Ecological Impact Assessment (EcIA) for proposed upgrade works to Killinarden Park and Green Infrastructure Corridor in Whitestown, Tallaght

Technical Report

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South Dublin County Council

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Contract

This report describes work commissioned by South Dublin County Council, by a letter dated 27/05/2020. Malin Lundberg, Hannah Mulcahy and Patricia Byrne of JBA Consulting carried out this work.

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Purpose

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Abbreviations

AA ..... Appropriate Assessment
AADT ..... Annual Average Daily Traffic
CIEEM ..... Chartered Institute of Ecology and Environmental Management
DoEHLG ..... Department of Environment, Heritage and Local Government
EC ..... European Communities
EcIA ..... Ecological Impact Assessment
EPA ..... Environmental Protection Agency
EU ..... European Union
GI ..... Green Infrastructure
GIS ..... Geographical Information Systems
NBDC ..... National Biodiversity Data Centre
NIS ..... Natura Impact Statement
NOx ..... Nitrogen oxides
NPWS ..... National Parks and Wildlife Service
QI ..... Qualifying Interest
SAC ..... Special Area of Conservation
SPA ..... Special Protection Area
WFD ..... Water Framework Directive
ZoI ..... Zone of Influence

1 Introduction

This Ecological Impact Assessment (EcIA) has been prepared by JBA Consulting in relation to a proposed upgrade to Killinarden Park and construction of a Strategic combined pathway and cycleway along a section of Whitestown Stream in Tallaght, Dublin 24, by South Dublin County Council.

1.1 Aims

The aims of this EcIA are to:

- Establish baseline ecological conditions to enable identification of potentially important ecological features within the zone of influence of the project
- Determine the ecological value of identified ecological features
- Assess the significance of impacts of proposed project on ecological features of value
- Identify avoidance, mitigation or compensatory measures
- Identify residual impacts after mitigation and the significance of their effects
- Identify opportunities for ecological enhancement and net gain of biodiversity

1.2 The Existing Site

Killinarden Park is located in Tallaght, Co. Dublin (Figure 1-1). The site is bound by a combination of residencies and associated roads and schools to the east and west. Cnoc Mhuire Senior School is situated directly to the west of the site, while Sacred Heart Senior School lies directly to the east, To the north, Killinarden Park is bound by Whitestown Stream and L3014 Killinarden Way. L3012 Killinarden Heights abuts the southern edge of the park.

Whitestown Stream flows through the northern section of the Park in an easterly direction. Past the park the steam flows through an area of unmade land between Tallaght Business Park into Sean Walsh Park to the east, along which the Strategic Corridor will continue.

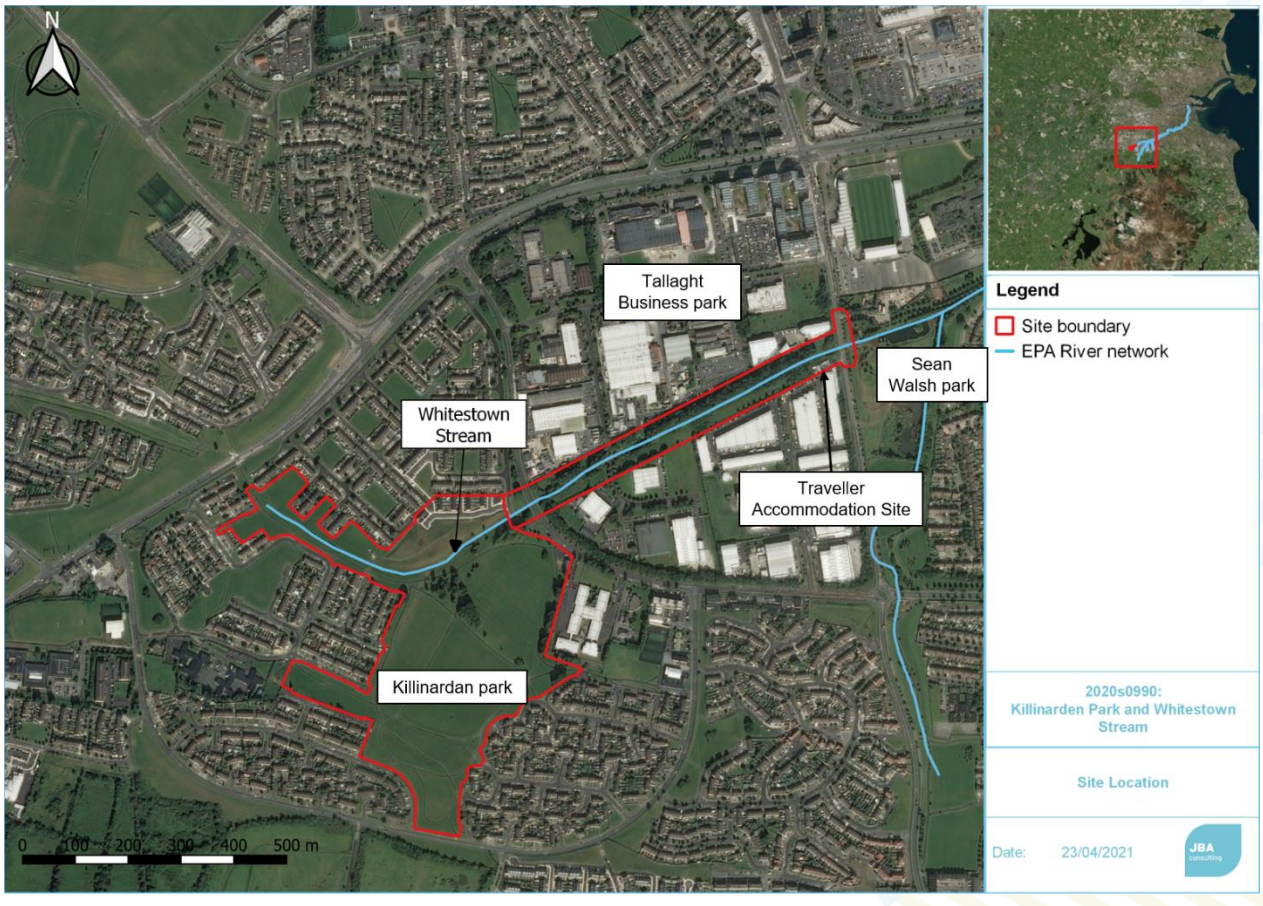

Figure 1-1: Site location (Imagery: Bing maps)

2 Project Description

South Dublin County Council proposes to carry out the following project:

- Killinarden Park upgrade, total site area approx. 20ha; and
- Cycle and Pedestrian corridor with landscaped pedestrian/cycle routes between Killinarden Park and Sean Walsh Park, total site area approx. 4.50ha.

The works comprise:

- Strategic walk/cycleway with bat sensitive lighting along Whitestown Stream; new and enhanced entrances, including new road crossings at Killinarden Heights, Whitestown Drive, Whitestown Way and Killinarden Way/Killinarden Estate (with a revised carriageway arrangement); feature areas at primary and secondary accesses; a Primary Oval footpath and walking/exercise circuit 1km in length; existing secondary footpath network retained and resurfaced where required; and a new footbridge crossing the Whitestown Stream within the park.
- Replacement and new park perimeter walls/railings where required; retention of existing private walls/railings.
- Linear play trails, seating; two natural play areas; outdoor fitness and calisthenics equipment; a Multi-use Games and Skate Area; upgrade of existing grass sports pitches, to include re-levelling where required.
- Biodiversity and landscape improvements including a community orchard; wildflower meadows; surface water swale; willow clumps; native woodland; informal tree groups; signature trees; and retention of existing tree groups and scrub where shown.
- Installation of CCTV Cameras for monitoring by An Garda Siochána and South Dublin County Council.
- All ancillary works.

This work will be part of a Strategic Green Infrastructure (GI) Corridor with landscaped pedestrian/cycle routes between Killinarden Park and Sean Walsh Park (Figure 2-1). There is a long-term intention to relocate the section of route alongside the Traveller Accommodation Site (Figure 1-1) to a position that is further away from the Whitestown Stream, if and when the Traveller Accommodation Site is relocated in accordance with the Traveller Accommodation Programme for the County.

Figure 2-1 Proposed design layout of the upgrade to Killinarden Park and route of the Green Infrastructure Corridor. A larger version with a legend of this design is in Appendix A.

2.1 Construction elements

The works will comprise of the following:

Construction of strategic corridor along Whitestown Stream:

- The strategic footpath and cycleway corridor along the south side of the Whitestown Stream, 4.0m wide shared surface, linking Killinarden Park to Sean Walsh Park
- The site is approximately 630 metres in length.
- The footpath/cycleway will require excavation to 300mm deep into unmade land, with 150mm subbase and 4.0metre in width, topped with Asphalt.
- Non-intrusive, motion sensor street lighting of 6m high mono-directional LED luminaires. The lighting poles will require 1.5m depth excavations.
- Installation of CCTV Cameras for monitoring by An Garda Siochána and South Dublin County Council

Upgrade to access and circulation within the park:

- Strategic walk/cycleway access to north side of park, along Whitestown Stream, 4.0m wide shared surface, a continuation of the strategic corridor that will link Killinarden to Sean Walsh Park.
- Creation of a fully accessible Primary Oval footpath, 3.0m wide, connecting the main park facilities and providing a walking/exercise circuit 1km in length, connected southwards across Killinarden Heights to the future Elder Park and onwards to the foothills and uplands;

- Non-intrusive, motion sensor street lighting of 6m high mono-directional LED luminaires at park entrances and along the strategic corridor. The lighting poles will require 1.5m depth excavations.
- Installation of CCTV Cameras for monitoring by An Garda Siochána and South Dublin County Council
- Enhanced primary pedestrian/cycle entrances to the park, including new road crossings at Killinarden Way to the North-east and Killinarden Heights to the south;
- Enhanced secondary pedestrian/cycle entrances by the existing pedestrian crossing on the N81 to the west, and at an improved crossing on Whitestown Way to the east;
- Feature areas at primary and secondary accesses, for gathering, seating and orientation;
- Existing secondary footpath network retained and resurfaced where required;
- One new bridge across the Whitestown Stream.

Upgrade to Boundary Treatments in park:

- Replacement and new public park perimeter wall/railings where required;
- Retention of existing private wall/railings;
- Pinch-points and bollards at all pedestrian/cycle access points to the park.

Installation of Recreation Facilities in park:

- Linear play trails along main walkways, with natural play equipment, sculptures and informal seating;
- Two natural play areas located around the Primary Oval, with nearby seating/social areas;
- Multi-use Games Area and Skate-ramp close to GAA Club, with teenager social space;
- Upgrade of existing grass sports pitches where required (e.g. re-levelling).

Landscape and Biodiversity in park:

- Continuous wildflower meadow around western side of park and extended along parts of Whitestown Stream, with pollinator-friendly native species;
- Drainage swale along western boundary, connected to Whitestown Stream;
- Clumps of willow scrub along Whitestown Stream for enhanced amenity and habitat creation;
- Continuous woodland around eastern side of park with native tree and shrub species;
- Community orchard to north of park with over 100 heritage fruit and nut trees;
- Informal tree groups dispersed throughout the park at key activity points;
- Semi-mature Signature Trees to reinforce the Primary Oval footpath;
- Existing tree groups retained;
- Existing trees and scrub along strategic cycle/pedestrian route retained and managed for biodiversity.

Existing Vegetation:

- All trees to be retained in accordance with BS5837:2012 ‘Trees in relation to design, demolition and construction – Recommendations’.

Table 2-1 Main Construction elements of landscape plan

Element	Description	Excavation depth (approx.)
Strategic walk/cycleway	Asphalt, 4.0m wide, 60mm th + 150mm sub-base	300mm
	Kerbs, PCC, 50x150mm	
	Lighting columns of 6m high pole, mono-directional LED luminaires with motion sensor	1.5m

Oval footpath	Asphalt, 3.0m wide, 60mm th + 150mm sub-base	300mm
	Kerbs, PCC, 50x150mm	
Entrance feature areas	Blockwork walls, rendered, average 1.2m high x 350mm wide	1.0m
	PCC pavers, 80mm th + 150mm sub-base	300mm
	Walls in PCC	1m
	PCC Pavers Surface	300mm
	Street lighting 6m high pole, mono-directional LED luminaires	1.5m
	Service ducts	600mm
Footbridge	Width=4m, length=35m max, Height=1.8m high ground piles	Pile depth=1.8m
MUGA	Artificial surface on 150mm sub-base	300mm
	Fencing and floodlights	1.5m
	Skate-ramp, conc.	600mm
Play equipment	Timber, various types, set in ground with conc. founds.	1.0m
CCTV		1.5m

3 Methodology

3.1 The EcIA team

This Ecological Impact Assessment was completed by Patricia Byrne (BSc (Hons), PhD, MCIEEM) and Malin Lundberg (BSc (Hons), MSc), and Hannah Mulcahy (BSc (Hons), MSc), all experienced field ecologists with JBA.

The report has been reviewed by Dr Steven Heathcote BA(Hons) DPhil MCIEEM a Senior Ecologist at JBA with over 10 years' consultancy experience.

These staff members thus fulfil the Environmental Impact Assessment (EIA) Directive personnel requirements of 'competent persons'.

3.2 Policy and Legislation

Policy and legalisation for nature conservation, protected and priority species relevant to the proposed project is provided in Appendix D.

3.3 Guidance

This assessment was conducted in accordance with the following guidance documents:

- 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).
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (Draft) Environmental Protection Agency (EPA, 2017).
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009a).
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008b).
- Best Practice Guidance for habitat Survey and Mapping, The Heritage Council. (Smith et al. 2011).

3.3.1 Consultation with Inland Fisheries Ireland

JBA Consulting contacted Inland Fisheries Ireland (IFI) in March 2021 to discuss the preferred route selection of the Strategic GI Corridor along the Whitestown Stream outside of Killinarden Park in regards to impact to water quality and fish. IFI advised the following points:

- Regarding route selection it is IFI preference that the route will have the least impact on the existing ecology, where possible existing pathways should be used widened and upgraded if required.
- Where new pathways are to be constructed detail should be provided on the width and depth , fill materials to be used, management , storage and disposal of excavated material.
- Drainage arrangement cognisant of GDSDS recommendations and SuDS technologies should be incorporated within the design.
- A plan for the Identification, management, treatment and disposal of alien species is required. Any new planting must be with native species (All Ireland Pollinator Plan). The protection of habitats and their biodiversity from increasing invasion by alien species is key. Biosecurity and environmental sustainability of the Greenway is essential.
- Maintenance and development of suitable riparian habitat throughout should be planned.
- All construction works should be in line with a Construction Environmental Management Plan (CEMP). The CEMP should identify potential impacts and mitigating measures, it should provide a mechanism for ensuring compliance with environmental legislation and statutory consents. The CEMP should detail and ensure Best Construction Practices including measures to prevent and control the introduction of pollutants and deleterious matter and measures to minimise the generation of sediment and silt.

3.4 Baseline

To determine the baseline conditions at the site a review of all available information was made. When determining the pre-work conditions on-site, including the presence or absence of protected habitats and/or species, the precautionary principle was used where limited information was available. The following reports were consulted during this process:

- A desk-based assessment was carried out to collate information regarding protected/notable species and statutorily designated nature conservation sites in, or within close proximity to, the study area.
- A data search for protected and notable species was conducted using the National Biodiversity Data Centre Mapping System (National Biodiversity Data Centre, 2020). A 10km grid square was used to encompass the study area and species records were extracted from the map at a 10km² resolution.
- Information for statutory designated sites including Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar Sites, Natural Heritage Areas (NHAs) and proposed NHAs (pNHA) was collected from the online resources provided by the National Parks and Wildlife Service (NPWS).

Other information on the local area was obtained, including information form the following sources:

- NPWS (2019a). The Status of EU Protected Habitats and Species in Ireland. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland (NPWS 2019a).
- NPWS (2019b). The Status of EU Protected Habitats and Species in Ireland. Habitats Assessment Volume 2. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland (NPWS 2019b).
- NPWS (2019c). The Status of EU Protected Habitats and Species in Ireland. Species Assessment Volume 3. Habitats Assessment Volume 2. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland (NPWS 2019c).
- Environmental Protection Agency online databases on water quality (Available online at https://gis.epa.ie/EPAMaps/).
- Aerial photography available from www.osi.ie and Google Maps http://maps.google.com/ ;
- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie; Accessed September 2018.;
- National Biodiversity Data Centre – Species Distribution Maps; Available online at www.biodiversityireland.ie Accessed on various dates;
- All Ireland Red Data lists for vascular flora, mammals, butterflies, non-marine molluscs, dragonflies & damselflies, amphibians and fish;
- Water Framework Directive water maps (available online at http://www.wfdireland.ie/maps.html and https://www.catchments.ie/); and
- International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (available online at http://www.iucnredlist.org).

3.4.1 Zone of Influence

The zone of influence (ZoI) for the project is based on a judgement of the likely extent of the ecological impacts. This will vary for different ecological features, depending on their sensitivities to environmental change. For the majority of the project, impacts will be limited to within the site boundary. However, for impacts relating to airborne emissions, surface and ground water and disturbance, the ZoI is extended to 10km.

3.4.2 Field Surveys

Ecological baseline surveys were carried out in the area within and directly adjacent to the proposed development site, and the presence or likely presence of protected species, and the presence of good potential habitats for those species. All sites visits, dates, survey team and field survey methodology is summarised in Table 3-1

Table 3-1: Surveys carried out in Killinarden Park

Survey	Date	Survey team	Survey method reference
Habitats and Flora and Non-native alien invasives	29.06.2020	JBA, JBB	Best Practise Guidance for Habitat Survey and Mapping, by the Heritage Council (Smith et al., 2011a); Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2009b);
Wintering Birds	16.12.2020, 13.01.2021, and 10.02.2021	JBA	Irish Wildlife Manual No. 106, Irish Wetland Bird Survey 2009/10-2015/16 (Lewis et al., 2019)
Breeding Birds	29.06.2020	JBA, JBB	CBS Manual - Guidelines for Countryside Bird Survey participants (BWI, 2012)
Kingfisher	29.06.2020 30.03.2021	JBA, JBB	CBS Manual - Guidelines for Countryside Bird Survey participants (BWI, 2012) and consultation with JBA in-house bird expert
Mammals (including Otter)	29.06.2020	JBA, JBB	Ecological Surveying Techniques for Protected Flora and Fauna during the Planning Road Scheme (NRA 2004)
Bat roost potential	29.06.2020	JBA, JBB	Bat Surveys for Professional Ecologists (Collins, 2016);
Bat activity	10-29.06.2020	JBA	Bat Surveys for Professional Ecologists (Collins, 2016);
Aquatic invertebrates	22.07.2020	JBA	Biological And Physico-Chemical Surveillance And Water Quality Assessment of Rivers, by the Environmental Protection Agency (EPA) in 2005. Guide to Freshwater Invertebrates (Dobson et al., 2012). Small Stream Risk Score Manual (EPA, 2005).
Terrestrial invertebrates	29.06.2020 18.08.2020	JBA	Irish Wildlife Manual No. 96, An Invertebrate survey of Scragh Bog, Co Westmeath (Anderson, et al. 2017)
Amphibian	10.02.2021	JBA	Ecological Surveying Techniques for Protected Flora and Fauna during the Planning Road Scheme (NRA 2004)
Eel and Lamprey	26.09.2020	Ross Macklin	Methodology outlined in Fisheries report, Appendix C
Eel and Newt eDNA	March 2021	Ross Macklin	Methodology outlined in Fisheries report, Appendix C

3.4.2.1 Habitat Survey and Baseline Ecology

The first site visit was conducted by JBA Ecologists, Malin Lundberg, Patricia Byrne and J.B. Barry Consultant Ecologists Harry Jones and Namrata Kaile on 29 June 2020. A baseline ecological survey

(habitats, flora, invasive alien plant species) was carried out, as well as surveys for breeding birds, Kingfisher and mammals, including Otter. Bat roost potential was also noted. An invertebrate survey for pollinators including butterflies and bumblebees was included on this day and on 18 August 2020. Aerial photographs and site maps assisted the habitat survey. Habitats have been named and described following (Fossitt 2000). Nomenclature for higher plants principally follows that given in Parnell and Curtis (2012).

3.4.2.2 Bat Survey

A preliminary bat roost survey was conducted by JBA and JBB ecologists on the 29th of August 2020. During this walkover survey the ecologists also recorded (from ground level) the suitability of habitats for bats for foraging and commuting purposes; identified and assessed potential roost features (PRFs) present on the proposed site; and assigned a level of suitability to each based on best practice guidance. The assigned level of suitability recorded during the preliminary survey, i.e. suitable foraging, roosting and commuting habitats, determines the amount and frequency of follow-up surveys required to fully assess bat activity within the site, as per the guideline instructions outlined in Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition) (Collins 2016).

A static bat detector was installed in Killinarden Park for 8 nights between the dates 11-18 August 2020 to record bat activity (see Table 4-5). The detector was installed in a tree, facing the Whitestown Stream just west of Killinarden Way (ITM coordinates: 707739 726542). Another static bat detector was installed on a tree next to Whitestown Stream (ITM coordinates: 707874, 726632) within the site for 6 nights during the period 18.08.2020 - 24.08.2020 to record the bat activity in the area. A second static bat detector was installed further downstream in Sean Walsh Park (ITM coordinates: 708543, 726949) during the period 11.08.2020 - 17.08.2020. Data collected by the static bat detectors was analysed by Malin Lundberg and William Mulville using AnalookW software, with all results checked for quality control by JBA Bat Specialist Tanya Slattery.

3.4.2.3 Aquatic invertebrate survey methodology

Aquatic invertebrates were surveyed on 22 July 2020. This survey type is in line with the monitoring and assessment of water body status that are an integral part of the management strategy for river water quality to meet the EU Water Framework Directive's (WFD) (2000/60/EC) objectives. The EU WFD requires all Member States to protect and improve water quality in all waters so that we achieve good ecological status by 2015 or, at the latest, by 2027. It was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

A total of three samples were taken, two from Whitestown Stream and the other from Jobstown Stream within the boundaries of the Whitestown Stream Park and Sean Walsh Park. This sampling effort was deemed sufficient for the assessment of the streams overall biological quality. The sampling points along the streams are shown in Figure 4-14.

The kick-sample was 2 minutes in length, plus additional stone washing as per the methodology set out in the document - Biological And Physico-Chemical Surveillance And Water Quality Assessment of Rivers, by the Environmental Protection Agency (EPA) in 2005.

With the exception the Whitestown Stream sample (artificial stream bed), the sample was collected from the fast flowing (riffle) areas of the river using a standard hand net (250mm width, mesh size 1mm; adhering to ISO Standard for kick sampling and utilising the EPA protocols). The stone washing procedure ensured that species which cling to stone surfaces – e.g. leeches and gastropods, were effectively collected. Macroinvertebrates collected from each sample were stored in plastic zip-lock bags.

Sample invertebrate specimens were identified to the minimum of Family level; and Genus and Species level where possible, using the Guide to Freshwater Invertebrates (Dobson et al., 2012).

Q-values were calculated for the invertebrate sample using the guidance set out in the document – 'Biological And Physico-Chemical Surveillance And Water Quality Assessment of Rivers', produced by the Environmental Protection Agency (EPA).

Additionally, Small Stream Risk Scores were calculated for the invertebrate sample using the methodology set out in the Small Stream Risk Score Manual (EPA, 2005).

3.4.2.4 Fish Survey Methodology

The following surveys were undertaken in two locations for the Whitestown Stream in Killinarden Park in September 2020:

- Fish stock assessment (electro-fishing)
- Fisheries habitat survey/appraisal
- eDNA analysis (taken from 2 downstream ponds in Sean Walsh Park)

The full report including detailed methodology is included in Appendix C.

3.4.2.5 Kingfisher breeding survey

A follow up survey was undertaken along Whitestown Stream to check for possible nesting sites for Kingfisher on the 30th March 2021. JBA bird expert Chris Toop was consulted on methodology prior to surveying.

3.5 Screening of Ecological Features

The ecological features identified during the walkover surveys and from desk-based assessments were reviewed.

An EIA screening has been prepared in conjunction with this report and results of this EcIA will inform the screening. An informal screening process is presented at the start of the results section to ensure that the assessment focuses only on features where the impact could have important consequences for biodiversity (valued ecological features). Any features which are important beyond the site level were identified for further evaluation. Ecological features with little or no value beyond the site level were screened out and a short statement explaining this is given in the screening section.

An Appropriate Assessment (AA) Screening Report has been produced separate to this EcIA to assess the potential for effects on Designated Natura 2000 sites. The AA Screening Report concluded there would be no likely significant effects on European sites arising from the proposed development, either alone or in-combination with other plans or projects.

3.6 Assessment of the Effects on Features

Ecological features include nature conservation sites, habitats, species assemblages/ communities, populations or groups of species. The assessment of the significance of predicted impacts on ecological features is based on both the 'value' of a feature, and the nature and magnitude of the impact that the project will have on it. The impact is based on the project which includes a certain amount of designed-in mitigation, including construction best practice measures that will be implemented with a high degree of certainty.

3.6.1 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).
- Any economic benefits that they provide.

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 may 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.

Designated sites, habitats and species populations have been valued using the scale in Table 3-2.

Table 3-2: Examples of criteria used to define the value of ecological features

Level of Value	Examples of Criteria
International	An internationally important site e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar (or a site considered worthy of such designation). A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive). Designated shellfish waters. Major fisheries area.
National	A nationally designated site e.g. Natural Heritage Area (NHA), a proposed Natural Heritage Area (pNHA), statutory Nature Reserve, or a site considered worthy of such designation. A viable area of a habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole. A regularly occurring substantial population of a nationally important species, e.g. listed on The Wildlife Act 1976 or The Wildlife (Amendment) Act 2000. A species included in the Irish Red Data Lists/Books. Significant populations of breeding birds.
Regional/County (Co. Dublin)	Species and habitats of special conservation significance within County Dublin. An area subject to a project/initiative under the County's Biodiversity Action Plan. A regularly occurring substantial population of a nationally scarce species.
Local (works site and its vicinity)	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration. A good example of a common or widespread habitat in the local area. Species of national or local importance, but which are only present very infrequently or in very low numbers within site area.
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.

3.6.2 Magnitude of Impacts

Ecological impacts can be categorised and assessed in a number of ways. They can be considered to be:

- Positive - A change which improves the quality of the environment.
- Neutral - A change that does not affect the quality of the environment.
- Negative - A change which reduces the quality of the environment. A negative impact can be sufficiently minimised or eliminated by the adoption of appropriate mitigation measures.
- Uncertain - When the full consequences of a change in the environment cannot be described.

In addition, the nature of impact can also be described in a number of ways, including:

- Direct/Indirect - a direct impact could include the loss of a species or habitat, whereas an indirect impact could be as a result of noise, dust or disturbance.
- Irreversible - when the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost. Alternatively, impacts can be temporary in nature, with the baseline condition restored after a period of time; this could occur over the short-term (1-2 years), medium-term (2-10 years) or long-term (+10 years).

- Cumulative - the addition of many small impacts to create one larger, more significant impact.
- Synergistic: Where the resultant impact is of greater significance than the sum of its constituents.

These factors are assessed together to determine the magnitude of the impact on the status of a habitat or species population, and on the integrity of the site that supports them. Professional judgement is then used to assign the impacts on the receptors to one of four classes of magnitude, detailed in Table 3-3.

Table 3-3: Definition of magnitude

Magnitude	Definition
High	An irreversible or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.
Medium	A medium to long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group, which if adverse, is unlikely to threaten its sustainability (or if beneficial, is likely to be sustainable but is unlikely to enhance its conservation status.'
Low	A short-term but temporary impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group that is within the range of variation normally experienced between years.
Negligible	A short-term but temporary impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group that is within the normal range of annual variation.

3.6.3 Significance of impacts

The significance of an impact is a product of the value of the ecological feature and the magnitude of the impact on it, moderated by professional judgement. Table 3-4 shows a matrix which is used for guidance in the assessment of significance, with impacts being considered to be of major, moderate or minor significance, or negligible. Impacts can also either be assessed as positive or negative using the same matrix.

Table 3-4: Significance of impacts matrix

Value of feature	Magnitude of impact			
	High	**Medium**	**Low**	**Negligible**
International	Major	Major	Moderate	Neutral
National	Major	Moderate	Minor	Neutral
Regional / County	Moderate	Minor	Minor	Neutral
Local	Minor	Minor	Negligible	Neutral
Less than local	Negligible	Negligible	Negligible	Neutral

3.6.4 Residual Impacts

The project is assessed including some designed-in mitigation. 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 Ecological Impact Assessment 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.

3.7 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 ranges, territories or catchments where there is the potential for a significant impact on a site or species.

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

- South Dublin Development Plan 2016 - 2022 (South Dublin County Council 2016)
- Tallaght Town Centre Local Area Plan 2020 (SDCC 2020a)
- River Basin Management Plan for Ireland 2018-2021 (DoHPLG 2018)
- Greater Dublin Drainage (GDD) (Irish Water 2021)
- Killinarden Masterplan (SDCC 2020b)
- Planning Applications (compiled from myplan.ie) (NPAD 2021)

3.8 Constraints and Limitations

This EcIA is based on several site visits and existing data from the above-mentioned sources. The report necessarily relies on some assumptions and is inevitably subject to some limitations. These do not affect the conclusion, but the following points are recorded in order to ensure the basis of the assessment is clear:

- Changes to the site since surveys were undertaken cannot be accounted for, however the site surveys have followed the CIEEM guidance provided on suitable lifespan for surveys (CIEEM (2019)) Advice note on the lifespan of ecological reports and surveys).
- The precautionary principle is used at all times when determining potential ecological sensitivity of the site.
- Bat activity surveys were not carried out due to safety concerns of carrying out surveys at night in this area. Static detectors recording bat activity was deemed sufficient survey effort for the scale of this project.

4 Baseline Conditions

This section is a collation of present information gathered on the existing environment of Killinarden Park from existing reports and desk-based sources and multiple site visits and surveys carried out in 2020 and 2021, as detailed in Section 3.4.

4.1 Designated Sites

This section lists the designated sites of International or National importance. Information for these sites was collected from the online resources provided by the National Parks and Wildlife Service (NPWS).

Table 4-1 lists these designated sites with their respective importance and distance from the proposed site development.

Table 4-1: Proximity and importance of designated sites within the 10km ZoI of the proposed site development

Designation	Name [Code]	Importance	Approx. direct distance from site
SAC + pNHA	Glenasmole Valley [001209]	International/ National	1.3km
SAC + SPA	Wicklow Mountains [002122] [004040]	International	4.0km
pNHA	Lugmore Glen [001212]	National	1.2km
pNHA	Dodder Valley [000991]	National	1.8km
pNHA	Glenasmole Valley [001209]	National	2.0km
pNHA	Slade Of Saggart And Crooksling Glen [000211]	National	3.8km
pNHA	Grand Canal [002104]	National	5.5km
pNHA	Liffey Valley[000128]	National	8.4km
pNHA	Fitzsimon's Wood [001753]	National	9.8km

Figure 4-1 illustrate the locations of the statutory (Natura 2000) and non-statutory (proposed Natural Heritage Area) designated sites within the ZoI of the site.

Table 4-2 summarises the site briefs, qualifying interests, relevant threats and pressures and their impacts and sources in relation to the Natura 2000 sites within the 10km ZoI and Table 4-3 summarises the site briefs and ecological features of exclusively proposed Natural Heritage Areas within the 10km ZoI sites listed in Table 4-1.

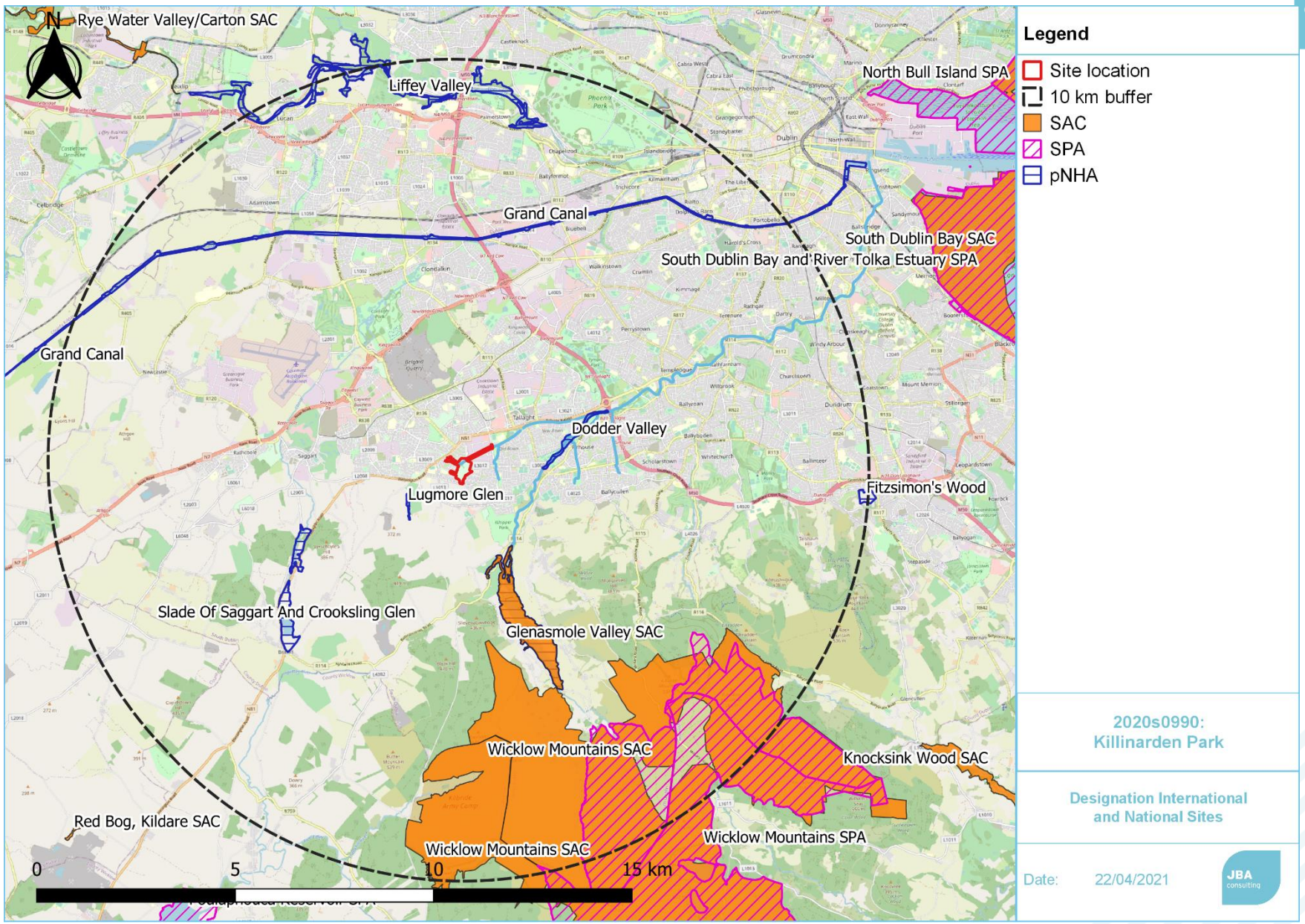

Figure 4-1: Statutory and non-statutory designated sites within the 10km Zone of Influence (OSM, 2021)

Table 4-2: Site briefs; Qualifying Interests; and project-relevant threats /pressures and their impacts and sources in relation to the Natura 2000 sites within the 10km ZoI (plus hydrological connectivity extension).

Site Name	Brief	Qualifying Interests	Threats / Pressures: Impact
Glenasmole Valley SAC	Glenasmole Valley lies at the northern foothills of the Dublin and Wicklow Mountains. It is a glaciated valley, with drift deposits, consisting of fluvioglacial sands and gravels of varying thickness and rich in Carboniferous limestone, occurring on the slopes. Spring lines occur along both sides of the northern part of the valley. The River Dodder flows through the valley and within the site the river has been impounded to form two reservoirs. Associated with the reservoirs are areas of swamp and marsh vegetation. The valley is heavily wooded, mostly with mixed woodland of both deciduous and coniferous species but also some native woodland. Dry calcareous pasture grassland, improved to varying degrees, is a main habitat of the valley sides and occurs in association with wet grassland and, in places of seepage, fen or marsh type vegetation. (NPWS 2017b)	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] Petrifying springs with tufa formation (Cratoneurion) [7220] 2km (NPWS, 2018b)	Human induced changes in hydraulic conditions: H (inside) Fertilisation: M (both) Diffuse pollution to surface waters due to household sewage and waste waters: M (outside) Invasive non-native species: M (inside) Diffuse pollution to surface waters due to abandoned industrial sites: M (outside) Discontinuous urbanisation: M (outside) (Full list of threats and pressures are listed in (NPWS 2017a)
Wicklow Mountains SAC	The site comprises the largest complex of upland habitats in eastern Ireland, with important examples of blanket bog, wet heath and dry heath, extensive in area and mostly of good quality. Alpine heath occurs at high levels, along with calcareous and siliceous rocky habitats harbouring an arctic-alpine flora. A fine series of oligotrophic lakes occur and some have *Salvelinus alpinus*. Several oakwoods of moderate quality, typical of the dry acidic woods of eastern Ireland, are found. Seven Red Data Book plant species occur, including the rare *Alchemilla alpina* and *Nitella gracilis* at its only Irish station. The site supports significant populations of breeding *Falco columbarius* and *Falco peregrinus*. The site is important for rare breeding passerines of oakwoods, notably *Phoenicurus phoenicurus* and *Phylloscopus sibilatrix*. The site also has breeding *Turdus torquatus* and *Lagopus lagopus. Lutra lutra* occurs on several of the riverine systems. (NPWS 2017c)	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110] Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Calaminarian grasslands of the Violetalia calaminariae [6130] Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Lutra lutra (Otter) [1355] (NPWS 2017b)	Urbanised areas, human habitation: Moderate Impact (both) (Full list of threats and pressures are listed in (NPWS, 2017c)
Wicklow Mountains SPA	This is an extensive upland site, comprising a substantial part of the Wicklow Mountains. The underlying geology of the site is mainly of Leinster granites, flanked by Ordovician schists, mudstones and volcanics. The area was subject to glaciation and features fine examples of glacial lakes, deep valleys and moraines. Most of site is over 300 m, with much ground over 600 m and the highest peak of Lugnaquillia at 925 m. The substrate over much of site is peat, with poor	Merlin (Falco columbarius) [A098] Peregrine (Falco peregrinus) [A103]	

Site Name	Brief	Qualifying Interests	Threats / Pressures: Impact
	mineral soil occurring on the slopes and lower ground. Exposed rock and scree are features of the site. The dominant habitats present are blanket bog, heaths and upland grassland. Fine examples of native Oak woodlands are found in the Glendalough area. The site, which is within the Wicklow Mountains National Park, is fragmented into about 20 separate parcels of land. (NPWS 2014)		
High-H, medium-M, Low- L (Source- inside, outside, both) * = priority Annex I habitat			

Table 4-3: Site briefs and ecological features of exclusively proposed Natural Heritage Areas within the 10km ZoI.

Site Name	Brief	Ecological Features
Lugmore Glen pNHA	This small wooded glen is located about 2 km south-east of Saggart in Co Dublin. It is quite a narrow valley cut in glacial drift. A small stream winds through the valley. It is a fine example of a wooded glen with a good representation of woodland plants. This type of semi-natural habitat is now scarce in Co Dublin. The presence of a rare plant species adds to the interest of the site (NPWS N.D.).	River and woodland
Dodder Valley pNHA	Dodder Valley contains a mix of habitats, including woodland scrub with well-developed understorey, wildflower meadows along the riverbanks and the river habitat. The site supports 48 species of birds and a Sand Martin riparian colony of up to 100 pairs are nesting in one section of the banks (NPWS N.D.)	River and woodland
Glenasmole Valley pNHA	Glenasmole Valley in south Co. Dublin lies on the edge of the Wicklow uplands, approximately 5 km from Tallaght. The River Dodder flows through the valley and has been impounded here to form two reservoirs which supply water to south Dublin. (NPWS N.D.)	River and woodland and orchid-rich grassland
Slade Of Saggart And Crooksling Glen pNHA	This site is located in the south-west of the county and stretches from Brittas northwards to approximately 2 km south of Saggart. The northern half of the site comprises a river valley with steep tree-covered sides, while the southern side is flatter and contains two small lakes, the Brittas Ponds. (NPWS N.D.)	Lake, river and woodland
Liffey Valley pNHA	Liffey Valley is located on the north side of Dublin The Liffey Valley site comprises a salmonid river between Leixlip Bridge on the Kildare-Dublin border and downstream of the weir at Glenaulin, Palmerstown, Co. Dublin. Terrestrial habitats include mixed deciduous woodland on both sides of the river, with willow and Alder fringing the river in places. (NPWS N.D.)	River, woodland, marsh
Grand Canal pNHA	The site comprises a canal channel and the banks on either side of it of the man-made canal between the River Liffey at Dublin and the River Shannon at Shannon Harbour, and the Barrow at Athy. (NPWS N.D.)	Canal, hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland.
Fitzsimon's Wood pNHA	FitzSimons Wood contains a good example of a seminatural woodland and a pond that holds a populations of Smooth Newt. (DLR N.D.)	Woodland, meadow, pond, scrub, smooth newt

4.1.1 Screening of Designated Sites

An AA Screening has been carried out for this project by JBA (2021). Following initial screening, and based upon best scientific judgement it is concluded that there will be **no likely significant effects** from the project on the following Natura 2000 sites within the Zone of Influence:

- Glenasmole Valley SAC
- Wicklow Mountains SAC
- Wicklow Mountains SPA
- South Dublin Bay and River Tolka Estuary SPA
- South Dublin Bay SAC
- North Bull Island SPA
- North Dublin Bay SAC

Glensamole Valley pNHA is located within Glensamole Valley SAC and has the same receptors as the Natura 2000 sites. As such, the assessment of any potential impacts on this site is covered within the AA Screening report and there are no likely significant impacts on Glensamole Valley pNHA.

All other protected sites can be screened in as they are within in the Zone of Influence of 10km. These sites include:

- Lugmore Glen pNHA
- Dodder Valley pNHA
- Slade Of Saggart And Crooksling Glen pNHA
- Liffey Valley pNHA
- Grand Canal pNHA
- Fitzsimon's Wood pNHA

4.2 Results of Site Visits

4.2.1 Habitats

Habitats and species recorded at the site are presented in detail in the following sections. The value of each habitat is based on the site visit. Habitats recorded in and around the site boundary are listed in Table 4-4 and habitat maps of the Park and GI corridor boundary is found in Figure 4-2 and Figure 4-3. Larger maps are included in Appendix B .

Table 4-4: Habitats recorded during site visit.

Habitats	Fossitt Code
Amenity grassland (improved)	GA2
Dry calcareous and neutral grassland	GS1
Wet grassland/ Dry calcareous and neutral grassland	GS4/ GS1
(Mixed) Broadleaved woodland	WD1
Scattered trees and parkland	WD5
Treelines	WL2
Treelines / Riparian woodland	WL2 / WN5
Scrub	WS1
Immature woodland	WS2
Depositing/lowland rivers	FW2
Drainage ditch (Swale)	FW4
Buildings and artificial surfaces	BL3

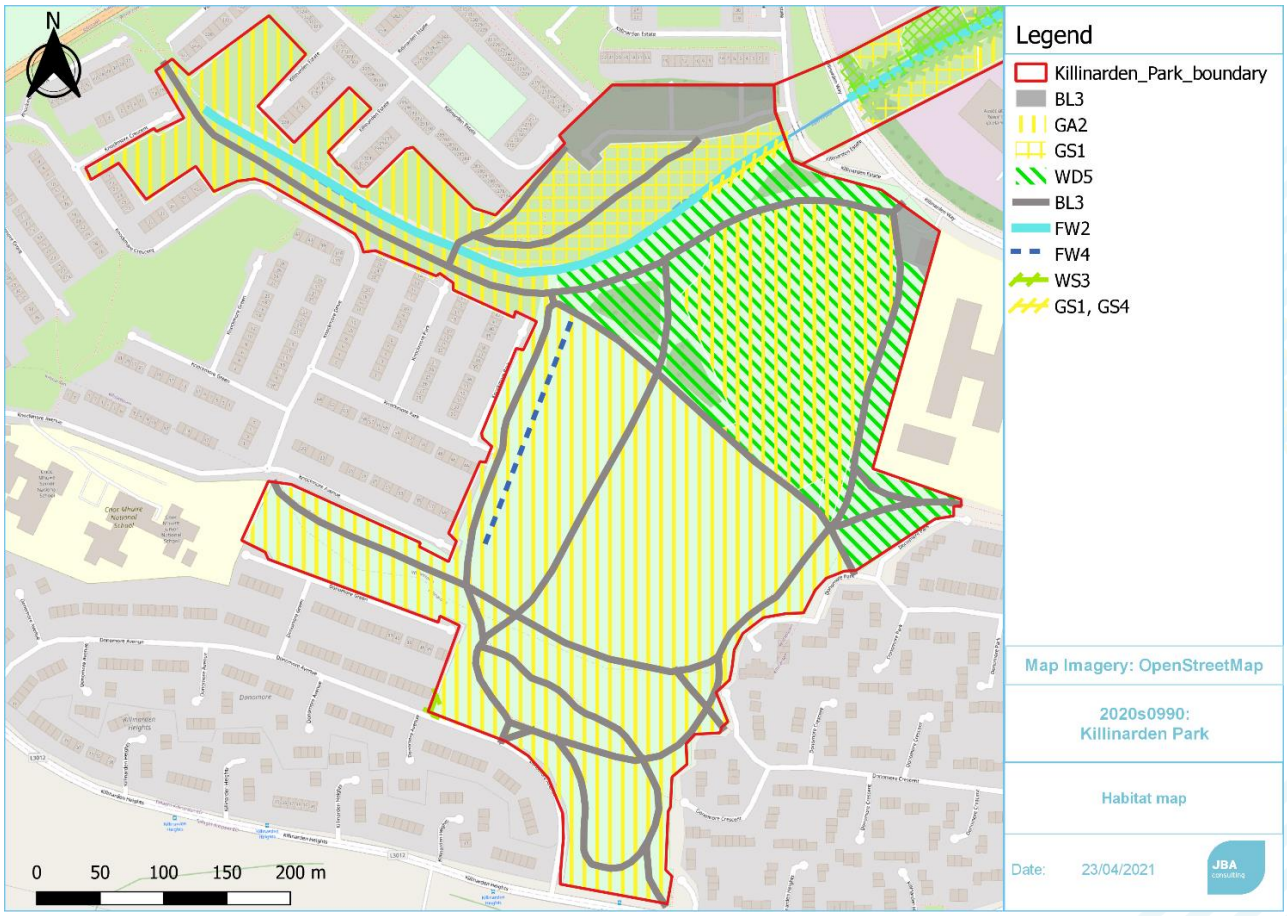

Figure 4-2: Habitat map of Killinarden Park (OSM, 2021)

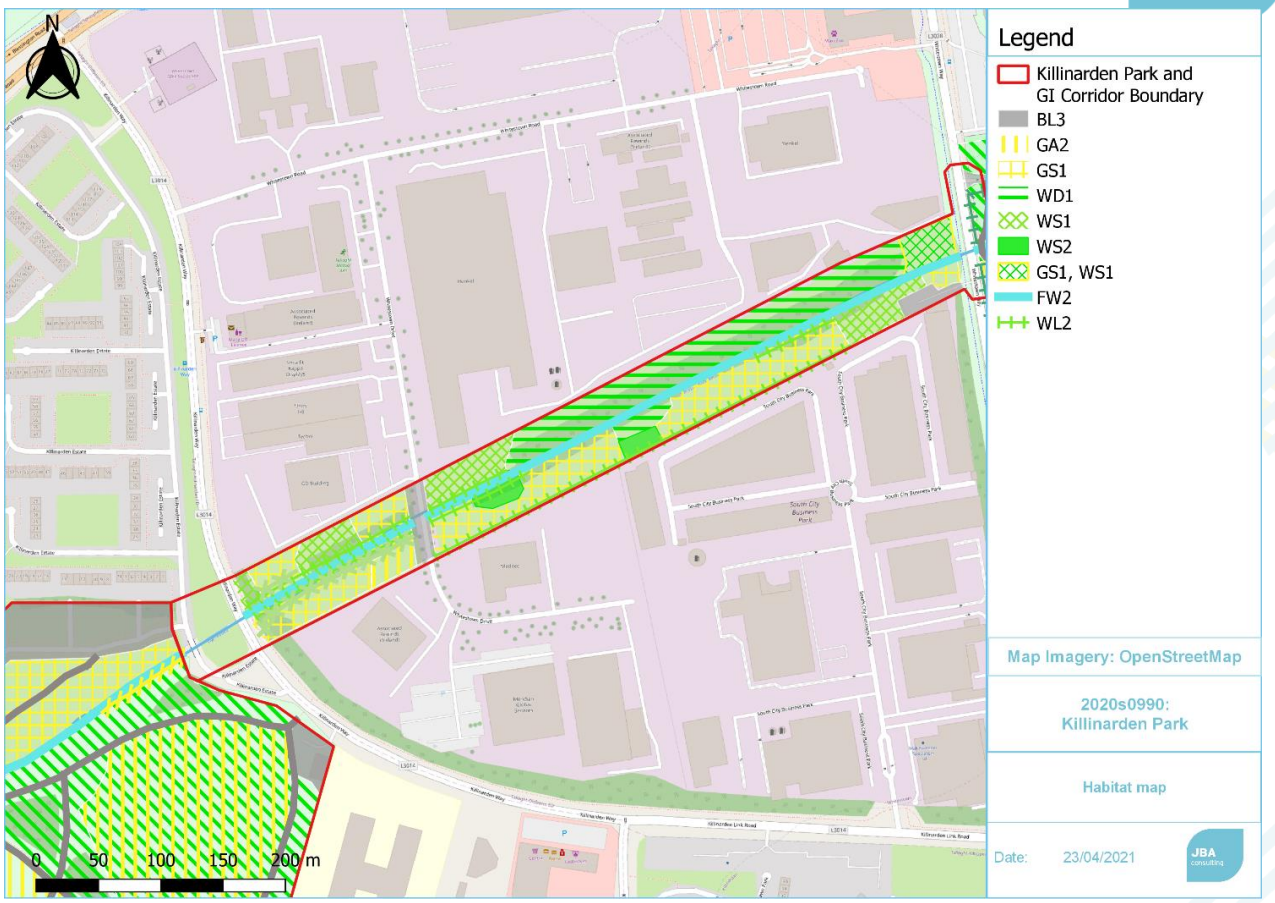

Figure 4-3: Habitat Map of Whitestown Stream of proposed GI corridor (OSM, 2021)

4.2.1.1 GA2 Amenity grassland (improved)

The most widespread habitat in Killinarden Park is amenity grassland (Figure 4-4), with both mown and unmown areas. The grassland was dominated by Rye- grass *Lolium* spp, Bent *Agrostis* spp., Meadow grasses *Poa* spp. and Yorkshire Fog *Holcus lanatus*, with diverse herbs including**;** Red Clover *Trifolium pratense,* White Clover *Trifolium repens*, Dandelions *Taraxacum* spp., Broadleaved Dock *Rumex obtusifolius*, Curled Dock *Rumex crispus*, Creeping Buttercup *Ranunculus repens*, Creeping Thistle *Cirsium arvense*, Ribwort Plantain *Plantago lanceolata*, Ragwort *Jacobaea vulgaris*, Shepherd's Purse *Capsella bursa-pastoris*, Pineappleweed *Matricaria discoidea*, Common Knapweed *Centaurea nigra*, Common Daisy *Bellis perennis*, Bird's-foot Trefoil *Lotus corniculatus*, Oxeye Daisy *Leucanthemum vulgare*, Yarrow *Achillea millefolium*, Common Poppy *Papaver rhoeas*, Red Dead-nettle *Lamium purpureum*, Sun Spurge *Euphorbia helioscopia,* Smooth Hawk's-beard *Crepis capillaris*, Willowherbs *Epilobioum* spp. and Self-heal *Prunella vulgaris*.

Areas of uncut grass adjacent to walls at the park boundaries included False Oat-grass *Arrhenatherum elatius*, Yorkshire Fog, Common Couch *Elymus repens*, Common Nettle *Urtica dioica*, Silverweed *Potentilla anserina*, Colt's-foot *Tussilago farfara*, Bramble *Rubus fruticosus* agg, Vetch *Vicia* spp., Dog-rose *Rosa canina*, Horsetail *Equisetum spp.*, and Creeping Cinquefoil *Potentilla reptans.* Ivy *Hedera helix* was seen on some walls.

There is a small area of amenity grassland along Whitestown Stream along the proposed GI pedestrian and cycle path corridor route, west of Whitestown Drive and south of the stream, which is being managed regularly.

This habitat can be considered of less-than-local importance. The majority of the works for the proposed upgrade project to Killinarden Park will take place in this habitat.

Figure 4-4: Killinarden Park- amenity grassland

4.2.1.2 GS1 -Dry calcareous and neutral grassland

Semi-natural grassland occurred where the grass was unmown, especially on the banks of Whitestown Stream within the park area (Figure 4-5), and on the parkland area north of Whitestown Stream (Figure 4-7). Vegetation near the banks included Red clover, Self-heal, Silverweed, Meadow buttercup *Ranunculus acris*, Oxeye Daisy (Figure 4-8), Curled Dock, False Oat-grass, Ribwort Plantain, Cowslip *Primula veris* (seedheads visible), and Common Spotted-orchid (Figure 4-8).

The soil on the ground to the north of the watercourse in the park was stony and dry, and included Fescue grasses, Vetch spp., Red and White Clover, Weld *Reseda luteola* and Common Centaury *Centaurium erythraea*. This grassland habitat is located beside the Whitestown stream, particularly on the North bank. It provides natural habitat for local pollinators.

Neutral grassland is the dominating habitat along the south side of the stream on the proposed GI corridor (to the east of the park) and occur in patches on the north side of the stream (Figure 4-6). These areas appear to be unmanaged. Vegetation included Herb Robert *Geranium robertanium*, Common Knapweed *Centaurea nigra*, Cinquefoil *Potentilla* spp., False Oat-grass *Arrhenatherum elatius*, Ribwort Plantain *Plantago lanceolata*, Yorkshire Fog *Holcus lanatus*, Dandelions *Taraxacum* spp., Cow Parsley *Anthriscus sylvestris*, Willowherb *Epilobium* spp., Black Medick *Medicago lupulina*, Vetches *Vicia* spp., Hogweed *Heracleum sphondylium*, Red Clover *Trifolium pratense*, Silver Weed *Potentilla anserina*, Cock's-foot *Dactylis glomerata*, Bird's-foot Trefoil *Lotus corniculatus*, Horsetail *Equisetum* spp., Cowslip *Primula veris*, Goat's-beard *Tragopogon pratensis* and Self-heal *Prunella vulgaris*, some Teasel *Dipsacus fullonum* occurring in the eastern most area. There are some patches of Bramble *Rubus fruticosus* agg. and Dogwood *Cornus sanguinea* within the grassland area.

Some of this habitat will be lost due to the planting of the Community Orchard and the construction of the GI corridor to the east of the park (on the south bank), although much of it will be retained, particularly species rich areas. This habitat can be considered less than local importance.

Figure 4-5: Semi-natural grassland by Whitestown Stream in Killinarden Park

Figure 4-6: Dry neutral grassland and treeline/riparian woodland outside of the Park on the proposed route of the GI corridor.

Figure 4-7: Semi-natural grassland with Common Centaury on the north side of the stream in Killinarden Park

Figure 4-8: Common Spotted Orchid and Oxeye Daisy on the south side of the stream in Killinarden Park

4.2.1.3 GS4 - Wet grassland

Wet grassland occurred along the banks of the watercourse within the Park and included a small area of Soft rush *Juncus effusus,* Meadowsweet *Filipendula ulmaria*, Hogweed *Heracleum sphondylium* and Willowherb.

This habitat is of less than local importance and will be retained and undisturbed under the design plan for Killinarden Park, therefore no impacts to this habitat is anticipated.

4.2.1.4 WD1 - (Mixed) Broadleaved woodland

Outside of the park area, on the section of the proposed GI corridor, broadleaved woodland dominates the north side of the stream, and occur in one small stand on the south side of the stream

Figure 4-3. Species include Aspen, Sycamore, Willows, Ash and Silver Poplar. The understory consists of Bramble, Herb Robert and Ivy *Hedera hibernica*, and some trees are covered with Ivy.

This habitat provides cover for mammals, commuting and foraging habitat for bats and nesting habitat for birds. This woodland will be retained as the GI corridor will be constructed on the south side of the steam, which will avoid any need to remove this habitat.

4.2.1.5 WD5 - Scattered trees and parkland

Aspen *Populus tremula* was the dominant tree recorded and was scattered in groups throughout the park. Other trees included Hornbeam *Carpinus betulus*, Oak *Quercus* spp., Beech *Fagus sylvatica*, Field maple *Acer campestre*, Birch *Betula pendula* (

Figure 4-9) and Sycamore *Acer pseudoplatanus*. A number of Alder *Alnus glutinosa* occurred beside the watercourse.

These clusters of trees will be retained as per the landscaping design, and additional semi-mature trees will be planted around the park.

Figure 4-9: Birch tree cluster

4.2.1.6 WL2 - Treelines

Treelines occur on both sides along the stream of the proposed GI corridor link

Figure 4-3. Species include Ash, Willows, Sycamore, Norway Maple *Acer platanoides*, Birch *Betula* spp. and Silver Poplar, (Figure 4-10).. In the south west is a treeline of Leyland cypress *Cupressus* × *leylandii* running from south to north, dividing the amenity grassland from the semi-natural grassland. Some hedgerow species are growing in this hedge including Dogwood and Guelder-rose *Viburnum opulus*. This habitat will be retained in the design of the proposed GI corridor plan.

This habitat will be retained in the design of the GI corridor plan.

Figure 4-10: Treeline along southern boundary.

4.2.1.7 WL2 / WN5 - Treeline / Riparian woodland

There is a section of the stream of the proposed GI corridor, east of Whitestown Drive, where there is a regeneration of riparian woodland on both sides of the stream

Figure 4-3. These treelines are dominated by Willows, but also include Ash, Hazel *Corylus avelana*, Elm *Ulmus* spp., Oak *Quercus* spp., Alder *Alnus* spp. and Sycamore. The trees on the south side maybe be partially removed for the construction of the pedestrian and cycle path, however this small area can be considered of less-than-local importance.

4.2.1.8 WS1 - Scrub

The park is mostly devoid of scrub, however the section outside the park in which the GI corridor wis proposed, this habitat is emerging mainly in the grassland north of the stream but also in small patches on the south side. Bramble is dominating, Dogwood, Sycamore *Acer pseudoplatanus*, Aspen *Populus tremula*, Ash *Fraxinus excelsior*, Willow *Salix* spp. and Dog Rose *Rosa canina* also occur. Some ornamental scrub occurs close to the Whitestown Drive bridge crossing the stream and the non-native species Chinese Bramble *Rubus tricolor* was recorded at several locations along the stream but this will not be affected by the works.

This habitat is considered to be of less-than-local importance.

4.2.1.9 WS2 - Immature woodland

A small area of Aspen and Oak seedlings occurred within the Park beside an area of mature Aspen, Oak and Beech. Immature woodland occurs in the area outside the park, mainly consisting of saplings

of Aspen and Silver Poplar *Populus alba* and a small pocket will be affected by the construction of the GI corridor

In the park these trees will be retained as per the landscaping design, and additional semi-mature trees will be planted. This habitat can be considered of less than local importance.

4.2.1.10 WS3 - Ornamental/non-native shrub

A small area of ornamental/non-native shrubs was located within the park at the south of the site at the boundary with Donomore Avenue. These shrubs are of less than local importance and will be retained in the design.

4.2.1.11 FW2 - Depositing/lowland rivers

Whitestown Stream flowed in an easterly direction in the northern part of the park (Figure 4-11). The stream flowed over a concrete base and there were a series of small weirs (Figure 4-11). Instream vegetation in the park included Fool's Watercress *Apium nodiflorum.* In the section to the east of the park stream vegetation included Fool's Watercress *Apium nodiflorum* Water-cress *Nasturtium officinale*. The stream in this section is more overgrown than in Killinarden Park and is fringed by Broadleaved dock *Rumex obtusifolius*, Figwort *Scrophularia* spp., Nettles *Urtica dioica*, Thistles *Cirsium* spp., Meadow buttercup *Ranunculus acris*, Horsetail, Meadowsweet *Filipendula ulmaria*, Cleavers *Galium aparine*, Willowherb and Pendulous Sedge *Carex pendula*.

The stream flows in an easterly direction for 720m where it enters artificial ponds in Sean Walsh Park. From here the watercourse continues as the River Poddle for 1.7 km before joining the River Dodder in Dodder Valley Park, west of the M50. The River Dodder flows in a north easterly direction for another 14km before entering the River Liffey at Ringsend.

The stream was further surveyed for Aquatic Invertebrates as detailed in Section 4.3.3.7.

There will be piling works taking place next to the stream to install a footbridge as part of the Killinarden Park upgrade works, as well as Willow planting and building/upgrading of the footpaths close the to the stream. The GI pedestrian and cycle corridor will be built only on the south side of the stream and will largely be built further than 20m back from the edge of the stream. However a small section of the corridor will be temporarily built closer to the stream to go around the Travellers Accommodation site (see Figure 1-1).

This waterbody has some fisheries value as it was found to have three-spined stickleback, and eDNA results were positive for Eels downstream. Therefore this stream can be considered of local importance.

Figure 4-11: Whitestown Stream in Killinarden Park with instream vegetation and concrete weir

4.2.1.12 FW4 - Drainage ditches/ Swale

A swale was located at the west of Killinarden park running in a north -south direction. The swale was dry and grassy and is used as a drainage collection area during high rainfall. Species included Watercress, Creeping Buttercup, Hogweed, Willowherb, Water figwort *Scrophularia auriculata*, Black Medick *Medicago lupulina*, Common Centaury, Meadow Buttercup and Weld. Paperbark Birch *Betula papyrifera* was recorded adjacent. This swale has been retained in the landscape design and will not be impacted during the works.

4.2.1.13 BL3 - Buildings and artificial surfaces

A network of tarmac paths traverses the park. A number of pedestrian bridges cross over Whitestown Stream. The paths will be upgraded where necessary during the implementation of the project to upgrade the park.

4.2.2 Flora

No protected floral species were recorded within or adjacent to the proposed site on the site visit.

4.2.3 Fauna

Records of protected fauna including invertebrates, amphibians, fish, birds and mammals collated from the (NBDC 2020) database, present within the surrounding 10km of the site within the past 10 years are listed in Appendix E.1. This table includes their level of protection, if they are red or amber listed on the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List and the date of the last record of this species at this location.

4.2.3.1 Terrestrial mammals

A mammal track was noted through the grass close to the Whitestown Stream during the ecological walkover survey, which is likely evidence of a fox. No other evidence of any terrestrial mammals were recorded during the site visits. A review of records held by the NBDC returned records of the following terrestrial mammal species protected under the Wildlife Acts (As Amended) within 10km of the proposed site:

- West European Hedgehog *Erinaceus europaeus*
- Eurasian Pygmy Shrew *Sorex minutus*
- Eurasian Badger *Meles meles*
- Eurasian Otter *Lutra lutra*
- Red Squirrel (*Sciurus vulgaris*)
- Pine Marten (*Martes martes*)

Otter

Although otter have been recorded in urban rivers, and sightings of Otter have been recorded downstream of Sean Walsh Park and in the River Dodder. However it is unlikely that Otters occur in Killinarden park in this section of the Whitestown Stream due the lack of evidence of this species over multiple surveys and the highly modified and exposed nature of the waterbody, as well as the lack of food for this species.

Pine Marten and Red Squirrel

Pine Martin and Red Squirrel are extremely shy and are both woodland specialists therefore due to the urban environment and lack of habitat the park environment can be considered of less than local importance for these mammals.

Other mammals

The site may occasionally be used by some Badger, Hedgehog and Shrew, but due to lack of habitat and lack of evidence of these mammals, the Killinarden park area can be considered of less than local importance for these mammals. The GI corridor section of the project contains more suitable habitat for these mammals with a mix of grassland, woodland and riparian habitat, particularly on the north side of

the stream. However the south of the stream appears to be less suitable and overall this site can be considered of less-than local importance for these mammals.

4.2.3.2 Bats

A preliminary bat roost survey was undertaken of the site and two Anabat Express Static detectors were placed in two locations along the Whitestown Stream: one in the park and another to the east where the GI corridor is proposed, to identify the species of bats and approximate level of use in this area. Data from another static detector in outside of the site boundary, in Sean Walsh Park, which was used to strengthen the data collected. The findings and conclusions of these surveys are detailed below.

Preliminary Bat Roost Survey

The preliminary bat roost survey inspected the trees in the proposed development from ground level. In Killinarden Park, several Aspen trees in the northern part of the site displayed some bat roost potential, largely as the result of burning of the trunk of the trees, creating cervices behind the bark, but it is unlikely to be used regularly or by large number of bats. Overall the park provides very little potential for roosting bats due to the lack of trees and structures. The park can be considered less than local importance for roosting bats.

The trees along the GI corridor site displayed negligible bat roost suitability due to the lack of roost features and majority of the trees were immature. Some of the trees of the north side of the stream could not be inspected in close detail due to restrictions in access due to dense undergrowth (Bramble) but these trees will not be disturbed as the works will only take place on the south side of the stream.

Given that there is negligible potential for bats roosting the site is considered to be of less-than local importance for roosting bats.

Foraging and Commuting Habitat

The habitats along the Whitestown Stream both in the park and the proposed GI corridor section provide commuting and foraging opportunities for bats. Of particular importance are the stream, treelines and the unmown neutral grassland.

Static bat detectors were installed to record bat activity along the Whitestown Stream in 3 separate locations for 3 separate survey periods:

- Location 1: In Killinarden Park along Whitestown Stream
- Location 2: Along GI corridor section Whitestown Stream.
- Location 3 Approximately 740m downstream of the site in Sean-Wash Park

The following bat species were recorded, and is further detailed in the tables below:

- Common Pipistrelle *Pipistrellus pipistrellus*
- Soprano Pipistrelle *Pipistrellus pygmaeus*
- Leisler's Bat *Nyctalus leisleri*
- *Myotis* spp. (likely Daubenton's Bat *Myotis daubentonii)*

Though the calls from *Myotis* spp. could not be identified to species, it is likely to be Daubenton's Bat *Myotis daubentonii* as this species is highly associated with rivers and lakes and has been recorded several times along the River Dodder (NBDC, 2021).

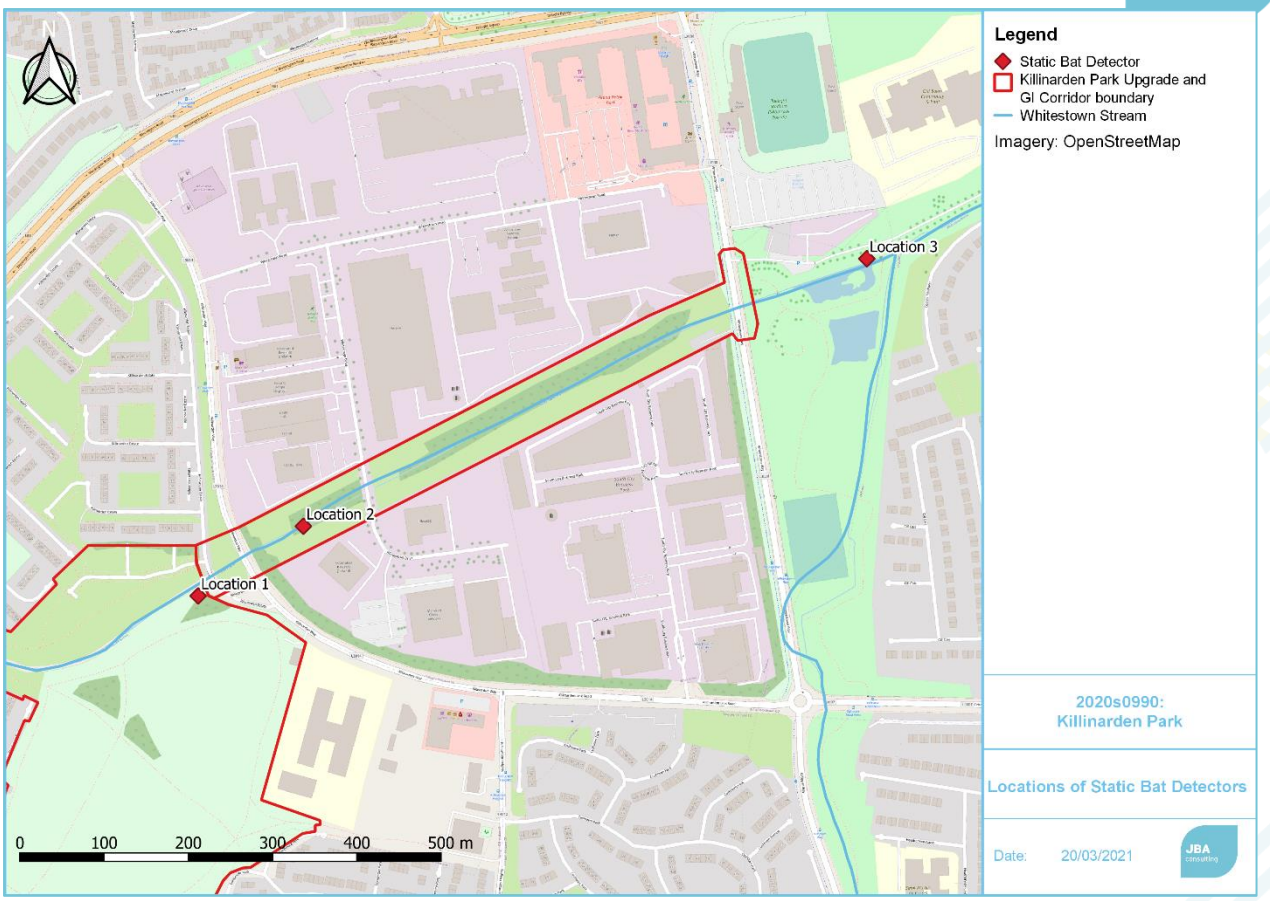

Figure 4-12: Location of static bat detectors installed along Whitestown Stream

Table 4-5: Bat species and counts recorded by the static detector installed at Location 1 during the nights between 11-18 August 2020

Species	11 Aug	12 Aug	13 Aug	14 Aug	15 Aug	16 Aug	17 Aug	Total
Pip spp	2	19	23	4	4	2		**54**
C. pip	9	139	206	97	44	121	14	**630**
S. pip	7	74	112	29	32	46	4	**304**
Leisler	20	35	14	12	14	9		**104**
Total	**38**	**267**	**355**	**142**	**94**	**178**	**18**	**1092**

Table 4-6: Bat species and counts recorded by the static detector installed at Location 2 during the nights between 18th to 24th August 2020.

Species	18 Aug	19 Aug	20 Aug	21 Aug	22 Aug	23 Aug	Total
Leisler's Bat	0	0	0	1	0	1	2
Myotis spp.	0	0	0	0	2	4	6
Soprano Pipistrelle	0	3	0	0	126	14	143
Total	**0**	**3**	**0**	**1**	**128**	**19**	**151**

Table 4-7: Bat species and counts recorded by the static detector installed in Sean-Walsh Park at Location 3 (outside of project boundary) from 11th to 17th August 2020.

Species	11 Aug	12 Aug	13 Aug	14 Aug	15 Aug	16 Aug	17 Aug	Total
Leisler's Bat	16	18	13	18	16	15	No records - poor weather	96
Myotis spp.	96	141	202	103	132	157		831
Soprano Pipistrelle	10	32	14	67	53	34		210
Common Pipistrelle	7	14	12	29	26	27		115
Total	**129**	**205**	**241**	**217**	**227**	**233**		**1,252**

Evaluating Importance of Commuting and Foraging for Bats along Whitestown Stream

The value of the foraging and commuting importance of the site is determined by the commonality of the bat species, the number of bats, the presence of roosts, and the structures and features of the habitats used for foraging and commuting, extrapolated on UK guidance "Valuing Bats in Ecological Impact Assessment (CIEEM 2010).

Overall the wider site of Killinarden Park has very low value for foraging and commuting bats due to the wide open space and low diversity and number of trees. However in this assessment, whites town Stream is considered

Features of value	Commuting value score				Foraging value score			
	Leisler's	***Myotis* spp.**	**S. Pip**	**C. Pip**	**Leisler's**	***Myotis* spp.**	**S. Pip**	**C. Pip**
Species rarity	2	5	2	2	2	5	2	2
Number of bats	5	10	10	10	5	10	10	10
Roosts nearby	3	3	3	3	3	3	3	3
Habitat/ Features	4	4	4	4	2	2	2	2
Score	14	22	19	19	12	20	17	17
Importance	**Local**	**County**	**Local**		**Local**			

It can be considered that the importance of the Whitestown Stream within Killinarden Park for foraging and commuting bats is of local importance. Reasoning for the valuation is given below:

- Species rarity: Leisler's Bat, Soprano Pipistrelle and Common Pipistrelle are the commonest bat species in Ireland (score = 2), while *Mytois* spp. are rarer (score =5).
- Number of bats: The static detectors recorded a small number of calls from Leisler's Bat (Score= 5) and a moderate number of Soprano Pipistrelle, Common Pipistrelle and *Myotis* spp., the majority of these were recorded in Sean-Walsh Park to Killinarden Park (Score= 10)
- In general, the trees present on have low suitability as roost due to the lack of roost features, however a few of the trees within the site could potentially provide bat roosts (Score =3)
- Foraging habitat is sparse in Killinarden Park (Score=2) but the numbers of bats suggest that the Whitestown Stream GI corridor is the key features for commuting bats in this urban landscape, particularly to connect Killinarden Park and Sean-Walsh Park, and further downstream connects with River Dodder (Score=4).

The evaluation of these parameters indicate that the site is of local importance for all foraging bats and of local commuting importance for Leisler's Bat, Common Pipistrelle, and Soprano Pipistrelle.

The GI corridor and Sean Walsh Park statics recorded Myotis spp, which is likely to be Daubenton's bat. This section of the project is of County importance for *Myotis* spp. Note that calls from Myotis spp occurred in Sean Walsh Park and Whitestown and did not occur in Killenarden Park.

Therefore, using the precautionary principle, the overall importance of the site for bats is considered to be of county importance for foraging and commuting bats.

4.2.3.3 Breeding Birds

Birds recorded in the park during the habitat survey (29 June 2020) included Amber listed birds Sparrow *Passer domesticus*, Starling *Sturnus vulgaris* and Swallow *Hirundo rustica.* Other birds observed included Pied Wagtail *Motacilla alba yarrellii*, Rook *Corvus frugilegus*, and Hooded Crow *Corvus cornix*.

No nests were observed at the time of the survey and overall the Killinarden Park is sparse of vegetation that may be used by birds for nests. Of the habitats that breeding birds may be use for nesting, e.g. scrub, woodland, all will be retained during the upgrade works and operation of the park.

In March 2021 a follow-up Kingfisher Survey was carried out to check for presence of nests for these birds (detailed in Section 4.2.3.5) The revisit on the 30.03.2021 also recorded Robin *Erithacus rubecula*, Wren *Troglodytes troglodytes*, Blue Tit *Cyanistes caeruleus*, Rook *Corvus frugilegus*, Wood Pigeon *Columba palumbus*, Blackbird *Turdus merula*, Magpie *Pica pica*, and Little Egret *Egretta garzetta*

This park has very little available habitat for breeding birds. The section of the GI corridor contains habitats of woodland, scrub and treelines which provide nesting habitat for breeding birds and will mostly be left undisturbed by the project. The project site can be considered of less than local importance to breeding birds.

4.2.3.4 Wintering Birds

Three wintering bird surveys were carried out on the 16.12.2020, 13.01.2021 and 10.02.2021 by JBA ecologists Patricia Byrne, Malin Lundberg and William Mulville. The following tables details the results of the survey (see Table 4-8, Table 4-9 and Table 4-10).

All three surveys noted presence of gull species on grassy areas including on the playing pitches. These species including the Red listed Black-headed Gull *Larus ridibundus* and Herring Gull *Larus argentatus*, as well as the Amber listed Great Black-backed gull *Larus marinus.*

It is likely that the Gulls are using this park as daytime roosting and foraging areas in the winter, notably the GAA pitches and amenity grassland areas are regular roosting places for these birds, particularly for the Black-headed Gull. As a precautionary approach, it will be assumed these areas are of local importance to Gulls, in particular Black-headed Gull.

Grey Wagtail *Motacilla cinerea*, Little Egret *Egretta garzetta* (Annex I Bird Species) and Grey Heron *Ardea cinerea* were all observed in the Whitestown stream. Although these species were observed during the wintering bird survey, they are present year-round. This park can be considered of less than local importance to these birds and all other birds recorded during the wintering bird survey.

Table 4-8: Wintering bird survey data (December)

Date	Time	Species	No.	Behaviour/ Location
16 Dec 2020	13.18	Herring gull	4	Flying overhead- near stream
		Herring gull	1	In Whitestown Stream – north west part of site
	13.20	Starlings	50	Perched in trees
	13.20	Black-headed gulls (BHG)	6	West of site- amenity grassland
		Herring gull	1	West of site- amenity grassland
		Lesser Black-backed Gull	1	West of site- amenity grassland
	13.26	BHG	28	Southernmost pitch
	13.30	BHG	32	GAA pitch
	13.30	Common Gull	5	GAA pitch
	13.30	Herring Gull	2	GAA pitch

Table 4-9: Wintering bird survey data (January)

Date	Time	Species	No.	Behaviour/ Location
13 Jan 2021	Not recorded	Herring gull	3	In Whitestown Stream, amenity grassland, GAA pitch
		Black Headed Gull	4	In Whitestown stream, amenity grassland, GAA pitch
		Common Gull	1	GAA pitch
		Little Egret	1	Whitestown Stream (near culvert)
		Starling	2	In or near trees
		Jackdaw	1	In or near trees
		Hooded Crow	1	In or near trees
		Pied Wagtail	1	Whitestown stream
		Meadow Pipit	1	In grassy bank north side of stream

Table 4-10: Wintering bird survey data (February)

Date	Time	Species	No.	Behaviour/ Location
10 Feb 2021	Not recorded	Herring gull	3	In Whitestown Stream, amenity grassland, GAA pitch
		Black Headed Gull	4	In Whitestown Stream, amenity grassland, GAA pitch
		Mallard	1	Whitestown Stream
		Heron	1	Whitestown Stream (near bridges)
		Rook	3	In or near trees
		Jackdaw	1	In or near trees
		Hooded Crow	1	In or near trees
		Grey Wagtail	1	Whitestown Stream (near bridges
		Magpie	1	In trees
		Meadow Pipit	1	By western boundary wall

4.2.3.5 Kingfisher

During the ecological walkover survey and the bird survey, three individuals of Kingfisher *Alcedo atthis* were recorded the GI corridor section of the site. One Kingfisher was recorded, at two separate occasions (during the ecological walkover survey in June 2020 and during the wintering bird survey in January 2021), perching on the bank to the stream at the eastern end of Whitestown Stream, next to the bridge at Whitestown Way. Another individual was recorded flying along the stream in the upstream section during the ecological walkover survey in June 2020, west of Whitestown Drive.

No Kingfisher were recorded in Killinarden Park. Although Kingfisher may utilise the watercourse in Killinarden, the lack of vegetation cover and natural perches likely discourages them from using this area. It is considered that this part of the Whitestown Stream in Killinarden is less than local importance to this species.

A follow up survey to check for the presence of Kingfishers and their nests along the Whitestown Stream was carried out on the 30th March 2021, within the bird nesting season. During this survey, no Kingfishers were recorded anywhere within Whitestown Stream Park or Sean Walsh Park.

After further investigation it was found that the banks of Whitestown Stream Park were very low to the water level and would easily be flooded with heavy rainfall. Whitestown had small pools with small shoals of Stickleback which would provide a food source for these birds. There were also potential fishing branches,

Given the scarce occurrence of Kingfisher and no nesting habitat, the site, notably the section outside of the Park along Whitestown Stream, can be considered of local importance of this species.

4.2.3.6 Invertebrates

Terrestrial invertebrates were surveyed on 18 August 2020. Transects were made along the semi-natural grassland adjacent to Whitestown Stream in Killinarden Park, the most likely area for records. Species recorded included Red-tailed Bumble bee *Bombus lapidarius*, Buff tailed bumble bee *Bombus*

terrestris, White-tailed bumble bee (*Bombus lucorum*) (Figure 4-13) and unidentified solitary bees. Butterfly species recorded included; Green-veined White *Piersi napi*, Common Blue *Polyommatus icarus* and Small Tortoiseshell *Aglais urticae*.

The area of natural grassland adjacent to the stream will be retained according to the design for the upgrade works. Overall the available habitat and food sources for these species will be increased as a result of upgrade works to Killinarden, particularly the increase in native woodland areas and grassland area set aside as 'meadow'. The park overall can be considered to have less-than-local value for invertebrates and the habitat will be retained.

Along the GI corridor section outside of the park, invertebrates were recorded in the neutral grassland habitat. Common Blue *Polyommatus icarus*, Large White *Pieris brassicae*, Common Carder Bee *Bombus pascourum*, Speckled Wood *Pararge aegeria*, Painted Lady *Vanessa cardui*, Moth, Unidentified dragonfly, Peacock *Aglais io* caterpillars. The species recorded are common species and not in great quantity, therefore the site is considered to be of less-than-local importance for invertebrates.

Figure 4-13: White-tailed Bumble Bee on Thistle in Killinarden Park

4.2.3.7 Aquatic Invertebrates

Aquatic invertebrates were surveyed by JBA Consulting Ecologist William Mulville through kick sampling method on 22 July 2020. The purpose of the invertebrate-kick sampling survey was to determine the overall biological health and water quality of the Whitestown Stream, which flows through Killinarden Park.

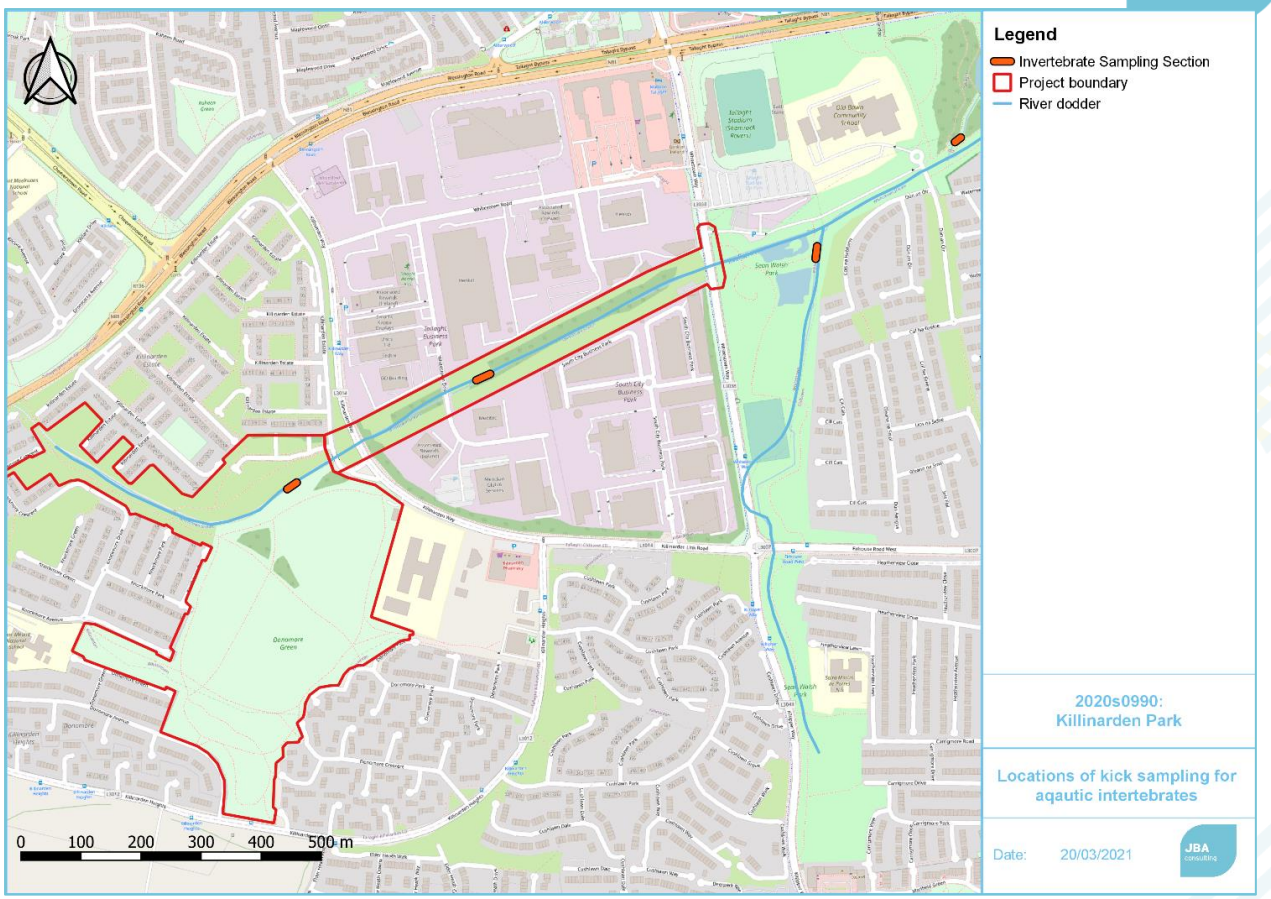

Figure 4-14: Location of aquatic invertebrate kick sampling survey (OpenStreetMap, 2021)

Freshwater invertebrate specimens were identified to at least the level of Family, and to Species or Genus level where possible. The invertebrates identified during the study are listed along with their respectively presence or absence for the kick-sample, in Table 4-11.

Table 4-11: Freshwater invertebrate identification of Family, Genus and Species levels for individuals present within the kick-sample.

Family	Genus	Species	Killinarden Park	Whitestown Stream (W.S.) Park	Sean Walsh Park (W.S)	Sean Walsh Park (J.S)
Baetidae	*Baetis*	*rhodani*	X		X	X
Dytsicidae			X			
Sericostomatidae	*Sericostoma*	-				X
Gammaridae	*Gammarus*	-	X		X	X
Asellidae	*Asellus*	*aquaticus*	X	X	X	X
Hydracarina	-	-	X	X		
Lymnaeidae	*Radix*	*balthica*				X
Physidae	-	-	X	X	X	X
Hydrobiidae	-	-	X	X	X	X
Sphaeriidae	-	-				X
Planorbidae	-	-	X			X

Glossiphoniidae	-	-			X		X
Lumbricidae	-	-		X		X	
Lumbriculidae				X		X	
Orthocladiinae	-	-			X	X	X
Chironminae	-	-		X	X	X	X
Simuliidae	-	-		X		X	X
Culicidae	-	-		X	X	X	X
W.S = Whitestown Stream, J.S.= Jobstown Stream							

Q-value and Small Stream Risk Score (SSRS)

Table 4-12 and Table 4-13 below display the results of the Q-value and Small Stream Risk Score analysis respectively for Killinarden Park.

Table 4-12: Invertebrate groups with their relative abundance and their respective Q-value for each stream sample.

Site	Group A	Group B	Group C	Group D	Group E	Note	Q-value
Killenarden Park	Absent	Absent	Excessive	Small Numbers	Absent	Extensive Cladophera present	
Whitestown Stream Park	Absent	Absent	Excessive	Fair Numbers	Absent	*Cladophera* present	3
Sean Walsh Park	Absent	Absent	Excessive	Fair Numbers	Absent	*Cladophera* present	3
Sean Walsh Park (J.S)	Absent	Small Numbers	Excessive	Common	Absent	Cladophera present	3

Table 4-13: Invertebrate groups with their individual group score, respective mean score (SSRS score) and status for each stream sample

Site	3-tails Score	2-tails Score	Trichopteran Score	GOLD Score	Asellus Score	SSRS Score (meanx2)	Status
Killenarden Park	0	0	0	4	2	2.4	At Risk
Whitestown Stream Park	0	0	0	4	2	2.4	At Risk
Sean Walsh Park (W.S)	0	0	0	0	2	0.8	At Risk
Sean Walsh Park (J.S)	0	0	2	0	2	1.6	At Risk

Conclusion:

While the three kick-sampling points displayed some minor differences in species assemblages between Whitestown Stream (itself) and Jobstown Stream, all samples were dominated by pollution tolerant species such as *Baetis rhodani* and Dipteran spp., in particular those from the Simuliidae family. This ultimately resulted in Q3 values for all samples and SSRS metric indications that the water body is 'At Risk'.

These invertebrate results are in line with the 'Poor' biological (invertebrate) Water Framework Directive (WFD) status (2013-2018) given to Whitestown Stream (DODDER_040). This 'Poor' status extends downstream to the River Dodder (Catchments, 2020).

Given the results of the Q-value (=3) and SSRS (At Risk) invertebrate metrics, it is clear that Whitestown Stream suffers from moderate levels of urban pollution, which is characteristic of small-scale river networks in the area.

The aquatic invertebrate survey results indicate that there are no species of importance in Whitestown Stream , therefore is can be considered that this site is of less than local importance.

4.2.3.8 Amphibians

A habitat suitability survey was carried out on the 29th June 2020, and it was found there is no suitable habitat (still water or ponds) for Common Frog. Frog spawn was also searched for on 10th February 2021 and none was found. However on a return visit to the GI Corridor section of the site in March 2021, one young frog was seen along this section on the south side of the Whitestown Stream in the grass. No frogspawn or tadpoles were observed at this time in the steam. It is likely this frog has moved in from the nearby ponds in Sean Walsh Park where it has been recorded.

An eDNA test was carried out for the presence of Newt in Sean Walsh Park ponds, downstream of Killinarden Park on the Whitestown Stream. The eDNA result showed a negative for the occurrence of Newt (results in Appendix C.2). Therefore, due to the lack of suitable habitat and no record of them from surveys, it is unlikely amphibians will be impacted by the proposed works.

It can be considered that Killinarden Park does not have an amphibian population present and is of less than local importance. One frog observed at the site of the proposed GI corridor does not indicate that a large population of frogs exist at this site, and therefore can be considered of less than local importance

4.2.3.9 Fish survey

Whitestown Stream base is a highly modified concrete bed, has degraded aquatic habitats, and supports a limited biota. The only fish species recorded was Three-spined Stickleback *Gasterosteus aculeatus*, typically the last fish species remaining in degraded channels. The stream is highly enriched and silted and offers poor habitat for salmonids, which would not survive in these conditions where oxygen levels would fluctuate highly.

Furthermore, while some lamprey ammocoete habitat existed (soft silt), the stream was not capable of supporting Lamprey given significant historical modifications and concreted bed with shallow superficial silt layers; and spawning habitat was poor and thus there is negligible potential for this species

The electrofishing survey found no evidence of Eel and Lamprey however an eDNA sample was taken from the ponds in Sean Walsh Park, downstream of Whitestown Stream from Killinarden Park. The eDNHA returned positive result for European Eel, and it is possible this species may be upstream in Killinarden Park. European Eel *Anguilla anguilla* is listed as 'Critically Threatened'. The full report is included in Appendix C.

As it cannot be ruled out that Eels are using the stream within the site boundary, therefore this feature can be considered of Local importance for Eels.

4.2.4 Invasive Non-native Species

During the ecological walkover JBA Ecologists did not record any invasive non-native species within or adjacent to the Killinarden Park. However the walkover survey recorded non-native species Chinese Bramble *Rubus tricolor* on the left bank of the stream within the proposed area for the GI Corridor. This plant was noted in one small stand upstream of Whitestown Drive and two large stands downstream of Whitestown Drive. This species is located on the north side of the stream and will not be impacted by the works. As this is not a third schedule species and will not be impacted by the works, there is no mitigation required to remove or contain this species.

No invasive non-native species listed on the third schedule of the EC (Birds and Natural Habitats) Regulations 2011 S.I. No. 477/2011 were recorded. The Records of Invasive Non-native Species collated from the NBDC (2019) database, present within the surrounding 10 km within the past 10 years are listed in Appendix E.2.

4.3 Screening of Ecological Features

The screening of ecological features is given in Table 4-14. Those features screened out are not considered further in this assessment. Ecological features that are screened in are assessed for potential impact during construction and operation in the following sections.

Table 4-14: Summary of ecological features and the screening assessment

Ecological feature	Value	Screening	Reasoning
Designated sites			
Glenasmole Valley SAC [001209]	International	Screened out	AA screening determined no impacts to this site
Wicklow Mountains SAC [002122]	International	Screened out	AA screening determined no impacts to this site
Wicklow Mountains SPA [004040]	International	Screened out	AA screening determined no impacts to this site
Lugmore Glen pNHA	**National**	**Screened in**	
Dodder Valley pNHA	**National**	**Screened in**	
Glenasmole Valley pNHA	National	Screened out	No connectivity (same as Glensamole Valley SAC)
Slade Of Saggart And Crooksling Glen pNHA	**National**	**Screened in**	
Liffey Valley pNHA	**National**	**Screened in**	
Grand Canal pNHA	**National**	**Screened in**	
Habitats			
Amenity grassland	Less than Local	Screened out	Low value
Dry calcareous and neutral grassland	Less than Local	Screened out	Low value
Scattered trees and parkland	Less than Local	Screened out	Low value
Scrub	Less than Local	Screened out	Low value, not impacted by works
(Mixed) Broadleaved woodland	Less than Local	Screened out	Not impacted by works
Treelines	Less than Local	Screened out	Not impacted by works
Riparian treeline	Less than Local	Screened out	Low value
Immature woodland	Less than Local	Screened out	Low value
Whitestown stream Depositing/lowland rivers	**Local**	**Screened in**	
Swale/ Drainage ditch	Less than Local	Screened out	Low value
Buildings and artificial surfaces	Less than local	Screened out	Low value
Species			
Mammals	Less than Local	Screened out	Low value, habitat not impacted
Bats (foraging / commuting)	**Local/ County**	**Screened in**	
Bats (roosting)	Less than Local	Screened out	Lack of suitable habitat
Breeding Birds	Less than Local	Screened out	Low value
Wintering Birds (Gulls)	**Local**	**Screened in**	
Kingfisher	**Local**	**Screened in**	
Invertebrates	Less than Local	Screened out	Low value
Aquatic invertebrates	Less than Local	Screened out	Low value

Amphibians	Less than Local	Screened out	Lack of suitable habitat
Fish (European Eel)	**Local**	**Screened in**	
Invasive Non-native species	Not impacted by works	Screened out	

The valued ecological features assessed in detail in the subsequent sections are therefore:

- Lugmore Glen pNHA
- Dodder Valley pNHA
- Slade Of Saggart And Crooksling Glen pNHA
- Liffey Valley pNHA
- Grand Canal pNHA
- Whitestown Stream and the Depositing/lowland rivers habitat
- Bats (foraging / commuting)
- Wintering Birds (gulls)
- Kingfisher
- Fish (European Eel)

5 Impact Assessment

The impacts on the valued ecological features are assessed here. The initial assessment considers the potential impact pathways and whether these apply to the ecological features. The impact assessment considers the project and the anticipated effects in the absence of any mitigation.

The following sections described the nature of immediate / short-term impacts, as well as any medium- or long-term impacts, predicted for designated protected sites, habitats and species in the absence of implemented mitigation measures during the construction and operation of this project.

There has also been identified long-term positive impacts to ecological features, which are described in Section 5.3.

5.1 Designated Sites

Protected Site	Importance	Distance	Surface water pathway
Lugmore Glen [001212]	National	1.2km	No
Dodder Valley [000991]	National	1.8km	Yes (downstream approx. 3km)
Slade Of Saggart And Crooksling Glen [000211]	National	3.8km	No
Grand Canal [002104]	National	5.5km	No
Liffey Valley[000128]	National	8.4km	No
Fitzsimon's Wood [001753]	National	9.8km	No

5.1.1 Lugmore Glen pNHA

This pNHA lies in a separate river catchment to this project and therefore will not be impacted by via surface water pathways. Lugmore Glen lies 1.2 km away it could be impacted by airborne pollution. However it is not expected that any release of pollutants during construction will be significant due to the small scale of the works and construction vehicle emissions are expected to be less than 20 AADT which is considered negligible compared to that from road traffic (CIEEM 2021). The site is more than 1km away and will not be impacted by noise pollution.

Therefore there will be no impacts to Lugmore Glen.

5.1.2 Slade Of Saggart And Crooksling Glen pNHA

This pNHA lies in a separate river catchment to this project and therefore will not be impacted by via surface water pathways. This pNHA lies 3.8 km away it could be impacted by airborne pollution. However it is not expected that any release of pollutants during construction will be significant due to the small scale of the works and construction vehicle emissions are expected to be less than 20 AADT which is considered negligible compared to that from road traffic (CIEEM 2021). The site is more than 1km away and will not be impacted by noise pollution.

Therefore there will be no impacts to Slade Of Saggart And Crooksling Glen.

5.1.3 Grand Canal pNHA

This pNHA lies in a separate river catchment to this project and therefore will not be impacted by via surface water pathways. This pNHA lies 5.5 km away it could be impacted by airborne pollution. However it is not expected that any release of pollutants during construction will be significant due to the small scale of the works and construction vehicle emissions are expected to be less than 20 AADT which is considered negligible compared to that from road traffic (CIEEM 2021). The site is more than 1km away and will not be impacted by noise pollution.

Therefore there will be no impacts to Grand Canal pNHA

5.1.4 Liffey Valley pNHA

This pNHA lies in a separate river catchment to this project and therefore will not be impacted by via surface water pathways. This pNHA lies 8.4 km away it could be impacted by airborne pollution. However it is not expected that any release of pollutants during construction will not be significant due to the small scale of the works and construction vehicle emissions are expected to be less than 20 AADT which is considered negligible compared to that from road traffic (CIEEM 2021). The site is more than 1km away and will not be impacted by noise pollution.

Therefore there will be no impacts to Liffey Valley pNHA

5.1.5 Fitzsimon's Wood pNHA

This pNHA lies in a separate river catchment to this project and therefore will not be impacted by via surface water pathways. This pNHA lies 9.8 km away it could be impacted by airborne pollution. However it is not expected that any release of pollutants during construction will be significant due to the small scale of the works and construction vehicle emissions are expected to be less than 20 AADT which is considered negligible compared to that from road traffic (CIEEM 2021). The site is more than 1km away and will not be impacted by noise pollution.

Therefore there will be no impacts to Fitzsimon's Wood pNHA

5.1.6 Dodder Valley pNHA

Whitestown Stream flows into the Dodder Valley pNHA approximately 3km downstream from Killinarden Park. The works that will be taking place near the river is upgrade of footpaths, planting of willows, and installation of a new footbridge.

The main impact concerns would be that of pollutants (hydrocarbon leakages from site machinery) and excess sediment from the excavations and any works carried out in or on the banks of the watercourse. As described in Section 4.2.3.7 Aquatic Invertebrates, the Q-value of the Whitestown stream is considered 'Poor'. These inputs would lead to further degradation of the Whitestown stream which enters the River Dodder and the protected aquatic and riverine species that it supports, notably including European Eel *Anguilla anguilla*; River Lamprey *Lampetra fluviatilis*; Otter; Dipper; Kingfisher; Sand Martin; and Grey Wagtail *Motacilla cinerea*.

Construction vehicle emissions are expected to be less than 20 AADT which is considered negligible compared to that from road traffic (CIEEM 2021). The site is more than 1km away and will not be impacted by noise pollution.

Therefore, in the absence of mitigation, short-term Minor impacts on water quality to this nationally protected site are anticipated.

5.2 Impacts to habitats

5.2.1 Whitestown Stream (Depositing/lowland river)

The Whitestown Stream may be impacted through the construction of the greenway by accidental spill resulting in pollutants (hydrocarbon leakages from site machinery) entering the stream and excess sediment from the excavation works and from the piling work to construct the foot bridge, and any works within a few metres of the stream.. These inputs would lead to the degradation of the Whitestown Stream and the riparian species that it supports. The Q-value of Whitestown Stream is 'Poor' (see Section 4.2.3.7) and any input of pollutants would further degrade this habitat.

The works are considered to be small and any impact would be temporary during the construction phase. **Therefore, the impact is considered negligible to Whitestown Steam which is of local importance.**

5.3 Impacts to species

5.3.1 Fish (European Eel)

There may be impacts during construction to European Eel living in the Whitestown Stream. The main impact concerns would be that of pollutants (hydrocarbon leakages from site machinery) and excess sediment from the excavations and any works carried out in or on the banks of the watercourse, as there will be piling works taking place next to the stream to install a footbridge as part of the Killinarden

Park upgrade works, as well as Willow planting and building/upgrading of the footpaths close the to the stream.

This site is of local importance to this species and this impact is short term and therefore can be considered negligible.

5.3.2 Bats (commuting and foraging)

Four Bat species were recorded along the Whitestown stream with a moderate amount of activity picked up by static detectors. Three static detectors were positioned along the Whitestown Stream. It is determined that this park and particularly the Whitestown stream is of local importance to Leisler's bat, Common and soprano Pipistrelles that are foraging and commuting along the stream, and further downstream towards Sean Walsh Park, a Myotis sp., most likely to be Daubenton's Bat and is determined to be of County importance to this rarer bat. The park is of negligible importance for roosts.

Predicted impacts to bats from construction may come from lighting at night during the bat active season (April-October), which could illuminate commuting and foraging habitats. Lighting during the hours of darkness would reduce the quality of foraging habitat for bats. Noise effects associated with the works would be temporary during diurnal parts of the day and no nocturnal noise effects are anticipated. **However these short-term impacts can be considered negligible**.

Predicted impacts to foraging and commuting bats will occur during operation from the lighting columns which will be installed close to the Whitestown Stream along the strategic GI Corridor, which will increase light pollution in the area.

A lighting strategy that has been designed for the proposed strategic GI corridor has been designed to minimise the effects of light pollution to bats that are foraging and commuting along the Whitestown Stream (Fahey O'Riordan Consulting Engineers 2021). The lighting elements will consist of mono-directional LED luminaires which will be motion sensor activated to reduce the need for lighting at night. The lights used will focus the light where it is required (on to the paths) in the aim to minimise light spill to maintain a dark corridor along the stream. The LED will be low intensity, warm-white 3000K which is recommended under the Bats and artificial lighting Guidance Note 8 developed by Bat Conservation Trust and Institute of Lighting Professionals (2018). The lighting columns will be 6m high and spaced 33m apart and have tightly controlled asymmetrical light distribution. The lighting strategy indicates that spill light at 4 metres from the path is calculated to be an average of 1.27 Lux on the off-side grass margin along the GI corridor path and cycleway. To retain the waterbody as a dark corridor, the lighting has been designed so there will be zero Lux spill light onto the Whitestown Stream with the exception of a small section at its eastern and western ends. Upward spill is calculated to be zero.

However, even with these measures, impacts due to lighting cannot be ruled out, therefore it is likely there will be small long-term impact to protected bat species commuting and foraging routes. **Therefore, the installation of lighting will result in Minor impacts to a species of county importance.**

The upgrade to the park will generally increase the available habitat for foraging and possibly roosting for bats, particularly the areas of native woodland which will be planted. **It is likely there will also be long-term beneficial impact on bats as a result of the upgrade works which will result in Minor positive impact for these bat species.**

5.3.3 Wintering Birds

From the wintering bird survey it was found the Red- and Amber-listed birds Herring Gull, Lesser Black-backed gull and Common gull were found to be using the park, particularly the amenity grassland and pitches. These birds are using open grassy areas of the park as day-time roosts and foraging.

It is likely there will be temporary impacts through disturbance to these birds during construction, particularly during the upgrade of the GAA pitch. However this impact can be considered to be negligible as the works will be small in scale and these birds are generally disturbance tolerant

There may be permanent impacts through the loss to the amenity grassland extent in the park, with the planting of some grassy areas with trees and woodland, and the installation of playgrounds and other new structures. However much of these open grassy areas will be retained including the GAA pitches which is where the wintering gulls species prefer to gather, as indicated during the survey.

Therefore it can be considered that impacts to gulls and other wintering birds cans be considered negligible.

5.3.4 Kingfisher

Two Kingfisher were recorded during the survey. Kingfisher territories typically cover around 1km up to 5km of a river section. The follow-up survey recorded no nests and the banks along Whitestown Stream Park provided low suitability for nests. However, if there is a delay in construction of this development, circumstances may change and Kingfisher may build a nest in the area.

Potential impact on Kingfisher during construction is through noise disturbance and potential reduction in water quality impacting on prey species available. The increase in presence of humans and machinery may cause disturbance to these birds that are particularly vulnerable to disturbance when nesting. The section of Whitestown Stream within the site where the proposed GI corridor will be built is also the most natural and least disturbed section of the steam until its confluences with the Dodder 2.5km downstream. Therefore the increased disturbance during construction within the proposed site may result in the loss of territory for this internationally protected bird.

Accidental spill resulting in pollutants (hydrocarbon leakages from site machinery) entering the stream and excess sediment from the excavation works could reduce the water quality and impact on fish and aquatic invertebrates present in the stream. This could indirectly impact on Kingfisher which feed on fish and aquatic invertebrates.

Potential impact during operation is through operational noise disturbance and human activity. Given the presence of Kingfisher further downstream in Sean-Walsh Park, which has a high presence of public visiting the park, it is not anticipated that the increased human activity within the proposed site will have a negative effect on the species. Most of the vegetation along the Whitestown Stream (trees and scrub) will be retained and provide shelter for these birds.

Therefore, it is anticipated that the construction phased will have temporary, minor impacts to these birds, and the operational phase of the project will have a negligible impact to Kingfisher.

5.4 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 ranges, territories or catchments where there is the potential for a significant impact on a site or species. The following plans were identified as potential sources of cumulative impacts:

5.4.1 Plans

5.4.1.1 South County Dublin Development Plan 2016-2022

The South County Dublin Development Plan 2016-2022 has been prepared in accordance with the Planning and Development Act 2000 (South Dublin County Council 2016). The Development Plan sets out an overall strategy for the proper planning and sustainable development of the county. The objectives include a target of increased population and continuing the consolidation of established urban areas, support and facilitate economic activity, promote the ease of movement by sustainable modes (walking, cycling and public transport). 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 2016).

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 (SDCC, 2016a).

A Screening for Appropriate Assessment was carried out on the plan. This concluded that there are no likely significant direct, indirect or secondary impacts of the project on any Natura 2000 sites (SDCC, 2016b).

5.4.1.2 Tallaght Town Centre Local Area Plan 2020-2026 (Draft)

The purpose of Tallaght Town Centre Local Area Plan (LAP) is to provide a strategic framework for the sustainable development of Tallaght Town Centre (South Dublin County Council 2021). This LAP seeks to deliver high quality housing and well connected neighbourhood areas with a strong sense of community and social cohesion. It seeks to promote prosperity and opportunity in terms of employment, economic development and tourism, while ensuring the conservation and enhancement of green infrastructure and built heritage. It also outlines the key objectives for Whitestown including WT4: to

provide new green infrastructure and amenity corridor along Whitestown Stream connecting Killinardan Park and Sean Walsh Park. This objective also outlines that an Ecological Impact Assessment of proposals should be undertaken prior to any works being carried out to open up the Whitestown Stream as a cycling / pedestrian corridor, which should include detailed ecological surveys of the eastern section of the Whitestown Stream.

A Natura Impact Report was carried out on the plan. This concluded that there are no likely significant direct, indirect or secondary impacts of the project on any Natura 2000 sites (Doherty Environmental 2020).

5.4.1.3 River Basin Management Plan for Ireland 2018-2021

The 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 (DoHPLG 2018). Changes 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 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.
- Reduce chemical pollution of water bodies

The ERBD Management Plan (2009-2015) and the River Basin Management Plan for Ireland (2018-2021) aim to improve the management and water quality of the Eastern RBD, and hence Whitestown Stream. There will only be temporary, short term impacts to the water quality of the Whitestown Stream.

5.4.1.4 Killinarden Masterplan

Killinarden Masterplan is a masterplan for strategic development lands at Killinarden in Tallaght, County Dublin. The SDCC County Development Plan 2016 – 2022 has zoned the lands subject to this Masterplan for New Residential Communities RES-N and the purpose of the Masterplan is to guide the development of these strategic lands in a sustainable and coherent manner and to provide an outline of the nature and extent of critical infrastructure needed for the development of the lands. The vision for Killinarden is to create a sustainable, high quality neighbourhood for a new community at the edge of the city and the foothills of the Dublin Mountains, with strong linkages to nature, established communities, local education, employment and recreation. This Masterplan includes a more detailed plan for the Killinarden Park (Killinarden Park Framework Plan), a critical piece of community and environmental infrastructure for the larger area.

A screening for Appropriate Assessment was carried out on the plan. This concluded that there are no likely significant direct, indirect or secondary impacts of the project on any Natura 2000 sites (SDCC 2020c).

The masterplan design for a sustainable, mixed tenure housing development has gone out to tender (September 2020), and cannot therefore be assessed.

5.4.2 Other Projects

As of February 2018, the projects listed below (Table 5-1), which are not retention applications, home extensions and/or internal alterations, have been granted planning permission in the locality of the proposed site. Projects have been collated from myplan.ie (DECLG 2016).

Table 5-1: Projects granted planning permission since 2018 in vicinity of proposed site.

Planning Reference	Address	Application Status	Decision date	Summary of development description	Potential Cumulative Impact
SD19A/0334	Killinarden Heights, Killinarden, Tallaght, Dublin 24.	Permission	19/06/2020	Residential development consisting of 16 two storey houses comprised of 1 four bed detached house; 6 three bed semi-detached houses & 9 two and three bed terraced houses;	Increased lighting and drainage in urban area
SD20A/0303	Killinarden Heights, Killinarden, Tallaght, Dublin 24.	Request for further information	21/01/2021	Two storey childcare facility of circa 459sq.m on a site measuring circa 0.136 hectares forming part of the existing Elder Heath residential estate;.	Increased traffic, lighting, and drainage in urban area
SD12A/0168/EP	Kiltipper Road, Killinarden, Dublin 24	Extension of permission	25/06/2018	A residential development comprised of 328 dwellings and a crèche on a site of 12.23 hectares.	Increased traffic, lighting, and drainage in urban area
SD19A/0381	Elder Heath, Kiltipper Road, Killinarden, Dublin 24	Permission	11/02/2020	Modifications to part of a previously permitted development under Ref. SD19A/0089; Permission is sought for the development of 3 two storey, three bed semi-detached houses, which will adjoin 4 permitted dwellings under SD19A/0089	Increased traffic, lighting, and drainage in urban area
SD19A/0089	Kiltipper Road, Killinarden, Dublin 24	Permission	21/10/2019	7 two storey houses consisting of 2 four bed, detached houses; 2 three bed, semi-detached houses; 3 three bed, terraced houses;	Increased traffic, lighting, and drainage in urban area
SD188/0004	Killinarden Heights, Tallaght, Dublin 24	Permission Under Part VIII	10/09/2018	Social Housing Development consisting of 7 housing units and 6 apartment units, 13 units in total, on undeveloped lands on a site located at Killinarden Heights, adjacent to Knockmore Avenue (adjoining St. Catherine's House) Killinarden, Tallaght, Dublin 24 consisting of: 7 3-bed, 2 storey houses, 6 2-bed apartments (3 storey).	Increased traffic, lighting, and drainage in urban area. EIA Screening carried out
SD19A/0166	Scoil Chaitlín Maude, Hazelgrove, Dublin 24	Permission and retention	11/07/2019	Retention of single storey pre-school and afterschool childcare buildings; Permission for the construction of two single storey classrooms and moving the existing shed with associated site works.	None anticipated- existing site
SD188/0008	Tallaght Stadium, Sean Walsh Park, Whitestown Way, Tallaght, Dublin 24	Pat 8 Approved by Council	10/12/2018	Older person's residential development consisting of: a range of 2 storey to 4 storey apartments which shall consist of 81 units and associated car parking comprising:- 18 2-bedroom 3 person units, 63 1-bed 2 person units, new access road off Whitestown Way	Increased traffic, lighting, and drainage in urban area

The above planning applications may have significant impacts on the present aquatic and terrestrial ecological features through the following pathways: surface water and air (dust, pollution, and lighting). As described in in the South Dublin County Development Plan these projects require assessments of ecological features. If these assessments have been carried out in a correct way the mitigation in these reports will prevent cumulative impacts.

Therefore, significant cumulative impacts are not expected to occur on the ecological features.

5.5 Summary

The following potential significant impacts have been identified and possible mitigation is discussed in the next chapter:

- Reduction of water quality during construction with short-term impacts to Dodder Valley pNHA and Kingfisher
- Short-term disturbance to Kingfisher during construction
- Long-term disturbance to bats through lighting impacts during operation

The mitigation is based on that proposed in existing documentation and where necessary additional mitigation is proposed to reduce the impacts identified above.

6 Mitigation

The following mitigation is recommended to ensure that the proposed design for the Killinarden Park upgrade and construction of Strategic GI Corridor do not adversely impact on the ecological receptors outlined in Section 5.

6.1 Do Nothing Scenario

If the proposed works were not to go ahead, it is likely that the current regime of management of the land will continue as currently.

6.2 Construction Impacts to water quality

The water column may be temporarily impacted by potential pollutants and increased sediment during works carried out in or near the Whitestown Stream. This may impact the water quality of the Stream, which may impact ecological features such as aquatic Invertebrates, and the River Dodder pNHA. The following pollution and sediment controls should be implemented when carrying out works near or in the stream.

6.2.1 Pollution Prevention Measures

Appropriate mitigation measures should be implemented prior and during the construction phase to ensure that the water quality is not adversely affected through pollution incidents and the release of contaminants from the site. The measures outlined below should be included in a Construction Environmental Management Plan (CEMP) for the proposed development.

Relevant legislation and best practice guidance that have been considered include, but are not limited to the following:

- C532 Control of water pollution from construction sites. Guidance for consultants and contractors (www.ciria.org);
- C515 Groundwater control – design and practice, 2nd ed. (www.ciria.org);
- Inland Fisheries Ireland 2016 'Guidance on Protection of Fisheries During Construction Works In and Adjacent to Waters';
- NRA 2008 ' Guidelines for the crossing of watercourses during the construction of national road schemes'.

The above best practice mitigations will alleviate the risk associated with accidental spills and runoff events. In particular silt runoff into the Whitestown Stream will be prevented by incorporating the following actions:

- A silt fence shall be installed between the works and the banks of the watercourse prior to any works commencing close to the watercourse e.g. footbridge construction. The silt fencing should be removed only when bare soil is re-vegetated and sediment movement is no longer a risk.
- The silt fence will be a permeable geotextile barrier installed vertically on support posts and entrenched in the ground. The silt fence is to be installed in “smile” and “J-hook” configurations designed to detain sediment-laden sheet flow from the site area and will capture any fine sediment, sand and silt-size particles.
- The extent of the silt fencing shall take account of the slope of the land and extent of works;
- Vegetation along the watercourse will be retained as much as possible to ensure a buffer zone remains undisturbed between the works and the watercourse. This vegetated strip will be a minimum of 10m along the stream, except for the eastern most section of the GI Corridor where the pathway will be located closer to the stream due to the existing Traveller Accommodation Site;
- Run-off from the working site or any areas of exposed soil should be channelled and intercepted for discharge to silt-traps with over-flows directed to land to prevent any flow of surface water

to the watercourse. Silt-traps should be maintained and cleaned regularly during the course of site works;

- All excavations close to the watercourse should be carried out in the dry and there will be no working near the watercourse during heavy or sustained period of rain
- All soil stockpiles shall be located >10m away from the watercourse and within the extent of the silt fence. All stock piles shall be covered to minimise the risk of rain / wind erosion;
- Any concrete and cement mixing or wash out areas should be sited on an impermeable designated area. The designated area should be located 50m away from the watercourse;
- The pouring of concrete will take place within a designated area using a geo-synthetic material to prevent concrete runoff into the soil media. Pumped or tremied concrete should be monitored carefully to ensure no accidental discharge into the watercourse;
- Any bare earth close to the water should be re-seeded immediately after works are completed.

General measures

- No excavation shall take place below the water-table on the site;
- Any stockpiling of topsoil must be considered and planned such that risk of pollution from these activities is minimised. Drainage from the topsoil storage area should not enter the stream;
- The compound shall be located within the site boundary and will be sited as far from the stream (>50m) as possible in order to minimise potential impacts. If it is not possible to locate the site compound >50m from the stream, a plastic membrane will be put up with berms around the edge to prevent any contaminants leaking through;
- Drainage collection system for washing area to prevent run-off into surface water system;
- There must be no discharge to, including any suspended solids or other deleterious matter, to the stream;
- All site runoff will be controlled and if necessary diverted to a sediment tank and the contents will be removed off site by a licenced waste contractor;
- Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded. Any items of plant machinery found to be defective should be removed from site immediately or positioned in a place of safety until such time that it can be removed.

6.2.2 Pollution Control and Spill Prevention

Spill kits containing absorbent pads, granules and booms will be stored in the site compound with easy access for delivery to site in the case of an emergency. A minimum stock of spill kits will be maintained at all times and site foremen's vehicles will carry large spill kits at all times. Absorbent material will be used with pumps and generators at all times and used material disposed of in accordance with the Waste Management Plan. All used spill materials e.g. Absorbent pads will be placed in a bunded container in the contractor's compound. The material will be disposed of by a licenced waste contractor at a licenced facility. Records will be maintained by the environmental site manager.

Regular inspections and maintenance of plant and machinery checking for leaks, damage or vandalism will be made on all plant and equipment.

In the event of a spill the Contractor will ensure that the following procedures are in place:

- Emergency response awareness training for all Project personnel on-site works.
- Appropriate and sufficient spill control materials will be installed at strategic locations within the site. Spills kits for immediate use will be kept in the cab of mobile equipment.
- Oil booms and oil soakage pads should be maintained on-site to enable a rapid and effective response to any accidental spillage or discharge. The correct disposal of these booms and pads will be demonstrated during the tool box talks. Records will be maintained by the environmental manager of the used booms and pads taken off site for disposal.
- Spill kits will be stored in the site compound with easy access for delivery to site in the case of an emergency. A minimum stock of spill kits will be maintained at all times and site vehicles will carry spill kits at all times. Spill kits must include suitable spill control materials to deal with the type of spillage that may occur and where it may occur. Typical contents of an on-site spill kit will include the following as a minimum;

- Absorbent granules;
    - Absorbent mats/cushions;
    - Absorbent booms.
- Spill kits will contain gloves to handle contaminated materials and sealable disposal sacks.
- Track mats, drain covers and geotextile material.
- Any pollutant chemicals, fuels of any kind, concrete additives etc. used on site will be stored in labelled waterproof and secured protective containers to mitigate the risk of pollution of the watercourses.
- To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents etc, used during construction will be stored in temporary bunded area within the construction compound, however they will not be stored on site overnight.
- Oil and fuel storage tanks shall be stored in designated areas, and these areas will, as a minimum, be bunded to a volume not less than the following;
    - 110% of the capacity of the largest tank or drum within the bunded area (plus an allowance of 30 mm for rainwater ingress); or
    - 25% of the total volume of substances which could be stored within the bunded area.
- The site compound fuel storage areas and cleaning areas will be rendered impervious and will be constructed to ensure no discharges will cause pollution to surface or ground waters.
- Re-fuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area which will be away from any existing surface water drains which could also provide pathways to the underlying geology.
- Mobile plant will refuel over a drip tray with an absorbent mat;
- The contractor will ensure that no hazardous or noxious materials enters a watercourse/drain. Should this situation arise emergency procedures will be activated;
- Potentially contaminated run off from plant and machinery maintenance areas will be managed within the site compound surface water collection system.
- Damaged or leaking containers will be removed from use and replaced immediately.
- During all works the weather forecast will be monitored and a contingency plan developed to prevent damage or pollution during extreme weather. Machinery and equipment will not be left on-site during such events and will be removed beforehand.

6.2.3 Biosecurity

There is a risk that non-native invasive species, both terrestrial and aquatic, could be introduced during construction via machine tracks, boots or clothes that have been contaminated. Measures will need to be put in place to ensure that there is no spread of invasive non-native species or diseases. The Check-Clean-Dry approach should be followed, ensuring that all PPE and equipment is cleaned before leaving site. For more information refer to: www.nonnativespecies.org/checkcleandry.

6.2.4 General Avoidance Measures during Construction

General avoidance measures that should be incorporated within the scheme include:

- Limit the hours of working to daylight hours, to limit disturbance to nocturnal and crepuscular animals;
- Due to the presence bats and possibly other nocturnal mammals the use of lighting at night should be avoided. If the use of lighting is essential, then a directional cowl should be fitted to all lights to prevent light spill and to be directed away from treelines/groups of trees.
- Contractors must ensure that no harm comes to wildlife by maintaining the site efficiently and clearing away materials which are not in use, such as wire or bags in which animals can become entangled; and
- Any pipes should be capped when not in use (especially at night) to prevent animals becoming trapped. Any excavations should be covered overnight to prevent animals from falling and getting trapped. If that is not possible, a strategically placed plank should be placed to allow animals to escape.

- Any clearance of trees and scrub will be conducted outside of the bird nesting season (March 1st- August 31st). If this is not possible, a breeding bird survey will be undertaken in advance of the works to ensure that there will be no impacts on nesting birds.
- Although no vegetation is outlined to be removed during the construction of this project, it should be noted that all nesting birds are protected during the bird-breeding season ().
- All trees are to be retained as part of the as part of the upgrade works to the landscape plan. Any trees that are within 15m of construction works or tracks will need to be protected. The following recommendations are from 'Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes' (NRA, 2006). Any excavation carried out within the Root Protection Area (RPA) should be undertaken with extreme care, avoiding damage to the protective bark covering larger roots.

6.3 Disturbance to Kingfisher during Construction

The following measures relating to impacts to Kingfisher shall be incorporated:

- A pre-construction Kingfisher survey should be conducted prior to any works commencing from February to August (in the breeding season) in case conditions change over the timeframe of the planning application until construction starts. While no suitable nesting habitat was recorded within the site, Kingfisher are confirmed to use the site and conditions can change over time. The survey should be carried out by a suitable qualified ecologist/ornithologist. If a Kingfisher nest is found, all works in the area will have to be postponed until the chicks have successfully fledged and appropriate mitigation measures identified and put in place.
- In the eastern section of the site where the GI Corridor will be constructed in the narrow section between the Traveller Accommodation Site and the Whitestown Stream, screening will be in place between the works and the stream to minimise disturbance impact to Kingfisher that may be foraging in this area. The screening will be installed from Whitestown Way and cover approximately 75m in length upstream.

6.4 Operational Impacts to Bats

6.4.1 Sensitive Lighting Design

A Lighting Strategy has been designed as part of this development, to reduce light spill and minimise the effects of light pollution to bats, particularly onto the Whitestown Stream which is used by commuting and foraging bats (Fahey O'Riordan Consulting Engineers 2021). This design has been developed in accordance with ILP's Guidance Note 08/18: Bats and Artificial Lighting in the UK: Bats and the Built Environment (Bat Conservation Trust and Institute of Lighting Professionals 2018).

This design also is developed according to a recent lighting design for the strategic greenway along the Dodder River (ROD Consulting 2017). The Dodder design incorporated the below measures as well as incorporating bollards instead of lighting columns in environmentally sensitive areas for example in areas where bats are roosting. As it was found that there are negligible roosting opportunities for bats in Killinarden Park and the GI corridor, bollards are not necessary and lighting columns are preferable in this case.

The following measures from the Lighting Strategy have been incorporated into the design to reduce the lighting impacts:

- The lighting elements will consist of mono-directional LED luminaires which will be motion sensor activated to reduce the need for lighting at night. The motion sensors and the mono-directional lights used will focus the light where it is required (on to the paths) in the aim to minimise light spill to maintain a dark corridor along the stream. When a member of the public approaches the area a bank of 4 or 5 lights come on. As they reach the middle of that bank the next bank of 4 or 5 lights come on allowing users to progress through in a safe manner. The lights are on constantly until a set time (7pm or 8pm in the winter months) after which the system switches to motion sensors. This will reduce the time the lighting is on during night time hours when the park is used less by people.
- The lighting columns will be 6m high and spaced 33m apart and have tightly controlled asymmetrical light distribution to reduce spill.

- The lighting strategy indicates that spill light at 4 metres from the path is calculated to be an average of 1.27 Lux on the off-side grass margin along the GI corridor path and cycleway. To retain the waterbody as a dark corridor, the lighting has been designed so there will be zero Lux spill light onto the Whitestown Stream with the exception of a small section at its eastern and western ends of the GI corridor. Upward spill is calculated to be zero.
- LED luminaires will be energy efficient, low wattage, low intensity LED with a warm white spectrum of 3000K and peak wavelengths higher than 550nm to avoid the component of light most disturbing to the Bats. The proposed luminaire, on which we have based the design calculations is the Schreder Axia 2.1 5165 with colour 730nm / 3000K warm white LED light source. which is recommended under the Bats and artificial lighting Guidance Note 8 developed by Bat Conservation Trust and Institute of Lighting Professionals (2018)
- There will be no other lighting of natural habitats, including woodlands, grassland, and Whitestown Stream and the north side of the stream will be retained as a dark corridor, thus protecting any potential roosts from lighting.

6.4.2 Post Construction Monitoring of Bats

Post construction monitoring of the local bat population, particularly for Myotis sp. (likely Daubenton's bat), will be undertaken by a suitably qualified ecologist with bat surveying experience. The monitoring should be carried out to determine the effectiveness of the lighting design on the foraging and commuting behaviour of bats and monitor if the population numbers are not declining. This monitoring will be carried out annually for a minimum period of three years after construction is completed. The survey timing and methodology should follow guidelines set out in Collins (2016) with regard to the time of year and weather conditions.

The ecologist will also recommend suitable locations for any bat boxes that are to be erected after works are finished and tree planting has taken place.

7 Residual Impact

Residual ecological impacts are those that remain once the development proposals have been implemented. The main aim of ecological mitigation, compensation, and enhancement is to minimise or eliminate residual impacts.

Provided the mitigation is set out in full, there are no negative residual impacts from the proposed works. The works provide an opportunity to significantly enhance the site for biodiversity if appropriate measures are included in the works. Further opportunities to enhance the site for biodiversity are noted below in Section 7.1.

The table below (Table 7-1) presents a summary of the EcIA assessment describing the ecological feature, the potential impacts of the works on these ecological features, their value according to European environmental law, the severity of the impact and mitigation measures which are to be implemented to avoid these impacts. Residual impacts following the implementation of mitigation measures are also provided.

Table 7-1 Ecological Impact Assessment Summary Table

Ecological Feature	Importance of Feature	Potential impact	Impact without Mitigation	Mitigation	Significance of Effects of Residual Impacts
Dodder Valley pNHA	National	Temporary decrease in Water Quality from sediment released and/or pollution incidents.	Minor	Follow pollution prevention measures (Outlined in Section 6.1.1)	No significant residual impact anticipated
Kingfisher	Local	Temporary decrease in Water Quality from sediment released and/or pollution incidents.	Minor		No significant residual impact anticipated
		Temporary disturbance to nesting sites	Minor	Pre-construction Kingfisher survey to ensure no nests will be disturbed by works	No significant residual impact anticipated
		Temporary disturbance to foraging birds	Minor	Screening of Whitestown Stream for 75m beside constricted area next to Travellers Accommodation Site	No significant residual impact anticipated
Bats (foraging / commuting)	Local/County	Low but long-term lighting impacts during operation	Minor	Install sensitive lighting design outlined in Section 6.4 including use of directional lighting and motion sensor to retain dark corridor along Whitestown Stream Post construction monitoring surveys to ensure lighting design measures are effective	Small residual impact from introduced lighting in previous dark corridor. Impact on bats to be monitored
		Long term Positive impact through increase in foraging and commuting habitat in Killinarden park from tree and vegetation planting	Minor	N/A	Long-term positive impact due to increase in available habitat

7.1 Recommended Enhancements

The following measures are recommended to enhance Killinarden Park and the Strategic Corridor site along Whitestown Stream for further opportunities for biodiversity. These measures are not mitigation measures required to ensure no negative residual impacts but rather represent significant opportunities for enhancements. Once final options are selected the EcIA will be updated to reflect positive impacts on any ecological features.

7.1.1 Installation of Bat Boxes

As an additional opportunity to enhance the site for bats, it is recommended that while the woodland matures, at least 4 bat boxes be installed in dark areas around the park and along the GI corridor. Currently the location of these bat boxes cannot be indicated as this will be carried out after the proposed tree planting has taken place. The locations of the bat boxes can be indicated by the ecologist carrying out post-construction monitoring of bat populations.

Simple bat boxes suitable for Pipistrelle's and Leisler's bats can be bought online or constructed by local community groups e.g. Men's Sheds. 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.

Example of suitable bat boxes include the 1FF Schwegler Bat Box with Built-in Wooden Rear Panel and the 2F Schwegler Bat Box (General Purpose).

Guidance on installing bat boxes is detailed in the following resource documents:

- https://www.bats.org.uk/our-work/buildings-planning-and-development/bat-boxes/putting-up-your-box
- http://www.batcon.org/images/InstallingYourBatHouse_Building.pdf

A summary on installing bat boxes can be summarised as:

- Suggested locations include areas with mature trees located near other treelines and water edges.
- All bat boxes should be mounted at least 3-4 metres above the ground
- Mount on the south facing side of the tree where the box exposed to the sun for part of the day
- Do no install bat boxes on a tree that is near any lighting column

7.1.2 Bird boxes

It is recommended that bird nesting boxes be installed in quieter areas of the park while the proposed planted woodlands and trees mature to enhance the site for birds. Bird nesting boxes come in a range of entrance sizes that are suitable for different species dependant on their size. A selection of the following is recommended:

- 25mm hole for Blue Tit and smaller birds
- 32mm hole for Great Tit and slighting larger small birds
- Open-fronted nest box for Robins
- 45mm hole for Starlings and larger birds.

7.1.3 All Ireland Pollinator Plan

There are further opportunities to enhance the site for pollinators. It is recommended that the All-Ireland Pollinator Plan actions be carried out during the operation of the park. Recommended actions are outlined in the guidance document All-Ireland Pollinator Plan 2015-2020 Council: actions to help pollinators:

https://www.biodiversityireland.ie/wordpress/wp-content/uploads/Pollinator-Council-Guide-FINAL.pdf

A summary of the actions in this document includes:

- Protect what you have
- Protect and enhance the natural habitats that are already available to pollinators
- Alter mowing regime of grassy areas.

- This is the most cost-effective way to help pollinators is to reduce mowing and allow grassland species such as dandelions, clover, and birds-foot trefoil to flower.
- Further guidance on this can be found here: https://pollinators.ie/wp-content/uploads/2019/04/Pollinator-friendly-grass-cutting-A5-Flyer-PRINT.pdf
- Plant Pollinator-friendly plants
- Choosing to plant native and nectar/pollen rich species that provide food sources for pollinators from early spring to autumn.
- Further guidance on this can be found here https://pollinators.ie/wordpress/wp-content/uploads/2018/04/Planting-Code-2018-WEB.pdf
- Provide nesting habitat
- Pollinators early life cycles are dependant on their nesting habitats, not just the food that is provided. Many pollinators nest in hedgerows, earth/sand banks, holes in wood or concrete, or in bee/bug hotels.
- Further guidance can be found here: https://pollinators.ie/wordpress/wp-content/uploads/2018/04/How-to-guide-Nesting-2018-WEB.pdf
- Reduce or eliminate pesticides
- Use alternatives to pesticides like glyphosate or eliminate their use altogether

7.1.4 Hedgehog houses

As hedgehog populations are decreasing in Ireland, it is important to support this vulnerable mammal. One way this can be done is to provide a place for these animals to sleep during the day and hibernate during the winter. Hedgehog houses can be constructed from a variety of materials, and should be placed in sheltered, undisturbed areas where the public or dogs cannot easily access.

The following guidance shows a few ways to build a hedgehog house:

- https://www.nhm.ac.uk/discover/how-to-make-a-hedgehog-house.html
- http://www.hedgehog-rescue.org.uk/houses.php

7.1.5 Fisheries recommendations

Recommendations from a fisheries baseline survey report, which do not purport to be an assessment or recommendation relating to the proposed development, are outlined in Appendix C. Recommendations that are relevant to the current proposal are reiterated below:

Reduction of pollution sources: Storm drains and other points sources of pollution are contributing to heavy enrichment and siltation of both the Whitestown Stream and Jobstown Stream in the vicinity of Killinarden and Sean Walsh Parks. The location of the most-significant sources should be addressed and remediated. Regular maintenance of silt traps in storm drain systems would help reduce silt loads to the watercourses and connecting ponds.

Remove instream rubbish: The clean-up of instream trash/refuse and unsightly waste from the Whitestown and Jobstown Streams will help to improve aquatic habitats. If clean-up operations are undertaken in conjunction with local residents and park users, this could lead to an improved sense of ownership and ecological responsibility between local community stakeholders and the aquatic habitats within the park sites.

8 Conclusion

The construction and operation of this proposed development has been shown to potentially impact Nationally important site Dodder Valley pNHA and locally important ecological features include the Whitestown Stream, European Eel, disturbance to Kingfisher and commuting and foraging routes for bats. There will also be long-term positive impacts for bats due to the upgrade works which will increase the habitat available for this species, particularly in Killinarden Park.

Based upon the information supplied and provided that the development is constructed in accordance with the mitigation measures outlined in Section 6, there will be no significant impact alone or in combination with other projects and plans, as result of the development and associated works on the ecology of the area and in particular on the following ecological features:

- Dodder Valley pNHA [000991]
- Breeding and foraging Kingfishers
- Commuting and foraging routes bats

Provided the mitigation is set out in full, there are no negative residual impacts from the proposed works. The works provide an opportunity to significantly enhance the site for biodiversity if appropriate measures are included in the works.

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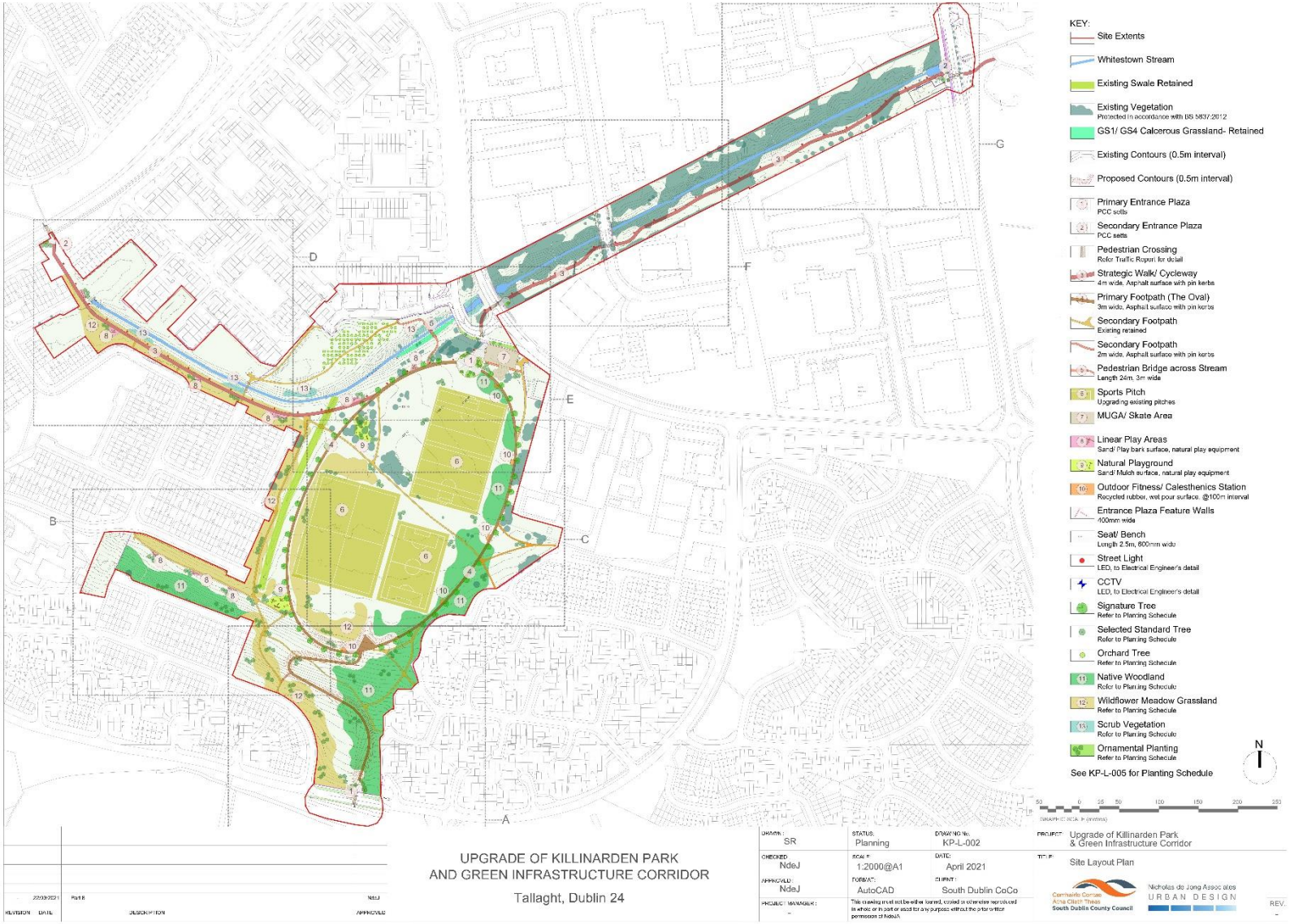
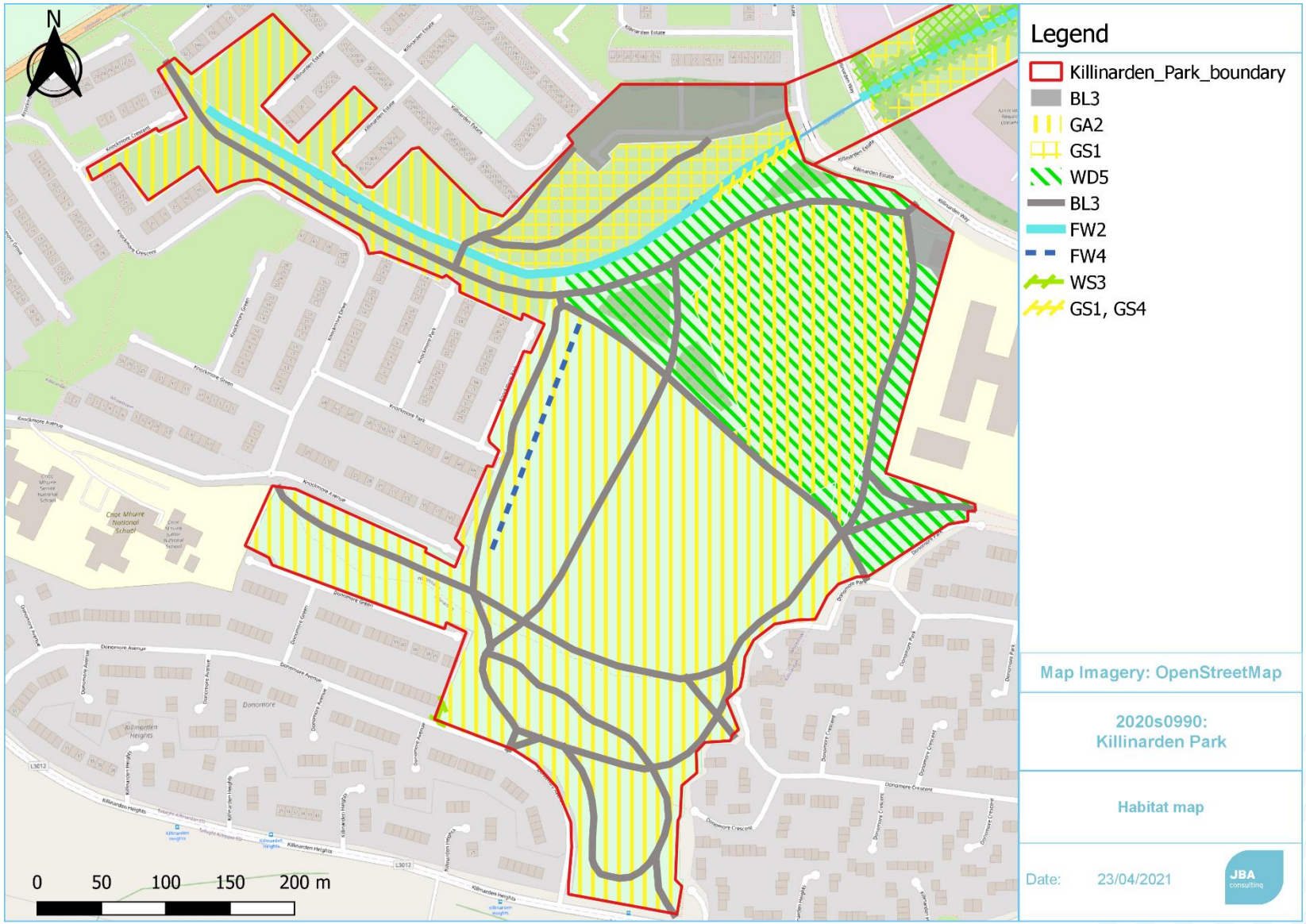
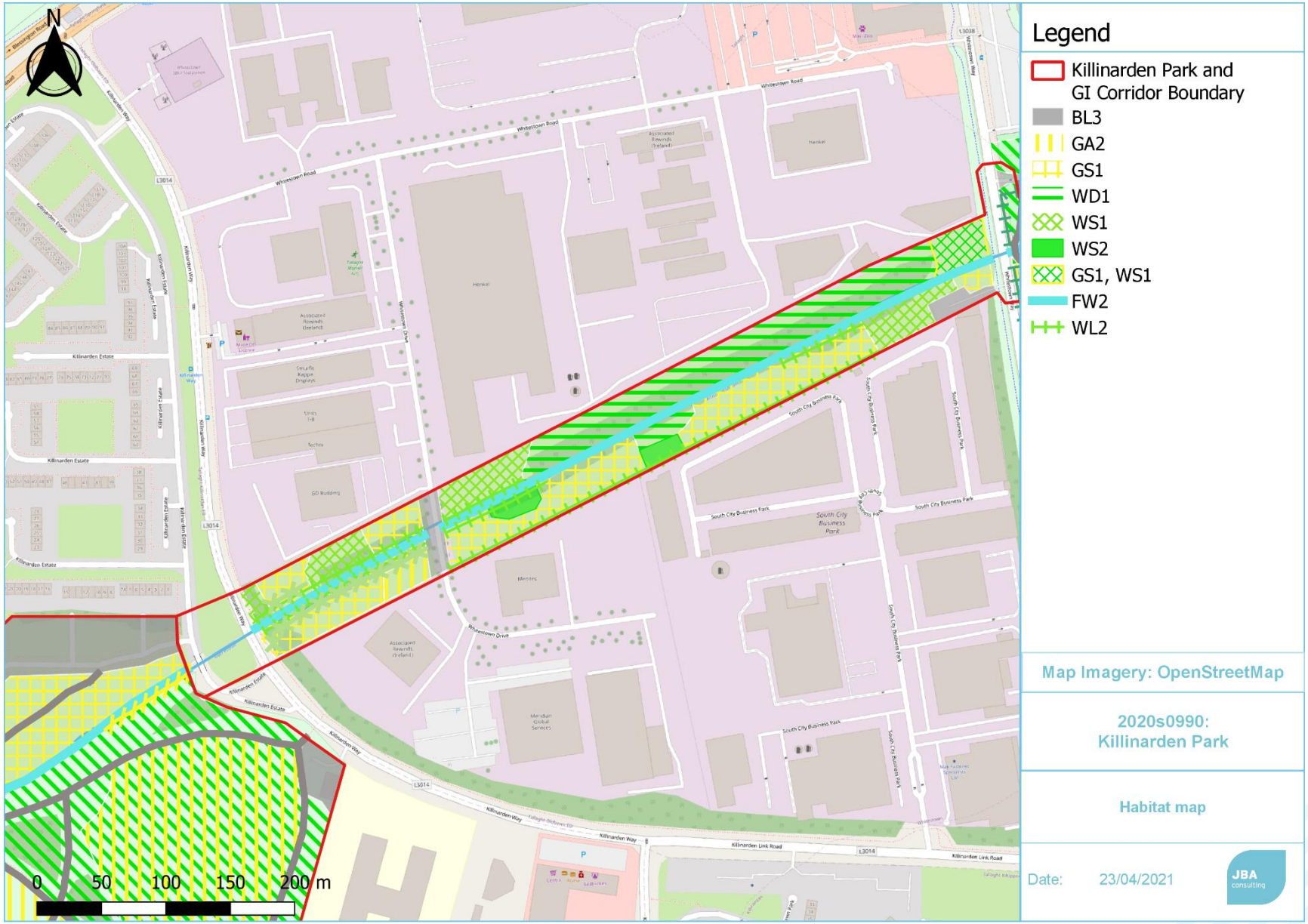
Appendices

A Killinarden Landscape and Green Infrastructure Corridor Design



B Habitat Maps




N
Legend
Killinarden Park and GI Corridor Boundary
BL3
GA2
GS1
WD1
WS1
WS2
GS1, WS1
FW2
WL2
Map Imagery: OpenStreetMap
2020s0990: Killinarden Park
Habitat map
Date: 23/04/2021
0 50 100 150 200 m

C Fisheries report

Fisheries assessment of watercourses and waterbodies in Killinarden Park and Sean Walsh Park, Tallaght, Dublin

Prepared by Triturus Environmental Ltd. for JBA Consulting

March 2021

Please cite as:

Triturus (2021). Fisheries assessment of watercourses and waterbodies in Killinarden Park and Sean Walsh Park, Tallaght, Dublin. Report prepared by Triturus Environmental Ltd. for JBA Consulting. March 2021.

Table of contents

1. Introduction

1.1 Background

Triturus Environmental Ltd. were contracted by JBA Consulting on behalf of South Dublin City Council to undertake a baseline fisheries assessment of watercourses within the vicinity of Killinarden Park and Sean Walsh Park in Tallaght, Dublin 24. The proposed survey sites were located on the Jobstown Stream (EPA code: 09J02) and an unnamed tributary (known locally as the Whitestown Stream), both of which fed the parklands (**Figure 2.1**). The Jobstown Stream shares downstream connectivity with the River Dodder, approx. 1.6km downstream from Sean Walsh Park. The survey area was located within the River Dodder sub-catchment (Dodder_SC_010).

The surveys were undertaken to establish baseline fisheries data, primarily in relation to European eel (*Anguilla anguilla*) and lamprey species (*Lampetra* sp.) species, which would inform future development and management of the parks by South Dublin County Council (SDCC). In order to gain an accurate overview of the existing and potential fisheries value of the survey area, an electro-fishing survey across *n*=8 riverine sites was undertaken (**Table 2.1; Figure 2.1**). Furthermore, a fisheries habitat appraisal was undertaken concurrently for the 5 no. ponds situated within Sean Walsh Park (**Figure 2.1**). The presence or absence of European eel within the study area was examined through the use of environmental DNA (eDNA) analysis, with *n*=3 water samples collected and analysed in March 2021 (**Figure 2.2**).

2. Methodology

2.1 Fish stock assessment (electro-fishing)

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake an electro-fishing survey of watercourses within and adjoining Killinarden and Sean Walsh Parks. Permission was granted on Monday 21st September 2020 and the survey was undertaken on Saturday 26th September 2020, following notification to Inland Fisheries Ireland and under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) license.

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on the Whitestown Stream and Jobstown Stream in the vicinity of Killinarden and Sean Walsh Parks. Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. All fish were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As two primary species groups were targeted during the survey, i.e. European eel and lamprey, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel can be surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g. CFB, 2008).

The electro-fishing survey was undertaken across *n*=8 sites (see **Table 2.1, Figure 2.1**). Length frequency graphs and species composition graphs for all species with numbers captured are illustrated in the Results section.

Table 2.1 *n*=8 electro-fishing survey site locations in the vicinity of Killinarden and Sean Walsh parks, Tallaght, September 2020

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Whitestown Stream	n/a	Killinarden Park	707349	726559
A2	Whitestown Stream	n/a	Killinarden Park	707701	726534
A3	Whitestown Stream	n/a	Whitestown Drive	707888	726645
A4	Whitestown Stream	n/a	Whitestown Way	708355	726878
B1	Jobstown Stream	09J02	Sean Walsh Park	708528	726563
B2	Jobstown Stream	09J02	Sean Walsh Park	708577	726955
B3	Jobstown Stream	09J02	Sean Walsh Park	708917	727153
B4	Jobstown Stream	09J02	Sean Walsh Park	709218	727409

2.1.1 European eel and non-lamprey species

For European eel, as well as other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of c.75m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages.

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract fish to the anode without harm. For the high conductivity waters of the sites, a voltage of 200-230v, frequency of 40Hz and pulse duration of 3.5ms was utilised to draw fish to the anode without causing physical damage.

2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted box quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approx. 10–15 cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

2.2 Fisheries habitat

A broad appraisal / overview of the upstream and downstream habitat at each riverine survey site, as well as the ponds within the survey area, was also undertaken to evaluate the wider contribution to general fisheries habitat. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (EA, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the river sites (i.e. channel profiles, substrata etc.).

2.3 eDNA analysis

To further validate the site surveys and to detect potentially cryptically-low populations of European eel within the study area, water samples from *n*=3 riverine and pond habitats in Sean Walsh Park were analysed for eel environmental DNA (eDNA) in March 2021 (**Figure 2.2**).

Sampling points were strategically chosen to maximise habitat coverage within the study area, with the Jobstown Stream sampled below the weir at the pond P5 outfall to determine if the structure was eel-passable or not.

In accordance with best practice, composite (500ml) water samples were collected from each sampling point, maximising the geographic spread within each site (20 x 25ml samples at each site) and thus increasing the chance of detecting the target species' DNA. Each composite sample was filtered on site using a sterile proprietary eDNA sampling kit. Fixed samples were sent to the laboratory for analysis on the same day as collection. A total of *n*=12 qPCR replicates were analysed for each site. Given the high sensitivity of eDNA analysis, a single positive qPCR replicate is considered as proof of the species' presence (termed qPCR No Threshold, or qPCR NT). Whilst an eDNA approach is not currently quantitative, the detection of the target species' DNA indicates the presence of the species at/within or upstream of the sampling point. Please refer to **Appendix B** for full eDNA laboratory analysis methodology.

2.4 Biosecurity

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was disinfected with Virkon® between survey sites to prevent the transfer of pathogens and/or invasive species between survey areas. As per best practice, surveys were undertaken at sites in a downstream order (i.e. uppermost site surveyed first etc.) to prevent the upstream mobilisation of invasive propagules and pathogens. Any invasive species recorded within or adjoining the survey area were geo-referenced.

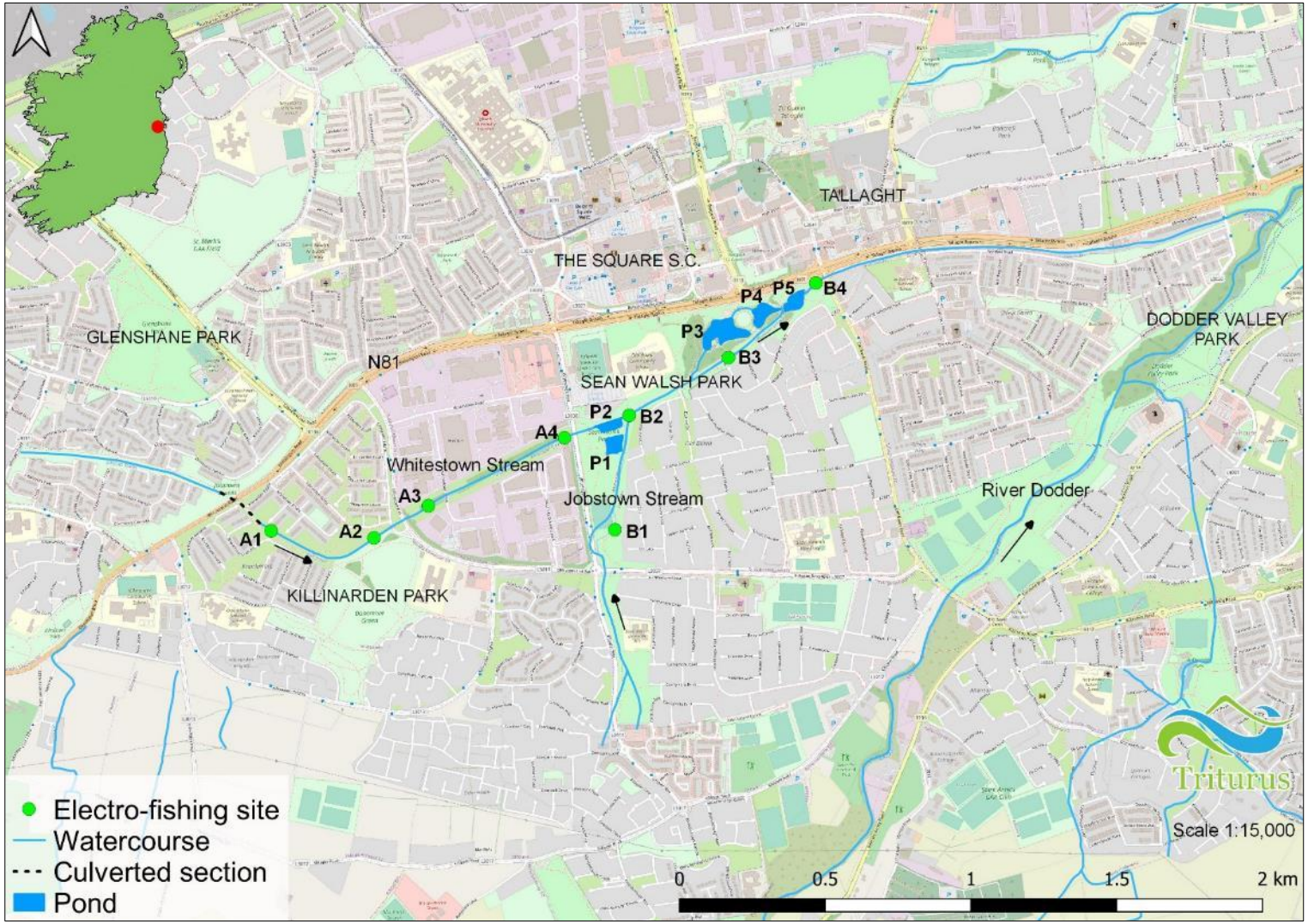


Figure 2.1 Location overview of the *n*=8 electro-fishing sites and *n*=5 pond fisheries appraisal sites.

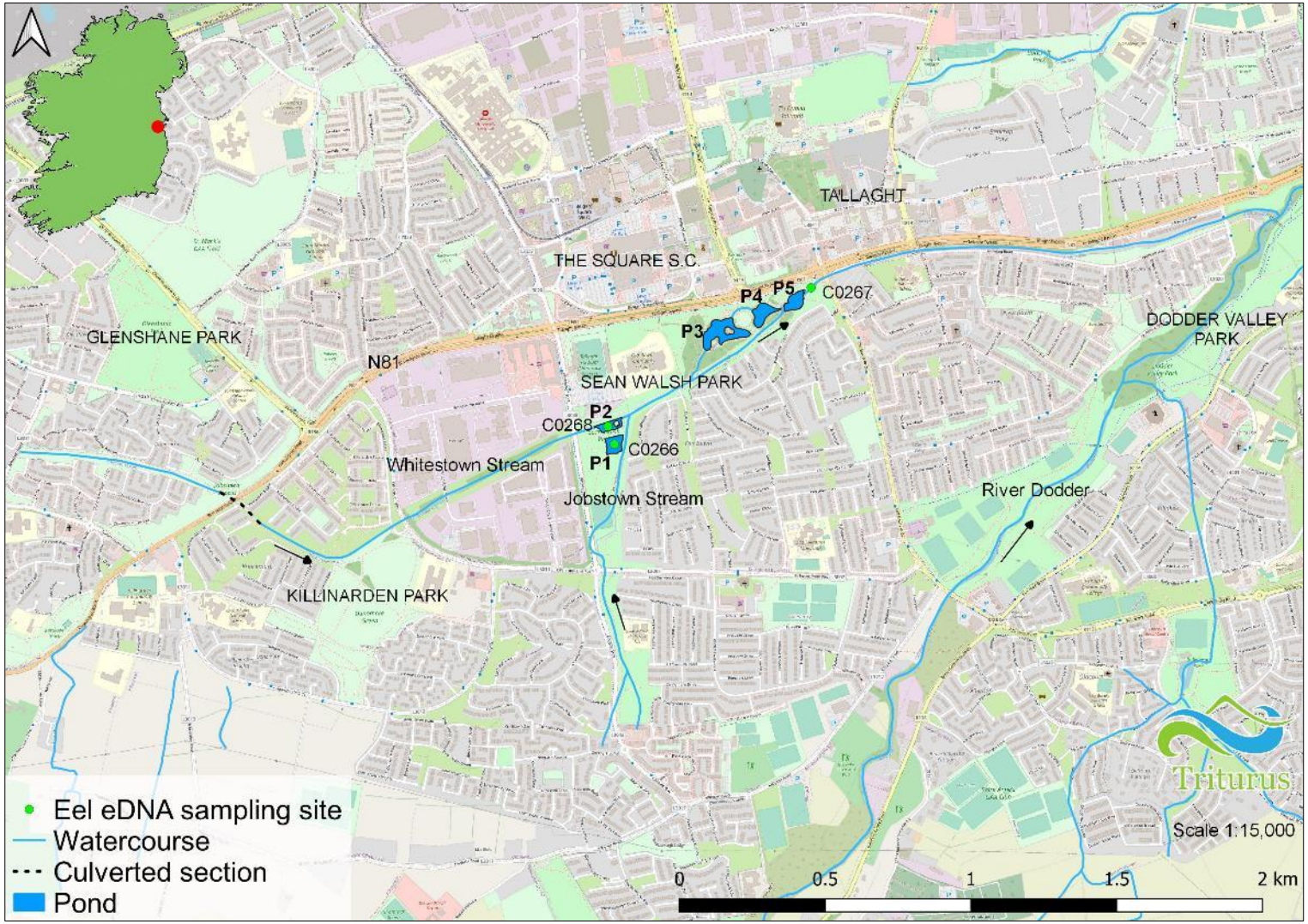


Figure 2.2 Location overview of the *n*=3 eDNA sampling sites for European eel, March 2021

3. Results

An electro-fishing survey of *n*=8 riverine sites and fisheries appraisal of *n*=5 pond sites in the vicinity of Killinarden and Sean Walsh Parks was conducted Saturday 26th September 2020. Water samples at *n*=3 sites were also analysed for European eel eDNA in March 2021. The results of the surveys are discussed below in terms of fish population structure and the suitability and value of the surveyed areas for European eel, lamprey and other fish species. Scientific names are provided at first mention only. Site characteristics are summarised in **Appendix A**.

3.1 Fish stock assessment (electro-fishing)

3.1.1 Site A1 – Whitestown Stream, Killinarden Park

Site A1 on the upper reaches of the Whitestown Stream at Killinarden Park was a heavily modified lowland depositing stream (FW2; Fossitt, 2000) that was 2.5m wide and 0.25m deep. The shallow U-shaped stream had 0.5m high bank heights in a historically straightened channel. The profile comprised 100% shallow glide. The stream bed featured a concrete base that was covered by a shallow silt layer of between 5cm and 10cm deep. Adjoining large pockets of silt, fine and medium gravels were present (i.e. 50% silt & 50% mixed gravels). The bed was covered by 20% filamentous green algae indicating significant enrichment pressures in addition to siltation pressures. The channel supported both brooklime (*Veronica beccabunga*) and watercress (*Nasturtium officinale*). These species helped improve the instream flow diversity by deflecting the flow around the marginal beds of macrophytes. The riparian zone was open and comprised of amenity grassland (GA2).

Three-spined stickleback was the only fish species recorded via electro-fishing at site A1 (**Figure 3.1**). A moderate density of adults and juveniles were present (*n*=28 total). The heavily modified channel suffered from significant siltation and enrichment pressures and was not considered capable of supporting salmonids. Furthermore, the stream was not capable of supporting lamprey given significant historical modifications and concreted bed with superficial/flocculent silt layers that were not deep enough to support lamprey ammocoetes. No European eel were recorded present and it is likely that observed downstream barriers (i.e. small weirs and culverts) are impeding the species' passage within the upper reaches of the stream (however, see **section 3.3**).

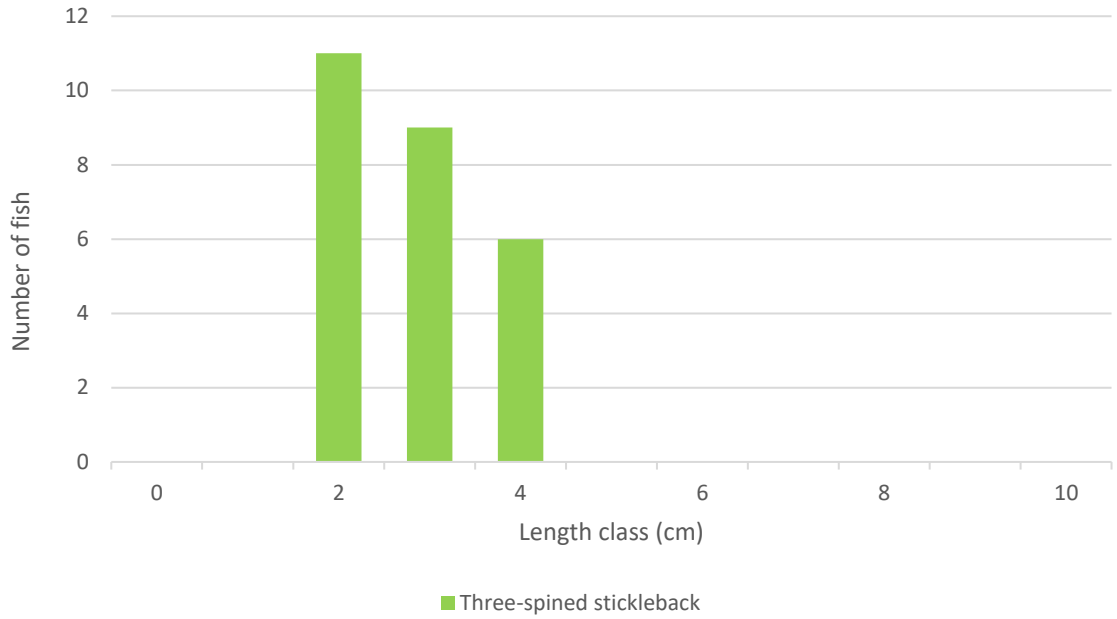


Figure 3.1 Fish stock length distribution recorded via electro-fishing at site A1 on the Whitestown Stream, September 2020

Plate 3.1 Three-spined stickleback recorded from site A1 on the Whitestown Stream

Plate 3.1 Representative image of site A1 on the upper reaches of the Whitestown Stream

3.1.2 Site A2 – Whitestown Stream, Killinarden Park

Site A2 on the Whitestown Stream, as with site A1, was a heavily modified lowland depositing stream channel (FW2). The channel was 2.5m wide but shallower than site A1 at 0.05m deep on average. The channel had 0.5m high bank heights that graded into the adjoining shaped slopes of the parkland. The channel profile comprised 80% shallow glide and 20% riffle. The stream bed featured a concreted base that had occasional scattered fine and medium gravels. These were bedded in a fine superficial silt later. The bed had variable cover of filamentous algae, estimated at 50% over the 100m survey section. The open banks and shallow nature of the stream at site A2 facilitated a proliferation of algae. The channel supported both brooklime and watercress. The riparian zone was open and comprised of scattered trees and parkland (WD5) with amenity grassland and scattered mature alder (*Alnus glutinosa*) and birch (*Fagus sylvatica*). A narrow fringe of rank grasses, nettle (*Urtica dioica*), wild angelica (*Angelica sylvestris*) and great willowherb (*Epilobium hirsutum*) 0.5m wide graded into the adjoining amenity grassland areas.

Three-spined stickleback was the only fish species recorded via electro-fishing at site A2 (**Figure 3.2**). A low density of adults and juveniles were present (*n*=20 total). The heavily modified channel suffered from significant siltation and enrichment pressures and was not considered capable of supporting salmonids. Consequentially, the shallow stream would be subject to deoxygenation pressures in summer creating conditions inimical to supporting salmonid populations. Furthermore, the Whitestown Stream at site A2 was not capable of supporting lamprey given significant historical modifications and concreted bed with shallow superficial silt layers. No European eel were recorded present and it is likely that observed downstream barriers (i.e. small weirs and culverts, **Figure 4.1** barrier map) are impeding the species' passage. Marginal macrophyte beds provided cover and enriched conditions (outside the tolerance ranges of other fish species) supported a fish community composed solely of three-spined stickleback.

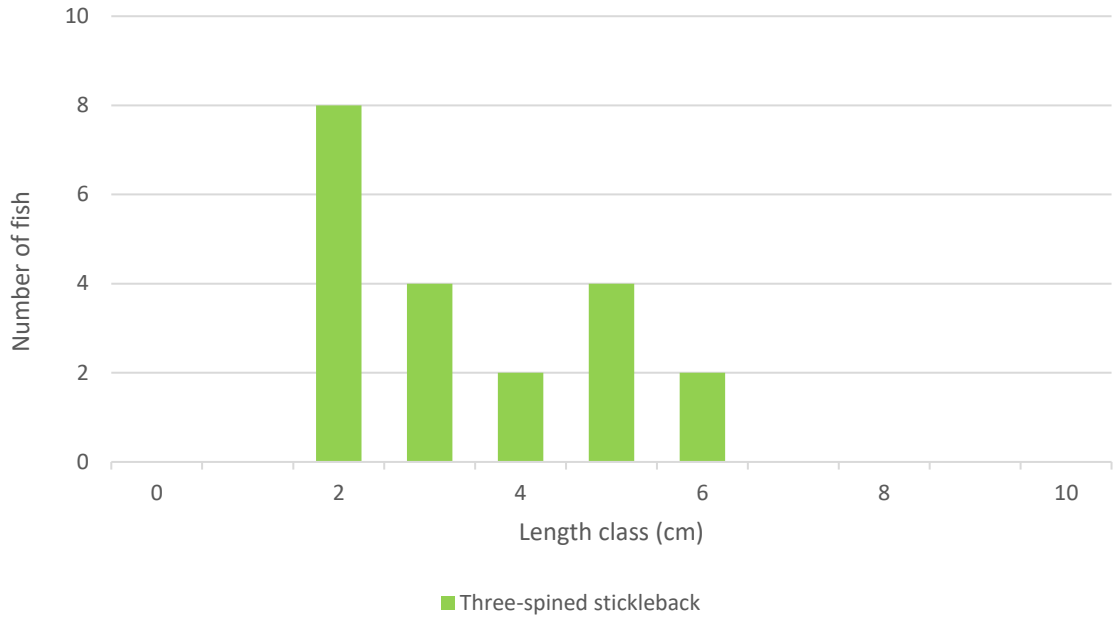


Figure 3.2 Fish stock length distribution recorded via electro-fishing at site A2 on the Whitestown Stream, September 2020

Plate 3.2 Representative image of site A2 on the upper reaches of the Whitestown Stream (showing multiple small weirs)

3.1.3 Site A3 – Whitestown Stream, Whitestown Drive

Site A3 on the Whitestown Stream at Whitestown Drive was a heavily modified lowland depositing stream channel (FW2). The stream flowed in a U-shaped, 2.5m wide channel with 0.5m bank heights. The channel depth was variable between 0.2m and 0.5m, deepening towards a small 0.5m-high weir at the upstream extent of the survey area (see **Figure 4.1**). The channel and margins comprised of rendered concrete with scattered patches of fine and medium gravels (30% cover). The bed, however, was dominated by a shallow (0.1m deep) silt layer covering 70% of the bed. The stream profile was of 90% glide and 10% pool (confined to the area below the small weir). The channel supported both brooklime and watercress. The riparian areas supported planted mixed broad-leaved woodland (WD1) and encroaching scrub vegetation (WS1). Tree species include mature beech and white poplar (*Populus alba*) with dense nettle, bramble (*Rubus fruticosus* agg.) and ivy in the understories. The channel had 10% cover of green filamentous algae and 20% cover of sewage fungus.

Three-spined stickleback was the only fish species recorded via electro-fishing at site A3 (**Figure 3.3**). A low density of adults and juveniles were present (*n*=25 total). The heavily modified channel suffered from significant siltation and enrichment pressures and was not considered capable of supporting salmonids. Consequentially, the shallow stream would be subject to deoxygenation pressures in summer creating conditions inimical for salmonid populations. Furthermore, as per upstream sites, the Whitestown Stream at site A3 was not capable of supporting lamprey given significant historical modifications and concreted bed with shallow superficial silt layers. No European eel were recorded present and it is likely that observed downstream barriers (i.e. small weirs and culverts, **Figure 4.1**) are impeding the species' passage within the stream (however, see **section 3.3**). Marginal macrophyte beds provided cover and the absence of predatory fish and enriched conditions outside the tolerance ranges of other fish species supported a fish community composed of three-spined stickleback only.

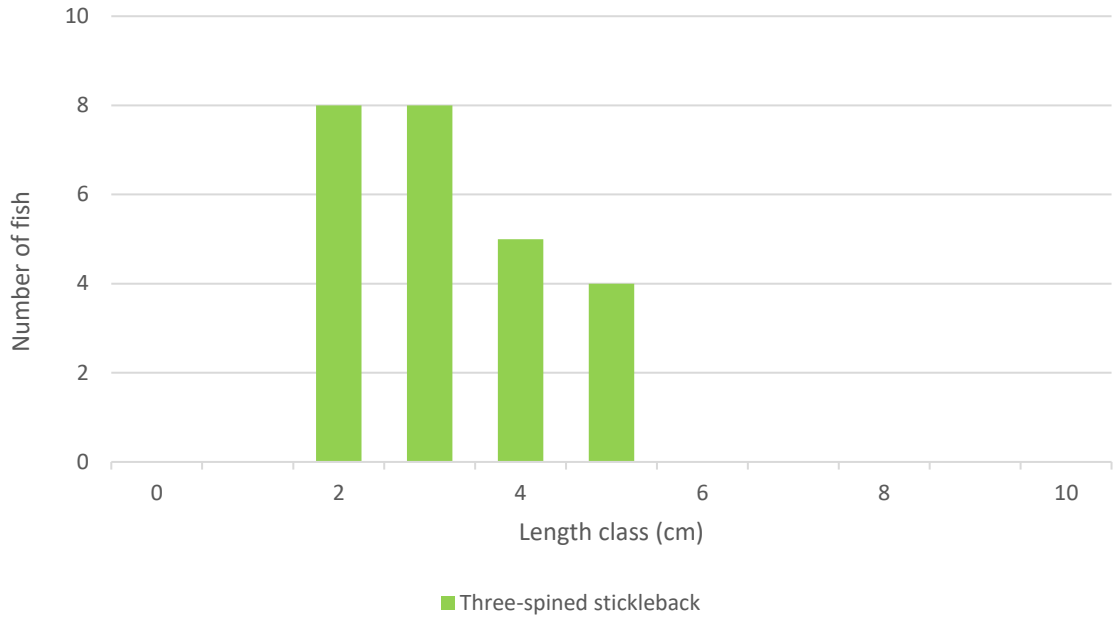


Figure 3.3 Fish stock length distribution recorded via electro-fishing at site A3 on the Whitestown Stream, September 2020

Plate 3.3 Representative image of site A3 on the upper reaches of the Whitestown Stream

3.1.4 Site A4 – Whitestown Stream, Whitestown Way

Site A4 on the Whitestown Stream was a heavily modified channel (FW2) situated west of the Whitestown Way Road. The stream was heavily modified by weirs, culverting and retaining walls at this location (**Plate 3.4**). It also had a concreted bed with small eroded pockets of pool habitat (20%) near the weir adjoining glide habitat (80%) downstream. The bed was comprised exclusively of concrete with 10% cover of filamentous algae and 90% cover of flocculate (excessive filamentous algae and unnatural levels of diatom growth decaying). The channel width was variable between 4m and 8m wide and the banks heights were 1-1.5m. The stream was shallow and averaged 0.1-0.4m in depth. No macrophyte plants were recorded due to the rendered concrete bed. The riparian areas were scrub-dominated with rank grasses, osier (*Salix viminalis*), bramble, hogweed (*Heracleum sphondylium*), wild angelica and great willowherb.

Three-spined stickleback was the only fish species recorded via electro-fishing at site A4 (**Figure 3.4, Plate 3.5**). A moderate density of juveniles was present in addition to low numbers of adults. (*n*=29 total). Stickleback were restricted to eroded pool habitat in the concreted bed of the stream. The heavily modified channel (with significant enrichment) pressures was not considered capable of supporting salmonids for the same reasons as discussed for sites A1 through A3 upstream. Furthermore, the stream was not capable of supporting lamprey given significant historical modifications and a concreted bed with shallow superficial silt layers only. No European eel were recorded present and it is likely that observed downstream barriers (i.e. small weirs and culverts, **Figure 4.1**) are impeding the species' passage within the stream. Marginal macrophyte beds provided cover and the absence of predatory fish and enriched conditions outside the tolerance ranges of other fish species supported a fish community composed of stickleback only.

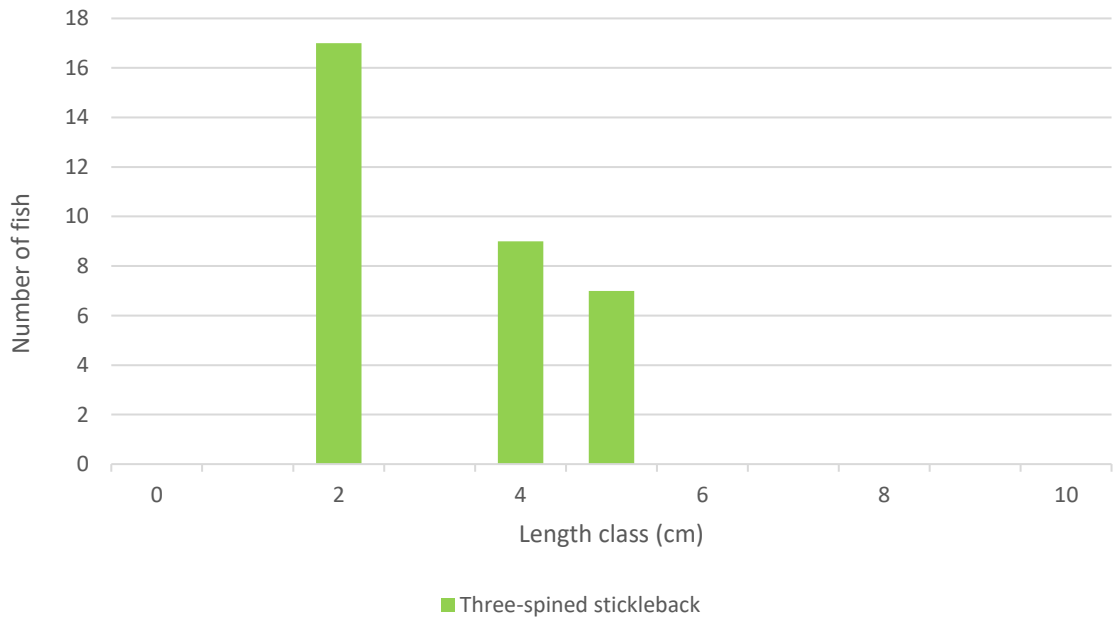


Figure 3.4 Fish stock length distribution recorded via electro-fishing at site A4 on the Whitestown Stream, September 2020.

Plate 3.4 Representative image of site A4 on the upper reaches of the Whitestown Stream showing weir and concreted stream bed.

Plate 3.5 Male (top) and female (bottom) three-spined stickleback recorded from site A4 on the Whitestown Stream, September 2020

3.1.5 Site B1 – Jobstown Stream, Sean Walsh Park

Site B1 on the upper reaches of the Jobstown Stream at Sean Walsh Park was a narrow 1.5m U-shaped drainage channel (FW4) that had 1.5-2m high banks and shallow water (0.2-0.3m deep). The open water habitat was limited with pockets of isolated pool and very limited flow. The profile was thus 100% pool. The bed comprised deep silt of 0.3-0.5m in depth. Macrophytes were limited to a mixture of watercress and lesser water parsnip (*Berula erecta*). The riparian areas comprised of rank grassy areas (GS2) with scrub areas (WS1) comprising reed canary grass (*Phalaris arundinacea*), great willowherb, hedge bindweed (*Calystegia sepium*) and nettle.

There were no fish species recorded via electro-fishing at site B1. From a fisheries perspective the drainage channel was not considered of value to fish due to the isolated pockets of water and heavily overgrown channel (**Plate 3.6**). No fish were recorded present.

Plate 3.6 Representative image of site B1 on the upper reaches of the Jobstown Stream (no fish recorded via electro-fishing)

3.1.6 Site B2 – Jobstown Stream, Sean Walsh Park

Site B2 on the Jobstown Stream was a heavily modified channel (FW2) situated at the confluence with the Whitestown Stream (downstream of pond P2). The stream was a 3m-wide U-shaped channel with variable bank heights (1.5-3m high). The depth was variable between 0.3m and 0.6m deep. The profile was dominated by deep glide (95%) with very localised pool habitat (5%). The bed of the river comprised a smooth concrete apron with deep silt on the surface (0.3-0.4m in depth) with scattered patches of gravel on the surface. The silt was very compacted in some areas with black anoxic plumes emerging on disturbance. Filamentous green algae and organic flocculate covered 100% of the stream bed. The riparian areas supported scattered mature ash

with rank grasses, nettle, hemp agrimony (*Eupatorium cannabinum*), great willowherb and water figwort (*Scrophularia auriculata*) present on the channel margins.

Three-spined stickleback was the only fish species recorded via electro-fishing at site B2 (**Figure 3.5**). Stickleback numbers were extremely high at site B2 and the species evidently benefited from the oxygenated water from the upstream pond (P2) and associated spill-over weir. From a fisheries perspective the heavily modified channel with significant siltation and enrichment pressures was not considered capable of supporting any fish species other than three-spined stickleback and European eel. However, as discussed above, the presence of downstream barriers were evidently impeding the species' passage within the stream and none were detected during the electro-fishing survey.

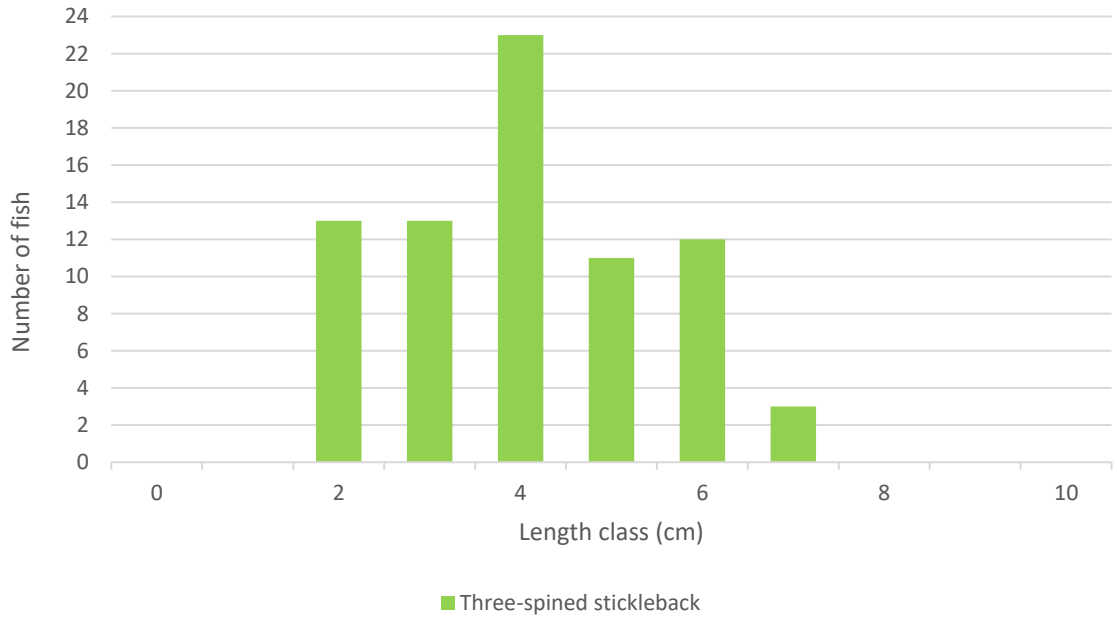


Figure 3.5 Fish stock length distribution recorded via electro-fishing at site B2 on the Jobstown Stream, September 2020

Plate 3.7 Abundant three-spined stickleback recorded from site B2 on the Jobstown Stream, September 2020

Plate 3.8 Representative image of site B2 on the Jobstown Stream near the Whitestown Stream confluence

3.1.7 Site B3 – Jobstown Stream, Sean Walsh Park

Site B3 on the Jobstown Stream in Sean Walsh Park was a deep, V-shaped and heavily modified drainage channel (FW4). The bankfull height was 3-4m and the channel was 1m wide with shallow water depth of 0.25m. The stream bed supported small quantities of coarse substrata (20% boulder and cobble) with a predominance of superficial silt (80%). The stream flows were very slight at the time of survey and the water was largely stagnated. The channel was heavily overgrown with watercress and limited pockets of open water were present, restricting the electro-fishing survey effort to 40m^2 of habitat. The banks supported rank grasses (dominated by reed canary grass) with hogweed, great willowherb and nettle. These rank grassy areas graded into the amenity grassland (GA2) of the adjoining parklands.

Three-spined stickleback was the only fish species recorded via electro-fishing at site B3 (**Figure 3.6**). A low density of adults and juveniles were present (*n*=18 total). The heavily modified channel suffered from significant siltation and enrichment pressures and was not considered capable of supporting salmonids. As a result (and as with upstream sites), the shallow stream would be subject to deoxygenation pressures in summer and such fluctuations in dissolved oxygen are inimical to salmonid presence. The Jobstown Stream at site B3 was not capable of supporting lamprey given significant historical modifications, superficial silt layers and poor (low) flows. No European eel were not recorded and it is likely that observed downstream barriers (i.e. small weirs and culverts, **Figure 4.1**) are impeding the species' passage within the stream and none were detected during the electro-fishing survey (however, see **section 3.3**). Overall, site B3 was not considered of any fisheries value apart from the presence of a small three-spined stickleback population.

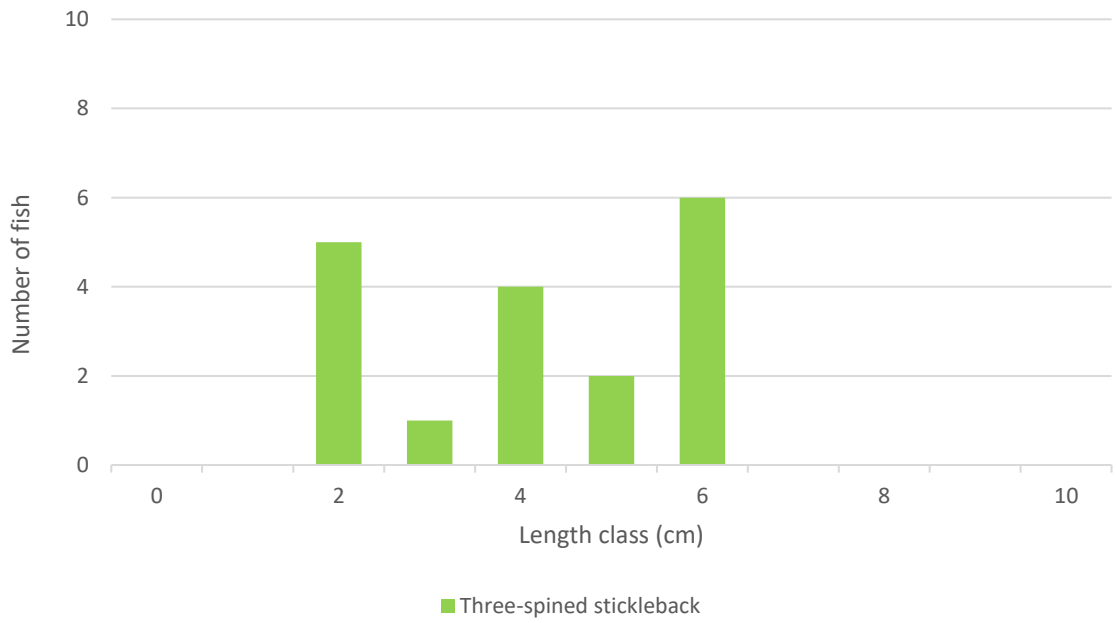


Figure 3.6 Fish stock length distribution recorded via electro-fishing at site B2 on the Jobstown Stream, September 2020

Plate 3.9 Large adult three-spined stickleback recorded from site B3 on the Jobstown Stream, September 2020

3.1.8 Site B4 – Jobstown Stream, Sean Walsh Park

Site B4 on the Jobstown Stream was situated downstream of the most easterly pond in the park (pond P5), below a significant and steep spill-over weir adjacent to the Old Bawn Road. It was considered the most natural of the stream survey sites, exhibiting some naturalness despite evident historical modifications to the channel. The channel width was variable between 1.5m and 4m wide with 2m high banks. The water depth varied from 0.2-0.5m. The profile was a mixture of 50% riffle, 30% glide and 20% pool. The substrata were comprised of small boulder and cobble (30%) with 30% coarse medium and fine gravels. Sand, silt and clay made up the remaining 40% of the substrata. Macrophytes present included abundant watercress and occasional lesser water parsnip. Very localised water crowfoot (*Ranunculus* subspecies *Batrachion* agg.) was also recorded present (<1% cover).

As with all other survey sites in the study area, three-spined stickleback was the only fish species recorded via electro-fishing at site B4 (**Figure 3.7**). A moderate density of juveniles was recorded present alongside a low number of adults (*n*=28 total). Most fish were associated with abundant marginal watercress beds. Site B4 exhibited the best-quality stream habitat of all the survey sites. Whilst it had some potential to support salmonids based on physical characteristics, the very heavily enriched water quality precluded the species' presence (none recorded or known from the stream). No eel were recorded present and, as with other survey areas in the catchment of the Killinarden and Sean Walsh Parks, physical barriers downstream are likely to be restricting eel passage into the system (i.e. from the downstream-connecting River Dodder) – however, see **section 3.3** below (eel presence confirmed by eDNA analysis).

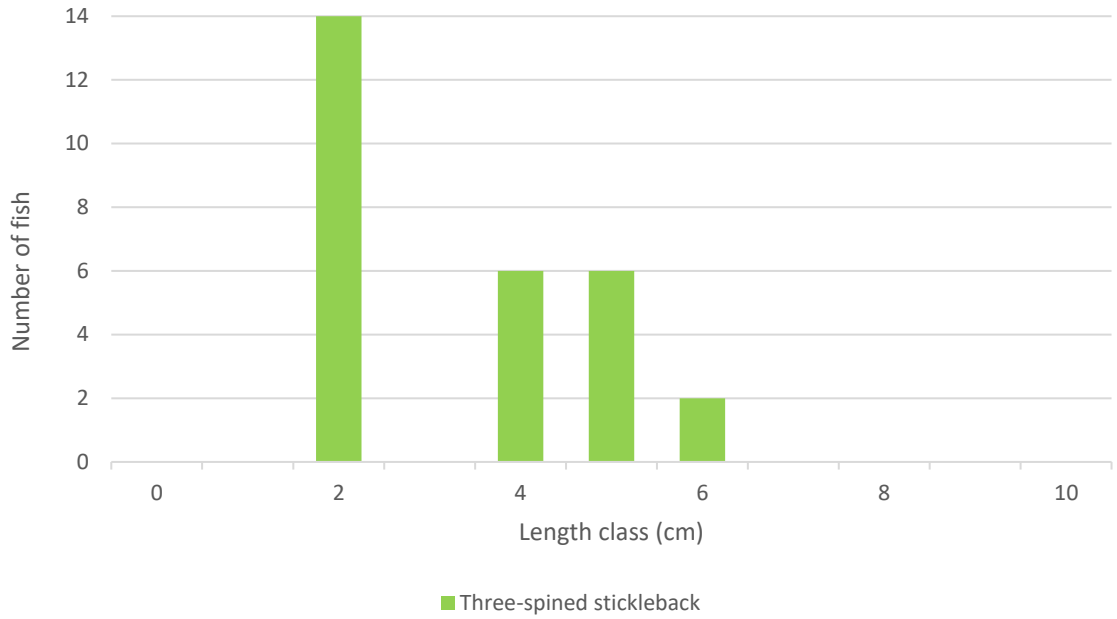


Figure 3.7 Fish stock length distribution recorded via electro-fishing at site B4 on the Jobstown Stream, September 2020

Plate 3.10 Representative image of site B4 on the Jobstown Stream, immediately downstream of the P5 pond spill-over weir, September 2020

3.2 Fisheries habitat appraisal (pond sites)

3.2.1 Pond P1, Sean Walsh Park

Pond P1 was a small artificial waterbody (FL8) located near the southern boundary of Sean Walsh Park, covering approximately 0.3ha surface area. The loosely square shaped pond was shallow (average 0.5-0.8m) with a heavy cover of macrophytes (unlike the other survey ponds). The littorals were well-vegetated and supported abundant bulrush (*Typha latifolia*) with occasional water mint (*Mentha aquatica*), brooklime (*Veronica beccabunga*) and watercress. The open water of the pond was heavily choked by the invasive pondweed *Lagarosiphon major* (up to 70% cover of the pond basin). The margins were reinforced with boulders for scour protection. The pond bed comprised mainly deep silt and clay with occasional scattered cobble and gravels. The banks graded into adjoining scattered trees and parkland (WD5), with dense scrub along the eastern (stream) bank.

The pond was connected to the Jobstown Stream via a small, 2m wide shallow channel in the south-eastern corner. This appeared accessible to European eel and other fish species with a gentle gradient at the outflow providing for access. The pond was the cleanest in terms of visual water quality of all the ponds in Sean Walsh Park. The presence of exuberant macrophyte growth and abundant refugia provided good European eel habitat. Three-spined stickleback were observed present during the site visit.

Plate 3.11 Representative image of pond site P1, March 2020

3.2.2 Pond P2, Sean Walsh Park

Pond P2 was a small artificial waterbody (FL8) located in the southern extent of Sean Walsh Park, covering approximately 0.22ha surface area (excluding a single 270m^2 island). The loosely rectangular pond was fed by the Whitestown Stream, with a small weir present at the inflow and a spill-over weir present on the outflow. The pond was the deepest in Sean Walsh Park, being 1.2m deep on average with locally deeper areas along the north bank (pond dredged in recent past). The pond bed comprised mainly deep silt with localised cobble and gravels. Macrophyte vegetation was largely absent, with localised watercress in margins. The banks were lined by boulder revetment which had grassed-over with rank grasses. The banks graded into adjoining scattered trees and parkland (WD5). The pond supported one small island with mature willow.

The pond visibly supported three-spined stickleback populations but also had potential to support European eel given sufficient depths and deep silt with a rich supply of chironomid larvae and gastropods (European eel confirmed present using eDNA analysis, see **section 3.3**). The vertical spill-over weir at the pond's outflow was a barrier to upstream fish passage although a naturally-scoured, steep gradient side-channel was present on the southern bank which may facilitate European eel passage (visible adjoining boulders on the left of Plate **3.12**).

Plate 3.12 Representative image of pond site P2, March 2021 showing small weir at outfall (Whitestown Stream)

3.2.3 Pond P3, Sean Walsh Park

Pond P3 was a small artificial waterbody (FL8) located in the western section of Sean Walsh Park. Covering approximately 0.8ha surface area (excluding a 600m^2 island), the irregular-shaped pond was the largest on site. The pond was fed by a 120m-long, shallow branch of the Jobstown Stream in the south-western corner (small weir), with another small spill-over weir present on the outflow to pond P4. A secondary moderate-gradient channel with a largely rendered bed fed pond P4 in the south-eastern corner. The site was the first in a series of three connected ponds (i.e. sites P3, P4 and P5). The pond averaged 0.5m deep, with a heavily silted base and frequent pockets of cobble and gravel in the margins. The pond margins supported natural soft vegetated areas with occasional brooklime, bulrush and reed canary grass but these areas were more localised than the adjacent pond P4. Mature alder were locally frequent in the margins and on the small island.

The mature pond had some suitability for European eel despite its shallow nature by virtue of marginal refugia and good foraging habitat (eel likely present, see **section 3.3**). However, instream barriers to eel passage were present at both outflows (to pond P4). The inflow area, while considered passable to eel given the shallow fall over boulders 0.5m in height, could be improved for eel passage. Three-spined stickleback were observed in the pond margins.

Plate 3.13 Representative image of pond site P3, March 2021

3.2.4 Pond P4, Sean Walsh Park

Pond P4 was a small artificial waterbody (FL8) located in the western section of Sean Walsh Park. Covering approximately 0.38ha surface area, the pond was fed by pond P3 via two separate narrow channels. The pond averaged 0.5-0.6m deep, with a very heavily silted base with localised pockets of gravel in the margins. Pond P4 was more natural than the upstream P3 given the more complex margins and natural with soft vegetated areas. These supported brooklime, bulrush, reed canary grass and mature alder.

The mature pond provided some good habitat for European eel in terms of refugia and foraging (eel likely present, see **section 3.3**). However, significant in-streams barriers were present on both inflows from pond P3. The northern inflow was 2.5m wide and cascaded over a boulder waterfall approx. 1.3m high and was considered poorly fish passable. It supported plunge pools to 1.6m deep. The southern inflow was connected via a 2m wide channel (mostly rendered bed) that cascaded over two weirs which combined were circa. 1.2m in height. This was also considered poorly passable to fish. Pond P4 fed the lowermost pond P5 via a steep, 2.5m high near-vertical weir which was considered poorly passable to eel. Three-spined stickleback were observed in the pond margins.

Plate 3.14 Representative image of pond site P4, March 2021

3.2.5 Pond P5, Sean Walsh Park

Pond P5 was a small artificial waterbody (FL8) located in the western section of Sean Walsh Park. Covering approximately 0.31ha surface area, the irregular-shaped pond was the last in the pond system. The pond was on average a homogenous 0.5m deep with a deep silt base. Unlike the other ponds within the park, the pond had concrete-walled margins with little adjoining semi-natural habitats (scattered trees and parkland). The lake supported abundant filamentous green algae and also small areas of stonewort (*Chara* sp). No other macrophytes were recorded. The pond was connected to the Whitestown River via a secondary inflow.

The pond was considered of limited fisheries value with the exception of three-spined stickleback (observed during the site visit). Suitability for European eel existed given the species can live in shallow silted pond habitats. However, the poor access to/from downstream river habitats in light of the vertical spill-over weir at the inflow and outfall of the pond system, in addition to extensive downstream culverting, reduced the viability of the habitat for eel (eel likely present, see **section 3.3**).

Plate 3.15 Representative image of site P5, March 2021

Plate 3.16 The vertical spill-over weir at the outfall of pond P5, March 2021 (the most significant instream barrier to fish passage within the survey area)

3.3 eDNA analysis

Composite water samples collected from both the Jobstown Stream (downstream of pond P5; C0267) and pond P2 (C0268) returned a positive result for European eel eDNA (2 of 12 and 6 of 12 qPCR replicates, respectively) (**Appendix B**). These test results were considered as evidence of the species' presence within the Sean Walsh Park ponds (P2, P3, P4 and P5), in addition to the Jobstown Stream (**Figure 3.8**).

However, a negative result was returned for pond P1 (C0266), i.e. eel DNA was not detected or was present below the limit of detection in a series of 12 qPCR replicates (0 positive replicates out of 12) (**Appendix B**).

Figure 3.8 Summary of positive and negative eDNA sampling sites for European eel, March 2021

4. Discussion and management recommendations

4.1 Fish stocks & fisheries habitat

No lamprey were recorded within the study area during the electro-fishing survey and this was considered consequential of the poor habitat conditions for the species in the Whitestown and Jobstown Streams. These included observed poor water quality, poor hydromorphology (i.e. modified channel character), a paucity or unavailability of suitable spawning substrata, extensive/flocculent silt deposits unsuitable for larval burial and the presence of multiple instream barriers poorly passable or even impassable to lamprey. The presence of poor fish possibility in the catchment was also supported by the recent Dendretic Connectivity Index study that was carried out on the River by Atkinson et al. (2020). In the study, from the ten surveyed Irish catchments approximately half of all obstacles mapped were recorded within the River Dodder catchment (i.e. 392 identified obstacles to fish passage including 112 weirs). *Lampetra* sp. (likely brook lamprey, *Lampetra planeri*) are known from the River Dodder downstream and upstream of the Jobstown Stream confluence (Matson et al., 2019). However, given the poor ability of *Lampetra* sp. to climb instream barriers such as weirs (Kelly & King, 2001; Lucas et al., 2009; Moser et al., 2014) their distribution is likely highly fragmented and compromised within the wider Dodder sub-catchment and the findings of the current study support the species absence from the Jobstown and Whitestown Streams upstream of Sean Walsh Park.

eDNA is proving useful in detecting species with patchy distributions or low abundances often overlooked by traditional survey methodologies, such as netting or spot-point electro-fishing (Wilcox et al., 2016). Although no European eel recorded via electro-fishing from the survey sites on the Whitestown or Jobstown Streams, eDNA analysis in March 2021 confirmed the presence of eel within the survey area. This technique proves a cost-effective method for the presence-absence of species to inform fisheries management decisions (Atkinson et al. 2020). Samples from the Jobstown Stream (immediately downstream of pond P5 weir) and pond P2 (on the Whitestown Stream) tested positive for eel DNA, thus confirming the species' presence within Sean Walsh Park. Notably, the results of 2 out of 12 and 6 out of 12 positive qPCR replicates for these samples, respectively (**Appendix B**), cannot reliably infer population abundance, only the presence of the species. No European eel DNA was detected from pond P1 (0 out of 12 positive qPCR replicates), despite relatively high habitat suitability and connectivity to the Jobstown and Whitestown Streams. Anecdotally, European eel were known to utilise the former wetland habitat located to the south of ponds P1 and P2.

Given the presence of eel eDNA both upstream and downstream of the significant instream barrier on the Jobstown Stream at the pond P5 outfall, it may be possible that small numbers of eel are able to navigate the vertical weir structure. Alternatively, a residual eel population is present upstream of this weir given the longevity of the species that may predate the build of the structure, thus producing positive results for eel DNA at this location. eDNA analysis is extremely sensitive and can be detected from a considerable distance upstream (often hundreds of metres upstream, or greater).

Overall, the fisheries value of the Jobstown and Whitestown Stream within the survey area was low, with only good suitability for three-spined stickleback, a species highly tolerant of pollution and poor water quality. Fisheries habitat was improved within the pond habitats, with a greater frequency of refugia and better prey resources for European eel in ponds P1, P2, P3 and P4. However, the shallow, heavily silted nature of the ponds reduced the potential for a more diverse fish population.

Eel are known from the River Dodder, both downstream and upstream of the Jobstown Stream confluence (Kelly et al., 2015; Matson et al., 2019). Whilst eels are known for their remarkable ability to often climb and navigate even near-vertical structures as glass eels (Podgorniak et al., 2015), our survey results suggest that instream barriers such as small weirs along the Jobstown Stream (and elsewhere in the Dodder catchment) are impacting eel migration and distribution within the study area, with cryptically-low populations present (i.e. detected only through eDNA analysis). Given the critically endangered status of this species on a global (Pike et al., 2020) and an Irish scale (King et al., 2011), as well as its overall value to biodiversity and ecosystem function, remediation or removal of instream barriers to eel should be investigated (see Management recommendations below).

4.2 Management recommendations

4.2.1 Remove weirs and improve flow diversity

The hydromorphology of both the Whitestown Stream and Jobstown Stream has been heavily impacted through historical modifications to the watercourses in the vicinity of Killinarden and Sean Walsh Parks, i.e. extensive straightening, culverting etc. This has reduced the overall fisheries and aquatic ecology value by altering flow regimes (see following paragraph), reducing instream habitat heterogeneity and significantly increasing siltation of the respective channels. The cumulative effect of low head weirs such as those recorded throughout the study area can also result in significant alteration of sediment dynamics (Casserly et al. 2021) with associated negative ecological consequences. Furthermore, the presence of multiple weirs within the study area (**Figure 4.1, Plates 3.4, 4.1**) has evidently reduced the available habitat area and migratory passage of fish species such as European eel. It is recommended to liaise with SDCC to remove instream barriers to improve eel passage and overall hydromorphology (e.g. Kemp & O'Hanley, 2010), where flood management considerations can accommodate barrier removal. Note that significant barriers to fish are also known downstream of Sean Walsh Park and, thus, any attempts to facilitate greater fish passage should fall under a catchment-scale approach.

To further improve stream hydromorphology and the overall aquatic environment, it is recommended that flow diversity be increased, where possible. This could be effectively and quickly achieved though low-cost, natural measures such as the installation of random boulders and or large woody debris (LWD) in sections of channel with particularly poor hydromorphology, i.e. straightened sections with rendered concrete bed etc. The addition of boulders or boulder clusters in strategic locations results in the alteration of local flow and hydrodynamic processes, leading to increased habitat diversity and complexity (Roni et al., 2019, 2008; Whiteway et al., 2010). Although the philosophy in contemporary river restoration is to move away from hard

engineering techniques where other options are feasible (Boon & Ravens, 2012), the placement of boulder clusters within the Whitestown and Jobstown Stream channels will help create a diversity of water depth, substrate and velocity and improve overall hydromorphology. Encouraging local scouring of the stream bed (through increased flows) and the creation of deeper pool areas will also greatly increase the resistance of the streams to thermal stresses and climate change pressures (i.e. shallow water = higher temperatures and reduced dissolved oxygen levels), thus benefiting fish and aquatic biota populations (O'Briain et al., 2019).

Similarly, large woody debris can be easily and cheaply installed to improve flow and instream habitat diversity, ultimately to establish the types of habitat features associated with such features in undisturbed streams (e.g. deeper pools, shallow riffles etc.). Material can be sourced within the respective parks (e.g. willow logs) and staked into the stream bed via rebar which penetrates at a 45° angle through the log and into the stream bed. This enables the LWD to resist flooding pressures and remain in-situ until natural decomposition occurs, whilst also allowing locational adjustment of the LWD, if required. The installation of LWD is particularly effective in modified, urbanised watercourses (Larson et al., 2001), such as the Whitestown and Jobstown Streams.

Plate 4.1 An example of a small weir on the Whitestown Stream at survey site A4

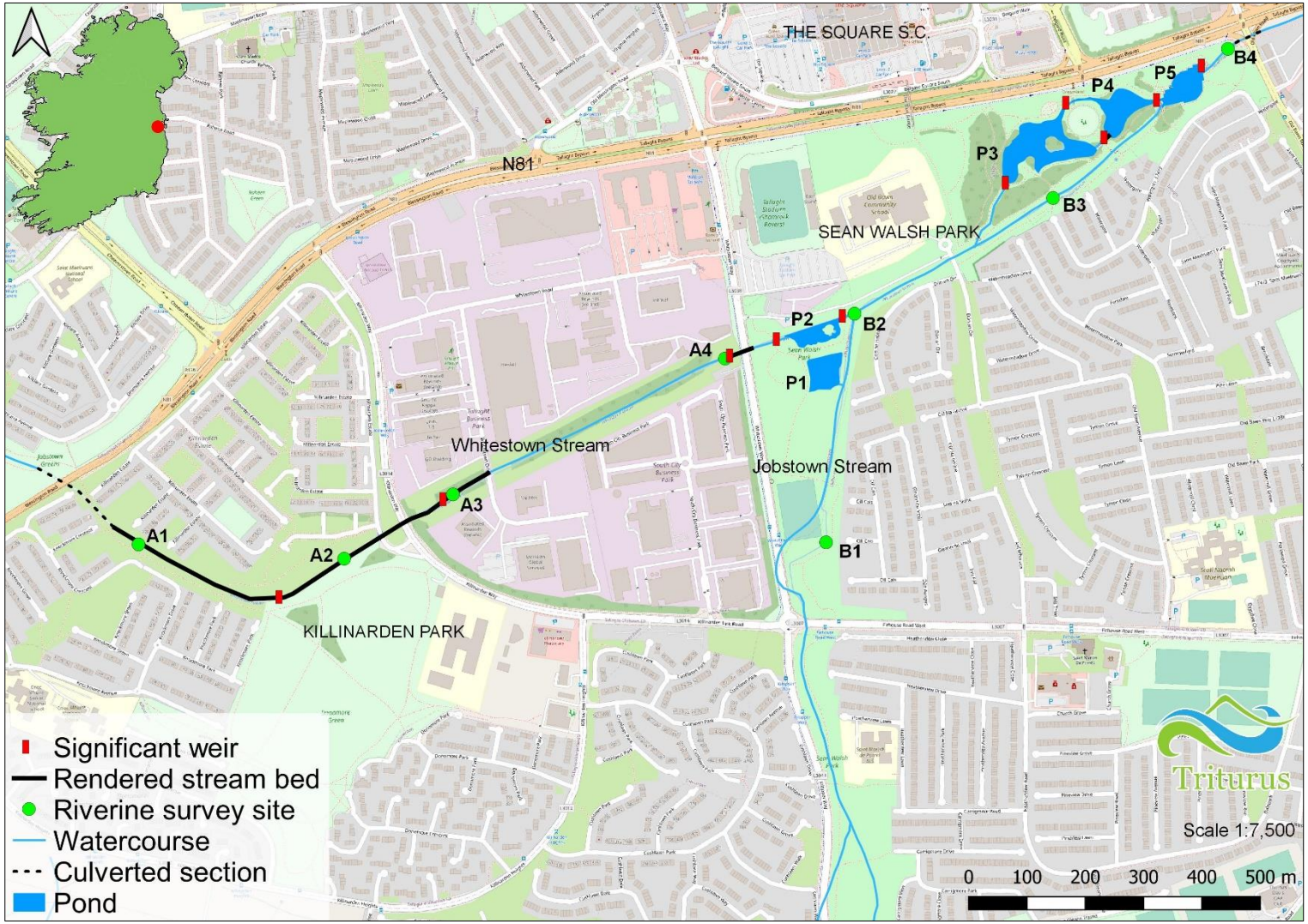


Figure 4.1 Location of identified instream barriers and major rendered stream bed locations within the vicinity of Killinarden and Sean Walsh Parks

4.2.2 Reinstatement of stream bed

To further improve stream hydromorphology and overall biodiversity, it is recommended to remove the rendered concrete bed from sections of channel, notably along the Whitestown Stream (**Figure 4.1**). Rendered concrete beds remove significant proportions of habitat from aquatic biota, particularly in terms of macroinvertebrates and fish but also aquatic plants, whilst also increasing the mobilisation of silt to downstream areas with more natural substrata. Streambed reinstatement would, therefore, greatly enhance instream habitat diversity and help to support a greater biodiversity of the streams and riparian areas.

Plate 4.2 An example of rendered concrete bed (i.e. 'open culvert') on the Whitestown Stream at site A4, providing very poor instream habitat diversity for aquatica flora and fauna

4.2.3 Reduce pollution sources

Storm drains and other points sources of pollution are contributing to heavy enrichment and siltation of both the Whitestown Stream and Jobstown Stream in the vicinity of Killinarden and Sean Walsh Parks. The location of the most-significant sources should be addressed and remediated. Regular maintenance of silt traps in storm drain systems would help reduce silt loads to the watercourses and connecting ponds.

Plate 4.3 Heavy siltation and enrichment evident on the Jobstown Stream in Sean Walsh Park

4.2.4 Remove instream trash

In addition to the above measures to improve overall hydromorphology and water quality, the clean-up of instream trash/refuse and unsightly waste from the Whitestown and Jobstown Streams will help to improve aquatic habitats. If clean-up operations are undertaken in conjunction with local residents and park users, this could lead to an improved sense of ownership and ecological responsibility between local community stakeholders and the aquatic habitats within the park sites.

Plate 4.4 Unsightly trash in the Whitestown Stream at Killinarden Park at site A1

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6. Appendix A – survey site characteristics

Table A1 Summary characteristics of each fisheries survey site, September 2020

Site	Watercourse	River profile	Bordering land uses & riparian habitat (Fossitt, 2000)	Substrata	Riverbed condition & siltation	Macrophytes & bryophytes (DAFOR)	Fish species recorded	Threats & pressures
A1	Whitestown Stream, Killinarden Park	Lowland depositing stream (FW2), 2.5 wide & 0.25m deep, historically straightened, 100% slow glide, heavily silted, concrete stream bed with patches of silted fine-medium gravels, filamentous algae (20% cover)	GA2	80% heavily-silted concrete base, 20% fine-medium gravels	Heavy siltation	Brooklime (O), watercress (F)	Three-spined stickleback	Siltation, enrichment, water quality, instream rubbish/dumping
A2	Whitestown Stream, Killinarden Park	Lowland depositing stream (FW2), 2.5 wide & 0.05m deep, historically straightened, 80% shallow glide & 20% riffle, heavily silted, concrete stream bed with patches of silted fine-medium gravels, filamentous algae (50% cover)	GA2	80% heavily-silted concrete base, 20% fine-medium gravels	Heavy siltation	Brooklime (O), watercress (O)	Three-spined stickleback	Siltation, enrichment, water quality, instream rubbish/dumping
A3	Whitestown Stream, Whitestown Drive	Lowland depositing stream (FW2), 2.5 wide & 0.2-0.5m deep, historically straightened, 90% glide & 10% riffle, heavily silted, concrete stream bed with patches of	WD1, WS1	70% silt, 30% fine-medium gravels	Heavy siltation	Brooklime (O), watercress (O)	Three-spined stickleback	Instream barrier (weir), siltation, enrichment, water quality, instream rubbish/dumping

Site	Watercourse	River profile	Bordering land uses & riparian habitat (Fossitt, 2000)	Substrata	Riverbed condition & siltation	Macrophytes & bryophytes (DAFOR)	Fish species recorded	Threats & pressures
		silted fine-medium gravels, 10% cover filamentous algae, 20% sewage fungus cover						
A4	Whitestown Stream, Whitestown Way	Lowland depositing stream (FW2), 4-8m wide & 0.1-0.4m deep, historically straightened, 80% glide & 20% pool, heavily silted, concrete stream bed, 10% cover filamentous algae, 90% flocculate cover	WS1, GS2, GA2	70% silt, 30% fine-medium gravels	Heavy siltation	None recorded	Three-spined stickleback	Instream barrier (weir), siltation, enrichment, water quality, instream rubbish/dumping
B1	Jobstown Stream, Sean Walsh Park	Drainage channel (FW4), 1.5m wide & 0.2-0.3m deep, historically straightened, 100% pool, heavily silted, deep silt bed, 10% cover filamentous algae, 20% sewage fungus cover	WS1, GS2, GA2	100% heavily-silted concrete	Heavy siltation	Watercress (F), lesser water parsnip (O)	None recorded	Siltation, enrichment, water quality
B2	Jobstown Stream, Sean Walsh Park	Lowland depositing channel (FW2), 3m wide & 0.3-0.6m deep, historically straightened, 95% slow glide and 5% pool, heavily silted, deep silt bed, 100% flocculate/ filamentous algae cover	WL2, GS2, GA2	100% heavily-silted concrete	Heavy siltation	Watercress (O)	Three-spined stickleback	Siltation, enrichment, water quality

Site	Watercourse	River profile	Bordering land uses & riparian habitat (Fossitt, 2000)	Substrata	Riverbed condition & siltation	Macrophytes & bryophytes (DAFOR)	Fish species recorded	Threats & pressures
B3	Jobstown Stream, Sean Walsh Park	Drainage channel (FW4), 1m wide & 0.25m deep, historically straightened, 100% pool (near stagnant), heavily silted, heavily vegetated, deep silt bed, 100% flocculate/ filamentous algae cover	GS2, GA2	80% silt, 10% cobble, 10% boulder	Heavy siltation	Watercress (A)	Three-spined stickleback	Siltation, enrichment, water quality
B4	Jobstown Stream, Sean Walsh Park	Lowland depositing watercourses (FW2), 1.5-4m wide, 1m wide & 0.2-0.5m deep, semi-natural with swift flows, 50% riffle, 30% glide & 20% pool	GS2, GA2	30% cobble, 30% mixed gravels, 40% sand/silt/ clay	Light to moderate siltation	Watercress (A), lesser water parsnip (O), water crowfoot (R)	Three-spined stickleback	Instream barrier (weir), siltation, enrichment, water quality
Site	**Waterbody**	**Pond profile**	**Bordering land uses & riparian habitat (Fossitt, 2000)**	**Substrata**	**Pond bed condition & siltation**	**Macrophytes & bryophytes (DAFOR)**	**Fish species recorded**	**Threats & pressures**
P1	Pond, Sean Walsh Park	Small shallow artificial pond (FL8), landlocked, 0.30ha surface area, average 0.5-0.8m deep, heavy macrophyte coverage (including invasive *Lagarosiphon major*)	GA2, WS1, WL2	90% silt/clay, 5% gravels, 5% cobble	Heavy siltation	Curly waterweed (D), bulrush (F), brooklime (O), water mint (O), watercress (O)	Three-spined stickleback (observed in margins)	Siltation, downstream barriers
P2	Pond, Sean Walsh Park	Small shallow artificial pond (FL8) fed by Whitestown Stream, 0.22ha surface area (excluding 270m^2 island), average 1-1.5m	GA2, WD5, WL1	90% silt, 5% gravels, 5% cobble	Heavy siltation	Watercress (R)	European eel (recorded via eDNA analysis); three-spined stickleback (observed in margins)	Siltation, enrichment, water quality, downstream barriers

Site	Watercourse	River profile	Bordering land uses & riparian habitat (Fossitt, 2000)	Substrata	Riverbed condition & siltation	Macrophytes & bryophytes (DAFOR)	Fish species recorded	Threats & pressures
		deep, sparse macrophyte vegetation						
P3	Pond, Sean Walsh Park	Small shallow artificial pond (FL8) fed by Jobstown Stream, 0.81ha surface area (excluding 600m^2 island), average 0.5m deep, marginal macrophyte vegetation	GA2, WD5. WD1	80% silt, 15% gravels, 5% cobble	Heavy siltation	Reed canary grass (F), brooklime (O), bulrush (O)	European eel likely present (recorded via eDNA analysis); three-spined stickleback (observed in margins)	Siltation, enrichment, water quality, downstream barriers
P4	Pond, Sean Walsh Park	Small shallow artificial pond (FL8) fed by Jobstown Stream via pond P3, 0.38ha surface area, average 0.5-0.6m deep, marginal macrophyte vegetation	GA2, WD5, WD1	95% silt (deep), 5% gravels (margins only)	Heavy siltation	Reed canary grass (F), brooklime (O), bulrush (O)	European eel likely present (recorded via eDNA analysis); three-spined stickleback (observed in margins)	Siltation, enrichment, water quality, downstream barriers
P5	Pond, Sean Walsh Park	Small shallow artificial pond (FL8) fed by Jobstown Stream via ponds P3 & P4, 0.31ha surface area, homogenous 0.5m deep, concrete basin and walled margins, very low macrophyte coverage, high filamentous algal cover	GA2, WD5	95% silt (deep), 5% gravels (margins only)	Heavy siltation	*Chara* sp. (R)	European eel likely present (recorded via eDNA analysis); three-spined stickleback (observed in margins)	Siltation, enrichment, water quality, downstream barriers

7. Appendix B – eDNA analysis laboratory report

SureScreen Scientifics

METHODOLOGY

The samples detailed above have been analysed for the presence of target species eDNA following scientifically published eDNA assays and protocols which have been thoroughly tested, developed and verified for use by SureScreen Scientifics.

The analysis is conducted in two phases. The sample first goes through an extraction process where each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then tested via real time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified.

If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target species DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

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Company Registration No. 08950940

SureScreen Scientifics

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of eDNA** [Positive/Negative/Inconclusive]

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

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SureScreen Scientifics

Folio No: E9101-3
Report No: 1.2
Client: TRITURUS ENVIRONMENTAL LTD
Contact: ROSS MACKLIN

TECHNICAL REPORT
ANALYSIS OF ENVIRONMENTAL DNA IN WATER FOR AQUATIC SPECIES DETECTION

SUMMARY

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

RESULTS

Date sample received in laboratory: 08/03/2021
Date results reported: 17/03/2021
Matters affecting result: None

TARGET SPECIES: European eel *(Anguilla anguilla)*

Lab ID	Site Name	Grid Reference	SIC	DC	IC	Result	Positive Replicates
C0266	Sean Walsh Park Pond No.1	-	Pass	Pass	Pass	NEGATIVE	0/12
C0267	Sean Walsh Park Pond No.5	-	Pass	Pass	Pass	POSITIVE	2/12
C0268	Sean Walsh Park Pond No.2	-	Pass	Pass	Pass	POSITIVE	6/12

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: **Dr Chris Troth (BSc)** Approved by: **Chris Troth**

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Triturus Environmental Ltd.

42 Norwood Court,

Rochestown,

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T12 ECF3.

C.1 eDNA eel report

Folio No: E9101-3
Report No: 1.2
Client: TRITURUS ENVIRONMENTAL LTD
Contact: ROSS MACKLIN

TECHNICAL REPORT
ANALYSIS OF ENVIRONMENTAL DNA IN WATER
FOR AQUATIC SPECIES DETECTION

SUMMARY

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

RESULTS

Date sample received in laboratory: 08/03/2021
Date results reported: 17/03/2021
Matters affecting result: None

TARGET SPECIES: European eel *(Anguilla anguilla)*

Lab ID	Site Name	Grid Reference	SIC	DC	IC	Result	Positive Replicates
C0266	**Sean Walsh Park Pond No.1**	**-**	Pass	Pass	Pass	**NEGATIVE**	**0/12**
C0267	**Sean Walsh Park Pond No.5**	**-**	Pass	Pass	Pass	**POSITIVE**	**2/12**
C0268	**Sean Walsh Park Pond No.2**	**-**	Pass	Pass	Pass	**POSITIVE**	**6/12**
C0272	**Ballymount**	**-**	Pass	Pass	Pass	**POSITIVE**	**3/12**

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: **Dr Chris Troth (BSc)** Approved by: **Chris Troth**

METHODOLOGY

The samples detailed above have been analysed for the presence of target species eDNA following scientifically published eDNA assays and protocols which have been thoroughly tested, developed and verified for use by SureScreen Scientifics.

The analysis is conducted in two phases. The sample first goes through an extraction process where each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then tested via real time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified.

If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target species DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of eDNA** [Positive/Negative/Inconclusive]

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

C.2 eDNA Newt report

SureScreen Scientifics

Folio No: E9101-2
Report No: 1.1
Client: TRITURUS ENVIRONMENTAL LTD
Contact: ROSS MACKLIN

TECHNICAL REPORT
ANALYSIS OF ENVIRONMENTAL DNA IN WATER FOR AQUATIC SPECIES DETECTION

SUMMARY

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

RESULTS

Date sample received in laboratory: 08/03/2021
Date results reported: 12/03/2021
Matters affecting result: None

TARGET SPECIES: Smooth Newt *(Lissotriton vulgaris)*

Lab ID	Site Name	Grid Reference	SIC	DC	IC	Result	Positive Replicates
C0265	**Ballycragh Pond**	**-**	Pass	Pass	Pass	**NEGATIVE**	**0/12**
C0266	**Sean Walsh Park Pond No.1**	**-**	Pass	Pass	Pass	**NEGATIVE**	**0/12**
C0267	**Sean Walsh Park Pond No.5**	**-**	Pass	Pass	Pass	**NEGATIVE**	**0/12**
C0268	**Sean Walsh Park Pond No.2**	**-**	Pass	Pass	Pass	**NEGATIVE**	**0/12**
C0270	**Big Pond, Tyman Park**	**-**	Pass	Pass	Pass	**NEGATIVE**	**0/12**
C0271	**Small Pond, Tyman Park**	**-**	Pass	Pass	Pass	**NEGATIVE**	**0/12**
C0272	**Ballymount**	**-**	Pass	Pass	Pass	**NEGATIVE**	**0/12**

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: **Dr Chris Troth (BSc)** Approved by: **Chris Troth**

METHODOLOGY

The samples detailed above have been analysed for the presence of target species eDNA following scientifically published eDNA assays and protocols which have been thoroughly tested, developed and verified for use by SureScreen Scientifics.

The analysis is conducted in two phases. The sample first goes through an extraction process where each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then tested via real time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified.

If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target species DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

SureScreen Scientifics

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of eDNA** [Positive/Negative/Inconclusive]

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

D Relevant Policy and Legislation

The legislation discussed below is intended as a guide only and does not replace formal legal advice.

D.1 Biodiversity Policy Guidance

'Biodiversity: The National Biodiversity Action Plan 2017-2021 (DCHG, 2017) sets out actions through which a range of government, civil and private sectors will undertake to achieve Ireland's 'Vision for Biodiversity' and has been developed in response to The Earth Summit, held in Rio de Janeiro in 1992 (UN Convention on Biological Diversity) and subsequent EU and International Biodiversity strategies and policies.

As part of the Action Plan process Local Authorities (LA) must produce Biodiversity Action Plans (BAP). BAPs highlight local biodiversity issues and set out a series of objectives and action plans for the conservation of priority species and habitats where they occur in each district or county.

D.2 Designated Sites and Nature Conservation

D.2.1 Statutory Designated Nature Conservation Sites

Sites with statutory designations receive varying degrees of legal protection under Irish statute (i.e. Wildlife Act 1976 and Wildlife (Amendment) Act (2000) and European Directives (i.e. the EC Birds Directive (2009/147/EC) and EC Habitats Directive (92/43/EC). The EU directives were transposed into Irish national law and subsequent amendments were revised and consolidated in the European Communities (Birds and Natural Habitats) Regulations 2011 and Irish Statutory Instrument 477/2011

There are a number of statutory designations used for sites of high nature conservation value in Ireland, which are applied depending upon the importance of the site in a local, regional, national or international context. These include:

- National
- Natural Heritage Area (NHA)
- Wildfowl Sanctuary
- Statutory Nature Reserve
- Refuge for Fauna
- European
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- International
- UNESCO Biosphere Reserve
- Ramsar Convention Site
- National Park (Category II) Sites

D.2.2 Non-Statutory Designations

Non-statutory sites are afforded no statutory legal protection, but are normally recognised by local planning authorities and statutory agencies as being of local nature conservation value

A proposed Natural Heritage Area (pNHA) is an area deemed to be of special interest containing important wildlife habitat and often containing rare or threatened species. They may also be selected on the basis of their geology or geomorphology.

D.2.3 Protected and Notable Species

A number of species are protected under Irish and international legislation. In Ireland, primary protection is provided under the 1976 Wildlife Act and Wildlife (Amendment) Acts (2000 & 2010) and revision 2018. Species of European importance receive additional protection in Ireland under the Birds and Natural habitats Regulations 2011.

The Flora (Protection) Order (2015) makes it illegal to cut, uproot or damage a listed species in any way. It is illegal to alter, damage or interfere in any way with their habitats.

D.2.4 Birds

Almost all resident wild birds are protected under the 1976 Wildlife Act (and amendments) This makes it an offence to:

- intentionally take, damage or destroy the nest of any wild bird whilst it is in use or being built
- take, destroy or possess the egg of any wild bird.

D.3 Badger

Badgers are protected under the 1976 Wildlife Act (and amendments) and it is illegal to intentionally kill, capture, injure or ill-treat any Badger. It is also an offence to obstruct, destroy or damage a Badger sett or disturb Badgers within a sett. Disturbance is defined, for development purposes, as any activity that could damage a sett or be greater than what Badgers commonly tolerate.

D.4 Bats

All Irish bat species are European Protected Species (EPS), protected under the Wildlife Act (and amendments) and the Conservation of Habitat and Species Regulations 2017 (as amended). This makes it an offence to:

- deliberately capture, injure or kill a bat
- intentionally or recklessly disturb a bat in its roost or deliberately disturb a group of bats
- damage or destroy a bat roosting place (even if bats are not occupying the roost at the time)
- intentionally or recklessly obstruct access to a bat roost.

D.5 Otter

The European Otter is an EPS protected under the Conservation of Habitats and Species Regulations 2017 (as amended), making it an offence to:

- deliberately capture, injure or kill an Otter
- deliberately disturb an Otter such as to affect local populations or breeding success
- damage or destroy an Otter holt, possess or transport an Otter or any part of an Otter
- sell or exchange an Otter.

Otters also receive protection under the Wildlife Act (and amendments), this makes it an offence to:

- intentionally or recklessly disturb any Otter whilst within a holt
- intentionally or recklessly obstruct access to a holt.

D.6 Reptiles and Amphibians

Common Frog *Rana temporaria*, Natterjack Toad, *Bufo calamita*, Smooth Newt *Triturus vulgaris* and Common Lizard *Zootoca vivipara* are all protected under the Wildlife Act 1976 (and amendments).

D.7 Invasive Non-native Species

Certain invasive non-native animals and plants are listed under the Third Schedule of S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011. This makes it an offence to release, plant them in the wild or cause them to disperse, spread or otherwise cause them to grow. If these species occur on a site proposed for development or other work which may disturb the ground, control of these species is likely to be required.

European Council's Regulation on the prevention and management of the introduction and spread of invasive alien species [1143/2014] sets out to prevent, minimise and mitigate the adverse impacts of the introduction and spread, both intentional and unintentional, of invasive alien species on biodiversity and the related ecosystem services as well as on human health and the economy.

E National Biodiversity Data Centre records

E.1 Protected Species Records within 10km of the site in the last 10 years.

Species name	Date of last record	Designation
Amphibian		
Common Frog (Rana temporaria)	12/05/2018	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Birds		
Little Egret (Egretta garzetta)	20/11/2017	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species
Peregrine Falcon (Falco peregrinus)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species
Common Kingfisher (Alcedo atthis)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Merlin (Falco columbarius)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Whooper Swan (Cygnus cygnus)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Rock Pigeon (Columba livia)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species
Common Pheasant (Phasianus colchicus)	23/03/2016	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
Common Wood Pigeon (Columba palumbus)	02/08/2016	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
Mallard (Anas platyrhynchos)	20/11/2017	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
Red Grouse (Lagopus lagopus)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Common Coot (Fulica atra)	20/11/2017	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Eurasian Teal (Anas crecca)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >>

Species name	Date of last record	Designation
		Birds of Conservation Concern - Amber List
Tufted Duck (Aythya fuligula)	20/11/2017	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Snipe (Gallinago gallinago)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section III Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Eurasian Woodcock (Scolopax rusticola)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section III Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Goldeneye (Bucephala clangula)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Eurasian Curlew (Numenius arquata)	26/12/2016	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Northern Lapwing (Vanellus vanellus)	31/12/2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Barn Swallow (Hirundo rustica)	15/09/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Kestrel (Falco tinnunculus)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Linnet (Carduelis cannabina)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Sandpiper (Actitis hypoleucos)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Starling (Sturnus vulgaris)	08/06/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Swift (Apus apus)	07/05/2016	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Eurasian Tree Sparrow (Passer montanus)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Great Cormorant (Phalacrocorax carbo)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Species name	Date of last record	Designation
Great Crested Grebe (Podiceps cristatus)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Martin (Delichon urbicum)	15/09/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Sparrow (Passer domesticus)	28/04/2016	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Lesser Black-backed Gull (Larus fuscus)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Little Grebe (Tachybaptus ruficollis)	20/09/2016	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mew Gull (Larus canus)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Mute Swan (Cygnus olor)	20/11/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Northern Wheatear (Oenanthe oenanthe)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sand Martin (Riparia riparia)	07/05/2016	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Sky Lark (Alauda arvensis)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Spotted Flycatcher (Muscicapa striata)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Black-headed Gull (Larus ridibundus)	20/11/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Herring Gull (Larus argentatus)	20/11/2017	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Yellowhammer (Emberiza citrinella)	31/12/2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Crustacean		
Freshwater White-clawed Crayfish (Austropotamobius pallipes)	19/08/2013	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Reptile		
Common Lizard (Zootoca vivipara)	21/08/2018	Protected Species: Wildlife Acts
Terrestrial mammal		
European Otter (Lutra lutra)	24/08/2014	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Brown Long-eared Bat (Plecotus auritus)	05/07/2012	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Daubenton's Bat (Myotis daubentonii)	21/08/2014	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts

Species name	Date of last record	Designation
Lesser Noctule (Nyctalus leisleri)	18/09/2012	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Natterer's Bat (Myotis nattereri)	14/09/2011	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pipistrelle (Pipistrellus pipistrellus sensu lato)	15/10/2012	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Soprano Pipistrelle (Pipistrellus pygmaeus)	05/08/2012	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Pine Marten (Martes martes)	01/05/2017	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Eurasian Badger (Meles meles)	14/05/2018	Protected Species: Wildlife Acts
Eurasian Pygmy Shrew (Sorex minutus)	25/04/2010	Protected Species: Wildlife Acts
Eurasian Red Squirrel (Sciurus vulgaris)	26/12/2018	Protected Species: Wildlife Acts
Red Deer (Cervus elaphus)	09/11/2015	Protected Species: Wildlife Acts
West European Hedgehog (Erinaceus europaeus)	14/07/2018	Protected Species: Wildlife Acts

E.2 Invasive species recorded within 10km of the site in the last 10 years

Species name	Date of last record	Designation
Bird		
Greylag Goose (Anser anser)	31/12/2011	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland) || Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Flowering plant		
American Skunk-cabbage (Lysichiton americanus)	02/04/2017	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species || Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Butterfly-bush (Buddleja davidii)	29/07/2019	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Cherry Laurel (Prunus laurocerasus)	15/02/2019	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species
Fringed Water-lily (Nymphoides peltata)	15/06/2016	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Giant Knotweed (Fallopia sachalinensis)	01/12/2017	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Indian Balsam (Impatiens glandulifera)	31/12/2017	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Japanese Knotweed (Fallopia japonica)	11/09/2019	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Rhododendron ponticum	13/04/2019	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Sycamore (Acer pseudoplatanus)	13/01/2018	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Three-cornered Garlic (Allium triquetrum)	05/05/2019	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Wild Parsnip (Pastinaca sativa)	11/07/2015	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Terrestrial mammal		
Brown Rat (Rattus norvegicus)	09/10/2015	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Eastern Grey Squirrel (Sciurus carolinensis)	31/12/2017	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
European Rabbit (Oryctolagus cuniculus)	19/10/2018	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
Fallow Deer (Dama dama)	20/12/2016	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland) || Protected Species: Wildlife Acts
Sika Deer (Cervus nippon)	02/11/2016	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species || Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland) || Protected Species: Wildlife Acts

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JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007