minimise exposure to prevailing winds; and
- All refuelling of vehicles will be carried out at the fuel stores within the main site compounds and only ADR trained personnel will be permitted to operate fuel bowsers.

6.8.2.3 Protection of Surface Water, Groundwater and Air Quality

In order to protect surface water, groundwater and air quality throughout the proposed development sites, the principal contractor will be required to implement the prepared Surface Water Management Plan (SWMP), Environmental Incident Response document, and Dust Management Plan (DMP). The minimally required list of mitigations measures outlined below will be incorporated into these plans.

Surface Water Management Plans

The SWMPs and the control and management measures relating to surface water management have been prepared with regard to the following guidance documents, where relevant:

- Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532) (Construction Industry Research and Information Association) (CIRIA, 2001);
- Best Practice Guide BPGCS005 – Oil Storage Guidelines (Enterprise Ireland, 2003);
- PUB C811 Environmental Good Practice on Site, 5th Edition (CIRIA, 2023);
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA, 2006d);
- Safety, Health and Welfare at Work (Construction) Regulations 2013 – S.I. No. 291 of 2013;
- Design Manual for Roads and Bridges Part 3 DN-DNG-03022 (NRA HD 33/15) (Including Amendment No. 1) (TII, 2015a);
- Road Drainage and the Water Environment DN-DNG-03065 (TII, 2015b);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Board (IFI, 2016); and
- Planning for Watercourses in the Urban Environment, A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning (IFI, 2020).

In order to safeguard the local surface water network, and in turn the local groundwater network, from surface water-based pollution events, the following must be strictly adhered to:

- The principal contractor will ensure compliance with environmental quality standards specified in the relevant legislation, namely European Communities (Environmental Objectives (Surface Waters)) Regulations, 2009 (S.I. No. 272 of 2009 and amendments), and the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988);
- Management of silt-laden water on-site, including procedures for accidental leaks / spills to ground, as well as water quality monitoring to ensure compliance with environmental quality standards specified above;
- At no point during the construction stage will treated- or untreated-water be discharged to the local surface water network without the water quality meeting the statutory limits as set under the environmental quality standards specified above, or limits imposed by a relevant authority such as An Bord Pleanála:
- Fail-safe site drainage and bunding, e.g. drip trays on plant and machinery will be provided to prevent discharge of chemical spillage from the sites to surface water;
- To prevent the spread of any accidental discharge into the surface water network, oil retention booms will be on hand when construction activities are located beside aquatic habitats in order to control and minimise the spread of the spill;
- Washout of concrete plant will occur at a designated impermeable area with waste control facilities (C649 – CIRIA, 2006b);
- Wherever reasonably possible, pre-cast concrete features will be utilised to minimise the risk of a concrete-based pollution event;

- Concrete delivery, concrete pours and related construction methodologies will be part of the procedure agreed with the principal contractor to mitigate any possibility of spillage or contamination of the local environment. Particular attention will be paid during the pouring process in order to avoid leakages or spills of concrete;
- Temporary stockpiles will be monitored for leachate generation. These stockpiles will be placed within designated areas (C649 – CIRIA, 2006b) and not located within 20m of any watercourses / waterbodies and wetlands, or within 10m artificial surface water drainage features;
- Any excavated contaminated soils will be segregated and securely stored in a designated area where the possibility of runoff generation or infiltration to ground or surface water drainage has been eliminated through bunding and imperviable geotextile linings. The contaminated soils will then be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC. Furthermore, the principal contractor will ensure that no cross-contamination with clean soils happens elsewhere throughout the proposed development sites;
- Silt fencing will be installed prior to the commencement of any construction works in order to enhance the protection of identified water features (Kilmahuddrick Stream). Shallow interceptor trenches will be installed in front of these silt fences where possible. An EcoW will be present during the installation of these protective measures to ensure that they are installed to best practice standard and correctly located in their assigned areas. The following site-specific mitigation sections will provide greater detail on specific locations of these silt fence / trench sections;
- Silt fences will be repaired and/or replaced as necessary by the principal contractor as part of the on-going environmental monitoring programme.

Construction Compound

There will be a construction compound for each of three development sites, as well as a number of temporary workings areas of various scales within the boundaries of these sites (e.g. at the bridge culvert location within Site 4). The construction compound will include installation of the necessary facilities including the site office, welfare facilities etc.

Site Establishment

Where construction compounds are located on a greenfield site, the principal contractor will be required to provide a temporary geogrid mattress overlain in stone for trafficking within the construction compound. All surface water runoff will be intercepted and directed to appropriate treatment systems (settlement facilities and oil trap) for the removal of pollutants prior to discharge.

Security

Controlled access to the construction compound will be implemented, fencing will be erected, and lighting will be installed. The construction compound will be monitored by Closed-Circuit Television (CCTV) with security contractors on standby, to ensure safe storage of all material, plant and equipment.

Welfare and Sanitary Facilities

The construction compounds will be engineered with appropriate services. Water and wastewater disposal etc. will be organized by the appointed contractor. In work areas of the proposed developments, where permanent provisions (for the duration of the construction programme) are not practicable, appropriate temporary provisions will be made. Temporary welfare facilities will need to be used: for example, portable toilets in the vicinity of works. Welfare facilities will discharge wastewater either to an existing sewer, with the permission of the water utility, or wastewater will be collected and disposed of in an appropriate manner to a suitably-licensed facility offsite to prevent water pollution and in accordance with the relevant statutory requirements.

Fuel Storage

The below will be strictly adhered to in respect to appropriate fuel storage management:

- All hydrocarbons used during the construction storage will be appropriately handled, stored, and disposed of in accordance with recognised standards as laid out by the EPA within the Guidance Note on Storage and Transfer of Materials for Scheduled Activities (EPA, 2004);
- All chemical and fuel filling locations will be contained within signposted, designated bunded areas, a minimum of 10m from any natural or artificial surface water drain;
- At the construction compounds, where the sites are pervious, an area of hard standing will be installed in a demarcated area for refuelling, and vehicle / plant cleaning and service areas. This area will be drained via a hydrocarbon interceptor trap to a soakaway if possible, or to local surface water drains, with the permission of the asset owner, under a permit or licence authorised by the relevant authority;
- The retained contents of the separators will be collected for disposal by a licensed operator to a licensed waste disposal / recovery facility;
- Suitable precautions will be taken to prevent spillages from equipment containing small quantities of hazardous substances (for example, chainsaws and jerry cans) including:
    - Each container or piece of equipment will be stored in its own drip tray made of a material suitable for the substance being handled;
    - Spill kits and drip trays will be provided for all equipment and at locations where any liquids are stored and dispensed, and staff will be trained on the procedures to be followed; and
    - Containers and equipment will be stored on a firm, level surface;
- Procedures and contingency plans will be in place at each work area to address cleaning up small spillages as well as dealing with an emergency incident. A stock of absorbent materials such as sand, spill granules, absorbent pads and booms will be kept at each work site, on plant working near water and particularly at refuelling areas and where fuel or oil is stored;
- The storage of fuels, other hydrocarbons and other chemicals within the construction compound shall be in accordance with relevant legislation and with best practice. In particular:
    - Fuel tanks, drums, and mobile bowsers (and any other equipment that contains oil and other fuels) will be housed within a bund of at least 110% capacity of the fuel tank itself or at least 25% of the total volume of the containers, whichever is greatest. The fuel tank will be double skinned. There will be no passive drainage from the bund; any water collected within it will be pumped out and removed off site for disposal; and
    - Any designated area or areas for oils, fuel, chemicals, hydraulic fluids, etc. storage and refuelling will be set up at least 10m from any surface water drains (C649 – CIRIA, 2006b) and the storage location within the construction compound shall be organised so as to be as far away from surface water drains as is practicable to minimise risks from leaks and spills.
- Storage areas will be covered, wherever possible, to prevent rainwater filling the bunded areas;
- Fuel fill pipes will not extend beyond the bund wall and will have a lockable cap secured with a chain;
- Where fuel is delivered through a pipe permanently attached to a tank or bowser:
    - The pipe will be fitted with a manually operated pump or a valve at the delivery end which closes automatically when not in use;
    - The pump or valve will be fitted with a lock;
    - The pipe will be fitted with a lockable valve at the end where it leaves the tank or bowser;
    - The pipework will pass over and not through bund walls;

- Tanks and bunds will be protected from vehicle impact damage;
- Tanks will be labelled with contents; capacity information and hazard warnings; and
- All valves, pumps and trigger guns will be turned off and locked when not in use. All caps on fill pipes will be locked when not in use.

Construction Phase Haul Road Mitigations

Through grassed areas, shallow land drains will be provided adjacent to haulage roads. The land drains will be provided with check dams which will allow infiltration of the collected surface water to ground. Silt screens will be provided running alongside the haulage roads through grassed areas to prevent silt and fines from impacting on the adjacent habitats and drainage features.

Procedures and contingency plans will be in place at each haul road to address cleaning up small spillages, as well as dealing with an emergency incident.

Control of Sediment

There are a number of sources of sedimentary or silt-laden water on a construction site, including silty 'runoff' from stripped soils; and the stockpiling of soils. Control measures for each of these are to be provided. Area specific measures are identified below in the site-specific mitigations sections.

Fuel and Chemical Spillages

An effective pollution SWMP relies on the following elements, with regards to fuel, and chemical spillages:

- Identification of receptors / pathways (e.g. water body/surface water paths);
- Identification and clear marking of surface water drain locations within the construction compound and other work areas;
- Having designated re-fuelling areas;
- All hydrocarbons used during the construction stage will be appropriately handled, stored, and disposed of in accordance with recognised standards as laid out by the EPA;
- Identification of all possible emergency scenarios;
- Effective planning, e.g. oil booms and oil soakage pads will be maintained at appropriate locations on site to enable a rapid and effective response to any accidental spillage or discharge. These shall be disposed of correctly and records will be maintained by the environmental manager of the used booms and pads taken off site for disposal;
- Identification and dissemination of contact numbers;
- Definition of personnel responsibilities;
- Assurance that all appropriate personnel are aware of the emergency procedure(s) (e.g. spillage, leakage, fire, explosion, and flooding), that drain covers and spill kits are available, and personnel know how to use them;
- Knowledge of incident scenarios, such as spill drills; and
- Implementation of lessons learnt from previous incidents.

In terms of pollution spill response procedures, these will vary depending on the sensitive receptor and nature of construction activities. However, the following information will be included as a minimum and displayed at appropriate locations along the proposed development sites, at river crossings, near outfalls, re-fuelling locations, fuel storage areas etc.:

- Instructions on how to stop work and switch off sources of ignition;
- Instructions on how to contain the spill;
- Location of spill clean-up material;

- Name and contact details of responsible personnel (these personnel will assess the scale of the incident to determine whether the environmental regulator needs to be called); and
- Measures particular to that location or activity (for example, close to a settlement pond).

Emergency equipment will be obtained from a reputable supplier, and personnel will be trained in its correct use. Material Safety Data Sheets (MSDS) and best practice assessments will be used for advice on appropriate spill measures. The type of equipment required will depend on the activity taking place. The CIRIA Technical Guidance Document provides details on the types and applications of emergency equipment. Refer to Table 15.2 of the CIRIA Technical Guidance Document for further information.

Every effort will be made to prevent an environmental incident during the construction stage of the proposed development sites. The objective of the measures in the SWMP is to prevent an incident arising in the first place. Oil / fuel spillages are one of the main environmental risks that will exist during the construction stage of the proposed development sites which will require an emergency response procedure. An example of the steps that will be followed in the event of a spillage to ensure that the environmental risk is reduced to as low as reasonably practical is provided in this section. This procedure can be tailored to be location / activity specific as required:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers;
- Notify the Environmental Manager immediately giving information on the location, type, and extent of the spill so that they can take appropriate action;
- If necessary, the Environmental Manager will inform the appropriate regulatory authority, including the Fire Services, depending on the size and nature of the spill – the appropriate regulatory authority will vary depending on the nature of the incident;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident; and
- Contain the spill using the spill control materials, track mats or other material as required. Do not use detergent or hoses to disperse spilled fuel.

If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats:

- Clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully-licensed waste contractor with the appropriate permits so that further contamination is limited. The details of the incident will be recorded on an Environmental Incident Form (identified by the appointed contractor), which will provide information such as the cause, extent, actions, and remedial measures used following the incident. The form will also include any recommendations made to avoid the reoccurrence of the incident;
- A record of all environmental incidents will be kept on file by the Environmental Manager and the appointed contractor;
- These records will be made available to the relevant authorities if required; and
- The Environmental Manager will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the appointed contractor as appropriate.

By carrying out the above steps, a proper system will be in place to investigate, record and report any potential fuel or chemical spillages.

Surface Water Monitoring

The principal contractor shall carry out visual inspection of surface water control measures (settlement tanks, silt fences, fuel storage areas etc.) on a daily basis for any damage and correct functioning. In addition, daily visual inspections of the Kilmahuddrick Stream will be carried out.

Furthermore, surface water quality sampling will be undertaken at two locations, one where the Kilmahuddrick Stream enters Site 4 to the south-east and the other to the north-west where the stream exits the Site 4.

Surface water sampling will be undertaken throughout the length of the construction stage, with the first round to align with the commencement of the geotechnical ground investigation works, and at intervals of 2 / 3 months thereafter. Indicators that water pollution may have occurred include the following:

- Change in water colour;
- Change in water transparency;
- Increases in the level of silt in the water;
- Oily sheen to water surface; and
- Floating detritus, or scums and foams.

If hydrocarbons are observed or other water quality parameters are suspected to have been exceeded, relevant regulatory authorities will be informed immediately so that they can contribute to any investigations conducted to determine whether any element of the construction of the proposed development sites (particularly Site 4) may be causing the contamination. If any potential sources of contamination are observed, appropriate actions will be taken (depending on the source and nature) to prevent further contamination and the incident shall be recorded and investigated in more detail to prevent a recurrence. If required, the relevant regulatory authorities will be informed.

Environmental Incidence Response

Environmental incidents are not limited to just fuel spillages. For example, other environmental incidents may include:

- Accidental stripping of a protected habitat;
- Accidental excavation of protected archaeological structure (without archaeologist present);
- Accidental release from settlement pond / tank etc.; and
- Unplanned utility strikes, resulting in foul water releases, temporary loss of services etc.

Therefore, any environmental incident will be investigated in accordance with the following steps:

- Immediately notify the Environmental Manager, giving information on the location, type, and extent of the incident so that they can take appropriate action;
- In the very unlikely event of an incident occurring which may impact on a sensitive receptor, the Environmental Manager will inform the appropriate persons / regulatory authority. The appropriate persons / regulatory authority will vary depending on the nature of the incident;
- The details of the incident will be recorded on an Environmental Incident Form (identified by the appointed contractor) which will provide information such as the cause, extent, actions, and remedial measures used following the incident. The form will also include any recommendations made to avoid the reoccurrence of the incident;
- A record of all environmental incidents will be kept on file by the Environmental Manager and the appointed contractor. These records will be made available to the relevant authorities if required; and
- The Environmental Manager will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the appointed contractor as appropriate.

By carrying out the above steps, a proper system will be in place to investigate, record and report any potential accidents or incidents.

Dust Management Plan

A Dust Management Plan (DMP) provides the strategy to be adopted in order to manage dust during construction stage of the development sites. This will be incorporated by each contractor into their plans and implemented as part of their works. This plan and measures within align with IAQM Guidance, with the mitigation measures proposed in accordance with the determination that the highest risk category will be applied to the construction stage of the proposed development sites.

Construction dust will be controlled and managed in accordance with the DMP contained within the CEMP. The DMP within the CEMP will be updated by the construction contractor prior to the commencement of the construction stage, so as to include any additional measures required pursuant to conditions attached to any decision to grant approval. The DMP may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and will include as a minimum the recommended dust mitigation measures outlined below. The recommended construction dust mitigation measures will be implemented as appropriate for the site. The DMP will include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority when asked;
- Record any exceptional incidents that cause dust and/or air emissions, either on or offsite, and the action taken to resolve the situation in the logbook; and
- Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary if applicable, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

Daily Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary;
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and to make an inspection log available to the local authority when asked; and
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and Maintaining Development Sites

- Plan site layouts so that machinery and dust causing activities are located away from sensitive ecological receptors, as far as possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicle / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles;
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable;
- Impose and signpost a maximum-speed-limit of 25km on surfaced and 1km on unsurfaced haul roads and work areas; and
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Wate Management

- Avoid the use of bonfires and general burning of waste materials.

The IAQM Guidance (IAQM, 2024) mitigation measures applicable to the specific works to be undertaken as part of the proposed development sites are as follows:

Demolition Measures

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust;
- Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;
- Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

Earthworks Measures

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- Only remove the cover in small areas during work and not all at once.

Construction Measures

- Avoid scabbling (roughening of concrete surfaces) if possible;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;

- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Trackout Measures

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Record all inspections of haul routes and any subsequent action in a site logbook;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
- Access gates to be located at least 10m from sensitive ecological receptors where possible.

Construction Monitoring (Short-term Period)

As part of the DMP, monitoring of construction stage dust deposition levels, PM_{10}, $PM_{2.5}$ and NO^2 will be undertaken in order to ensure on-site mitigation measures are being successfully implemented.

The monitoring of Construction Phase dust deposition levels, PM_{10}, $PM_{2.5}$ and NO^2 will be developed and implemented as part of the DMP. Monthly monitoring of construction stage dust deposition levels, PM_{10}, $PM_{2.5}$ and NO^2 levels shall be undertaken by an appointed contractor throughout for the duration of construction stage.

The results of the construction stage dust deposition levels shall be compared with the guideline of 350mg/m2/day (for non-hazardous dusts). The results of the construction stage PM_{10}, $PM_{2.5}$ and NO^2 concentrations shall be compared with the relevant Ambient Air Quality Standard limit values.

This monitoring shall be carried out at a minimum of three locations at each construction compound and further monitoring locations shall be designated at sensitive receptors within the locality (e.g. at the Grand Canal). The monitoring locations will be chosen with consideration of the prevailing wind direction and proximity of sensitive receptors.

If dust deposition levels are measured to be above the relevant guideline of 350mg/m2/day and/or PM_{10}, $PM_{2.5}$ and NO^2 concentrations are measured to be above the relevant Ambient Air Quality Standard limit values, the mitigation measures in the area shall be reviewed and improved to ensure that dust deposition levels and/or PM_{10}, $PM_{2.5}$ and NO^2 concentrations are reduced.

Should high dust deposition levels and/or PM_{10}, $PM_{2.5}$ and NO^2 concentrations continue to occur following these improvements, the appointed contractor shall provide alternative mitigation measures and/or will modify the construction works taking place.

Six months of pre-construction dust monitoring will be undertaken at all sites to establish a baseline prior to construction works. The data will assist in confirming if the construction of the proposed development sites has the potential for any air quality impacts which contribute to the risk of the respective limit values, or target values or alert thresholds being exceeded. During construction, trigger levels will be used to alert the principal contractor to a potential peak in particulate

concentrations. These trigger levels will be agreed with SDCC prior to construction. In the event that a trigger level is breached SMS text messages and/ or emails will be sent to the Council's representative and the principal contractor from monitoring equipment. In such an event:

- The Council's representative and the principal contractor will review the construction activities in the vicinity to determine the cause;
- The Council's representative will be entitled to stop the works. Where activities outside the control of the Contractor may have had an influence on a trigger level being breached, these will be identified, and works can recommence following agreement with the Council's representative;
- The principal contractor will review the monitoring data, including the most recent air quality data; and
- The principal contractor will identify and agree with the Council's representative appropriate engineering controls and management procedures to reduce dust levels resulting from the works activities identified as the cause of the trigger level being reached.

The principal contractor will confirm to the Council's representative that controls and management procedures have been implemented.

The principal contractor, along with the sites' appointed EcoWs, will hold regular liaison meetings with other active and future construction sites within 500m of the proposed development sites (where there is the potential for cumulative and in-combination impacts, i.e., overlapping disturbance and dust settlement buffers), to ensure plans are co-ordinated so that the potential for cumulative and/or in-combination surface water (dust settlement in water), disturbance and dust impacts are minimised.

6.8.2.4 Invasive Species Management Plan (ISMP**)**

The prepared ISMP (see Appendix 6.2 for all ISMP details) includes mitigation measures that utilises the below best practice management guidance documents, where relevant:

- The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020a);
- The Management of Invasive Alien Plant Species on National Roads – Standard (TII, 2020b);
- Inland Fisheries Ireland – Biosecurity Protocol for Field Survey Work (IFI, 2010);
- Managing Invasive Non-Native Plants in or near Freshwater (EA, 2010);
- Invasive Species Ireland (ISI) Best Practice Management Guidelines for Japanese Knotweed (ISI, 2008a); and
- The Environment Agency (EA) Managing Japanese Knotweed on development sites – the Knotweed Code of Practice (Version 3, amended in 2013, withdrawn from online publication in 2016) (EA, 2013). (This document, although no longer supported by the EA, is nonetheless a practical document in determining the approach and control mechanisms for Japanese Knotweed).

General Measures to Control and Prevent the Spread of INNS

Pre-construction Survey

An updated invasive species baseline survey shall be conducted prior to the commencement of the proposed project's enabling works. This updated baseline is required as invasive species may have continued to spread within and adjacent to the proposed development sites since the last invasive species or habitat survey was conducted on-site.

As per TII guidance (TII, 2020a), this additional invasive species survey will include detailed maps of the precise location of each individual invasive species plant, as well as photos of these specific locations.

During the interim between the original invasive species surveys and the commencement of construction, it is possible that the existing stands of First Schedule invasive species may have expanded (if unmanaged) or decreased (if there is an active management regime in place), or that newly established First Schedule non-native invasive species may have become established within the footprint of the proposed development sites. A confirmatory pre-construction invasive species survey will be undertaken by a suitably qualified specialist, arranged by the principal contractor, to confirm the absence, presence and / or extent of all First Schedule invasive species within the footprint of the proposed development sites. Where an infestation is confirmed / identified within the footprint of the proposed development sites, this will require the implementation of the final ISMP.

Final Invasive Species Management Plan

Following appointment, the contractor(s) will be required to develop more specific Method Statements and submit an updated ISMP that is cognisant of the proposed construction activities, equipment and plant usage and environmental monitoring plan for the proposed development sites. The updated ISMP is referred to as the 'final ISMP' in this document. The contractor(s) may only propose modifications to the ISMP which will not give rise to any impacts which are more significant than those already identified within the Biodiversity Chapter.

All of the measures set out in this ISMP will be implemented in full by the appointed contractor(s) and its finalisation will not affect the robustness and adequacy of the information presented and relied upon in the Biodiversity Chapter.

The ISMP will be updated following the pre-construction invasive species survey to detail the exact measures for any invasive species population present within the footprint of the proposed development sites. Depending on the extent and nature of the works, a number of approaches / treatments may be approved, all following the measures in the ISMP.

All control measures specified in the final ISMP shall be implemented by a suitably qualified and licensed specialist prior to the construction stage of the three proposed development sites to control the spread of any newly established INNS within the footprint of the proposed development sites. Furthermore, the contractor(s) will adhere to control measures specified within the final ISMP throughout the construction stage of the proposed development sites. The site will be monitored by the appointed contractor after control measures have been implemented. Any re-growth will be subsequently treated by the contractor. All measures that are prescribed in the final ISMP shall be equally applicable to advance works as to construction works. The contractor will be required to update the Final ISMP with a detailed Monitoring Plan and Programme which will require approval by NPWS.

General INNS Spread Prevention Measures

The unintentional spread of INNS during construction works (within the proposed developments sites, originating from outside the proposed developments sites, such as through the importation of materials, poor biosecurity practices regarding plant and machinery or natural processes) can be a significant issue, and if not managed properly, can result in the spread of INNS to non-infested areas (within or adjacent to works areas). This will potentially increase the future cost and effort required to control the species and has the potential to pose further public health and safety risks (e.g. Japanese Knotweed can cause damage to weaknesses in built environment).

Listed below is a brief detailing of necessary measures to be undertaken to ensure biosecurity within this section of the proposed developments sites, all of which will need to be included within the proposed developments sites ISMP:

- The adherence to a set of biosecurity measures, including:
    - the fencing off / demarcating of the individual invasive species;
    - identifying dedicated access points into and out of fenced-off areas;
    - the installation of designated decontamination facilities (where appropriate);
    - protocols around the removal of contaminated soils; and
    - seed and fragment checks on boot, tyres and tracks entering and leaving the work site.

- Best practice measures for the treatment of soils contaminated with invasive species (including potential seeds and fragments of mature plants) to prevent the accidental spread of INNS;
- As required by law, licences for the disposal of contaminated materials will be obtained, as well as the utilisation of licensed facilities;
- In regard to the importation of soil and other materials, the principal contractor will only utilise traceable topsoil for landscaping that has been cleared of any invasive species material;
- Measures to be implemented during the application of herbicides – Commitment to the appointment of a suitably qualified/registered/licensed pesticides advisor for any works requiring the use of pesticides, and safety precautions for consideration in the use of pesticides near watercourses; and
- Areas which contained invasives species, where invasives were treated on-site or removed, prior to the enabling and construction works will require an on-going post-construction monitoring programme to ensure that there is no reestablishment of any invasive species within these areas. The appointed INNS contractor will provide this detailed Monitoring Plan and Programme within the final ISMP.

Biosecurity

Unwashed construction equipment, plant and vehicles, and footwear can provide a vector for the spread of non-native invasive species within the proposed project and from areas outside the project where INNS are present or where vector material potentially containing seed / root material is attached to plant or personnel. The following hygiene measures shall be undertaken for the proposed development sites:

- Known or potentially infested areas within the working area of the proposed development sites shall be clearly demarcated and fenced off in advance of works and access restricted until such time that treatment has commenced and / or construction works are monitored in accordance with the ISMP in the area. In relation to Japanese Knotweed, the guidance recommends an exclusion buffer of 7m (metres) in all directions (within the works area and 3m vertically underground);
- The implementation of clear signage in accordance with TII IAPS standards will be erected at compounds, and at the boundary of the exclusion fencing. These signs will be briefed out at toolbox talks specific to each INNS to personnel on site;
- Identify and create access points into exclusion areas for INNS. These are only to be used by specialist personnel for the removal of INNS and are not to be used by general site workers until such a time as all contaminated material has been removed from site and it is safe to enter;
- Where it is practicable, a wheel wash and footwear washing facilities will be provided to ensure biosecurity measure are preventing the further potential spread of INNS. These locations are to be provided by the contractor. Where a dedicated / bespoke wheel wash cannot be installed owing to space limitations, the appointed contractor will ensure that no excavated loose material is allowed off site from within an exclusion zone;
- Where plant that is used to excavate soils, it shall be visually checked for loose soil before movement to another part of site (where possible, the movements of tracked machinery will be restricted within the invasive species exclusion zone). Loose soil shall be scraped off and disposed of, and a solution of Virkon© (or similar approved disinfectant) applied to machinery to ensure that no obscured seed / root material remains viable. Vehicular movements within the exclusion area shall be minimised as far as is practical;
- Unless in the exceptional circumstance that direction is given from a suitably qualified ecologist, no storage of contaminated soil on site. Instead, being disposed of in a licensed soil waste facility; and
- Where there are small volumes (e.g. volumes capable of being double bagged in quarantine bags such as cut plants, bulbs or loose soil occur), it may be practical to bag the material and bring it to a clearly demarcated and dedicated quarantine area within the construction compounds until

such time that the material is disposed of to an authorised facility, similar to the process of disposing of bulk excavated contaminated soil.

Soil Excavation

No excavation or removal of soil within areas demarcated as having INNS present is to be permitted unless under strict supervision by a suitably qualified ecologist or INNS specialist. Buffer zones to be installed by the contractor(s) will be advised by a suitably qualified ecologist or INNS specialist and strictly adhered to. Guidance regarding Japanese Knotweed recommends a buffer of 7m from the plant due to its expansive rhizomes.

Where mechanical means of removal are required to dispose of INNS (treated or un-treated by chemicals) a suitably qualified ecologist or INNS specialist will be present to supervise and provide support to the contractor(s) for the duration of the operation.

There will be no temporary storage on-site of bulk excavated contaminated material. Where the final ISMP calls for shallow / deep burial, this material shall be removed from the excavated area and transported immediately to approved receptor area on-site. Furthermore, the temporary storage of non-contaminated material will not occur within a European or National designated site nor within 20m of any watercourse / wetland and any land within an identified flood zone.

Plant and machinery used in the control, excavation and transport of contaminated material shall also be subject to the recommendations described in the above Biosecurity sub-section. The installation of industry-rated invasive species-proof membrane before infilling construction of road / paths surface may be required. All waste arising out of this process which has been in contact with the excavated ground shall be treated as contaminated waste and disposed of at a facility that is authorised to accept such waste.

Where the movement of any First Schedule invasive species is required off site, a licence will be required from NPWS in advance of any movement to a site / facility licensed to accept such waste, as per the Birds and Natural Habitats Regulation. This licence is separate to and does not negate the need for licences / permits / authorisations required under waste legislation.

Disposal of Materials

Where any INNS related material is collected and is required to be disposed of, it is essential to dispose of said material in a manner that does not afford it the potential to spread further either within the proposed development sites, or in the nearby vicinity.

The movement of invasive plant material off-site, requires a licence from the NPWS, as per the Birds and Natural Habitats Regulations. Invasive species (particularly roots, flower heads or seeds) must be disposed of at licensed waste facilities or composting sites, appropriately buried, or incinerated having regard to relevant legislation (e.g. Waste Management Act, as amended, Section 4 of Number 6 of 1987 – Air Pollution Act, 1987, relevant local authority bylaws and any other relevant legislation). All disposals must be carried out in accordance with the relevant waste management legislation, as outlined in the Guidelines for the Management of Waste from National Road Construction Projects (TII, 2017).

It is important to note that some invasive species plant material or soil (vector material) containing residual herbicides may be classified as either ‘hazardous waste’ or ‘non-hazardous waste’ under the terms of the Waste Management Act, as amended, and both categories may require special disposal procedures or permissions. Advice will be sought from a suitably qualified waste expert regarding the classification of waste and the suitability of different disposal measures.

Measures to be Implemented During the Application of Herbicides

If the application of herbicides is the expert advice given and then implemented during the lifespan of the proposed developments sites then a suitably qualified pesticides advisor, registered with the Department of Agriculture, Food and the Marine must be employed.

The appointed contractor is required to refer to the appropriate guidance documents, including but not limited to those listed at the beginning of this ISMP sub-section, which provide detailed recommendations for the control of invasive species and noxious weeds. The appointed contractor

(or specialist license holder) will update the final ISMP in accordance with current and relevant guidelines before commencing works; and

It is important to note that where a chemical treatment is to be used, there is a risk of contaminating a watercourse. The choice of herbicide is typically limited to formulations of Glyphosate or 2,4-D amine that are approved for use near water. Full details of any chemical used, where required and as advised by a registered pesticides advisor, will be included in the final ISMP prepared in advance of construction of the proposed developments sites.

Post-construction Monitoring

Following the construction of the proposed development sites, there may be ongoing treatment programmes which extend for a number of years (length of programme is dependent on the effectiveness of treatment) into the operational stage. In the operational stage, the management of the infrastructure will be the responsibility of the local authority and the control of invasive species will be as per their plans and procedures, and responsibilities under The Birds and Natural Habitats Regulations.

The above measures are important for all First Schedule non-native invasive species, and in particular Japanese Knotweed, where it occurs, as maintenance works associated with landscaping, such as mowing and hedge cutting have the potential to spread this plant via the dispersal of very small amounts of shredded plant material. If invasive plants are found, then they shall be treated as per the measures outlined in the ISMP and any species-specific guidelines.

The appointed INNS contractor will provide a detailed post-construction section within the Monitoring Plan and Programme within the final Invasive Species Management Plan.

Assessment of Management Options for First Schedule Invasives Species

The general measures included in the sections above are required to ensure good on-site practices in respect of known or potential First Schedule invasive species as per Regulations 2024 [S.I. 374/2024]. The following sections further identify practical management controls. It is acknowledged that more than one potential control measure exists and that a single or combination of measures may be required.

The recommendations presented in this ISMP provide the minimum requirements for the likely control measures and the measures outlined in this ISMP shall be developed (with further detail on methodology used at each location, timing, practical management etc.) by the appointed contractor(s) (or the specialist as appropriate) by way of producing and implementing the final ISMP.

The use of chemical treatments is recognised as a potential treatment option. However, the services of a registered herbicide advisor must be employed in the specifying of named chemicals including those rated for use adjacent to aquatic environments where required, treatment type, dosage, and timing etc., and / or use of pesticides in the management of potential First Schedule invasive species within the proposed development sites.

Selected Management Controls

The selected management control to be defined for each invasive species stand within the three proposed developments sites will depend on:

- Results of the pre-construction survey;
- Construction requirements – timing of works at specific locations, level of infestation and practical considerations such as reducing disturbance to road users / homeowners; and
- Feasibility of control measure, where possible the most practicable method (with regards to the environmental impact and human health) will be used e.g.; if mechanical methods of removal are not feasible due to access. Then a step back and assess approach will be employed to remove INNS.

The ISMP, which will be updated (in the form of the final ISMP) following on from the pre-construction surveys, may require the utilisation of a number of controls that are described below.

The Site-specific Mitigation sub-section provide the specific invasive species mitigation measures required for the invasive species within and immediately adjacent to Sites 3, 4 and 5.

6.8.2.5 Tree Protection Measures

The tree protection measures detail how sensitive operations are to be achieved in proximity to trees to be retained within and adjacent to the three development sites. A list of tree-based habitat mitigation measures (Order of operations) are outlined below:

- Pre commencement Site meeting;
- Preliminary tree works;
- Site Briefing for Site personnel;
- Installation of protective fencing and ground protection as required;
- Demolition and enabling works including utility diversions;
- Re-adjustment of protective fencing and ground protection as required;
- Construction operations;
- Re-adjustment of protective fencing and ground protection as required;
- Installation of new hard surfaces and hard landscaping;
- Site signed off on agreed completion of significant works;
- Dismantling of tree protection measures; and
- Soft landscaping works within the Root Protection Area of retained trees.

6.8.2.6 Rare and Protected Floral Mitigations

Protected and/or Red-listed Flora: Lesser Centaury

Pre-construction surveys will be conducted for Lesser Centaury across the Site 3, 4 and 5 to observe the existing populations where present, as well as to identify the potential new colonisation of Lesser Centaury within new sections of the three sites. All the data from the pre-construction surveys will be provided to the appointed ECoW, who will continue to monitor the populations before their relocations to a suitably undisturbed area within the locality (i.e. the northern riparian zone of the Kilmahuddrick Stream, where there will be no public access or maintenance), prior to the commencement of the construction stage. The ECoW will apply and obtain a Licence to Take or Interfere with Protected Plant Species for Scientific, Educational, or Other Such Purposes from the NPWS, prior to the relocation of this protected floral species. In this new location, the Lesser Centaury will be sectioned (rope / tape fence) off with a 1m buffer to prevent stray machinery or site personnel entering their immediate vicinity, ensuring no physical impacts. The sectioning off will be carried out under the supervision of the ECoW.

Uncommon / Rare Flora: Pyramidal Orchid and Bee Orchid

Pre-construction surveys will be conducted for Pyramidal Orchid and Bee Orchid, (and other potential emerging uncommon/rare flora), across the Site 3, 4 and 5 to observe the existing populations where present, as well as to identify the potential new colonisation of Pyramidal Orchid and Bee Orchid within new sections of the three sites. All data from the pre-construction surveys will be provided to the appointed ECoW, who will continue to monitor the potential spread of Orchid species during the site enabling works / early construction stages.

Additionally, the ECoW will relocate any newly sprouted Orchid species from work areas to be cleared of vegetation into suitable areas, that will not undergo any future vegetation clearance, e.g. the riparian zone of the Kilmahuddrick Stream. In this new location, the Orchid(s) will be sectioned (rope / tape fence) off with a 1m buffer to prevent stray machinery or site personnel entering their

immediate vicinity, ensuring no physical impacts. The sectioning off will be carried out under the supervision of the ECoW.

6.8.2.7 Rare and Protected Fauna Mitigations

Otter

Pre-construction surveys (four in total to account for potential seasonal use) in the year prior to the commencement of the construction stage will be required to monitor the use of Site 4 and the Grand Canal section to the south by the local Otter population. The main aim of these surveys is to ensure that any potential new holt is identified and accounted for within the construction mitigations before commencement of site works. All data from the pre-construction surveys will be provided to the appointed ECoW, who will briefed in detail by the pre-construction study team. The ECoW will then continue to monitor any new Otter holt within the disturbance zone of the site during the construction stage; and will engage in discussion with NPWS officials in regard to the requirement of a derogation licence.

The works have the potential to impact local Otters via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements has the potential to impact the health of the local Otter population. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality.

Standard mammal mitigation measures will be adhered to including the covering of all excavations to prevent accidental trapping or the use of mammal ramps in larger excavations to allow for escape as well as the use of exclusionary fencing where appropriate to prevent mammals from entering any potentially dangerous areas.

There will also be a toolbox talk given to the site personnel by the appointed ECoW about the local Otters and where they are likely to potentially encounter them within works area (i.e. the Grand Canal and Kilmahuddrick Stream, and their respective banks).

The ECoW will monitor site lighting along the banks of the Grand Canal and Kilmahuddrick Stream during the construction stage, in order to ensure that there is no light spillage into these watercourses, which may disturb the commuting and foraging activities of Otter along these two watercourses.

Non-volant Mammals

Pre-construction surveys will be conducted for non-volant mammals, such as Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew, to check if these species have increased their presence or expanded their respective ranges into the proposed development sites, including the formation of new setts, dens, and hibernacula within the disturbance buffer of the proposed development sites. All data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor the potential expansion of these non-volant mammal species into the site areas during the construction stage.

The construction works at the development sites have the potential to impact the local Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew populations via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements has the potential to impact the health of the Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew populations. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local non-volant mammal populations, and their associated habitats.

Standard mammal mitigation measures will be adhered to including the covering of all excavations to prevent accidental trapping or the use of mammal ramps in larger excavations to allow for escape as

well as the use of exclusionary fencing where appropriate to prevent mammals from entering any potentially dangerous areas.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the terrestrial mammals known to frequent the works area, as well as those that may expand their range into the works area (e.g. Badger and newly excavated potential setts).

Additionally, in the event one of the above mammals establishes a resting place e.g. sett etc., within the proposed works area, the ECoW will be required to adjust the mitigation measures within the area of the new resting place in order to safeguard the mammal species in question. Furthermore, the EcoW will be responsible for performing checks within areas to immediately undergo vegetation clearance, in order to safely disturb / relocate mammal species, such as Irish Hare, so that they may vacant the area before machinery enters the area. Moreover, the EcoW will also have to check the vegetation and relocate any Hedgehog hibernacula present (hibernation nests formed under hedges, tree roots, and piles of deadwood / leaves / grass).

Bats

The proposed development sites' construction works have the potential to impact local bat populations via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements has the potential to impact the health of the local bat species. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local bat populations and their prey base.

Additionally, regular (seasonal) pre-construction surveys will be required for monitoring of newly formed potential bat roost features within structures and trees present within the boundaries of Sites 3, 4 and 5. If the event that suitable potential bat roost features are formed, subsequent endoscopic examinations will need to be performed, with further follow-up through emergence activity surveys. At the time of writing of this chapter, no bat roosts have been recorded within or the lands immediately adjacent to the proposed development sites, therefore no derogation licence will be accompanying the submission of this EIAR.

Site lighting required during construction stage will be installed in a manner that it is positioned, directed and cowled away from any dark corridors (e.g. neighbouring treelines / hedgerows / waterbodies (Grand Canal)) or high-quality foraging areas (e.g. wetland habitats) located beyond the construction compound / immediate works area, therefore avoiding any unnecessary light spill and disturbance to bat activities. The site lux levels at suitable foraging and commuting habitats for local bat species will not be increased above 1lux in important dark corridors or baseline levels in secondary habitats (amenity grasslands) as a result of construction activities within the locality of the proposed development sites. Furthermore, wherever reasonably possible, works will be carried out in daylight hours in order to reduce the need for lighting on site (outside of compound areas). The appointed EcoW will be present when site lighting is initially set up in a works area and will regularly monitor the lux levels to ensure that they are not impacting dark corridors or secondary foraging locations. The EcoW will also familiarise themselves with the following best practice documentation in order to ensure that they are correctly fulfilling their role in respect to lighting mitigation:

- Bats and Lighting in the UK – Bats and the Built Environment Series (BCT, 2008);
- Bats & Lighting – Guidance Notes for Planners, Engineers, Architects and Developers (BCI, 2010); and
- Guidance Notes for the Reduction of Obtrusive Light GN01 (ILP, 2011).

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the bat species known to frequent the works area, in the event the personnel encounter a downed / or stunned bat during the works period.

Wintering Birds

Migrant wintering bird populations have the potential to establish new foraging areas within the ZoI of the proposed development sites after the time of writing of this EIAR. In order to address this

potential future data limitation, pre-construction wintering bird surveys will be conducted during the winter periods up until the commencement of the enabling works / construction stage of the proposed developments, ensuring that mitigation measures can be adjusted accordingly in the event that wintering bird species establish new foraging areas within the ZoI of the three sites. All data from the pre-construction surveys will be provided to the appointed EcoW (and extended survey team in this instance), who will continue to monitor these migrant wintering bird populations during the construction stage.

The works have the potential to impact wintering birds via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements has the potential to impact the health of wintering birds. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the migrant wintering bird populations and their associated habitats.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the wintering bird species known to frequent the works area; with a particular focus on their sensitivity to audible and visual disturbance.

Breeding Birds

Pre-construction surveys will be conducted for breeding birds to check if the local species have built new nests within trees due to be felled as a result of the works. All data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor the presence of previously recorded and new breeding bird nests during the construction stage.

The works have the potential to impact wintering birds via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements has the potential to impact the health of local breeding bird species. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local breeding bird populations, and their associated nesting habitats and prey base.

The seasonal restriction on the removal of vegetation is in place from March till August (inclusive), in order to safeguard breeding bird species utilising scrub and wooded vegetation for nesting purposes. If a scenario presents itself where vegetation must be cleared within the breeding bird season, the appointed EcoW will be required to undertake a breeding bird nest-check survey in advance of the works to ensure that there will be no impacts on nesting birds. If nests are found, they will be safeguarded, with the nests' hedge / tree left untouched by trimming or removal works, until the chicks have successfully fledged.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the breeding bird species known to frequent the works area, with a focus on nests, fallen nests and hatchlings / fledglings.

Amphibians

Pre-construction surveys will be conducted for both Common Frog and Smooth Newt to check if their respective local populations have expanded the range of habitats they utilise within the proposed development sites; as well as their continued presence within habitats they have previously been recorded in. All data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor these amphibian populations during the construction stage.

Deleterious pollutants accidentally introduced via surface water pathways into the habitats located on-site and adjacent, during the construction stage, will reduce the capacity of these habitats to support the foraging activities of amphibians. Common Frog and Smooth Newt may also be subjected to disturbance-based impacts, which have the potential to negatively impact their foraging and commuting activities, as well as potential loss of life for individuals within the construction site (e.g. accidental trappings), after failure to exclude entry. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to

best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local amphibian populations, and their associated habitats and prey base.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the Common Frog and Smooth Newt and where they are likely to encounter them within the works area. The EcoW will also perform checks prior to vegetation clearance within meadow, scrub and woodland areas, in order to ensure that any hibernating Common Frog and Smooth Newt individuals within the area are relocated safely to another suitable location to continue their hibernation period.

Fish

Adverse impacts may arise in the form of accidental introduction of pollutants, such as hydrocarbons, into the local surface water network. A number of fish species are known to bioaccumulate pollutants within the marine and freshwater environment, damaging their physiological health, as well as introducing the toxin into the lowest trophic level of the local food web. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local amphibian populations, and their associated aquatic habitats and prey base.

Seasonal restrictions will be in place for works along the Kilmahuddrick Stream and its riparian zone (10m from the top of the bank), as per IFI best practice. These seasonal works restrictions will be in place from July to September for all construction-based works; other small-scale work types, i.e. invasive species management, may be conducted during this seasonal time period given the seasonal treatment restrictions for specific invasive non-native species, such as Japanese Knotweed.

Terrestrial Invertebrates

The works have the potential to impact upon terrestrial invertebrates via the following pathways: surface water, ground water, air (dust) and disturbance. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local terrestrial invertebrate populations, and their associated habitats.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the terrestrial invertebrates, in particular the identification of tree, shrub, grass-tussock or subterranean based bee and wasp hives. While the EcoW will conduct pre-clearance checks of vegetated areas to be cleared, it is still possible for hives to be established in the works area following clearance. Where reasonably practicable, prior to clearance, hives will be relocated by the qualified apiarist under supervision of the EcoW to nearby suitable habitat, safe from any future clearance, thus safeguarding the local hive-based bee and wasp species.

Additionally, prior to vegetation clearance the EcoW will check for any larval stage pollinators located in large groupings upon host-flora (food plants), e.g. Peacock Butterfly caterpillars on Nettle or Cinnabar Moth caterpillars on Ragwort. The EcoW will then relocate these larval groups to another area containing the larvae's respective host-flora, that will not be subject to any future clearance within that summer (flight period).

Freshwater Aquatic Invertebrates

Adverse impacts may arise in the form of accidental introduction of pollutants, such as hydrocarbons, into the local surface water network. A large range of freshwater invertebrate species are known to bioaccumulate pollutants within the freshwater environment, damaging their physiological health, as well as introducing the toxin into the lowest trophic level of the local food web. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local freshwater aquatic invertebrate populations, and their associated habitats.

6.8.3 Operational Stage Mitigations (All Sites)

The operational stage mitigation sections below will address remedial planting, operational surface water run-off management and woodland enhancement for local fauna. Much of operational mitigations were pre-emptively accounted for and planned into the drainage, landscape and lighting designs (Design Incorporated Mitigation). This strategy helps ensure neutral and positive residual impacts wherever possible.

6.8.3.1 Remedial Planting (Design Incorporated Mitigation)

Listed below are remedial mitigation actions to be carried out for selected habitats, as part of the landscape design for the three proposed development sites.

Meadows

Amenity grassland (Meadow grass)

Areas within the landscape plan are set aside to be flowering lawns; this is referred to as 'Meadow Grass' within the planting schedule. Species in this area include grasses for a lawn and Meadow Buttercup, White Clover, and Red Clover. This will be maintained in a short flowering meadow methodology to keep the area visually like a lawn but with some flowering aspect to provide pollen for invertebrates. Short flowering meadows are formed when the mowing of the grassland is limited to every 4-6 weeks. After the mowing of the grass the cuttings are to be lifted away from the site to reduce the nutrients available in the soil which promotes more wildflower species than grass species.

This management will be staggered throughout the site to ensure that some areas of meadow are always in flower throughout the summer. This will provide a constant source of pollen for terrestrial invertebrates during the summer when they will be most actively foraging. Furthermore, this will specifically benefit the local red-listed Gypsy Cuckoo-bee, as well as its local host species, White-tailed Bumblebee. Additionally, this management practice will increase the abundance of invertebrate species which will also provide more foraging potential for local bat and bird populations.

Dry meadows and grassy verges (Grassy Habitat)

Areas of grassland verges that are incorporated into the landscape plans, referred to as 'Grass Habitat' in the landscape plan, have the potential to support a variety of floral species which are beneficial to local invertebrate species. This will create foraging potential for local bird populations, as well as refuge habitat along with material for nest building.

The species to be planted within the landscape plan include Cow Parsley *Anthriscus sylvestris*, Crocus and Grape Hyacinth. The project ecology team recommends the sowing of False Oat-grass; Meadow Foxtail and Smooth Meadow-grass *Poa pratensis* for the grass component. For the herbaceous aspect of the planting, the project ecology team recommends the sowing of Nettle; Common Knapweed; Field Scabious *Knautia arvensis*; Bush Vetch; Meadow Vetchling; and Yellow Rattle *Rhinanthus minor*. The Yellow Rattle will play a salient role in maintaining the balance between herbaceous wildflowers and the meadow grasses, as this species will parasitise the grass species present; and prevent the wildflowers from being overgrown by the grasses within areas not under regular maintenance, i.e. areas under a yearly mowing regime.

Ideally maintenance of this habitat will be carried out twice a year, mowing this grassland area in the autumn (September) and end of winter (February), lifting the cuttings from the area to reduce the nutrients that are in the soil over a prolonged time and promote a greater wildflower composition within the grassland.

Hedgerows and Treelines

The planting of new linear (screening) native hedging and trees within the three sites, along with soils from the cleared hedgerow areas (to preserve existing seedbank / local flora genetics), will help remedy the loss experience by the hedgerow and treeline habitat during the construction stage. When these new hedges and tress have matured, they will mirror the ecological diversity and ecosystem services (e.g. refuge; nesting opportunities for birds; and wildlife commuting corridors) of the existing hedgerow and treeline sections to be removed.

Scrub

The proposed landscape plans for the three development sites include the creation of new shrub areas (of varying height) scattered throughout the sites, which will in part include maintenance-suitable scrub species. The landscaping will also prioritise the planting of shrub species that will provide multiple ecosystem services (e.g. refuge; nesting opportunities for birds; and wildlife commuting corridors) and be pollinator-friendly.

6.8.3.2 Operational Sustainable Drainage Systems (Design Incorporated Mitigation)

As previously mentioned within the operational impacts section, the proposed range of SuDS design features to be installed within and adjacent to Sites 3, 4 and 5, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the terrestrial, wetland and aquatic habitats (i.e., the Kilmahuddrick Stream) from deleterious urban run-off during the operations of the three proposed developments.

6.8.3.3 Lighting Design and Specifications (Design Incorporated Mitigation) – Nocturnal Fauna

The below incorporated specifications within the lighting design described herein will ensure that operational lighting levels will not significantly affect the activities of nocturnal species, primarily the local bat species, though these design elements will also ensure no disruption to Otter, Badger, Pine Marten, Hedgehog, Common Frog and Smooth Newt activities; in the event they increase their frequency within the site or expand their respective ranges into the three proposed development sites.

Light Levels and type

Operational site lighting that meets the lowest light levels permitted under health and safety is preferable for bats in the vicinity. The specification and colour of light treatments, such as single bandwidth lights and no UV light are essential. LED luminaires are ideal and will be used where possible due to their sharp cut-off, lower intensity, and dimming capability. A warm white spectrum (3000K) will be used in the lighting located along the adjacent to dark corridors within the proposed development sites, to reduce the blue light component.

Column Heights of Lamp Posts

In order to reduce the amount of light spillage where it is not needed, the height of lamp columns located adjacent to dark corridors will be restricted to a height of 6m to avert negative light spillage impacts from the three proposed development sites.

Dark Corridor Connectivity

Placement of lamp posts was considered in cases where road infrastructure bisected dark corridors within and adjacent to the three proposed development sites. The ecological review of lamp post placements allowed for relocations, where necessary, in order to help minimising any bottlenecking of the future dark corridors. As this was of particular concern for local bat species, where notable bottlenecks did occur as result of road and pedestrian health and safety requirements, it was ensured that a dark “V” or elevated section was still present for local bats to commute through the dark corridor bottleneck.

6.8.3.4 Checks for Vulnerable Fauna Prior to Maintenance Works

Within the maintained green areas, checks for Hedgehogs prior to any maintenance grass or scrub trimming on-site during the Hedgehog hibernation period from November-February and their breeding period from June-September, when the young hoglets will be particularly vulnerable within their nests and not yet ready to venture into exposed areas with potential predator species.

6.8.3.5 Deadwood Piling

The logs / large branches that were used to provide Otter with a sheltered commuting corridor along the Kilmahuddrick Stream will be re-used for habitat enhancement (see Site 4 specific Protected Fauna Mitigations sub-section), as well as other native tree and shrub species felled during the construction stage. The logs and branches will be cut into shorter, more manageable segments. These shorter deadwood segments are to be incorporated into the new and existing woodland areas as discrete deadwood piles. The placement of these deadwood piles will be overseen by the appointed EcoW. The addition of the deadwood piles will be beneficial for local amphibians, which may utilise them as a hibernation location; as well as for terrestrial invertebrates, such as detritivore species and wood-burrowing solitary bee species.

6.8.4 Proposed Development – Site 3 (Construction Stage Mitigations)

6.8.4.1 Site-specific Habitat Mitigations

Management of Habitat Loss

During the construction stage there will be large scale clearance of most habitat types across Site 3. In particular for the grassland and scrub, with a smaller degree of habitat clearance for woodland and treelines. By following the SDCC Policy Objective: NCBH1 Objective 1, the project will retain and incorporate existing natural features where possible. In order to facilitate the retention and continuation of the on-site vegetative communities, mitigation is required to accommodate this retention. This will include:

- The relocation of the existing dry meadow and grassy verge habitat to the areas of the landscape plan designated for ‘meadow grass’ and ‘grassy habitat’. During construction this will involve setting the soil from these areas aside to be used during the installation of the landscaping of the proposed development.
- The integration of small sections of the existing hedgerow and treelines, along with the topsoil, to the planned ‘double staggered native hedgerow’ within the landscape plan for Site 3. This will maintain the established symbiosis within the soil that has developed within the site and allow the newly planted hedgerows to benefit from this. During the construction phase this will involve the storing of these trees and soil to be incorporated into the landscape plan where possible.

6.8.4.2 Site-specific Rare and Protected Flora Mitigations

<u>Pyramidal Orchid and Bee Orchid</u>

Pre-construction surveys will be conducted for orchid species across Site 3 to observe the existing populations where present, as well as to identify the potential new colonisation of new orchid species within new sections of Site 3.

The Pyramidal Orchid and Bee Orchid must be relocated from their current Site 3 habitats, prior to clearance of the site for construction. Suitable locations will be chosen within the northern section of the safeguarded ecological corridor within Site 4, as the operational Site 3 landscape will not possess any suitable habitats that are also sectioned off from the public, which is essential given the vulnerability of these species to trampling. It is important that the individuals are immediately relocated to their new habitat after, in order to minimise the likelihood of relocation failure.

The presence of fungi mycorrhizae for Orchid species is essential for successful germination, this mycorrhizae will be within the soil surrounding the Orchid individuals; therefore, these soils are to be translocated along with their associated Orchid species, in order to ensure optimal reestablishment of these species within their new habitat.

Lesser Centaury

Pre-construction surveys will be conducted for Lesser Centaury across Site 3 to observe the existing populations where present, as well as to identify the potential new colonisation of Lesser Centaury within new sections of Site 3. All the data from the pre-construction surveys will be provided to the appointed ECoW, who will continue to monitor the populations before their relocations to a suitably undisturbed area within the locality (i.e. the safeguarded northern riparian zone of the Kilmahuddrick Stream in Site 4, where there will be no public access or maintenance), prior to the commencement of the construction stage.

The Lesser Centaury individuals within Site 3 will be relocated to the northern section of the suitable safeguarded ecological corridor within Site 4 (see Site 4: Site-specific Rare and Protected Flora Mitigations for further details), as Site 3 will not possess any suitable habitats that are also sectioned off from the public, which is essential given the vulnerability of this species to trampling and its protection status.

6.8.4.3 Site-specific Protected Fauna Mitigations

Hedgehog, Pygmy Shrew and Breeding Birds

The clearance of any tall meadow, woodland, treelines, hedgerows or scrub is to be conducted between mid-September and late October; which is a time that is both outside of the breeding bird nesting period and the hibernation period of Hedgehogs. Vegetation will be removed in sections working in a consistent direction to prevent entrapment of protected fauna potentially present (e.g. Hedgehog and Pygmy Shrew).

Where this seasonal restriction cannot be observed, a check for active nests or hibernating Hedgehogs (depending on the season) will be carried out immediately prior to any site clearance by an appropriately qualified ecologist and repeated as required to ensure compliance with legislative requirements. If active nests are recorded, they will be safeguarded, with an appropriate buffer, until the chicks / hoglets have successfully fledged / matured. Additionally, any leaf piles and deadwood piles will be checked for Hedgehogs before moving or interfering the surrounding detritus or vegetation.

6.8.4.4 Site-specific Invasive Species Management

Winter Heliotrope

Winter Heliotrope is located along the existing paths within the northern section of Site 3. This species is highly transferable via construction activities and the tyres of vehicles. To limit the spread of this species it is recommended that it is to be mechanically removed from Site 3 prior to clearance. This will require an EcoW to identify areas to be cleared prior to the works to ensure that all areas of Winter Heliotrope are removed from site to prevent the spread during construction activities.

Butterfly-bush

Butterfly-bush was recorded within Site 3. This invasive species may also be mechanically removed from the site prior to clearance of the site. This species can spread via construction vehicles and activities, removal of this species prior to the clearance will limit the spread of this species within the site and externally. An EcoW will be required to identify the plants of Butterfly-bush within the site and direct those who will remove it to ensure that all the Butterfly-bush within the site is removed.

Japanese Knotweed

There is on-going treatment of the Japanese Knotweed on Site 3. This is crucial for the site prior to clearance as Japanese Knotweed spreads incredibly quickly and effectively when disturbed by machinery.

Japanese Knotweed is a high impact invasive species that is particularly effective at colonising disturbed ground (e.g. construction sites) and can spread by the re-growth of cut fragments or root material. Therefore, if it is broken up during site clearance or other earthworks, it can readily re-

grow in new areas to which contaminated soil is moved. Japanese Knotweed reproduces asexually (in Ireland insofar as only female plants have been recorded) and regrowth can occur from plant material weighing as little as 0.7g (grams) of viable material. It is acknowledged to be very difficult to effectively control and even more difficult to fully eradicate.

Given the nature of Japanese Knotweed, chemical treatments are often preferred over physical methods as they can, if implemented properly, reduce the disturbance of the plant / population, thus reducing the chances of its spread. If herbicide is applied as the treatment option, it will need to be reapplied for up to five years after the first application to ensure the plant control measures have been effective or monitored for a minimum of two years during which no regrowth is recorded. However, physical removal may be necessitated when timely interventions are required.

Table 6-34 assessed the potential management methods for Japanese Knotweed with colour coding of the potential to implement on the proposed project. The methods to be used will be fully detailed in the contractors final ISMP after the recommended pre-construction survey of Site 3 has been undertaken.

Approach	Treatment Options	Comment	Potential for Implementation on the proposed Developments sites
Physical	Dig and dispose offsite, under licence	This option requires that all plant material (above and below ground) is excavated along with soil and disposed of to a facility authorized to accept it. In addition to waste permits / authorizations, a wildlife licence issued by NPWS is required for the transport of First Schedule invasive species offsite. Depending on the nature of the excavation the proximity of services etc, the use of root barrier membrane may be required.	Likely – given the nature of the developments sites, there may be a need to excavate soil and plant material to enable construction works to go ahead in timely manner.
	Dig and dispose onsite. - Shallow burial - Deep burial	Wildlife licence from NPWS is not ordinarily required if the burial of collected material is proposed for within the consented proposed project. Shallow burial in a constructed pit such as a dedicated sealed cell within a constructed berm will allow for periodic monitoring and of easy chemical treatment of any regrowth. Deep burial entails a dedicated sealed cell within a constructed excavation, that is at least 2m below the surface of the ground. The landscaping regime will not specify trees or scrub to be planted above. Either shallow or deep options may require the use of root barrier membrane. The use of chemical pretreatment of deep / shallow cells may also be required	Unlikely – given the lack of suitable lands within the largely developed metropolitan area.
	Screen on site – remove fragments offsite and reuse soil.	A control option that can be used to reduce the volume of soil / sediment to be moved elsewhere for burial, this option requires suitable plant, adequate space and volumes of soil to make the operation at a location cost effective. This option often requires the use of root barrier membrane owing to reuse of screened soil. The use of chemical pre-treatment of deep / shallow cells may also be required.	Possible but unlikely given the space requirements for a screener (unless a bespoke small-scale screener is available).
	Cutting and / or strimming	Not recommended and does not apparently diminish vigour of plants over time. Largely cosmetic and can result in considerable spread	Not Recommended

Approach	Treatment Options	Comment	Potential for Implementation on the proposed Developments sites
		of viable vegetative material that can readily regenerate on suitable conditions.	
Chemical	Spot	Used for isolated plants – knapsack or weep sprayers. Chemical treatments for infestations near water will be rated for use near aquatic locations.	Chemical treatments are often a preferred option for treating Japanese Knotweed, but the process can take between 3 to 5 years before eradication can be guaranteed and requires at least 2-year post implementation monitoring. However, given the nature of the proposed Developments sites, the use of chemical treatment alone is unlikely to be adequate unless treatment regime begins a number of years before construction commencement.

Table 6-34: Assessment of Management Methods for Japanese Knotweed (Site 3)

Root Barrier Membrane

Following the excavation of Japanese Knotweed, there may be a need to install a root barrier membrane. These are specialised products that can provide protection to structures / services etc. from regrowth from within or outside a site, if suitably rated and properly installed. Thereafter, any small adjacent infestation can be more readily treated with chemical treatment for example. This durable material can be used to line spoil pits and prevent rhizome lateral root spread or effective growth in the plant and can keep it contained to an area where suitable chemical treatment can be undertaken.

Reseeding Following Eradication

This is not strictly a control method. However, where treated ground is not being built upon, planting or resowing mixtures of native grass species helps to restore the original vegetation and aids post-control management of affected sites. A grass sward established in autumn will compete with germinating Japanese Knotweed seedlings in the following spring.

6.8.5 Proposed Development – Site 3 (Operational Stage Mitigations)

The operational stage site-specific mitigation sections below will address ecological corridor enhancement via landscaping features (planting and remedial features for fauna) and vegetation management during the operational stage of Site 3.

6.8.5.1 Site-specific Landscape Mitigation (Design Incorporated Mitigation)

A combination of ecologically-minded landscape management and specifically targeted measures to enhance the operational habitats of Site 3 for local fauna will be enacted to ensure the persistence of valued species (as detailed within the Biodiversity Management Plan Appendix 6.3).

Safeguarding of the Eastern Ecological Corridor

The eastern ecological corridor (mixed broadleaved / conifer woodland and dry meadow verge) will be fenced off from the public, both north and south of the access road, with a 1.5m height wooden fence, with chicken-wire mesh that will have occasional gaps in the mesh to allow passage for local fauna in and out of the eastern wildlife corridor.

The exclusion of public footfall will allow the woodland habitat to develop a more typical woodland ground flora composition unhindered; as well as minimising littering of this important wildlife corridor and disturbance to fauna, which find refuge within.

Operational Vegetation Management

Following the removal of invasive flora, planting of new shrub / tree vegetation and erection of fencing, the eastern ecological corridor is to be unmaintained, bar overhanging vegetation, broken limbs and fallen trees along the western boundary of the wildlife corridor. This will further aid in the establishment of optimal woodland wildlife corridor, with a complex internal structure that provides ample refuge for local fauna.

Installation of Remedial Features for Fauna

Non-volant Mammals

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Hedgehog and Pygmy Shrew across Site 3, ensuring landscape connectivity for these smaller non-volant mammal species.

Non-volant Mammals – Hedgehog

Large-scale habitat loss and/or alteration of scrub and woodland habitat will reduce the availability of potential nesting and hibernation sites for the local Hedgehog population. Providing small log and leaf piles to increase nesting options for local Hedgehogs during the spring, summer and early autumn. These will be installed within the eastern corridor woodland (north and south sections) and the north-western woodland patch, which will not be open to the public, towards the site of Site 3. This will also create refugia for terrestrial invertebrates, which in turn will boost prey species abundance for local Hedgehogs. In addition to these measures, to mitigate the loss of hedgehog hibernation habitat, artificial / built Hedgehog hibernacula will be installed in the same locations listed above. These can be created from wooden planters or storage boxes. While the hibernacula will be primarily utilised by Hedgehog, they may potentially also be utilised by Pygmy Shrew.

Bats

To offset some of the loss of commuting and foraging habitat that the proposed development will incur for local bat populations, it is recommended that a minimum of eight bat boxes are to be installed on the trees within the eastern ecological corridor. The lighting of Site 3 along with the existing urban spaces makes it difficult to incorporate bat features within the site, utilising the existing woodland which creates a natural darker corridor.

Where possible, these bat boxes will be south facing and at least 4m off the ground. When erecting on a tree, the placement must be free from Ivy with no branches within a 1m radius around the location of the bat box.

Within the Irish context, the Vincent's Wildlife Trust's reporting on Irish Bat Box schemes highlighted that 1FF Schwegler boxes are recommended for use by Pipistrelle spp., whereas Leisler's Bat displayed no preference for bat box type (McAney and Hanniffy, 2015), therefore the 1FF Schwegler boxes will be suitable to house all bat species which frequent Site 3.

Breeding Birds

Site 3 supports nine species of breeding bird of conservation concern, two of which can be accommodated for through artificial means.

While the proposed trees to be planted as part of the landscape plan will provide some nesting potential for local bird populations; it is recommended that additional bird boxes are placed within

the site to allow for additional nesting opportunities during the ecological lag period (while the newly planted trees mature).

Bird boxes will be hung with the face of the box orientated between north and south-east, and at a height of at least 2-3m from ground level to avoid potential predation. Based on the breeding bird species of conservation concern (which utilise artificial nests) recorded within Site 3, the bird box types (five each) to be installed within Site 3 are:

- For House Sparrow: a 32mm diameter oval opening for entry. Bird boxes can be hung from trees or nailed to the trunk at a height of 2-4 metres, and it is preferred that the bird boxes are faced in a way to avoid the brunt of prevailing direct wind or rain. House Sparrows will also utilise terraced nest boxes, facilitating two or three nest boxes in one installation; and
- For Starling: a 45mm entrance hole, with height 51cm, width 16cm and depth 18cm (may also be used by local Great Spotted Woodpecker).

Amphibians

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Common Frog across Site 3, ensuring continued landscape connectivity.

Wetland and drainage ditch / swale habitats are not to undergo maintenance (clearance of vegetation or dredging) during sensitive amphibian life stages for both Common Frog; therefore, such maintenance will only be conducted between June and late September.

Terrestrial Invertebrates

The Site 3 development will lead to the direct loss of nesting habitat for local terrestrial invertebrate species, potentially displacing species from the locality. To help remedy this loss, insect refugia will be installed in shrub, hedgerow and woodland habitats within Site 3. These can include log and leaf piles, as well as stone piles and old bricks with holes in them.

6.8.6 Proposed Development – Site 4 (Construction Stage Mitigations)

6.8.6.1 Site-specific Habitat Mitigations

Eroding / upland rivers (Kilmahuddrick Stream) and connected Drainage Ditches

Silt Fence Layout

The general silt fence layout for Site 4 is displayed in Figure 6-37 and Figure 6-38 below. The silt fence layout also accounts for the relocation of the silt fences following the creation of the stream overflow basin in the northern section of the site. These approximate locations do not include the detailed set-up required for the installation of the culverted stream section within the north-east corner of the site. These more precise details and locations will need to be outlined at the detailed design stage. An example of suitable silt-fencing installation is displayed in Figure 6-39.

Figure 6-37: Approximate silt fence locations in northern section of Site 4

Figure 6-38: Approximate silt fence locations in southern section of Site 4

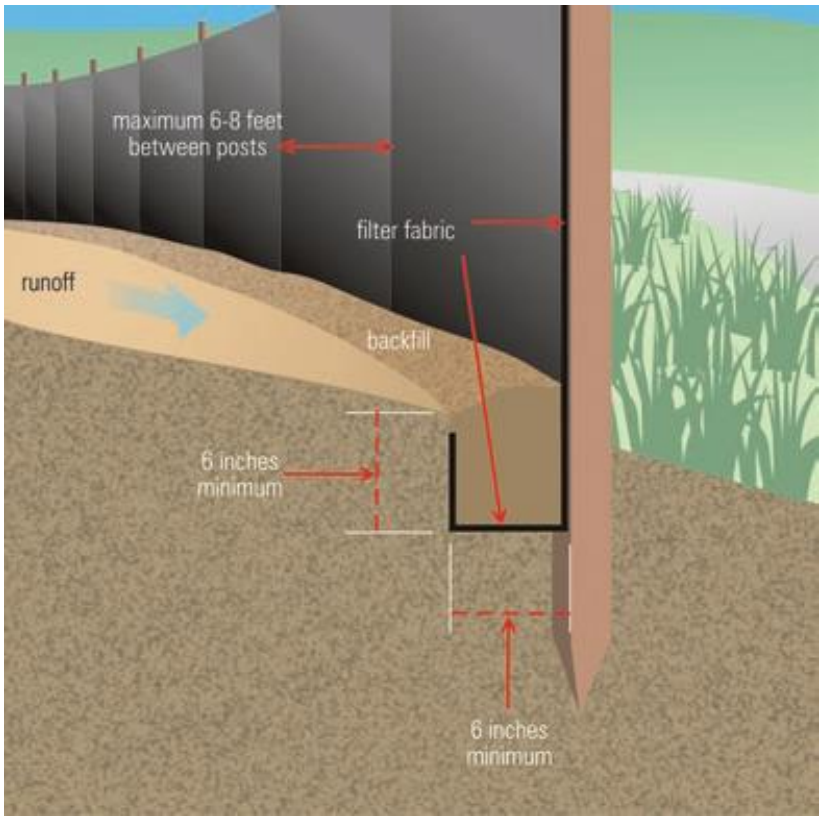

Figure 6-39: Example of suitable silt fence mitigation ensuring maximum safeguarding efficiency

Mitigations for Installation of the Overflow Basin

After completion of the overflow basin and relocation of the silt fence to its southern border, the basin will remain offline until the proposed landscaping has been planted and the ground flora re-established. This will ensure that there will not be an excessive input of lose sediments from the basin into the Kilmahuddrick Stream during the first flood event, which will result in the operation of the overflow basin.

Mitigations for Installation of the Kilmahuddrick Stream Culvert Section

The instream works are to be scheduled between July and September, in order to minimise adverse impacts on the local fish species (e.g. Three-spined Stickleback) and protected fish species downstream (e.g. Lamprey spp.; European Eel; and Atlantic Salmon).

The following measures will be implemented to prevent liquid concrete/ cement-based dust entering the riparian habitats during the culvert installation phases:

- Wherever reasonably possible, pre-cast concrete bridge features should be utilised to minimise the risk of a concrete-based pollution event.
- Concrete delivery, concrete pours and related construction methodologies will be part of the procedure agreed with the contractor to mitigate any possibility of spillage or contamination of the local environment. Particular attention will be paid during the pouring process in order to avoid leakages or spills of concrete.
- Washout of concrete plant will occur off site at a designated impermeable area with waste control facilities.
- Raw, uncured or waste concrete will be stored appropriately prior to disposal by licenced contractor.

- The contractor's construction methodology will require the use of precast elements where practical; the use of secondary protection shuttering for concrete pours; all pours to be carried out in dry weather conditions; and that all trucks be cleaned prior to leaving respective depots.
- The contractor will be required to use experienced operators for the work; provide an appropriate level of continuous monitoring during any concrete pours by experienced management; and have method statements approved by the client prior to commencing works. Works will be carried out using recommendations from current guidance and relevant codes of practise as outlined in EA (2011) – Managing concrete wash waters on construction sites: good practice and temporary discharges to ground or to surface waters.

The mitigations for the culvert installation and stream realignment will be split into the following two phases.

- Phase 1: Dry Cell Establishment and Electro-fishing

Before the excavations for the foundations of the culvert can take place, dry cells extending 5m up and downstream of culvert section point be established through the use of geotextile sandbag dams (double layered). The stream flow will be over-pumped along the bankside in order to maintain the hydrological regime of the Kilmahuddrick Stream. The pump ends will be fitted with mesh filters in order to prevent the accidental introduction of fish into the pump inlets and outlets.

The collection of fish within the dry cell section will be required as not all fish would be able to relocate themselves upstream or downstream before the dry cell area is secure. A trained aquatic ecologist will conduct electro-fishing within the dry cell area within the Kilmahuddrick Stream, and any fish encountered will be transferred downstream of the dry cell section.

Water will be pumped downstream of the dry cell section as the freshwater invertebrates present in the water were part of the food base of the fish that have already been relocated downstream. Once the dry cell is empty of water, works on the culvert and associated soil works, road and pedestrian infrastructure may proceed. Pre-cast concrete options should be utilised wherever reasonably practical; otherwise, the concrete procedures outlined earlier within this section will need to be strictly adhered to

- Phase 2: Re-establishment of Streambed / Hydromorphological Features

Once the culvert section works are complete, substrate (sand, gravel, cobble and small boulders) will be used to reestablish the streambed within the dry cell section. The ECoW on-site will oversee the creation of riffle, pool, glide along the streambed length, with the addition of the occasional small boulders splitting the flow. The ECoW will also oversee the installation of a Grey Wagtail nest box into the eastern bank south of the new culvert section. Before the flow can be established within the channel the downstream geotextile sandbag dam will be removed; and in its place a straw silt-screen will be staked into place across, in order to mitigate the influx of suspended sediments that will occur when the stream flows through the dried-out channel section. Once the above is completed, the stream's flow will be allowed to return to the channel in the dry cell selection, with the removal of the geotextile sandbag dams and the water-pump.

Management of Habitats to be Removed

During the construction stage there will be large scale clearance of the majority of habitat types across Site 4. By following the SDCC Policy Objective: NCBH1 Objective 1, the project will retain and incorporate existing natural features wherever possible. In order to facilitate the retention and continuation of the on-site vegetative communities, mitigation is required to accommodate this retention. This will include:

- Excavated material from the meadow section including any topsoil removed during the clearance of vegetation will be incorporated back into the meadow strips within the Site 4 landscaping.
- The initial gathering of sods / topsoil and plants with their core rooting systems from the existing woodland, treeline and scrub will begin and be completed before the entire removal of any of these habitats. This relocation of soil (seed banks) and juvenile shrub / trees will be done to retain the local genetic integrity of floral populations as long as possible and minimise the

ecological lag time of the habitats that will receive these sods / top soil and juvenile shrubs /trees. The sods / topsoil and extracted plants will be transferred directly to areas of outside of major construction works, i.e., the future neighbouring parklands (west and east of Site 4) and vegetated site boundaries, provided the major earthwork / landscape regrading has been completed.

6.8.6.2 Site-specific Rare and Protected Flora Mitigations

Pyramidal Orchid

Pre-construction surveys will be conducted for orchid species across the Site 4 to observe the existing populations where present, as well as to identify the potential new colonisation of new orchid species within new sections of Site 4. All the data from the pre-construction surveys will be provided to the appointed ECoW, who will continue to monitor the populations before their relocations to a suitably undisturbed area within the locality (i.e. the northern riparian zone of the Kilmahuddrick Stream, where there will be no public access or maintenance), prior to the commencement of the construction stage.

The Pyramidal Orchid (and any other new orchid species) must be relocated from their current Site 4 habitats, prior to clearance of the site for construction. Suitable relocation areas will be chosen within the northern section of the safeguarded ecological corridor within Site 4. It is important that the individuals are immediately relocated to their new habitat after unearthing, in order to minimise the likelihood of relocation failure.

Additionally, the associated mycorrhizae for Orchid species is essential for successful germination. This mycorrhizae will be within the soil surrounding the Orchid individuals; therefore, these soils are to be translocated along with their associated Orchid species, in order to ensure optimal reestablishment of these species within their new habitat.

Lesser Centaury

Pre-construction surveys will be conducted for Lesser Centaury across the Site 4 to observe the existing populations where present, as well as to identify the potential new colonisation of Lesser Centaury within new sections of Site 4. All the data from the pre-construction surveys will be provided to the appointed ECoW, who will continue to monitor the populations before their relocations to a suitably undisturbed area within the locality (i.e. the northern riparian zone of the Kilmahuddrick Stream, where there will be no public access or maintenance), prior to the commencement of the construction stage.

The ECoW will apply and obtain a Licence to Take or Interfere with Protected Plant Species for Scientific, Educational, or Other Such Purposes from the NPWS, prior to the relocation of this protected floral species. In this new location, the Lesser Centaury will be sectioned (rope / tape fence) off with a 1m buffer to prevent stray machinery or site personnel entering their immediate vicinity, ensuring no physical impacts. The sectioning off will be carried out under the supervision of the ECoW.

6.8.6.3 Site-specific Protected Fauna Mitigations

Otter

Given that bankside vegetation clearance that will take place along the Kilmahuddrick Stream during the construction stage, the provision of replacement commuting shelter will be required. In order to achieve this trees and hedging due to be felled in the immediate locality will be cut to into segments, bundled and installed along the cleared sections of the riparian zone. These bundles will form segmented walls of vegetative cover along the riparian zone in Site 4, providing a degree of shelter that will allow Otters to commute these affected stream sections with reduced disturbance.

Hedgehog, Pygmy Shrew and Breeding Birds

The clearance of any treelines, hedgerows or scrub is to be conducted between mid-September and late October; which is a time that is both outside of the breeding bird nesting period and the

hibernation period of Hedgehogs. Vegetation will be removed in sections working in a consistent direction to prevent entrapment of protected fauna potentially present (e.g. Hedgehog and Pygmy Shrew).

Where this seasonal restriction cannot be observed, a check for active nests or hibernating Hedgehogs (depending on the season) will be carried out immediately prior to any site clearance by an appropriately qualified ecologist and repeated as required to ensure compliance with legislative requirements. If active nests are recorded, they will be safeguarded, with an appropriate buffer, until the chicks / hoglets have successfully fledged / matured. Additionally, any leaf piles and deadwood piles will be checked for Hedgehogs before moving or interfering the surrounding detritus or vegetation.

6.8.6.4 Site-specific Invasive Species Management

Japanese Knotweed

Japanese Knotweed is a high impact invasive species that is particularly effective at colonising disturbed ground (e.g. construction sites) and can spread by the re-growth of cut fragments or root material. Therefore, if it is broken up during site clearance or other earthworks, it can readily re-grow in new areas to which contaminated soil is moved. Japanese Knotweed reproduces asexually (in Ireland insofar as only female plants have been recorded) and regrowth can occur from plant material weighing as little as 0.7g (grams) of viable material. It is acknowledged to be very difficult to effectively control and even more difficult to fully eradicate.

Given the nature of Japanese Knotweed, chemical treatments are often preferred over physical methods as they can, if implemented properly, reduce the disturbance of the plant / population, thus reducing the chances of its spread. If herbicide is applied as the treatment option, it will need to be reapplied for up to five years after the first application to ensure the plant control measures have been effective or monitored for a minimum of two years during which no regrowth is recorded. However, physical removal may be necessitated when timely interventions are required.

Table 6-35 assessed the potential management methods for Japanese Knotweed with colour coding of the potential to implement on the proposed project. The methods to be used will be fully detailed in the contractors final ISMP after the recommended pre-construction survey of Site 4 has been undertaken.

Approach	Treatment Options	Comment	Potential for Implementation on the proposed Developments sites
Physical	Dig and dispose offsite, under licence	This option requires that all plant material (above and below ground) is excavated along with soil and disposed of to a facility authorized to accept it. In addition to waste permits / authorizations, a wildlife licence issued by NPWS is required for the transport of First Schedule invasive species offsite. Depending on the nature of the excavation the proximity of services etc, the use of root barrier membrane may be required.	Likely – given the nature of the developments sites, there may be a need to excavate soil and plant material to enable construction works to go ahead in timely manner.
	Dig and dispose onsite. - Shallow burial - Deep burial	Wildlife licence from NPWS is not ordinarily required if the burial of collected material is proposed for within the consented proposed project. Shallow burial in a constructed pit such as a dedicated sealed cell within a constructed berm will allow for periodic monitoring and of easy chemical treatment of any regrowth. Deep burial entails a dedicated sealed cell within a constructed excavation, that is at least 2m below the surface of the ground. The landscaping regime will not specify trees or	Unlikely – given the lack of suitable lands within the largely developed metropolitan area.

Approach	Treatment Options	Comment	Potential for Implementation on the proposed Developments sites
		scrub to be planted above. Either shallow or deep options may require the use of root barrier membrane. The use of chemical pretreatment of deep / shallow cells may also be required	
	Screen on site – remove fragments offsite and reuse soil.	A control option that can be used to reduce the volume of soil / sediment to be moved elsewhere for burial, this option requires suitable plant, adequate space and volumes of soil to make the operation at a location cost effective. This option often requires the use of root barrier membrane owing to reuse of screened soil. The use of chemical pre-treatment of deep / shallow cells may also be required.	Possible but unlikely given the space requirements for a screener (unless a bespoke small-scale screener is available).
	Cutting and / or strimming	Not recommended and does not apparently diminish vigour of plants over time. Largely cosmetic and can result in considerable spread of viable vegetative material that can readily regenerate on suitable conditions.	Not Recommended
Chemical	Spot	Used for isolated plants – knapsack or weep sprayers. Chemical treatments for infestations near water will be rated for use near aquatic locations.	Chemical treatments are often a preferred option for treating Japanese Knotweed, but the process can take between 3 to 5 years before eradication can be guaranteed and requires at least 2-year post implementation monitoring. However, given the nature of the proposed Developments sites, the use of chemical treatment alone is unlikely to be adequate unless treatment regime begins a number of years before construction commencement.

Table 6-35: Assessment of Management Methods for Japanese Knotweed (Site 4)

Root Barrier Membrane

Following the excavation of Japanese Knotweed, there may be a need to install a root barrier membrane. These are specialised products that can provide protection to structures / services etc. from regrowth from within or outside a site, if suitably rated and properly installed. Thereafter, any small adjacent infestation can be more readily treated with chemical treatment for example. This durable material can be used to line spoil pits and prevent rhizome lateral root spread or effective growth in the plant and can keep it contained to an area where suitable chemical treatment can be undertaken.

Reseeding Following Eradication

This is not strictly a control method. However, where treated ground is not being built upon, planting or resowing mixtures of native grass species helps to restore the original vegetation and aids post-control management of affected sites. A grass sward established in autumn will compete with germinating Japanese Knotweed seedlings in the following spring.

Butterfly-bush

For physical control, hand-picking of young plants is feasible but should be undertaken with care to avoid soil disturbance which can give rise to a flush of new seedlings (NRA, 2010). For larger stands, mechanical excavation/ cutting may be employed. Deadhead specimens will be handled with great care as seeds can rapidly germinate and grow in different habitats.

Snowberry

Snowberry, being a low-impact invasive species, lacks any species-specific guidelines for management and control. The management of Snowberry within the site will follow the guidelines of Butterfly-bush outlined in NRA (2010). Under these management guidelines, physical control, hand-picking of young plants is feasible but should be undertaken with care to avoid soil disturbance which can give rise to a flush of new seedlings (NRA, 2010). For larger stands, mechanical excavation/ cutting may be employed. Deadhead specimens will be handled with great care as seeds can rapidly germinate and grow in different habitats.

6.8.7 Proposed Development – Site 4 (Operational Stage Mitigations)

The operational stage site-specific mitigation sections below will address road collision mitigation measures and ecological corridor safeguarding via landscaping features (fencing, planting alignment and remedial features for fauna) and vegetation management during the operational stage of Site 4.

6.8.7.1 Road Collision Mitigation (Design Incorporated Mitigation)

In order to maintain commuting corridors for terrestrial and semi-aquatic fauna through the site, and along the Kilmahuddrick Stream riparian corridor, a wildlife shelf has been designed into the culverted section of the stream in the north-east corner of Site 4. This shelf will allow fauna such as, Otter, Badger, Pine Marten, Stoat, Hedgehog, Pygmy Shrew, Common Frog and Smooth Newt to safely pass under the proposed pedestrian and roadway infrastructure while navigating the riparian corridor. This mitigation by design measure will notably decrease the risk of vehicular collisions, resulting in injuries or fatalities, for these protected faunal species.

6.8.7.2 Site-specific Landscape Mitigation (Design Incorporated Mitigation)

A combination of ecologically-minded landscape management and specifically targeted measures to enhance the operational development for local fauna will be employed to ensure the persistence of rare and protected flora and fauna within Site 4 (as detailed within the Biodiversity Management Plan Appendix 6.3).

Safeguarding of the Northern Ecological Corridor

The northern ecological corridor (Kilmahuddrick Stream riparian zone) will be fenced off from the public with a 1.5m height wooden fence, with chicken-wire mesh that will have occasional gaps in the mesh to allow passage for local fauna in and out of the northern wildlife corridor. The fencing will run from the north-western corner along the southern riparian zone boundary across to the north-eastern in road culvert section. A gate will be incorporated into the fence to allow for maintenance of the road culvert. This gate will be able to accommodate the passage of small machinery.

The exclusion of the public from this wildlife corridor will help ensure that the relocated Lesser Centaury will persist within this location. The exclusion of public footfall will also allow the marsh habitat to expand into the new flood overflow section unhindered; as well as minimising littering of the stream and disturbance to fauna which find refuge within this wildlife corridor.

Operational Vegetation Management

Following the relocations, removal of invasive flora, planting of new shrub / tree vegetation and erection of fencing, the northern ecological corridor is to be unmaintained, bar removal of stream blockages and overhanging vegetation along the southern boundary of the wildlife corridor. This will protect the relocated Lesser Centaury and ensure the fauna within the corridor remain undisturbed year-round.

Following the relocations, removal of invasive flora, planting of new shrub / tree vegetation and erection of fencing, the secure woodland and pond area to the south of Site 4 is to be minimally maintained, bar removal of ditch blockages and the vegetation extending outward into the surrounding public access and private areas. This will ensure minimal disturbance to the fauna that will reside / take refuge within this small woodland area.

Installation of Remedial Features for Fauna

Non-volant Mammals

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Hedgehog and Pygmy Shrew across Site 4, ensuring landscape connectivity for these smaller non-volant mammal species.

Non-volant Mammals – Hedgehog

Large-scale habitat loss and/or alteration of scrub and woodland habitat will reduce the availability of potential nesting and hibernation sites for the local Hedgehog population. Providing small log and leaf piles to increase nesting options for local Hedgehogs during the spring, summer and early autumn. These will be installed within the woodland and pond area, which will not be open to the public, towards the site of Site 4, as well as the upper banks of the riparian zone along the Kilmahuddrick Stream. This will also create refugia for terrestrial invertebrates, which in turn will boost prey species for local Hedgehogs.

In addition to these measures, to mitigate the loss of hedgehog hibernation habitat, artificial / built Hedgehog hibernacula will be installed in Site 4, within the secure woodland and pond area and the north-eastern and north-western corners of Site 4, north of the Kilmahuddrick Stream. These can be created from wooden planters or storage boxes. While the hibernacula will be primarily utilised by Hedgehog, they may potentially also be utilised by Pygmy Shrew.

Bats

In the interest of remedying the loss of potential future roosting features within the site for the local bats, a minimum of eight bat boxes will be installed on-site. Where possible, these bat boxes will be south-facing and at least 4m off the ground. When erecting on a tree, the placement must be free from Ivy with no branches within a 1m radius around the location of the bat box.

Within the Irish context, the Vincent's Wildlife Trust's reporting on Irish Bat Box schemes highlighted that 1FF Schwegler boxes are recommended for use by Pipistrelle spp., whereas Leisler's Bat displayed no preference for bat box type (McAney and Hanniffy, 2015), therefore the 1FF Schwegler boxes will be suitable to house all bat species which frequent Site 4.

Breeding Birds

The notable loss of mature and semi-mature trees within Site 4 will reduce the nesting habitat on site for local breeding bird species. To mitigate the loss of nesting habitat, bird boxes will be installed on the retained the mature and semi-mature trees present within Site 4. Bird boxes will be hung with the face of the box orientated between north and south-east, and at a height of at least 2-3m from ground level to avoid potential predation. Based on the breeding bird species of conservation concern (which utilise artificial nests) recorded within Site 4, the bird box types (five each) to be installed within Site 4 are:

- For Starling: 45mm entrance hole, with height 51cm, width 16cm and depth 18cm (may also be used by local Great Spotted Woodpecker); and

- For Spotted Flycatcher: semi-open nest box style (will also be used by local Blackbird, Robin and Wren).
- For Goldcrest: a brushwood style nest, 28m diameter oval opening with dimensions 290 x 145 x 110 mm for the nest (may also be used by Wren and Treecreeper

Amphibians

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Common Frog and Smooth Newt across Site 4, ensuring continued landscape connectivity.

Wetland, drainage ditch and pond habitats are not to undergo maintenance (clearance of vegetation or dredging) during sensitive amphibian life stages for both Common Frog and Smooth Newt.; therefore, such maintenance will only be conducted between July and late September.

Terrestrial Invertebrates

The development of Site 4 will lead to the direct loss of nesting habitat for local terrestrial invertebrate species, potentially displacing species from the locality. To help remedy this loss, insect refugia will be installed in shrub, hedgerow and woodland habitats within Site 4. These can include log and leaf piles, as well as stone piles and old bricks with holes in them.

6.8.8 Proposed Development – Site 5 (Construction Stage Mitigations)

6.8.8.1 Site-specific Habitat Mitigations

Management of Habitats to be Removed

During the construction stage there will be large scale clearance of habitats across the whole of Site 5. In particular for the grassland and scrub, with a smaller degree of habitat clearance for some hedgerows and treelines. By following the SDCC Policy Objective: NCBH1 Objective 1, the project will retain and incorporate existing natural features where possible. In order to facilitate the retention and continuation of the on-site vegetative communities, mitigation is required to accommodate this retention. This will include:

- Excavated material from the grassland section including any topsoil removed during the clearance of vegetation to be stored within the north / north-eastern park area, where it will later be incorporated back into the grassland habitats within the park area.
- The initial gathering of sods / topsoil and plants with their core rooting systems from the existing hedgerows and scrub will begin and be completed before the entire removal of any of these habitats. This relocation of soil (seed banks) and juvenile shrub / trees will be done to retain the local genetic integrity of floral populations as long as possible and minimise the ecological lag time of the habitats that will receive these sods / top soil and juvenile shrubs /trees. The sods / topsoil and extracted plants will be transferred directly to areas of outside of major construction works, i.e., the future parklands and vegetated site boundaries, provided the major earthwork / landscape regrading has been completed.

6.8.8.2 Site-specific Faunal Mitigations

Hedgehog, Pygmy Shrew and Breeding Birds

The clearance of any treelines, hedgerows or scrub is to be conducted between mid-September and late October; which is a time that is both outside of the breeding bird nesting period and the hibernation period of Hedgehogs. Vegetation will be removed in sections working in a consistent direction to prevent entrapment of protected fauna potentially present (e.g. Hedgehog and Pygmy Shrew).

Where this seasonal restriction cannot be observed, a check for active nests or hibernating Hedgehogs (depending on the season) will be carried out immediately prior to any site clearance by an appropriately qualified ecologist and repeated as required to ensure compliance with legislative

requirements. If active nests are recorded, they will be safeguarded, with an appropriate buffer, until the chicks / hoglets have successfully fledged / matured. Additionally, any leaf piles and deadwood piles will be checked for Hedgehogs before moving or interfering the surrounding detritus or vegetation.

6.8.8.3 Site-specific Invasive Species Management

Butterfly-bush

For physical control, hand-picking of young plants is feasible but should be undertaken with care to avoid soil disturbance which can give rise to a flush of new seedlings (NRA, 2010). For larger stands, mechanical excavation/ cutting may be employed. Deadhead specimens will be handled with great care as seeds can rapidly germinate and grow in different habitats.

6.8.9 Proposed Development – Site 5 (Operational Stage Mitigations)

The operational stage site-specific mitigation sections below will address remedial features for local fauna during the operational stage of Site 5.

6.8.9.1 Site-specific Landscape Mitigation (Design Incorporated Mitigation)

Installation of Remedial Features for Fauna

Non-volant Mammals

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Hedgehog and Pygmy Shrew across Site 5, ensuring landscape connectivity for these smaller non-volant mammal populations.

Non-volant Mammals – Hedgehog

Large-scale habitat loss and/or alteration of scrub and woodland habitat will reduce the availability of potential nesting and hibernation sites for the local Hedgehog population. Providing small log and leaf piles to increase nesting options for local Hedgehogs during the spring, summer and early autumn. These will be installed within the wooded parkland section, adjacent to the wetland planting in the north-east section of Site 5. This will also create refugia for terrestrial invertebrates, which in turn will boost prey species abundance for local Hedgehogs. In addition to these measures, to mitigate the loss of hedgehog hibernation habitat, artificial / built Hedgehog hibernacula will be installed in the same location. This can be created from wooden planters or storage boxes. While the hibernacula will be primarily utilised by Hedgehog, they may potentially also be utilised by Pygmy Shrew.

Bats

To offset some of the loss of commuting and foraging habitat that the proposed development will incur for local bat populations, it is recommended that a minimum of eight bat boxes are to be installed on the trees within eastern ecological corridor. The lighting of Site 5 along with the existing urban spaces make it difficult to incorporate bat features within the site, utilising the existing woodland which creates a natural darker corridor.

Where possible, these bat boxes will be south facing and at least 4m off the ground; and not adjacent to any lighting columns. When erecting on a tree, the placement must be free from Ivy with not branches within a 1m radius around the location of the bat box.

Within the Irish context, the Vincent's Wildlife Trust's reporting on Irish Bat Box schemes highlighted that 1FF Schwegler boxes are recommended for use by Pipistrelle spp., whereas Leisler's Bat displayed no preference for bat box type (McAney and Hanniffy, 2015), therefore the 1FF Schwegler boxes will be suitable to house at least three of four bat species which frequent Site 5.

Note that some bat box designs (that are enclosed at the base) require annual cleaning out, which must be carried out by a Bat Specialist or NPWS Ranger.

Breeding Birds

The Site 5 area currently supports a number of breeding bird species of conservation concern, three of which can be accommodated for through artificial means.

While the proposed trees to planted as part of the landscape plan will provide some nesting potential for local bird populations; it is recommended that additional bird boxes are placed within the site to allow for additional nesting opportunities during the ecological lag period (while the newly planted trees mature).

Bird boxes will be hung with the face of the box orientated between north and south-east, and at a height of at least 2-3m from ground level to avoid potential predation. Based on the breeding bird species of conservation concern (which utilise artificial nests) recorded within Site 3, the bird box types (five each) to be installed within Site 3 are:

- For House Sparrow: a 32mm diameter oval opening for entry. These bird boxes can be hung from trees or nailed to the trunk at a height of 2-4 metres, and it is preferred that the bird boxes are faced in a way to avoid the brunt of prevailing direct wind or rain. House Sparrows will also utilise terraced nest boxes, facilitating two or three nest boxes in one installation; and
- For Starling: a 45mm entrance hole, with height 51cm, width 16cm and depth 18cm (may also be used by local Great Spotted Woodpecker).
- For Goldcrest: a brushwood style nest, 28m diameter oval opening with dimensions 290 x 145 x 110 mm for the nest (may also be used by Wren and Treecreeper)

Amphibians

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Common Frog across Site 5, ensuring continued landscape connectivity.

Wetland and drainage ditch / swale habitats are not to undergo maintenance (clearance of vegetation or dredging) during sensitive amphibian life stages for both Common Frog.; therefore, such maintenance will only be conducted between June and late September.

Terrestrial Invertebrates

The construction of Site 5 will lead to the direct loss of nesting / hive-building habitat for local terrestrial invertebrate species, potentially displacing species from the locality. To help remedy this loss, insect refugia will be installed in shrub, hedgerow and woodland habitats within Site 5. These can include log and leaf piles, as well as stone piles and old bricks with holes in them.

Residual ecological impacts are those that remain once the development proposals have been implemented. The main aim of ecological mitigation, remediation and enhancement is to minimise or eliminate negative residual impacts and promote positive residual impacts.

6.9.1 Proposed Development – Site 3

6.9.1.1 Habitats

Recolonising bare ground [High Local -> Low Local]

Following the implementation of both construction and operational stage mitigation measures, the rare and protected flora within this habitat will be relocated to new a habitat type, resulting in the devaluation of this habitat to low local ecological importance. As this habitat will be absent from the site during the operational stage, a long-term negative residual impact that is of profound significance is predicted for this low value habitat.

Reed and large sedge swamps [High Local]

The reed and large sedge swamp habitat beyond the north-eastern boundary of the western section of Site 3 is predicted to experience and neutral residual impact that is not significant.

Drainage ditches [High Local]

It is predicted that the drainage ditch habitat will undergo a long-term positive residual impact that is not significant, following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (maturation of landscaped habitats).

Dry meadows and grassy verges [High Local]

Following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (maturation of landscaped habitats), a long-term negative residual impact of slight significance is anticipated for the dry meadow habitats within and immediately adjacent to Site 3.

(Mixed) broadleaved woodland [High Local]

It is predicted that the mixed broadleaved woodland habitat within Site 3 will experience a long-term negative residual impact that is not significant, following the implementation of both construction and operational stage mitigation measures and medium-term ecological lag (maturation of landscaped tree-based habitats).

Mixed broadleaved / conifer woodland [High Local]

Following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (maturation of landscaped habitats), a long-term negative residual impact of that is not significant is anticipated for the mixed broadleaved / conifer woodland habitat within and immediately adjacent to Site 3's eastern boundaries.

Treelines [High Local]

Following the implementation of both construction and operational stage mitigation measures and medium-term ecological lag (maturation of landscaped tree-based habitats), a long-term neutral residual impact of that is not significant is anticipated for the treeline habitats within and immediately adjacent to Site 3.

Scrub [High Local]

It is predicted that the scrub habitats within Site 3 will experience a long-term negative residual impact that is of slight significance, following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (maturation of landscaped scrub/shrub-based habitats).

6.9.1.2 Rare & Protected Flora

Pyramidal Orchid and Bee Orchid [High Local]

Following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (full reestablishment of orchid populations post-relocation), a long-term neutral residual impact is anticipated for the Pyramidal Orchid and Bee Orchid populations.

Lesser Centaury [National]

Following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (reestablishment of Lesser Centaury population post-relocation), a long-term neutral residual impact is anticipated for the Lesser Centaury population.

6.9.1.3 Protected Fauna

Non-volant Mammals – Badger; Pine Marten; Irish Stoat; Hedgehog; and Pygmy Shrew [High Local]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats), it is predicted that a long-term negative residual impact of slight significance for local Badger, Pine Marten, Irish Stoat, Hedgehog, and Pygmy Shrew populations.

Bats [High Local]

The local bat populations are predicted to experience a long-term negative residual impact of slight significance, following the implementation of both construction and operational stage mitigation measures, and medium-term ecological lag (maturation of landscaped habitats).

Wintering Birds – Snipe [High Local]

It is predicted that the operational habitats within Site 3, even after a period of ecological lag, will not have the capacity to support the migrant wintering Snipe population that frequents the site, as well as similar wading bird species that could utilise the site. Therefore, there will be a long-term negative residual impact that is of slight significance for wintering bird species, despite the implementation of both construction and operational stage mitigation measures and ecological maturation of landscaped habitats.

Breeding Birds [High Local]

Following the implementation of both construction and operational stage mitigation measures, and medium-term ecological lag (maturation of landscaped tree and shrub-based habitats), it is anticipated that Site 3 breeding bird populations will experience a long-term negative residual impact that is not significant.

Amphibians [High Local]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped wetland habitats), it is predicted that there will be a long-term positive residual impact of slight significance for the local Common Frog population.

Terrestrial Invertebrates [High Local]

It is predicted that local terrestrial invertebrate populations will experience a long-term positive residual impact that is not significant, following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of a greater variety of landscaped habitats).

6.9.2 Summary of Residual Impacts (Site 3)

Table 6-36 overleaf presents an overall summary of the KERs and their respective ecological valuations; potential impacts; significance of impact in the absence of mitigations measures; prescribed mitigations measures and the significance of their residual impacts for Site 3.

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Habitats					
Recolonising bare ground	High Local -> Low Local (following enabling works)	Construction Stage: Large-scale clearance of this habitat will result in direct physical disturbance to sensitive floral species, namely Pyramidal Orchid and Bee Orchid. Operational Stage: Habitat will be completely lost to the proposed development as it will be replaced by the residential units and associated infrastructure, as well as different operational habitat types.	Construction Stage: Long-term profound negative impact Operational Stage: Long-term negative impact of profound significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protective measures Ih detail the protection and relocation of the orchid species, as outlined in sub-section 6.8.2.6. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and	Long-term negative impact that is of profound significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Reed and large sedge swamps	High Local	Construction Stage: Degradation of flora and reduction of photosynthesis within the habitat as a result of the settlement of cement-based and general dust settlement during construction works. Operational Stage: Located beyond the northern boundary of the western section of Site 3, and as a result will not be notably impacted by site emissions (surface water, groundwater and air). Physical disturbance to and degradation of swamp flora, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.	Construction Stage: Short-term adverse impact of slight significance Operational Stage: Long-term negative impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. Operational Stage:	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Drainage ditches	High Local	Construction Stage: This habitat will be completely removed from Site 3 as part of the construction clearance works. Operational Stage: Creation of new drainage ditch type habitat in form of SuDS swales. Water quality within these swales will be occasionally degraded by urban run-off, which will have knock-on impacts to flora and associated fauna. Physical disturbance to and degradation of new ditches and associated flora, as a	Construction Stage: Long-term profound negative impact Operational Stage: Long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4.	Long-term positive impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.		The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				protected fauna, as outlined in sub-section 6.8.5.1.	
Dry meadow and grassy verges	High Local	Construction Stage: Potential loss of the Flora Protection Order species, Lesser Centaury. Notable loss in total habitat area as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Japanese Knotweed, into the retained dry meadow habitats via machinery, and site staff. Operational Stage: There will be large-scale removal of the majority of the dry meadow habitat; however, the extent of this loss is lessened as a result of the operational landscape design.	Construction Stage: Long-term significant negative impact Operational Stage: Long-term negative impact of moderate significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protective measures Ih detail the protection and relocation of the Lesser Centaury individuals, as outlined in sub-section 6.8.2.6. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3.	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Physical disturbance to and degradation of new meadow type habitats and their associated flora, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.		Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
(Mixed) broadleaved woodland	High Local	<u>Construction Stage</u>: Significant habitat loss as result of the physical footprint of the proposed development.	<u>Construction Stage</u>: Long-term significant negative impact	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Habitat degradation for retained habitat as a result land-based impacts, i.e. physical degradation of ground flora as result of machinery or excessive footfall; compaction of soils and tree roots by machinery; and accidental breakages of tree limbs by machinery. Habitat degradation as a result of air-based pollution events, i.e. cement dust causing the degradation of flora. Spread of invasive species, such as Japanese Knotweed, into the mixed broadleaved woodland habitat via machinery and site staff. <u>Operational Stage</u>: There will be a notable loss of the extent of the broadleaved woodland within Site 3; however, the extent is lessened somewhat, as a result of the operational landscape design and planting plan. Physical disturbance to and degradation of woodland flora, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.	<u>Operational Stage</u>: Long-term negative impact of moderate significance	Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>:	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Mixed broadleaved / conifer woodland	High Local	Construction Stage: Habitat degradation as a result land-based impacts, i.e. physical degradation of ground flora as result of machinery or excessive footfall; compaction of soils and tree roots by machinery; and accidental breakages of tree limbs by machinery. Habitat degradation as a result of air-based pollution events, i.e. cement dust causing the degradation of flora.	Construction Stage: Short-term negative impact of slight significance Operational Stage: Long-term negative impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Spread of invasive species, such as Japanese Knotweed, into the broadleaved woodland habitat via machinery and site staff. <u>Operational Stage</u>: Located beyond the northern boundary of the western section of Site 3, and as a result will not be notably impacted by site emissions (surface water, groundwater and air). Physical disturbance to and degradation of woodland flora, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.		The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Treelines	High Local	<u>Construction Stage</u>: Notable loss in total habitat area as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery.	<u>Construction Stage</u>: Long-term significant negative impact <u>Operational Stage</u>: Long-term negative impact of slight significance	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4.	Long-term neutral impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Spread of invasive species, such as Japanese Knotweed, into the treeline habitats via machinery and site staff. <u>Operational Stage</u>: Treeline habitats will see an increase in their frequency within Site 3, as a result of the operational landscape design, however, the quality of the majority of the understorey flora will not replicate that of the existing treelines present on-site. A portion of the street treeline habitats will be subject to a degree or surface water run-off as they are a part of the SuDS network. Physical disturbance to and degradation of treeline flora, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.		The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Scrub	High Local	Construction Stage: Notable loss in total habitat area as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Japanese Knotweed, into the scrub habitats via machinery and site staff. Operational Stage: There will be permanent scrub habitat loss, however, the extent of this loss is	Construction Stage: Long-term significant negative impact Operational Stage: Long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7.	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		lessened as a result of the operational landscape design. Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of shrub flora, as a result of the activities of the increased local populace.		Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Rare and Protected Flora					
Lesser Centaury	National	Construction Stage: Physical removal and/or regrading of supporting habitat will degrade the few individuals present, with the death of the plants being the most likely outcome, resulting in the protected population's local extinction from the site. Operational Stage: The specific dry meadow habitats, that currently support the Lesser Centaury individuals within Site 3, will not be present during the operational phase; however, the Lesser Centaury individuals will be relocated to a suitable habitat within Site 4, prior to site clearance.	Construction Stage: Long-term profound negative impact Operational Stage: Long-term neutral impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protective measures Ih detail the protection and relocation of the Lesser Centaury individuals, as outlined in sub-section 6.8.2.6. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4.	Long-term neutral impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Operational Stage: The completion of all remedial planting within Sites' 3 and 4 landscape planting plans, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Pyramidal Orchid Bee Orchid	High Local	Construction Stage: Physical removal and/or regrading of supporting habitat will degrade the individuals present, with the death of the plants being the most likely outcome, resulting in the local extinction of these orchid populations from Site 3. Operational Stage: The specific recolonising bare ground and dry meadow habitats, that currently support the Pyramidal and Bee Orchid populations within Site 3, will not be present during the operational phase; however, these orchid populations will	Construction Stage: Long-term very significant negative impact Operational Stage: Long-term neutral impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4.	Long-term neutral impact that is not significant.

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		be relocated, prior to site clearance, to a suitable habitat within Site 4.		The protective measures Ih detail the protection and relocation of the orchid species, as outlined in sub-section 6.8.2.6. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within Sites' 3 and 4 landscape planting plans, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Protected Fauna					
Non-volant Mammals: Badger	High Local	<u>Construction Stage</u>: Degradation of supporting habitats, prey items / foraging resources and the	<u>Construction Stage</u>: Temporary to short-	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1.	Long-term negative residual impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Pine Marten Irish Stoat Hedgehog Pygmy Shrew		physiological health of protected non-volant mammals as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of protected non-volant mammals commuting and foraging activities, as well as potential future resting sites (e.g. setts). Habitat loss and fragmentation of supporting terrestrial habitats. <u>Operational Stage</u>: Negligible to slight physical, noise and lighting disturbance to local non-volant mammal populations, when within, or in close proximity to Site 3 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 3. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site.	term negative impact of slight significance <u>Operational Stage</u>: Long-term negative impact of slight significance	Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Permanent loss of foraging and refuge habitats, the extent of which is lessened somewhat by the proposed operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 3.		Operational Stage: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Bats	High Local	Construction Stage: Loss of potential future roosting features within existing trees and structures. Degradation of supporting habitats, prey items / foraging resources and the physiological health of local bat populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended	Construction Stage: Long-term negative impact of moderate significance Operational Stage: Long-term negative impact of moderate significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3.	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		sediments and sediment-bound nutrients, and cement-base dusts). Lighting and physical disturbance of the local bat populations' commuting and foraging activities. Habitat loss and fragmentation of supporting terrestrial habitats, including linear commuting features. <u>Operational Stage</u>: Negligible increase to collision risk mortality for bats frequenting the site. A notable increase in lighting disturbance for local bat populations, as a result of the illumination of the majority of Site 3 during operations. The fragmentation of dark commuting corridors within Site 3. Furthermore, there will be a reduced quality to all retained dark wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and refuge (potential future roosting features) habitats, the extent of which is lessened somewhat by the proposed operational landscape design.		The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Wintering Birds	High Local	Construction Stage: Large scale removal of suitable habitat, resulting in the loss of refuge and foraging potential for migrant wintering bird populations, including Snipe. Degradation of supporting habitats, prey items / foraging resources and the physiological health of migrant wintering birds as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of migrant wintering bird populations' roosting, commuting and foraging activities.	Construction Stage: Long-term negative impact of moderate significance Operational Stage: Long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5.	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Operational Stage: Negligible to slight physical, noise and visual disturbance to migrant wintering bird populations, when within, or in close proximity to Site 3 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Permanent loss of foraging and roosting habitats, the extent of which is lessened entirely by the proximity to a new urbanised environment. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 3.		The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. Operational Stage: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Breeding Birds	High Local	Construction Stage: Degradation of supporting habitats, prey items / foraging resources and the physiological health of breeding bird populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of breeding bird populations' commuting and foraging activities, as well as potential future nesting sites. Habitat loss and fragmentation of supporting terrestrial habitats, including those that provide nesting opportunities. Operational Stage: Negligible to slight physical, noise and visual disturbance to local breeding bird populations, when within, or in close proximity to Site 3 operations.	Construction Stage: Temporary to long-term negative impact of moderate significance Operational Stage: Long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic)	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 3. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and nesting habitats, the extent of which is lessened somewhat by the proposed operational landscape design. Species such as Meadow Pipit and Skylark will not regain any nesting potential within the proposed development due to their requirements. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 3.		preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				protected fauna, as outlined in sub-section 6.8.5.1.	
Amphibians - Common Frog	High Local	Construction Stage: Degradation of supporting habitats, prey items and physiological health of local Common Frog populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of amphibian commuting and foraging activities. Habitat loss and fragmentation of supporting terrestrial habitats. Operational Stage: Negligible to slight physical, noise and lighting disturbance to local amphibian populations, when within, or in close proximity to Site 3 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 3. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed	Construction Stage: Long-term negative impact of moderate significance Operational Stage: Long-term negative impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of	Long-term positive impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and hibernation habitats, the extent of which is lessened somewhat by the proposed operational landscape design. However, there will be an increase in total available spawning habitats for amphibians as result of the operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 3.		invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	
Terrestrial Invertebrates	High Local	<u>Construction Stage</u>: Degradation of supporting habitats and physiological health of terrestrial invertebrate populations as a result of surface water, groundwater to surface water, air, and air to surface water	<u>Construction Stage</u>: Temporary to short-term adverse impact of slight significance	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2.	Long-term positive impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of terrestrial invertebrates commuting and foraging activities. Habitat loss and fragmentation of terrestrial habitats, which support life cycle stages of local pollinators. <u>Operational Stage</u>: Fragmentation of commuting corridor habitats within Site 3. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging, hive-building and hibernation habitats, the extent of which is lessened somewhat by the proposed operational landscape design.	<u>Operational Stage</u>: Long-term negative impact of slight significance	Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4; as well as the site-specific invasives species mitigations outlined in sub-section 6.8.4.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5. The protective measures which detail the protection and relocation of the orchid species, as outlined in sub-section 6.8.2.6. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.4.1. Specific measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Operational Stage: The completion of all remedial planting within the Site 3 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 3 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-section 6.8.5.1.	

Table 6-36: Summary of Site 3 KERs and their respective valuations, potential impact; significance of unmitigated impacts; required mitigations; and residual impacts

6.9.3 Proposed Development – Site 4

6.9.3.1 Designated Sites

Grand Canal pNHA and Liffey Valley pNHA [National]

Following the implementation of both construction and operational stage mitigation measures, it is predicted that there will be a long-term neutral residual impact that is not significant for the designated sites (Grand Canal pNHA and Liffey Valley pNHA) and their respective key ecological receptors.

6.9.3.2 Habitats

Reed and large sedge swamp [High Local]

Following the implementation of both construction and operational stage mitigation measures, the reed and large sedge swamp habitat, along the banks of the Grand Canal, will experience a long-term negative impact that is not significant.

Eroding / upland rivers (Kilmahuddrick Stream) [County]

The eroding / upland rivers (Kilmahuddrick Stream) will experience a long-term negative impact that is not significant, following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (maturation of the landscaped habitats).

Canals (Grand Canal) [National]

Following the implementation of both construction and operational stage mitigation measures, the aquatic canal (Grand Canal) habitat will experience a long-term neutral residual impact that is not significant for this aquatic habitat.

Drainage ditches [High Local]

It is predicted that the drainage ditch habitat will experience a long-term neutral residual impact that is not significant for this aquatic habitat, following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (maturation of landscaped habitats).

Marsh [High Local]

Following the implementation of both construction and operational stage mitigation measures, and a short-term ecological lag (maturation of landscaped habitats), the wetland marsh habitat will experience a long-term positive impact of slight significance for this wetland habitat.

Dry meadow and grassy verges [High Local]

The dry meadow and grassy verges habitat will experience a long-term negative impact that is not significant, following the implementation of both construction and operational stage mitigation measures and short-term ecological lag (maturation of landscaped habitats).

(Mixed) broadleaved woodland [High Local]

Following the implementation of both construction and operational stage mitigation measures, and a medium-term ecological lag (maturation of landscaped habitats), it is predicted that the mixed broadleaved woodland habitats will experience a long-term negative impact of moderate significance.

Hedgerows [High Local]

It is predicted that the hedgerow habitats will experience a long-term positive impact of slight significance, following the implementation of both construction and operational stage mitigation measures, and medium-term ecological lag (maturation of landscaped habitats).

Treelines [High Local]

Following the implementation of both construction and operational stage mitigation measures, and medium-term ecological lag (maturation of landscaped habitats), the treelines habitat is predicted to experience a long-term negative impact of slight significance.

Wet willow-alder-ash woodland [High Local]

Following the implementation of both construction and operational stage mitigation measures, it is predicted that the wet willow-alder-ash woodland will experience a long-term negative impact that is not significant.

Scrub [High Local]

The scrub habitat is predicted to experience a long-term negative impact that is not significant, following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats).

Immature woodland [High Local]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats), the immature woodland habitat is predicted to experience a long-term positive impact that is not significant.

6.9.3.3 Rare and Protected Flora

Pyramidal Orchid [High Local]

Following the implementation of both construction and operational stage mitigation measures, it is predicted that the local Pyramidal Orchid population will experience a long-term neutral impact that is not significant.

Lesser Centaury [National]

Following the implementation of both construction and operational stage mitigation measures, it is predicted that the local protected Lesser Centaury population will experience a long-term neutral impact that is not significant.

6.9.3.4 Protected Fauna

Otter [County]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats), it is predicted that the local Otter population will experience a long-term negative impact that is not significant.

Non-volant Mammals – Badger; Pine Marten; Irish Stoat; Hedgehog; and Pygmy Shrew [High Local]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats), it is predicted that there will be a long-term negative residual impact of slight significance for local Badger, Pine Marten, Irish Stoat, Hedgehog, and Pygmy Shrew populations.

Bats [High Local]

It is predicted that the local bat populations will experience a long-term negative impact of slight significance, following the implementation of both construction and operational stage mitigation measures, and medium-term ecological lag (maturation of landscaped habitats).

Wintering Birds [High Local]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats), it is predicted that there will be a long-term negative residual impact of slight significance for migrant wintering bird populations.

Breeding Birds [High Local]

It is predicted that the local breeding bird populations will experience a long-term negative impact of slight significance, following the implementation of both construction and operational stage mitigation measures, and medium-term ecological lag (maturation of landscaped habitats).

Amphibians [High Local]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats), it is predicted that there will be a long-term positive residual impact of slight significance for local Common Frog and Smooth Newt populations.

Fish [County / High Local]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats), it is predicted that the local and downstream fish populations will experience a long-term positive impact that is not significant.

Terrestrial Invertebrates [High Local]

It is predicted that the local terrestrial invertebrate populations will experience a long-term negative impact of slight significance, following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats).

Freshwater Aquatic Invertebrates [High Local]

Following the implementation of both construction and operational stage mitigation measures, and short-term ecological lag (maturation of landscaped habitats), it is predicted that the local freshwater aquatic invertebrate populations will experience a long-term positive impact that is not significant.

6.9.4 Summary of Residual Impacts (Site 4)

Table 6-37 overleaf presents an overall summary of the KERs and their respective ecological valuations; potential impacts; significance of impact in the absence of mitigations measures; prescribed mitigations measures and the significance of their residual impacts for Site 4.

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Designated Sites					
Grand Canal pNHA	National	Construction Stage: Water quality, riparian and aquatic habitat degradation as a result of air and air to surface water pollution (standard and cement-based dusts). Spread of invasive species, such as Japanese Knotweed, into the northern canal bank area via disturbance of known plant locations along the southern boundary of Site 4. Physical degradation of its associated habitats along the north bank, as well the disturbance to and accidental fatalities of associated fauna. Operational Stage: Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. An increase in predator pressure on associated fauna, in particular birds, given the increased likelihood of free-roaming	Construction Stage: Significant short-term adverse impact Operational Stage: Initial long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The safeguarding mitigations measures aimed to protect fauna associated with this pNHA, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the pNHA, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the pNHA; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the pNHA, as outlined in sub-section 6.8.6.3.	Long-term negative residual impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		domestic cats and dogs that coincide with local population increases.		Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. Operational Stage: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Liffey Valley pNHA	National	Construction Stage: Water quality, riparian and aquatic habitat degradation as a result of surface water, groundwater to surface water, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, cement-base dusts). Acidification of upstream tributaries (Kilmahuddrick Stream) through the increase in nitrogen oxides, with subsequent negative impacts on pNHA	Construction Stage: Short-term adverse impact of moderate significance Operational Stage: Initial long-term neutral operational impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3.	Long-term neutral residual impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		associated fish species, i.e. Lamprey and Atlantic Salmon. Spread of invasive species, such as Japanese Knotweed, downstream via the local surface water network. <u>Operational Stage</u>: No negative operational impacts are anticipated for the Liffey Valley pNHA.		The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The safeguarding mitigations measures aimed to protect fauna associated with this pNHA, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the pNHA, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the pNHA; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the pNHA, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Habitats					
Reed and large sedge swamps	High Local	Construction Stage: Degradation of flora (epidermal cells) within the habitat as a result of the settlement of cement-based dusts generated during construction. Additionally, general dust settlement also has the potential to reduce photosynthesis through the physical coating of leaves. Operational Stage: Physical disturbance to and degradation of swamp flora, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.	Construction Stage: Short- term adverse impact of slight significance Operational Stage: Initial long-term negative impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the pNHA, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Eroding / upland rivers (Kilmahuddrick Stream)	County	<u>Construction Stage</u>: Water quality, riparian and aquatic habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive	<u>Construction Stage</u>: Short- term adverse impact of moderate significance <u>Operational Stage</u>:	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		suspended sediments and sediment-bound nutrients, cement-base dusts). Acidification of Kilmahuddrick Stream through the increase in nitrogen oxides, with subsequent negative impacts on protected fish species, i.e. Lamprey and Atlantic Salmon, located downstream. Spread of invasive species, such as Japanese Knotweed along the banks of the stream. <u>Operational Stage</u>: Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.	Initial long-term negative impact that is not significant	Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with this habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Operational Stage: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Canals (Grand Canal)	National	Construction Stage: Water quality, riparian and aquatic habitat degradation as a result of air and air to surface water pollution (standard and cement-based dusts). Operational Stage: Physical, audible and visual disturbances to associated aquatic flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.	Construction Stage: Short- to medium-term adverse impact of moderate significance Operational Stage: Initial long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna	Long-term negative residual impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				associated with the pNHA, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the pNHA, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Drainage ditches	High Local	Construction Stage: Direct and permanent habitat loss of the majority of existing drainage ditches. Water quality, riparian and aquatic habitat degradation for retained drainage ditches as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Acidification of retained drainage ditches, that are connected to the Kilmahuddrick Stream, through the increase in nitrogen oxides, with subsequent negative impacts on protected fish species, i.e. Lamprey and Atlantic Salmon, located downstream. Spread of invasive species, such as Japanese Knotweed along the banks of the retained drainage ditches. Operational Stage: Drainage ditches removal during the construction stage will be replaced with new ditches in the operational site, and therefore no long-term habitat loss. New and retained drainage ditches will be subjected to physical, audible and visual disturbances to associated aquatic flora	Construction Stage: Short-term adverse impact of moderate significance Operational Stage: Initial long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3.	Long-term neutral residual impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		and fauna, as a result of the activities of the increased local populace. The drainage ditch habitats will be subjected to surface water run-off as they are a part of the SuDS network, which has the potential to degrade the water quality and instream flora in these ditches. Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.		Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Marsh	High Local	<u>Construction Stage</u>: Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora	<u>Construction Stage</u>: Short-term adverse impact of slight significance <u>Operational Stage</u>:	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response;	Long-term positive impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Japanese Knotweed, into the marsh habitat via machinery, site staff and/or fragments being washed downstream along the Kilmahuddrick Stream and into the riparian zone. <u>Operational Stage</u>: The marsh habitat will potentially be subjected to physical, audible and visual disturbances to associated wetland flora and fauna, as a result of the activities of the increased local populace. Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of marsh flora, as a result of the activities of the increased local populace.	Initial long-term negative impact that is not significant	and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protective measures which detail the protection and relocation of the rare flora, as outlined in sub-section 6.8.2.6. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Operational Stage: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Dry meadow and grassy verges	High Local	Construction Stage: Notable loss in total habitat area as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts).	Construction Stage: Very significant short-term adverse impact Operational Stage: Initial long-term negative operational impact of slight significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Japanese Knotweed, into the dry meadow habitats via machinery, site staff and/or fragments being washed downstream along the Kilmahuddrick Stream and into the riparian zone. <u>Operational Stage</u>: There will be long-term dry meadow habitat loss, however, the extent of this loss is lessened as a result of the operational landscape design. Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of meadow flora, as a result of the activities of the increased local populace.		The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protective measures which detail the protection and relocation of the rare flora, as outlined in sub-section 6.8.2.6. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
(Mixed) broadleaved woodland	High Local	Construction Stage: Significant habitat loss as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of ground flora as result of machinery or excessive footfall; compaction of soils and	Construction Stage: Very significant short- to long-term adverse impact Operational Stage: Initial significant long-term adverse impact	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4.	Long-term negative impact of moderate significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		tree roots by machinery; and accidental breakages of tree limbs by machinery. Spread of invasive species, such as Japanese Knotweed, into the broadleaved woodland habitat via machinery and site staff. <u>Operational Stage</u>: There will be permanent and notable loss of the extent of the broadleaved woodland within Site 4, however, the extent is lessened somewhat, as a result of the operational landscape design.		The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Hedgerows	High Local	Construction Stage: Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of ground flora as result of machinery or excessive footfall; compaction of soils and tree roots by machinery; and accidental breakages of tree limbs by machinery. Spread of invasive species, such as Japanese Knotweed, into the hedgerow habitats via machinery and site staff.	Construction Stage: Short-term adverse impact of slight significance Operational Stage: Initial long-term positive impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 3, as outlined in sub-section 6.8.2.5.	Long-term positive impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Operational Stage: Hedgerow habitats will see an increase in their frequency within Site 4 as a result of the operational landscape design. Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.		The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the pNHA; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. Operational Stage: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Treelines	High Local	<u>Construction Stage</u>: Notable loss in total habitat area as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Japanese Knotweed, into the treeline habitats via machinery, site staff and/or fragments being washed downstream along the Kilmahuddrick Stream and into the riparian zone.	<u>Construction Stage</u>: Very significant short- to long-term adverse impact <u>Operational Stage</u>: Initial long-term negative impact that is of slight significance	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7.	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		<u>Operational Stage</u>: Treeline habitats will see an increase in their frequency within Site 4 as a result of the operational landscape design, however, the quality of the majority of the understorey flora will not replicate that of the existing treelines present on-site. A portion of the street treeline habitats will be subject to a degree or surface water run-off as they are a part of the SuDS network. Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.		General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Wet willow-alder-ash woodland	High Local	Construction Stage: Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of ground flora as result of machinery or excessive footfall; compaction of soils and tree roots by machinery; and accidental breakages of tree limbs by machinery. Spread of invasive species, such as Japanese Knotweed, into the Wet willow-alder-ash woodland via machinery and site staff. Operational Stage: Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace.	Construction Stage: Short-term adverse impact of slight significance Operational Stage: Initial long-term negative impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.		Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Scrub	High Local	Construction Stage: Notable loss in total habitat area as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Japanese Knotweed, into the scrub habitats via machinery, site staff and/or fragments being washed downstream along the Kilmahuddrick Stream and into the riparian zone. Operational Stage: There will be permanent scrub habitat loss, however, the extent of this loss is lessened as a result of the operational landscape design.	Construction Stage: Very significant short-term adverse impact Operational Stage: Initial long-term negative operational impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The protective measures which detail the protection and relocation of the rare flora, as outlined in sub-section 6.8.2.6. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the habitat, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat;	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.		and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Immature woodland	High Local	Construction Stage: Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; compaction of soils and root systems by machinery; and accidental breakages of tree limbs by machinery. Spread of invasive species, such as Japanese Knotweed, into the immature woodland habitats via machinery, site staff and/or fragments being washed downstream along the Kilmahuddrick Stream and into the riparian zone. Operational Stage: Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.	Construction Stage: Short-term adverse impact of slight significance Operational Stage: Initial long-term positive impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the pNHA, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the pNHA; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1.	Long-term positive impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.		Specific measures to safeguard protected faunal species associated with the pNHA, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Rare and Protected Flora					

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Lesser Centaury	National	Construction Stage: Degradation of the habitat supporting Lesser Centaury, as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Physical degradation of Lesser Centaury individuals as result of stray machinery, footfall; and/or compaction of soils by machinery (during the winter period). Spread of invasive species, such as Japanese Knotweed, into habitat supporting the Lesser Centaury population via machinery, site staff and/or fragments being washed downstream along the Kilmahuddrick Stream and into the riparian zone. Operational Stage: Physical disturbance (e.g. trampling) to the Lesser Centaury population, as a result of the activities of the increased local populace. The increased potential for the introduction of invasive non-native flora and fauna to the site, as a result of the increased local populace, has the potential to have negative impacts the Lesser Centaury population (e.g.	Construction Stage: Significant short-term adverse impact Operational Stage: Initial long-term negative impact of moderate significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protective measures which detail the protection and relocation of the rare flora, as outlined in sub-section 6.8.2.6. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna associated with the pNHA, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream riparian zone; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4.	Long-term neutral impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		consumption and overshading / outcompeting)		Operational Stage: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Pyramidal Orchid	High Local	Construction Stage: Degradation of the habitat supporting Pyramidal Orchid, as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Physical degradation of Pyramidal Orchid individuals as result of stray machinery, footfall; and/or compaction of soils by machinery (during the winter period). Spread of invasive species, such as Japanese Knotweed, into habitat supporting the Pyramidal Orchid population via machinery, site staff and/or fragments being washed downstream along the Kilmahuddrick Stream and into the riparian zone.	Construction Stage: Temporary to short-term adverse impact of slight significance Operational Stage: Initial long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protective measures which detail the protection and relocation of the rare flora, as outlined in sub-section 6.8.2.6. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna	Long-term neutral impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Operational Stage: Physical disturbance (e.g. trampling) to the Pyramidal Orchid population, as a result of the activities of the increased local populace. The increased potential for the introduction of invasive non-native flora and fauna to the site, as a result of the increased local populace, has the potential to have negative impacts the Pyramidal Orchid population (e.g. consumption and overshading / outcompeting)		associated with the pNHA, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream riparian zone; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. Operational Stage: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Protected Fauna					
Otter	County	Construction Stage: Degradation of supporting habitats, prey items and Otter physiological health as a	Construction Stage: Temporary to short-	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of Otter commuting and foraging activities, as well as potential future resting sites (couches and holts). Habitat loss and fragmentation of supporting aquatic and riparian habitats. <u>Operational Stage</u>: Negligible to slight physical, noise and lighting disturbance to the local Otter population, when within, or in close proximity to Site 4 operations. The introduction of pets (dogs) to the area also has the potential to result in injuries for local Otters. Fragmentation of riparian and aquatic habitat within Site 4. Furthermore, there will be a reduced quality to the riparian corridor while the proposed landscaping is still within the ecological lag (maturation) period. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 4.	term adverse impact of moderate significance <u>Operational Stage</u>: Initial long-term negative impact of slight significance	Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The safeguarding mitigations measures aimed to protect fauna, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species associated with the habitat, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>:	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Non-volant Mammals: Badger Pine Marten Irish Stoat Hedgehog Pygmy Shrew	High Local	<u>Construction Stage</u>: Degradation of supporting habitats, prey items / foraging resources and the physiological health of protected non-volant mammals as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of protected non-volant mammals	<u>Construction Stage</u>: Temporary to short-term adverse impact of slight significance <u>Operational Stage</u>: Initial long-term negative operational impact of slight significance	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3.	Long-term negative residual impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		commuting and foraging activities, as well as potential future resting sites (e.g. setts). Habitat loss and fragmentation of supporting terrestrial and aquatic habitats. <u>Operational Stage</u>: Negligible to slight physical, noise and lighting disturbance to local non-volant mammal populations, when within, or in close proximity to Site 4 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 4. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and refuge habitats, the extent of which is lessened somewhat by the proposed operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 4.		The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Bats	High Local	Construction Stage: Loss of potential future roosting features within existing trees and structures. Degradation of supporting habitats, prey items / foraging resources and the physiological health of local bat populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Lighting and physical disturbance of the local bat populations' commuting and foraging activities.	Construction Stage: Temporary to medium-term adverse impact of moderate significance Operational Stage: Initial long-term adverse impact of moderate significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5.	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Habitat loss and fragmentation of supporting terrestrial and aquatic habitats. <u>Operational Stage</u>: Negligible increase to collision risk mortality for bats frequenting the site. A notable increase in lighting disturbance for local bat populations, as a result of the illumination of the majority of Site 4 during operations. The fragmentation of dark commuting corridors within Site 4. Furthermore, there will be a reduced quality to all retained dark wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and refuge (potential future roosting features) habitats, the extent of which is lessened somewhat by the proposed operational landscape design.		The safeguarding mitigations measures aimed to protect fauna, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Wintering Birds	High Local	Construction Stage: Degradation of supporting habitats, prey items / foraging resources and the physiological health of migrant wintering birds as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of migrant wintering bird populations' roosting, commuting and foraging activities. Habitat loss and fragmentation of supporting terrestrial and aquatic habitats. Operational Stage: Negligible to slight physical, noise and lighting disturbance to migrant wintering bird populations, when within, or in close proximity to Site 4 operations.	Construction Stage: Temporary to short-term adverse impact of slight significance Operational Stage: Initial long-term negative operational impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 4. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and roosting habitats, the extent of which is lessened somewhat by the proposed operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 4.		habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Breeding Birds	High Local	Construction Stage: Degradation of supporting habitats, prey items / foraging resources and the physiological health of breeding bird populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of breeding bird populations' commuting and foraging activities, as well as potential future nesting sites. Habitat loss and fragmentation of supporting terrestrial and aquatic habitats, including those that provide nesting opportunities. Operational Stage: Negligible to slight physical, noise and lighting disturbance to local breeding bird populations, when within, or in close proximity to Site 4 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 4. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed	Construction Stage: Temporary to long-term adverse impact of slight significance Operational Stage: Initial long-term negative operational impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and nesting habitats, the extent of which is lessened somewhat by the proposed operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 4.		invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Amphibians	High Local	<u>Construction Stage</u>: Degradation of supporting habitats, prey items and physiological health of local amphibian populations as a result of surface water, groundwater to surface water, air, and air to surface water	<u>Construction Stage</u>: Temporary to short-term adverse impact of slight significance	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2.	Long-term positive residual impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of amphibian commuting and foraging activities. Habitat loss and fragmentation of supporting aquatic and terrestrial habitats, including those which provide suitable spawning grounds. <u>Operational Stage</u>: Negligible to slight physical, noise and lighting disturbance to local amphibian populations, when within, or in close proximity to Site 4 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 4. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and hibernation habitats, the extent of which is lessened somewhat by the proposed operational landscape design. However,	<u>Operational Stage</u>: Initial long-term negative operational impact that is not significant	Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The safeguarding mitigations measures aimed to protect fauna, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		there will be an increase in total available spawning habitats for amphibians as result of the operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 4.		the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Fish	County High Local	Construction Stage: Degradation of supporting habitats, prey items and physiological health of local fish populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of fish commuting and foraging activities. Physical disturbance of the Kilmahuddrick Stream has the potential to result in fish fatalities. Habitat loss and fragmentation of supporting aquatic habitats as a result of	Construction Stage: Temporary to short-term adverse impacts ranging from slight (Brown Trout and Three-spined Stickleback) to moderate (Atlantic Salmon, Lamprey spp. and European Eel) significance Operational Stage: Initial long-term positive impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5.	Long-term positive impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		the development's proposed culvert installation. <u>Operational Stage</u>: Increased shading of the stream will assist in stabilising the local surface water network temperatures.		The protective measures which detail the protection and relocation of the rare flora, as outlined in sub-section 6.8.2.6. The safeguarding mitigations measures aimed to protect fauna, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Terrestrial Invertebrates	High Local	<u>Construction Stage</u>: Degradation of supporting habitats, prey items and physiological health of terrestrial invertebrate populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of terrestrial invertebrates commuting and foraging activities. Habitat loss and fragmentation of supporting terrestrial habitats. <u>Operational Stage</u>: Fragmentation of commuting corridor habitats within Site 4. Furthermore, there	<u>Construction Stage</u>: Temporary to short-term adverse impact of slight significance <u>Operational Stage</u>: Initial long-term negative operational impact of slight significance	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The protective measures which detail the protection and relocation of the rare flora, as outlined in sub-section 6.8.2.6.	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging, hive-building and hibernation habitats, the extent of which is lessened somewhat by the proposed operational landscape design.		The safeguarding mitigations measures aimed to protect fauna associated with this pNHA, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	
Freshwater Aquatic Invertebrates	High Local	Construction Stage: Degradation of supporting habitats, prey items and physiological health of freshwater invertebrate populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of freshwater invertebrates commuting and foraging activities. Physical disturbance of the Kilmahuddrick Stream has the potential to result in freshwater invertebrate fatalities. Habitat loss and fragmentation of supporting aquatic habitats as a result of the development's proposed culvert installation. Operational Stage:	Construction Stage: Temporary to short-term adverse impact of slight significance Operational Stage: Initial long-term positive impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3.	Long-term positive impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		No negative operational impacts are anticipated. Diversity of freshwater aquatic invertebrate species will increase given the proposed pond SuDS features within the drainage and landscape operational designs.		Specific measures to protect the Kilmahuddrick Stream and fauna associated with the habitat; and to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.6.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.6.3. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.4.4. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure safe passage through the site and limit maintenance of ecological corridors, as well as the installation of remedial	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				features for rare and protected fauna, as outlined in sub-sections 6.8.7.1 and 6.8.7.2.	

Table 6-37: Summary of Site 4 KERs and their respective valuations, potential impact; significance of unmitigated impacts; required mitigations; and residual impacts

6.9.1 Proposed Development – Site 5

6.9.1.1 Habitats

Drainage ditches [Low Local]

Following the implementation of both construction and operational stage ecological mitigation measures and short-term ecological lag (maturation of the landscaped habitats), a long-term positive residual impact, that is of slight significance is predicted for this linear wetland habitat.

Dry meadows and grassy verges [High Local]

The dry meadow and grassy verges habitat will experience a long-term negative residual impact of slight significance, following the implementation of both construction and operational stage ecological mitigation measures and short-term ecological lag (maturation of the landscaped habitats).

(Mixed) broadleaved woodland [High Local]

It is anticipated that following the implementation of both construction and operational stage ecological mitigation measures, there will be a long-term neutral residual impact that is not significant for this mixed broadleaved woodland habitat.

Mixed broadleaved / conifer woodland [High Local]

Following the implementation of both construction and operational stage ecological mitigation measures, a long-term negative residual impact that is not significant, is predicted for this mixed broadleaved / conifer woodland habitat.

Hedgerows [High Local]

The hedgerows habitat will experience a long-term positive residual impact that is not significant, following the implementation of both construction and operational stage ecological mitigation measures and medium-term ecological lag (maturation of the landscaped habitats).

Treelines [High Local]

Following the implementation of both construction and operational stage ecological mitigation measures and medium-term ecological lag (maturation of the landscaped habitats), the treelines habitat will experience a long-term positive residual impact that is of slight significance.

Scrub [High Local]

It is predicted that the scrub habitat will experience a long-term negative residual impact that is not significant, following the implementation of both construction and operational stage ecological mitigation measures and short-term ecological lag (maturation of the landscaped habitats).

6.9.1.2 Protected Fauna

Non-volant Mammals – Badger; Pine Marten; Irish Stoat; Hedgehog and Pygmy Shrew [Low – High Local]

Following the implementation of both construction and operational stage ecological mitigation measures and medium-term ecological lag (maturation of the landscaped habitats), it is anticipated that there will be a long-term negative residual impact that is not significant for the local non-volant mammal populations of Site 5.

Bats [High Local]

It is predicted that the bat populations of Site 5 will experience a long-term negative impact of slight significance, following the implementation of both construction and operational stage ecological mitigation measures and medium-term ecological lag (maturation of the landscaped habitats).

Wintering Birds [High Local]

Following the implementation of both construction and operational stage ecological mitigation measures and shot-term ecological lag (maturation of the landscaped habitats), it is anticipated that the migrant wintering bird populations of Site 5 will experience a long-term negative residual impact that is not significant.

Breeding Birds [High Local]

The breeding bird populations of Site 5 are anticipated to experience a long-term positive impact that is not significant, following the implementation of both construction and operational stage ecological mitigation measures and medium-term ecological lag (maturation of the landscaped habitats).

Amphibians

Following the implementation of both construction and operational stage ecological mitigation measures and shot-term ecological lag (maturation of the landscaped habitats), it is anticipated that the local amphibians will experience a long-term positive residual impact that is not significant.

Terrestrial Invertebrates

It is predicted that the terrestrial invertebrate populations of Site 5 will experience a long-term positive impact of slight significance, following the implementation of both construction and operational stage ecological mitigation measures and short-term ecological lag (maturation of the landscaped habitats).

6.9.2 Summary of Residual Impacts (Site 5)

Table 6-38 overleaf presents an overall summary of the KERs and their respective ecological valuations; potential impacts; significance of impact in the absence of mitigations measures; prescribed mitigations measures and the significance of their residual impacts for Site 5.

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Habitats					
Drainage ditches	Low Local	Construction Stage: The drainage ditch habitat will experience complete habitat loss. Operational Stage: While the existing drainage ditch will be removed during the construction stage, the habitat will be replaced with new ditch-like swales in the operational site, and therefore no long-term habitat loss. New drainage ditches will be subjected to physical, audible and visual disturbances to associated aquatic flora and fauna, as a result of the activities of the increased local populace. The drainage ditch habitats will be subjected to surface water run-off as they are a part of the SuDS network, which has the potential to degrade the water quality and instream flora in these ditches. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.	Construction Stage: Short-term negative impact of profound significance Operational Stage: Long-term positive impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of	Long-term positive impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				invasive non-native species, as outlined within sub-section 6.8.8.3. Operational Stage: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Dry meadow and grassy verges	High Local	Construction Stage: Notable loss in total habitat area as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution	Construction Stage: Temporary to long-term negative impact of slight to moderate significance Operational Stage:	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		(deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Butterfly-bush, into the dry meadow habitats via machinery and site staff. <u>Operational Stage:</u> Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of meadow flora, as a result of the activities of the increased local populace.	Long-term negative impact of slight significance	response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
(Mixed) broadleaved woodland	High Local	<u>Construction Stage:</u> Degradation of flora and reduction of photosynthesis within the habitat as a result of the settlement of cement-based and general dust settlement during construction works. <u>Operational Stage:</u> As the mixed broadleaved woodland is only adjacent to Site 5 and not within the site, and not accessible to the public during Site 5 operations, this woodland habitat is not anticipated to be negatively impacted by the operational stage.	<u>Construction Stage:</u> Short-term negative impact of slight significance <u>Operational Stage:</u> Long-term neutral impact that is not significant	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5.	Long-term neutral impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Mixed broadleaved / conifer woodland	High Local	<u>Construction Stage:</u> Small-scale habitat loss as result of physical footprint of the Site 5 development. Habitat degradation as a result land-based impacts, i.e. physical degradation of ground flora as result of machinery or excessive footfall; compaction of soils and tree roots by machinery; and accidental breakages of tree limbs by machinery. Habitat degradation as a result of air-based pollution events, i.e. cement dust causing the degradation of flora. Spread of invasive species, such as Butterfly-bush, into the broadleaved woodland habitat via machinery and site staff. <u>Operational Stage:</u> Habitat loss that will not be remedied by the proposed landscape plan, i.e., not planting of replacement mixed	<u>Construction Stage:</u> Temporary to long-term negative impact of slight to moderate significance <u>Operational Stage:</u> Long-term negative impact of slight significance	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 4, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		broadleaved and conifer woodland patch.		Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
Hedgerows	High Local	Construction Stage: Habitat loss as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Butterfly-bush, into the treeline habitats via machinery and site staff. Operational Stage: Increase in immature hedgerow habitat within the site. Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace.	Construction Stage: Temporary to long-term negative impact of slight significance Operational Stage: Long-term neutral impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of	Long-term positive impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.		invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Treelines	High Local	<u>Construction Stage:</u> Habitat loss as result of the physical footprint of the proposed Site 5 development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution	<u>Construction Stage:</u> Temporary to long-term negative impact of slight significance <u>Operational Stage:</u>	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence	Long-term positive impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		(deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery. Spread of invasive species, such as Butterfly-bush, into the treeline habitats via machinery and site staff. <u>Operational Stage:</u> Planting of new treeline aligned habitats across the Site 5 development. Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.	Long-term neutral impact that is not significant	response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Scrub	High Local	<u>Construction Stage:</u> Notable loss in total habitat area as result of the physical footprint of the proposed development. Habitat degradation as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, and general and/or cement-base dusts). Habitat degradation as a result land-based impacts, i.e. physical degradation of flora as result of machinery or excessive footfall; and compaction of soils by machinery.	<u>Construction Stage:</u> Short to long-term negative impact of slight to moderate significance <u>Operational Stage:</u>	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Spread of invasive species, such as Butterfly-bush, into the scrub habitats via machinery and site staff. <u>Operational Stage:</u> Physical, audible and visual disturbances to associated flora and fauna, as a result of the activities of the increased local populace. Increased potential for introduction of invasive non-native flora and fauna as a result of the increased local populace. Physical disturbance to and degradation of associated flora, as a result of the activities of the increased local populace.		The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Protected Fauna					
Non-volant Mammals: Badger Pine Marten Irish Stoat Hedgehog Pygmy Shrew	Low – High Local	Construction Stage: Degradation of supporting habitats, prey items / foraging resources and the physiological health of protected non-volant mammals as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of protected non-volant mammals commuting and foraging activities, as well as potential future resting sites (e.g. setts). Habitat loss and fragmentation of supporting terrestrial habitats. Operational Stage: Negligible to slight physical, noise and lighting disturbance to local non-volant	Construction Stage: Temporary to short-term negative impact of slight significance Operational Stage: Long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		mammal populations, when within, or in close proximity to Site 5 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 5. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and refuge habitats, the extent of which is lessened somewhat by the proposed operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 5.		fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Bats	High Local	Construction Stage: Loss of potential future roosting features within existing trees and structures. Degradation of supporting habitats, prey items / foraging resources and the physiological health of local bat populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Lighting and physical disturbance of the local bat populations' commuting and foraging activities. Habitat loss and fragmentation of supporting terrestrial habitats, including linear commuting features. Operational Stage: Negligible increase to collision risk mortality for bats frequenting the site. A notable increase in lighting disturbance for local bat populations, as a result of the illumination of the majority of Site 5 during operations.	Construction Stage: Temporary to medium-term negative impact of moderate significance Operational Stage: Long-term negative impact of moderate significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1.	Long-term negative impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		The fragmentation of dark commuting corridors within Site 5. Furthermore, there will be a reduced quality to all retained dark wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and refuge (potential future roosting features) habitats, the extent of which is lessened somewhat by the proposed operational landscape design.		Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 4 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 4 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Wintering Birds	High Local	<u>Construction Stage</u>: Large scale removal of suitable habitat, resulting in the loss of refuge and	<u>Construction Stage:</u>	<u>Construction Stage</u>: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1.	Long-term negative impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		foraging potential for migrant wintering bird populations, including Snipe. Degradation of supporting habitats, prey items / foraging resources and the physiological health of migrant wintering birds as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of migrant wintering bird populations' roosting, commuting and foraging activities. <u>Operational Stage</u>: Negligible to slight physical, noise and visual disturbance to migrant wintering bird populations, when within, or in close proximity to Site 5 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Permanent loss of foraging and roosting habitats, the extent of which is lessened entirely by the proximity to a new urbanised environment. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 5.	Temporary to short-term negative impact of slight significance <u>Operational Stage:</u> Long-term negative impact of slight significance	Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Operational Stage: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Breeding Birds	High Local	Construction Stage: Degradation of supporting habitats, prey items / foraging resources and the physiological health of breeding bird populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of breeding bird populations' commuting	Construction Stage: Temporary to long-term negative impacts of slight significance Operational Stage: Long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3.	Long-term positive impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		and foraging activities, as well as potential future nesting sites. Habitat loss and fragmentation of supporting terrestrial habitats, including those that provide nesting opportunities. <u>Operational Stage</u>: Negligible to slight physical, noise and visual disturbance to local breeding bird populations, when within, or in close proximity to Site 3 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 5. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and nesting habitats, the extent of which is lessened somewhat by the proposed operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 5.		The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Amphibians: Common Frog	Low Local	Construction Stage: Degradation of supporting habitats, prey items and physiological health of local Common Frog populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of amphibian commuting and foraging activities. Habitat loss and fragmentation of supporting terrestrial habitats. Operational Stage:	Construction Stage: Temporary to short-term negative impact of slight significance Operational Stage: Long-term negative impact that is not significant	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5.	Long-term positive impact that is not significant

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		Negligible to slight physical, noise and lighting disturbance to local amphibian populations, when within, or in close proximity to Site 3 operations. The introduction of pets to the area also has the potential to result in predation injuries and fatalities. Fragmentation of commuting corridor habitats within Site 5. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the case for the newly created wildlife corridors within the site. Permanent loss of foraging and hibernation habitats, the extent of which is lessened somewhat by the proposed operational landscape design. However, there will be an increase in total available spawning habitats for amphibians as result of the operational landscape design. Increased risk in road collision mortality as result of the operational vehicular traffic of Site 5.		The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3. Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4.	

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
				Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	
Terrestrial Invertebrates	High Local	Construction Stage: Degradation of supporting habitats and physiological health of terrestrial invertebrate populations as a result of surface water, groundwater to surface water, air, and air to surface water pollution (deleterious substances, excessive suspended sediments and sediment-bound nutrients, and cement-base dusts). Audible, visual and physical disturbance of terrestrial invertebrates commuting and foraging activities. Habitat loss and fragmentation of terrestrial habitats, which support life cycle stages of local pollinators. Operational Stage: Fragmentation of commuting corridor habitats within Site 5. Furthermore, there will be a reduced quality to all retained wildlife corridors while the proposed landscaping is still within the ecological lag (maturation) period. This is also the	Construction Stage: Temporary to short-term negative impact of slight significance Operational Stage: Long-term negative impact of slight significance	Construction Stage: Standard environmental best practice guidance as outlined in sub-section 6.8.2.1. Environmental management procedures for site compounds as outlined in sub-section 6.8.2.2. Mitigation measures within the surface water management; environmental incidence response; and dust management plans, as outlined in sub-section 6.8.2.3. The detailed mitigation measures provided within the invasive species management plan, as outlined within sub-section 6.8.2.4. The protection measures for retained trees within and immediately adjacent to Site 5, as outlined in sub-section 6.8.2.5. The safeguarding mitigations measures aimed to protect fauna associated with this habitat, as outlined in sub-section 6.8.2.7. General measures to ensure the safeguarding and persistence of rare and protected flora and fauna, as outlined in sub-sections 6.8.4.2 and 6.8.4.3.	Long-term positive impact of slight significance

Key Ecological Receptors	Ecological Valuation	Potential Impacts	Significance of Impact without Mitigation	Mitigation Measures	Significance of Residual Impacts
		case for the newly created wildlife corridors within the site. Permanent loss of foraging, hive-building and hibernation habitats, the extent of which is lessened somewhat by the proposed operational landscape design.		Specific measures to ensure enacting of ecologically-minded habitat seed bank (genetic) preservation during clearance, as outlined in sub-section 6.8.8.1. Specific measures to safeguard protected faunal species, as outlined in sub-section 6.8.8.2. Specific mitigation measures to control / management the spread and extermination of invasive non-native species, as outlined within sub-section 6.8.8.3. <u>Operational Stage</u>: The completion of all remedial planting within the Site 5 landscape planting plan, as outlined in sub-section 6.8.3.1. The correct functional specifications and alignment of all the elements contained within the Site 5 drainage (SuDS) and lighting designs, as outlined in sub-section 6.8.3.2 and 6.8.3.3. The protection of vulnerable fauna through ecological guidance of operational maintenance of dense vegetation and piles of vegetative debris, as outlined sub-section 6.8.3.4. Guidance measures in respect to the re-use of cleared tree limbs, during the initial operational stage, for the benefit of local fauna, as outlined within sub-section 6.8.3.5. Specific measures to secure the installation of remedial features for rare and protected fauna, as outlined in sub-sections 6.8.9.1.	

Table 6-38: Summary of Site 5 KERs and their respective valuations, potential impact; significance of unmitigated impacts; required mitigations; and residual impact

6.9.3 Cumulative Residual Impact (Sites 3, 4 and 5, and Local Developments)

The high-level strategic plans outlined in section 6.6.2, and listed below, including their policies and objectives were examined for potential in-combination effects with respect to the proposed development sites:

- South Dublin County Development Plan 2022-2028;
- Greater Dublin Drainage Strategy 2005;
- Transport Strategy for Greater Dublin Area 2022-2042; and
- Third Cycle River Basin Management Plan for Ireland 2022-2027.

Of the local permitted (and pending) plans and projects, and those for which an application for approval has been made but not yet determined, 12 projects are presented as the most likely to act in a cumulative manner given the presence of overlapping ZoIs with Sites 3, 4 and 5. These 12 development projects are listed below:

- SDZ24A/0032W;
- SDZ24A/0033W;
- SDZ23A/0043;
- SDZ23A/0018;
- SDZ23A/0004;
- SDZ22A/0018;
- SDZ22A/0017;
- SDZ22A/0011;
- SD228/0003;
- SDZ21A/0022;
- SDZ21A/0013; and
- SDZ20A/0021.

Each of these projects overlaps with one or more of the ZoI buffers, i.e. surface water, disturbance and dust, associated with Site 3, 4 and/or 5, where a subset of negative residual impacts are anticipated, even after the implementation of mitigation measures. Therefore, there is potential for cumulative and/or in-combination impacts to arise with the construction and operation of the three development sites. However, this chapter outlines within its mitigation section that the principal contractor, along with the sites' appointed ECoWs, will hold regular liaison meetings with other active and future construction sites within 500m of the proposed development sites (where there is the potential for cumulative and in-combination impacts, i.e., overlapping disturbance and dust settlement buffers), to ensure plans are co-ordinated so that the potential for cumulative and/or in-combination surface water, disturbance and dust impacts are prevented where possible, and at the very least minimised.

6.9.4 Worst Case Impact

In the unlikely event that mitigation measures within this chapter, and the ecological reports associated with the other local developments, fail to prevent construction and operational impacts from this development, and the cumulative and in-combination impacts generated between the three sites, and other identified developments within ZoI overlap, ultimately degrading/ removing / forcing out a range of the more sensitive and rare habitats, fauna and flora out of the Kishoge locality, leaving only the more urban adaptable flora and fauna within the area. Furthermore, these construction and operational impacts, either alone or cumulatively, will negatively impact Grand Canal pNHA,

degrading the biodiversity quality of the canal between the 9th and 12th locks. The Liffey Valley pNHA will also see the degradation of its water quality in this worst-case scenario. This will ultimately result in a notable reduction in the biodiversity value and functionality within the area.

6.10.1 Proposed Development – Site 3

6.10.1.1 Post-construction Monitoring of Flora and Fauna

Rare and Protected Flora

A qualified ecologist will conduct post-construction floral surveys over a 24-month period, one year apart during the optimal growth period, for the Lesser Centaury and Pyramidal Orchids, and any other rare or protected flora, which may have established between the time of writing of this chapter and the post-construction period of the proposed development. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Non-volant Mammals

A suitably qualified ecologist will conduct four mammal surveys (one summer and one winter) over a 24-month period in order to monitor mammal activity and potential new rest sites, as well as the potential use of provided artificial refuges (Hedgehog hibernacula). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

A suitably qualified environmental scientist or ecologist will regularly (every three months for the first 24 months of operations) monitor the level of lighting disturbance within the dark corridors of Site 4. The periodic monitoring will allow for the variation of vegetation and canopy cover during the different seasons and how they affect the levels of light spillage into the dark corridors. This monitoring can identify potential gaps in the cover and then provide recommendations on how to resolve this unintended light spillage (e.g. additional landscaping or cowling of specific lamp posts). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Bats

A 36-month post-construction monitoring period will be conducted by a suitably qualified bat ecology team on the local bat populations. The bat activity data collected during this monitoring period will be compared with that of the existing baseline, and the pre-construction surveys, in order to establish whether the general activity levels, flight patterns and specific habitat utilisation have been altered during these time periods. The ecology team will also check the use of the installed artificial bat boxes by the local bats. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

A suitably qualified environmental scientist or ecologist will regularly (every three months for the first 24 months of operations) monitor the level of lighting disturbance within the dark corridors of Site 4. The periodic monitoring will allow for the variation of vegetation and canopy cover during the different seasons and how they affect the levels of light spillage into the dark corridors. This monitoring can identify potential gaps in the cover and then provide recommendations on how to resolve this unintended light spillage (e.g. additional landscaping or cowling of specific lamp posts). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Breeding Birds

A 24-month post-construction monitoring period will be conducted by a suitably qualified ecology team on the local breeding bird species. The breeding bird data collected during this monitoring period will be compared with that of the existing baseline, the pre-construction surveys, in order to establish whether there has been changes to frequency of occurrence and numbers within Site 4. The ecology team will also monitor the use of the artificial bird nesting boxes during this 24-month period. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Invasive Non-native Species

A qualified invasive species specialist shall be engaged to verify if the invasive species recorded in this report are still present following construction works. This will be carried out for five years post-

construction and a copy of any records of the invasive flora shall be lodged with the NBDC, NPWS and SDCC. If invasive floral species are recorded, they shall be treated as per the measures outlined in the ISMP and any species-specific guidelines.

6.10.2 Proposed Development – Site 4

6.10.2.1 Post-construction Monitoring of Flora and Fauna

Rare and Protected Flora

A qualified ecologist will conduct post-construction floral surveys over 24-month period, one year apart during the optimal growth period, for the Lesser Centaury and Pyramidal Orchids, and any other rare or protected flora, which may have established between the time of writing of this chapter and the post-construction period of the proposed development. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Otter and other Non-volant Mammals

A suitably qualified ecologist will conduct four mammal surveys (one summer and one winter) over a 24-month period in order to monitor mammal activity and potential new rest sites, as well as the potential use of provided artificial refuges (Hedgehog hibernacula). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

A suitably qualified environmental scientist or ecologist will regularly (every three months for the first 24 months of operations) monitor the level of lighting disturbance within the dark corridors of Site 4. The periodic monitoring will allow for the variation of vegetation and canopy cover during the different seasons and how they affect the levels of light spillage into the dark corridors. This monitoring can identify potential gaps in the cover and then provide recommendations on how to resolve this unintended light spillage (e.g. additional landscaping or cowling of specific lamp posts). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Bats

A 36-month post-construction monitoring period will be conducted by a suitably qualified bat ecology team on the local bat populations. The bat activity data collected during this monitoring period will be compared with that of the existing baseline, and the pre-construction surveys, in order to establish whether the general activity levels, flight patterns and specific habitat utilisation have been altered during these time periods. The ecology team will also check the use of the installed artificial bat boxes by the local bats. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

A suitably qualified environmental scientist or ecologist will regularly (every three months for the first 24 months of operations) monitor the level of lighting disturbance within the dark corridors of Site 4. The periodic monitoring will allow for the variation of vegetation and canopy cover during the different seasons and how they affect the levels of light spillage into the dark corridors. This monitoring can identify potential gaps in the cover and then provide recommendations on how to resolve this unintended light spillage (e.g. additional landscaping or cowling of specific lamp posts). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Breeding Birds

A 24-month post-construction monitoring period will be conducted by a suitably qualified ecology team on the local breeding bird species. The breeding bird data collected during this monitoring period will be compared with that of the existing baseline, the pre-construction surveys, in order to establish whether there has been changes to frequency of occurrence and numbers within Site 4. The ecology team will also monitor the use of the artificial bird nesting boxes during this 24-month period. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Amphibians

A 24-month post-construction monitoring period, four surveys in total, will be conducted by a suitably qualified ecologist to monitor the use of the new waterbodies capable of supporting the

spawning of Common Frog and Smooth Newt. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Invasive Non-native Species

A qualified invasive species specialist shall be engaged to verify if the invasive species recorded in this report are still present following construction works. This will be carried out for five years post-construction and a copy of any records of the invasive flora shall be lodged with the NBDC, NPWS and SDCC. If invasive floral species are recorded, they shall be treated as per the measures outlined in the ISMP and any species-specific guidelines.

6.10.3 Proposed Development – Site 5

6.10.3.1 Post-construction Monitoring of Flora and Fauna

Non-volant Mammals

A suitably qualified ecologist will conduct four mammal surveys (one summer and one winter) over a 24-month period in order to monitor mammal activity and potential new rest sites, as well as the potential use of provided artificial refuges (Hedgehog hibernacula). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

A suitably qualified environmental scientist or ecologist will regularly (every three months for the first 24 months of operations) monitor the level of lighting disturbance within the dark corridors of Site 4. The periodic monitoring will allow for the variation of vegetation and canopy cover during the different seasons and how they affect the levels of light spillage into the dark corridors. This monitoring can identify potential gaps in the cover and then provide recommendations on how to resolve this unintended light spillage (e.g. additional landscaping or cowling of specific lamp posts). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Bats

A 36-month post-construction monitoring period will be conducted by a suitably qualified bat ecology team on the local bat populations. The bat activity data collected during this monitoring period will be compared with that of the existing baseline, and the pre-construction surveys, in order to establish whether the general activity levels, flight patterns and specific habitat utilisation have been altered during these time periods. The ecology team will also check the use of the installed artificial bat boxes by the local bats. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

A suitably qualified environmental scientist or ecologist will regularly (every three months for the first 24 months of operations) monitor the level of lighting disturbance within the dark corridors of Site 4. The periodic monitoring will allow for the variation of vegetation and canopy cover during the different seasons and how they affect the levels of light spillage into the dark corridors. This monitoring can identify potential gaps in the cover and then provide recommendations on how to resolve this unintended light spillage (e.g. additional landscaping or cowling of specific lamp posts). The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Breeding Birds

A 24-month post-construction monitoring period will be conducted by a suitably qualified ecology team on the local breeding bird species. The breeding bird data collected during this monitoring period will be compared with that of the existing baseline, the pre-construction surveys, in order to establish whether there has been changes to frequency of occurrence and numbers within Site 4. The ecology team will also monitor the use of the artificial bird nesting boxes during this 24-month period. The subsequent survey report will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Invasive Non-native Species

A qualified invasive species specialist shall be engaged to verify if the invasive species recorded in this report are still present following construction works. This will be carried out for five years post–construction and a copy of any records of the invasive flora shall be lodged with the NBDC, NPWS

and SDCC. If invasive floral species are recorded, they shall be treated as per the measures outlined in the ISMP and any species-specific guidelines.

6.11.1 Proposed Development (All Sites)

6.11.1.1 Landscape Maturation (Operational Habitat Functionality)

In order to guarantee that the operational landscaping, including the newly landscaped or reinstated areas, within the three sites, matures in manner that ensures the long-term ecological functionality of these new habitats, a suitably qualified ecologist (or ecologists) will be appointed to liaise with the post-construction landscape team. As dictated within the Biodiversity Management Plan (Appendix 6.3), yearly spring and summer visits will be conducted by the ecologist over a 60-month period so that they may identify potential functional ecological failings within the site's (sites') operational landscape(s). The ecologist will write up yearly summary reports detailing the natural maturation of habitats within the site's (sites') landscapes; and provide recommendations to resolve any identified issues, which may impede the long-term maturation of habitats at the targeted quality set out within the landscape designs for the site(s). The ecologist will then work with the post-construction landscape team to implement the ecological solutions provided within the summary report. The subsequent summary report(s) will be disseminated to relevant bodies, i.e. NPWS and SDCC.

Some minor difficulties were encounter during the collection of static bat data during the 2022 and 2023 bat activity seasons, with Sites 3 and 4 impacted as result of the deployed static recording device having a software malfunction or being knowingly, or unknowingly, interfered with by a member of the public. However, given that there is multi-season data available (Site 3); and the most recent data being unimpacted (Site 4), the project ecology team had more than enough data to accurately assess the potential ecological impacts on local bat species.

There were also some initial data deficiencies in respect to habitats and flora in Site 3 at the beginning of the baseline surveying as a result of some scrub fires; however, the multi-year surveying of Site 3 has provided ample follow-up habitat and flora data, allowing the project ecology team to make accurate assessments of habitat valuations and floral species diversity.

Based upon the information supplied, regarding the site layout, drainage, landscape and lighting design plans along with remedial planting; and provided that Sites 3, 4 and 5 are constructed in accordance with the ecological mitigation measures outlined above, there will be no significant negative impacts to any specific KERs within the ZoI, with the significance of negative long-term impacts ranging from 'Not significant' to 'Moderate', and the significance of positive impacts ranging from 'Not significant' to 'Slight'.