18 SUMMARY OF MITIGATION MEASURES

18.1 Introduction

This Chapter of the EIAR collates and summarises the mitigation measures recommended for each of the environmental topics examined in Chapters 5 – 17 of this EIAR.

These mitigation measures and any associated monitoring comprise what would be implemented during the Construction and Operational Phase to reduce identified potential for significant adverse environmental effects of the proposed development.

This chapter does not expand on the reasoning or expected effectiveness of the proposed mitigation or monitoring measures. For such descriptions, we refer to each of the individual chapters of the EIAR.

The implementation of the recommended mitigation measures would be expected to be required as a condition of any grant of permission by An Bord Pleanála.

This chapter has been prepared by Eleanor Mac Partlin, EIAR Manager, with assistance from Niamh Robinson, EIAR Co-ordinator and Ian Doyle, EIAR Assistant, all at Stephen Little and Associates. Eleanor is the Associate Director of Stephen Little and Associates and has significant experience in the management and delivery of complex multidisciplinary projects, with particular experience in Town Planning and EIA. Niamh has 4 years' professional experience in the planning field, and holds a MRUP – Masters in Regional and Urban Planning. Ian has 2 years' professional experience in the planning field, and holds a Bachelor of Science (Honours) in Spatial Planning.

18.2 Proposed Mitigation Measures

18.2.1 Population and Human Health (Chapter 5)

Construction Stage

Any perceived nuisance impacts on the immediate local population will be short-term in nature due to the length of the construction process for the Proposed Development. The remedial and mitigation measures to address the potential effects on population and human health from the Proposed Development have been assessed within the corresponding chapters of the EIAR.

Businesses and Residences

The construction contractor will establish a feedback mechanism for residents to report any concerns or issues related to construction activities. The construction contractor will engage with the community to address concerns and provide updates on mitigation efforts.

Landscape, Amenity and Tourism

Consideration shall be made to mitigate any potentially adverse construction related impacts on the surrounding lands, including erecting visually sensitive site hoarding.

The construction compounds, temporary car parking and storage facilities etc will be located sensitively to avoid any visual sensitive areas. As the site is located on the edge of the existing urban areas the visual elements associated within construction would be considered part of the urban landscape.

Land and Water Emissions

As detailed in Chapter 7 (Land, Soil & Geology) of this EIAR, all mitigation measures set out in Section 7.6.2 will be implemented during the construction phase, for the protection of human health and populations as a result of change to the geological and soil environment.

The mitigation measures set out in Chapter 8: Water, Section 8.6.2, relating to erosion and sediment control, and accidental spills and leaks, will be implemented during the construction works, for the protection of human health and populations.

Air Quality

In order to mitigate the potential dust-related health impacts during the construction phase, dust related mitigation measures have been provided in Chapter 11: Climate (Air Quality) of this EIAR. The mitigation measures draw on best practice guidance from Ireland (DCC (2018), DLRCC (2022)), the UK (IAQM (2024), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997).

Noise and Vibration

Best practice noise and vibration control measures will be employed by the contractor during the construction phase in order to avoid exceedance of the adopted construction noise threshold values at the nearest NSLs. The best practice measures set out in BS 5228 (2009 +A1 2014) Parts 1 and 2 will be complied with. Further details are provided in Chapter 10 Air (Noise & Vibration).

Traffic and Transportation

All construction activities on-site will be governed by a Construction Traffic Management Plan (CTMP), the details of which will be agreed in full of South Dublin County Council prior to the commencement of construction activities on site. The principal objective of the CTMP is to ensure that the impacts of all building activities generated during the construction of the proposed development upon both the public (off-site) and internal (on-site) workers environments, are fully considered and proactively managed / programmed respecting key stakeholders thereby ensuring that both the public's and construction workers safety is maintained at all times, disruptions minimised and undertaken within a controlled hazard free / minimised environment.

Major Accident Hazards and Disasters

There are no specific mitigation measures required during construction in respect of Major Accident Hazards and Disasters.

Operational Stage

Business and Residences

Once construction works are completed there are no specific mitigation measures required in respect of local businesses and residences.

Landscape, Amenity and Tourism

Once construction works are completed there are no specific mitigation measures required in respect of amenity and tourism.

Grass cutting, tree, shrub and hedge maintenance and leaf and litter clearing are the primary landscape operations required, these will be supported with soil aeration, fertiliser application and tree, shrub and hedgerow assessment to maintain and management the primary landscape design features.

Land and Water Emissions

The design of proposed sites levels (roads, buildings etc.) have been carried out in such a way as to replicate existing surface gradients where possible, therefore replicating existing overland flow paths, and not concentrating additional surface water flow in a particular location.

SuDS features such as permeable paving parking spaces, bioretention areas and brown roofs to provide additional storage and promote infiltration of and treatment of surface water run-off have been provided in landscaped areas.

Air Quality

Once construction works are completed there are no specific mitigation measures required in respect of air quality.

Noise and Vibration

With consideration at the detailed design stage, the selection and location of plant items within the proposed development and associated buildings will ensure that noise emissions from any

mechanical and electrical building services plant do not exceed the relevant noise criteria outlined in Chapter 10.

Once construction works are completed there are no specific mitigation measures required in respect of noise and vibration.

Traffic and Transportation

A management regime will be implemented by the development's management company to control access to the on-site car parking spaces thereby actively managing the availability of on-site car parking for residents of the development.

A Mobility Management (MMP) is to be rolled out with the aim of guiding the delivery and management of a range of coordinated initiatives by the scheme promotor. The MMP ultimately seeks to encourage sustainable travel practices for all journeys to and from the proposed development site. The MMP will be developed in partnership with SDCC to specifically consider the opportunities of shaping all journeys and promoting sustainable transport habits at the proposed residential scheme.

Major Accident Hazards and Disasters

Once construction works are completed there are no specific mitigation measures required in respect of Major Accident Hazards and Disasters.

18.2.2 Biodiversity (Chapter 6)

Construction Stage

The Construction Phase mitigation sections below will be divided into:

- Standard environmental best practice;
- Compound environmental management;
- Mitigation management plans ensuring the protection of surface water, groundwater and air quality and prevention of invasive species spread throughout the proposed sites; and
- Flora and Fauna mitigation measures.

Standard Environmental Best Practice

The activities required for the proposed developments' construction stage shall remain within the boundary of the proposed site, excluding select compound areas, which will be located in adjacent lands for mitigation control reasons. The prepared CEMP strictly adheres to best practice environmental guidance including but not limited to the following:

- BS (2012) – Trees in Relation to Design, Demolition and Construction. British Standard 5837;
- NRA (2006e): Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post-Construction of National Road Schemes. Dublin: National Roads Authority;
- CIRIA Guidance C532: Control of water pollution from construction sites. Guidance for consultants and contractors. (CIRIA 2019a);
- CIRIA Guidance C741: Environmental good practice on site guide (Charles & Edwards, 2015; CIRIA, 2023);
- CIRIA Guidance C750D: Groundwater control: design and practice (Preene et al., 2016; CIRIA, 2019b);
- CIRIA (C512): Environmental Handbook for Building and Civil Engineering Projects (CIRIA, 2000);
- CIRIA (C697): The SuDS Manual (CIRIA, 2015);

- Inland Fisheries Ireland: Guidance on Protection of Fisheries During Construction Works In and Adjacent to Waters (IFI, 2016); and
- Inland Fisheries Ireland: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning (IFI, 2020).

Environmental Management of Site Compounds

The principal contractor will be required to ensure good environmental management within the site compounds set up within the proposed development sites. A suitably qualified Ecological Clerk of Works (EcoW) will be required to regularly conduct site compound checks to ensure they are adhering to ecological safeguarding protocols The below list of measures will be incorporated into site compound environmental management:

- Site compounds will not be set up within Flood Zone A or B lands in accordance with the Office of Public Works (OPW) 'Planning System and Flood Risk Management Guidelines' (2009);
- Only plant and materials necessary for the construction of the works will be permitted to be stored at the compound locations;
- Site establishment by the Contractor will include the following;
    - Site offices;
    - Site facilities (canteen, toilets, drying rooms, etc.);
    - Office for construction management team;
    - Secure compounds for the storage of all on-site machinery and materials;
    - Temporary car parking facilities; and
    - Temporary fencing
- Site Security to restrict unauthorized entry;
- All Subcontractors will be given induction toolbox talk so that they are aware of material storage arrangements;
- Construction materials within the compounds will be stored in a designated area in an organised manner so as to protect them from accidental damage and deterioration as a result of exposure;
- Bunded storage of fuels and refuelling area. Bunds shall be 110% capacity of the largest vessel contained within the bunded area;
- A separate container will be located in the Contractors compounds to store contaminated absorbents used to contain spillages of hazardous materials. The container will be clearly labelled, and the contents of the container will be disposed of by an appropriately licenced waste contractor at an appropriately licenced site. Waste disposal documentation of hazardous waste material taken off site for disposal will be retained by the Contractor;
- A maintenance programme for the bunded areas will be managed by the site environmental manager. The removal of rainwater from the bunded areas will be their responsibility. Records will be maintained of materials taken off site for disposal;
- The site environmental manger will be responsible for maintaining all training records and weekly environmental inspections;
- Drainage collection system for washing area to prevent run-off into surface water system;
- Stockpiling of spoil and spoil-like materials will be appropriately located within the compounds to minimise exposure to prevailing winds; and
- All refuelling of vehicles will be carried out at the fuel stores within the main site compounds and only ADR trained personnel will be permitted to operate fuel bowsers.

Protection of Surface Water, Groundwater and Air Quality

In order to protect surface water, groundwater and air quality throughout the proposed development sites, the principle contractor will be required to implement the prepared Surface Water Management Plan (SWMP), Environmental Incident Response document, and Dust Management Plan (DMP). The minimally required list of mitigations measures outlined below will be incorporated into these plans.

Surface Water Management Plans

The SWMPs and the control and management measures relating to surface water management have been prepared with regard to the following guidance documents, where relevant:

- Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532) (Construction Industry Research and Information Association) (CIRIA, 2001);
- Best Practice Guide BPGCS005 – Oil Storage Guidelines (Enterprise Ireland, 2003);
- PUB C811 Environmental Good Practice on Site, 5th Edition (CIRIA, 2023);
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA, 2006d);
- Safety, Health and Welfare at Work (Construction) Regulations 2013 – S.I. No. 291 of 2013;
- Design Manual for Roads and Bridges Part 3 DN-DNG-03022 (NRA HD 33/15) (Including Amendment No. 1) (TII, 2015a);
- Road Drainage and the Water Environment DN-DNG-03065 (TII, 2015b);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Board (IFI, 2016); and
- Planning for Watercourses in the Urban Environment, A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning (IFI, 2020).

In order to safeguard the local surface water network, and in turn the local groundwater network, from surface water-based pollution events, the following must be strictly adhered to:

- The principal contractor will ensure compliance with environmental quality standards specified in the relevant legislation, namely European Communities (Environmental Objectives (Surface Waters)) Regulations, 2009 (S.I. No. 272 of 2009 and amendments), and the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988);
- Management of silt-laden water on-site, including procedures for accidental leaks / spills to ground, as well as water quality monitoring to ensure compliance with environmental quality standards specified above;
- At no point during the construction stage will be treated- or untreated-water be discharged to local surface water network without the water quality meeting the statutory limits as set under the environmental quality standards specified above, or limits imposed by a relevant authority such as An Bord Pleanála:
- Fail-safe site drainage and bunding, e.g. drip trays on plant and machinery will be provided to prevent discharge of chemical spillage from the sites to surface water;
- To prevent the spread of any accidental discharge into the surface water network, oil retention booms will be on hand when construction activities are located beside aquatic habitats in order to control and minimise the spread of the spill;
- Washout of concrete plant will occur at a designated impermeable area with waste control facilities (C649 – CIRIA, 2006b);
- Wherever reasonably possible, pre-cast concrete features will be utilised to minimise the risk of a concrete-based pollution event;

- Concrete delivery, concrete pours and related construction methodologies will be part of the procedure agreed with the principal contractor to mitigate any possibility of spillage or contamination of the local environment. Particular attention will be paid during the pouring process in order to avoid leakages or spills of concrete;
- Temporary stockpiles will be monitored for leachate generation. These stockpiles will be placed within designated areas (C649 – CIRIA, 2006b) and not located within 20m of any watercourses / waterbodies and wetlands, or within 10m artificial surface water drainage features;
- Any excavated contaminated soils will be segregated and securely stored in a designated area where the possibility of runoff generation or infiltration to ground or surface water drainage has been eliminated through bunding and impervious geotextile linings. The contaminated soils will then be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC. Furthermore, the principal contractor will ensure that no cross-contamination with clean soils happens elsewhere throughout the proposed development sites;
- Silt fencing will be installed prior to the commencement of any construction works in order to enhance the protection of identified water features (Kilmahuddrick Stream). Shallow interceptor trenches will be installed in front of these silt fences where possible. An EcoW will be present during the installation of these protective measures to ensure that they are installed to best practice standard and correctly located in their assigned areas. The following site-specific mitigation sections will provide greater detail on specific locations of these silt fence / trench sections;
- Silt fences will be repaired and/or replaced as necessary by the principal contractor as part of the on-going environmental monitoring programme.

Construction Compound

There will be a construction compound for each of three development sites, as well as a number of temporary workings areas of various scales within the boundaries of these sites (e.g. at the bridge culvert location within Site 4). The construction compound will include installation of the necessary facilities including the site office, welfare facilities etc.

Site Establishment

Where construction compounds are located on a greenfield site, the principal contractor will be required to provide a temporary geogrid mattress overlain in stone for trafficking within the construction compound. All surface water runoff will be intercepted and directed to appropriate treatment systems (settlement facilities and oil trap) for the removal of pollutants prior to discharge.

Security

Controlled access to the construction compound will be implemented, fencing will be erected, and lighting will be installed. The construction compound will be monitored by Closed-Circuit Television (CCTV) with security contractors on standby, to ensure safe storage of all material, plant and equipment.

Welfare and Sanitary Facilities

The construction compounds will be engineered with appropriate services. Water and wastewater disposal etc. will be organized by the appointed contractor. In work areas of the proposed developments, where permanent provisions (for the duration of the construction programme) are not practicable, appropriate temporary provisions will be made. Temporary welfare facilities will need to be used: for example, portable toilets in the vicinity of works. Welfare facilities will discharge wastewater either to an existing sewer, with the permission of the water utility, or wastewater will be collected and disposed of in an appropriate manner to a suitably licensed facility offsite to prevent water pollution and in accordance with the relevant statutory requirements.

Fuel Storage

The below will be strictly adhered to in respect to appropriate fuel storage management:

- All hydrocarbons used during the construction storage will be appropriately handled, stored, and disposed of in accordance with recognised standards as laid out by the EPA within the Guidance Note on Storage and Transfer of Materials for Scheduled Activities (EPA, 2004);
- All chemical and fuel filling locations will be contained within signposted, designated bunded areas, a minimum of 10m from any natural or artificial surface water drain;
- At the construction compounds, where the sites are pervious, an area of hard standing will be installed in a demarcated area for refuelling, and vehicle / plant cleaning and service areas. This area will be drained via a hydrocarbon interceptor trap to a soakaway if possible, or to local surface water drains, with the permission of the asset owner, under a permit or licence authorised by the relevant authority;
- The retained contents of the separators will be collected for disposal by a licensed operator to a licensed waste disposal / recovery facility;
- Suitable precautions will be taken to prevent spillages from equipment containing small quantities of hazardous substances (for example, chainsaws and jerry cans) including:
    - Each container or piece of equipment will be stored in its own drip tray made of a material suitable for the substance being handled;
    - Spill kits and drip trays will be provided for all equipment and at locations where any liquids are stored and dispensed, and staff will be trained on the procedures to be followed; and
    - Containers and equipment will be stored on a firm, level surface.
- Procedures and contingency plans will be in place at each work area to address cleaning up small spillages as well as dealing with an emergency incident. A stock of absorbent materials such as sand, spill granules, absorbent pads and booms will be kept at each work site, on plant working near water and particularly at refuelling areas and where fuel or oil is stored;
- The storage of fuels, other hydrocarbons and other chemicals within the construction compound shall be in accordance with relevant legislation and with best practice. In particular:
    - Fuel tanks, drums, and mobile bowsers (and any other equipment that contains oil and other fuels) will be housed within a bund of at least 110% capacity of the fuel tank itself or at least 25% of the total volume of the containers, whichever is greatest. The fuel tank will be double skinned. There will be no passive drainage from the bund; any water collected within it will be pumped out and removed off site for disposal; and
    - Any designated area or areas for oils, fuel, chemicals, hydraulic fluids, etc. storage and refuelling will be set up at least 10m from any surface water drains (C649 – CIRIA, 2006b) and the storage location within the construction compound shall be organised so as to be as far away from surface water drains as is practicable to minimise risks from leaks and spills.
- Storage areas will be covered, wherever possible, to prevent rainwater filling the bunded areas;
- Fuel fill pipes will not extend beyond the bund wall and will have a lockable cap secured with a chain;
- Where fuel is delivered through a pipe permanently attached to a tank or bowser:
    - The pipe will be fitted with a manually operated pump or a valve at the delivery end which closes automatically when not in use;
    - The pump or valve will be fitted with a lock;
    - The pipe will be fitted with a lockable valve at the end where it leaves the tank or bowser;
    - The pipework will pass over and not through bund walls;

- Tanks and bunds will be protected from vehicle impact damage;
- Tanks will be labelled with contents; capacity information and hazard warnings; and
- All valves, pumps and trigger guns will be turned off and locked when not in use. All caps on fill pipes will be locked when not in use.

Construction Phase Haul Road Mitigations

Through grassed areas, shallow land drains will be provided adjacent to haulage roads. The land drains will be provided with check dams which will allow infiltration of the collected surface water to ground. Silt screens will be provided running alongside the haulage roads through grassed areas to prevent silt and fines from impacting on the adjacent habitats and drainage features.

Procedures and contingency plans will be in place at each haul road to address cleaning up small spillages, as well as dealing with an emergency incident.

Control of Sediment

There are a number of sources of sedimentary or silt-laden water on a construction site, including silty 'runoff' from stripped soils; and the stockpiling of soils. Control measures for each of these are to be provided. Area specific measures are identified below in the site-specific mitigations sections.

Fuel and Chemical Spillages

An effective pollution SWMP relies on the following elements, with regards to fuel, and chemical spillages:

- Identification of receptors / pathways (e.g. water body/surface water paths);
- Identification and clear marking of surface water drain locations within the construction compound and other work areas;
- Having designated re-fuelling areas;
- All hydrocarbons used during the construction stage will be appropriately handled, stored, and disposed of in accordance with recognised standards as laid out by the EPA;
- Identification of all possible emergency scenarios;
- Effective planning, e.g. oil booms and oil soakage pads will be maintained at appropriate locations on site to enable a rapid and effective response to any accidental spillage or discharge. These shall be disposed of correctly and records will be maintained by the environmental manager of the used booms and pads taken off site for disposal;
- Identification and dissemination of contact numbers;
- Definition of personnel responsibilities;
- Assurance that all appropriate personnel are aware of the emergency procedure(s) (e.g. spillage, leakage, fire, explosion, and flooding), that drain covers and spill kits are available, and personnel know how to use them;
- Knowledge of incident scenarios, such as spill drills; and
- Implementation of lessons learnt from previous incidents.

In terms of pollution spill response procedures, these will vary depending on the sensitive receptor and nature of construction activities. However, the following information will be included as a minimum and displayed at appropriate locations along the proposed development sites, at river crossings, near outfalls, re-fuelling locations, fuel storage areas etc.:

- Instructions on how to stop work and switch off sources of ignition;
- Instructions on how to contain the spill;
- Location of spill clean-up material;

- Name and contact details of responsible personnel (these personnel will assess the scale of the incident to determine whether the environmental regulator needs to be called); and
- Measures particular to that location or activity (for example, close to a settlement pond).

Emergency equipment will be obtained from a reputable supplier, and personnel will be trained in its correct use. Material Safety Data Sheets (MSDS) and best practice assessments will be used for advice on appropriate spill measures. The type of equipment required will depend on the activity taking place. The CIRIA Technical Guidance Document provides details on the types and applications of emergency equipment. Refer to Table 15.2 of the CIRIA Technical Guidance Document for further information.

Every effort will be made to prevent an environmental incident during the construction stage of the proposed development sites. The objective of the measures in the SWMP is to prevent an incident arising in the first place. Oil / fuel spillages are one of the main environmental risks that will exist during the construction stage of the proposed development sites which will require an emergency response procedure. An example of the steps that will be followed in the event of a spillage to ensure that the environmental risk is reduced to as low as reasonably practical is provided in this section. This procedure can be tailored to be location / activity specific as required:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers;
- Notify the Environmental Manager immediately giving information on the location, type, and extent of the spill so that they can take appropriate action;
- If necessary, the Environmental Manager will inform the appropriate regulatory authority, including the Fire Services, depending on the size and nature of the spill – the appropriate regulatory authority will vary depending on the nature of the incident;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident; and
- Contain the spill using the spill control materials, track mats or other material as required. Do not use detergent or hoses to disperse spilled fuel.

If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats:

- Clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully-licensed waste contractor with the appropriate permits so that further contamination is limited; The details of the incident will be recorded on an Environmental Incident Form (identified by the appointed contractor), which will provide information such as the cause, extent, actions, and remedial measures used following the incident. The form will also include any recommendations made to avoid the reoccurrence of the incident;
- A record of all environmental incidents will be kept on file by the Environmental Manager and the appointed contractor;
- These records will be made available to the relevant authorities if required; and
- The Environmental Manager will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the appointed contractor as appropriate.

By carrying out the above steps, a proper system will be in place to investigate, record and report any potential fuel or chemical spillages.

Surface Water Monitoring

The principal contractor shall carry out visual inspection of surface water control measures (settlement tanks, silt fences, fuel storage areas etc.) on a daily basis for any damage and correct functioning. In addition, daily visual inspections of the Kilmahuddrick Stream will be carried out.

Furthermore, surface water quality sampling will be undertaken at two locations, one where the Kilmahuddrick Stream enters Site 4 to the south-east and the other the north-west where the stream exits the Site 4.

Surface water sampling will be undertaken throughout the length of the construction stage, with the first round to align with the commencement of the geotechnical ground investigation works, and at intervals of 2 / 3 months thereafter. Indicators that water pollution may have occurred include the following:

- Change in water colour;
- Change in water transparency;
- Increases in the level of silt in the water;
- Oily sheen to water surface; and
- Floating detritus, or scums and foams.

If hydrocarbons are observed or other water quality parameters are suspected to have been exceeded, relevant regulatory authorities will be informed immediately so that they can contribute to any investigations conducted to determine whether any element of the construction of the proposed development sites (particularly Site 4) may be causing the contamination. If any potential sources of contamination are observed, appropriate actions will be taken (depending on the source and nature) to prevent further contamination and the incident shall be recorded and investigated in more detail to prevent a recurrence. If required, the relevant regulatory authorities will be informed.

Environmental Incidence Response

Environmental incidents are not limited to just fuel spillages. For example, other environmental incidents may include:

- Accidental stripping of a protected habitat;
- Accidental excavation of protected archaeological structure (without archaeologist present);
- Accidental release from settlement pond / tank etc.; and
- Unplanned utility strikes, resulting in foul water releases, temporary loss of services etc.

Therefore, any environmental incident will be investigated in accordance with the following steps:

- Immediately notify the Environmental Manager, giving information on the location, type, and extent of the incident so that they can take appropriate action;
- In the very unlikely event of an incident occurring which may impact on a sensitive receptor, the Environmental Manager will inform the appropriate persons / regulatory authority. The appropriate persons / regulatory authority will vary depending on the nature of the incident;
- The details of the incident will be recorded on an Environmental Incident Form (identified by the appointed contractor) which will provide information such as the cause, extent, actions, and remedial measures used following the incident. The form will also include any recommendations made to avoid the reoccurrence of the incident;
- A record of all environmental incidents will be kept on file by the Environmental Manager and the appointed contractor. These records will be made available to the relevant authorities if required; and
- The Environmental Manager will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the appointed contractor as appropriate.

By carrying out the above steps, a proper system will be in place to investigate, record and report any potential accidents or incidents.

Dust Management Plan

A Dust Management Plan (DMP) provides the strategy to be adopted in order to manage dust during construction stage of the development sites. This will be incorporated by each contractor into their plans and implemented as part of their works. This plan and measures within align with IAQM Guidance, with the mitigation measures proposed in accordance with the determination that the highest risk category will be applied to the construction stage of the proposed development sites.

Construction dust will be controlled and managed in accordance with the DMP contained within the CEMP. The DMP within the CEMP will be updated by the construction contractor prior to the commencement of the construction stage, so as to include any additional measures required pursuant to conditions attached to any decision to grant approval. The DMP may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and will include as a minimum the recommended dust mitigation measures outlined below. The recommended construction dust mitigation measures will be implemented as appropriate for the site. The DMP will include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority when asked;
- Record any exceptional incidents that cause dust and/or air emissions, either on or offsite, and the action taken to resolve the situation in the logbook; and
- Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary if applicable, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

Daily Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary;
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and to make an inspection log available to the local authority when asked; and
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and Maintaining Development Sites

- Plan site layouts so that machinery and dust causing activities are located away from sensitive ecological receptors, as far as possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicle / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles;
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable;
- Impose and signpost a maximum-speed-limit of 25km on surfaced and 1km on unsurfaced haul roads and work areas; and
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Wate Management

- Avoid the use of bonfires and general burning of waste materials.

The IAQM Guidance (IAQM, 2024) mitigation measures applicable to the specific works to be undertaken as part of the proposed development sites are as follows:

Demolition Measures

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust;
- Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;
- Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

Earthworks Measures

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- Only remove the cover in small areas during work and not all at once.

Construction Measures

- Avoid scabbling (roughening of concrete surfaces) if possible;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;

- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Trackout Measures

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Record all inspections of haul routes and any subsequent action in a site logbook;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
- Access gates to be located at least 10m from sensitive ecological receptors where possible.

Construction Monitoring (Short-term Period)

As part of the DMP, monitoring of construction stage dust deposition levels, PM10, PM2.5 and NO2 will be undertaken in order to ensure on-site mitigation measures are being successfully implemented.

The monitoring of Construction Phase dust deposition levels, PM10, PM2.5 and NO2 will be developed and implemented as part of the DMP. Monthly monitoring of construction stage dust deposition levels, PM10, PM2.5 and NO2 levels shall be undertaken by an appointed contractor throughout for the duration of construction stage.

The results of the construction stage dust deposition levels shall be compared with the guideline of 350mg/m2/day (for non-hazardous dusts). The results of the construction stage PM10, PM2.5 and NO2 concentrations shall be compared with the relevant Ambient Air Quality Standard limit values.

This monitoring shall be carried out at a minimum of three locations at each construction compound and further monitoring locations shall be designated at sensitive receptors within the locality (e.g. at the Grand Canal). The monitoring locations will be chosen with consideration of the prevailing wind direction and proximity of sensitive receptors.

If dust deposition levels are measured to be above the relevant guideline of 350mg/m2/day and/or PM10, PM2.5 and NO2 concentrations are measured to be above the relevant Ambient Air Quality Standard limit values, the mitigation measures in the area shall be reviewed and improved to ensure that dust deposition levels and/or PM10, PM2.5 and NO2 concentrations are reduced.

Should high dust deposition levels and/or PM10, PM2.5 and NO2 concentrations continue to occur following these improvements, the appointed contractor shall provide alternative mitigation measures and/or will modify the construction works taking place.

Six months of pre-construction dust monitoring will be undertaken at all sites to establish a baseline prior to construction works. The data will assist in confirming if the construction of the proposed

development sites has the potential for any air quality impacts which contribute to the risk of the respective limit values, or target values or alert thresholds being exceeded. During construction, trigger levels will be used to alert the principal contractor to a potential peak in particulate concentrations. These trigger levels will be agreed with SDCC prior to construction. In the event that a trigger level is breached SMS text messages and/ or emails will be sent to the Council's representative and the principal contractor from monitoring equipment. In such an event:

- The Council's representative and the principal contractor will review the construction activities in the vicinity to determine the cause;
- The Council's representative will be entitled to stop the works. Where activities outside the control of the Contractor may have had an influence on a trigger level being breached, these will be identified, and works can recommence following agreement with the Council's representative;
- The principal contractor will review the monitoring data, including the most recent air quality data; and
- The principal contractor will identify and agree with the Council's representative appropriate engineering controls and management procedures to reduce dust levels resulting from the works activities identified as the cause of the trigger level being reached.

The principal contractor will confirm to the Council's representative that controls and management procedures have been implemented.

The principle contractor, along with the sites' appointed Ecological Clerk of Works (EcoWs), will hold regular liaison meetings with other active and future construction sites within 500m of the proposed development sites (where there is the potential for cumulative and in-combination impacts, i.e., overlapping disturbance and dust settlement buffers), to ensure plans are co-ordinated so that the potential for cumulative and/or in-combination surface water (dust settlement in water), disturbance and dust impacts are minimised

Invasive Species Management Plan (ISMP)

The prepared ISMP (see Appendix 6.2 for all ISMP details) includes mitigation measures that utilises the below best practice management guidance documents, where relevant:

- The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020a);
- The Management of Invasive Alien Plant Species on National Roads – Standard (TII, 2020b);
- Inland Fisheries Ireland – Biosecurity Protocol for Field Survey Work (IFI, 2010);
- Managing Invasive Non-Native Plants in or near Freshwater (EA, 2010);
- Invasive Species Ireland (ISI) Best Practice Management Guidelines for Japanese Knotweed (ISI, 2008a); and
- The Environment Agency (EA) Managing Japanese Knotweed on development sites – the Knotweed Code of Practice (Version 3, amended in 2013, withdrawn from online publication in 2016) (EA, 2013). (This document, although no longer supported by the EA, is nonetheless a practical document in determining the approach and control mechanisms for Japanese Knotweed).

General Measures to Control and Prevent the Spread of Invasive Non-Native Species (INNS)

Pre-construction Survey

An updated invasive species baseline survey shall be conducted prior to the commencement of the proposed project's enabling works. This updated baseline is required as invasive species may have continued to spread within and adjacent to the proposed development sites since the last invasive species or habitat survey was conducted on-site.

As per TII guidance (TII, 2020a), this additional invasive species survey will include detailed maps of the precise location of each individual invasive species plant, as well as photos of these specific locations.

During the interim between the original invasive species surveys and the commencement of construction, it is possible that the existing stands of First Schedule invasive species may have expanded (if unmanaged) or decreased (if there is an active management regime in place), or that newly established First Schedule non-native invasive species may have become established within the footprint of the proposed development sites. A confirmatory pre-construction invasive species survey will be undertaken by a suitably qualified specialist, arranged by the principal contractor, to confirm the absence, presence and / or extent of all First Schedule invasive species within the footprint of the proposed development sites. Where an infestation is confirmed / identified within the footprint of the proposed development sites, this will require the implementation of the final ISMP.

Final Invasive Species Management Plan

Following appointment, the contractor(s) will be required to develop more specific Method Statements and submit an updated ISMP that is cognisant of the proposed construction activities, equipment and plant usage and environmental monitoring plan for the proposed development sites. The updated ISMP is referred to as the 'final ISMP' in this document. The contractor(s) may only propose modifications to the ISMP which will not give rise to any impacts which are more significant than those already identified within the Biodiversity Chapter.

All of the measures set out in this ISMP will be implemented in full by the appointed contractor(s) and its finalisation will not affect the robustness and adequacy of the information presented and relied upon in the Biodiversity Chapter.

The ISMP will be updated following the pre-construction invasive species survey to detail the exact measures for any invasive species population present within the footprint of the proposed development sites. Depending on the extent and nature of the works, a number of approaches / treatments may be approved, all following the measures in the ISMP.

All control measures specified in the final ISMP shall be implemented by a suitably qualified and licenced specialist prior to the construction stage of the three proposed development sites to control the spread of any newly established Invasive Non-Native Species (INNS) within the footprint of the proposed development sites. Furthermore, the contractor(s) will adhere to control measures specified within the final ISMP throughout the construction stage of the proposed development sites. The site will be monitored by the appointed contractor after control measures have been implemented. Any re-growth will be subsequently treated by the contractor. All measures that are prescribed in the final ISMP shall be equally applicable to advance works as to construction works. The contractor will be required to update the Final ISMP with a detailed Monitoring Plan and Programme which will require approval by NPWS.

General INNS Spread Prevention Measures

The unintentional spread of INNS during construction works (within the proposed developments sites, originating from outside the proposed developments sites, such as through the importation of materials, poor biosecurity practices regarding plant and machinery or natural processes) can be a significant issue, and if not managed properly, can result in the spread of INNS to non-infested areas (within or adjacent to works areas). This will potentially increase the future cost and effort required to control the species and has the potential to pose further public health and safety risks (e.g. Japanese Knotweed can cause damage to weaknesses in built environment).

Listed below is a brief detailing of necessary measures to be undertaken to ensure biosecurity within this section of the proposed developments sites, all of which will need to be included within the proposed developments sites ISMP:

- The adherence to a set of biosecurity measures, including:
    - the fencing off / demarcating of the individual invasive species;
    - identifying dedicated access points into and out of fenced-off areas;

  - the installation of designated decontamination facilities (where appropriate);
  - protocols around the removal of contaminated soils; and
  - seed and fragment checks on boot, tyres and tracks entering and leaving the work site.

- Best practice measures for the treatment of soils contaminated with invasive species (including potential seeds and fragments of mature plants) to prevent the accidental spread of INNS;
- As required by law, licences for the disposal of contaminated materials will be obtained, as well as the utilisation of licensed facilities;
- In regard to the importation of soil and other materials, the principal contractor will only utilise traceable topsoil for landscaping that has been cleared of any invasive species material;
- Measures to be implemented during the application of herbicides – Commitment to the appointment of a suitably qualified/registered/licensed pesticides advisor for any works requiring the use of pesticides, and safety precautions for consideration in the use of pesticides near watercourses; and
- Areas which contained invasives species, where invasives were treated on-site or removed, prior to the enabling and construction works will require an on-going post-construction monitoring programme to ensure that there is no reestablishment of any invasive species within these areas. The appointed INNS contractor will provide this detailed Monitoring Plan and Programme within the final ISMP.

Biosecurity

Unwashed construction equipment, plant and vehicles, and footwear can provide a vector for the spread of non-native invasive species within the proposed project and from areas outside the project where INNS are present or where vector material potentially containing seed / root material is attached to plant or personnel. The following hygiene measures shall be undertaken for the proposed development sites:

- Known or potentially infested areas within the working area of the proposed development sites shall be clearly demarcated and fenced off in advance of works and access restricted until such time that treatment has commenced and / or construction works are monitored in accordance with the ISMP in the area. In relation to Japanese Knotweed, the guidance recommends an exclusion buffer of 7m (metres) in all directions (within the works area and 3m vertically underground);
- The implementation of clear signage in accordance with TII IAPS standards will be erected at compounds, and at the boundary of the exclusion fencing. These signs will be briefed out at toolbox talks specific to each INNS to personnel on site;
- Identify and create access points into exclusion areas for INNS. These are only to be used by specialist personnel for the removal of INNS and are not to be used by general site workers until such a time as all contaminated material has been removed from site and it is safe to enter;
- Where it is practicable, a wheel wash and footwear washing facilities will be provided to ensure biosecurity measure are preventing the further potential spread of INNS. These locations are to be provided by the contractor. Where a dedicated / bespoke wheel wash cannot be installed owing to space limitations, the appointed contractor will ensure that no excavated loose material is allowed off site from within an exclusion zone;
- Where plant that is used to excavate soils, it shall be visually checked for loose soil before movement to another part of site (where possible, the movements of tracked machinery will be restricted within the invasive species exclusion zone). Loose soil shall be scraped off and disposed of, and a solution of Virkon© (or similar approved disinfectant) applied to machinery to ensure that no obscured seed / root material remains viable. Vehicular movements within the exclusion area shall be minimised as far as is practical;

- Unless in the exceptional circumstance that direction is given from a suitably qualified ecologist, no storage of contaminated soil on site. Instead, being disposed of in a licenced soil waste facility; and
- Where there are small volumes (e.g. volumes capable of being double bagged in quarantine bags such as cut plants, bulbs or loose soil occur), it may be practical to bag the material and bring it to a clearly demarcated and dedicated quarantine area within the construction compounds until such time that the material is disposed of to an authorised facility, similar to the process of disposing of bulk excavated contaminated soil.

Soil Excavation

No excavation or removal of soil within areas demarcated as having INNS present is to be permitted unless under strict supervision by a suitably qualified ecologist or INNS specialist. Buffer zones to be installed by the contractor(s) will be advised by a suitably qualified ecologist or INNS specialist and strictly adhered to. Guidance regarding Japanese Knotweed recommends a buffer of 7m from the plant due to its expansive rhizomes.

Where mechanical means of removal are required to dispose of INNS (treated or un-treated by chemicals) a suitably qualified ecologist or INNS specialist will be present to supervise and provide support to the contractor(s) for the duration of the operation.

There will be no temporary storage on-site of bulk excavated contaminated material. Where the final ISMP calls for shallow / deep burial, this material shall be removed from the excavated area and transported immediately to approved receptor area on-site. Furthermore, the temporary storage of non-contaminated material will not occur within a European or National designated site nor within 20m of any watercourse / wetland and any land within an identified flood zone.

Plant and machinery used in the control, excavation and transport of contaminated material shall also be subject to the recommendations described in the above Biosecurity sub-section. The installation of industry-rated invasive species-proof membrane before infilling construction of road / paths surface may be required. All waste arising out of this process which has been in contact with the excavated ground shall be treated as contaminated waste and disposed of at a facility that is authorised to accept such waste.

Where the movement of any First Schedule invasive species is required off site, a licence will be required from NPWS in advance of any movement to a site / facility licensed to accept such waste, as per the Birds and Natural Habitats Regulation. This licence is separate to and does not negate the need for licences / permits / authorisations required under waste legislation.

Disposal of Materials

Where any INNS related material is collected and is required to be disposed of, it is essential to dispose of said material in a manner that does not afford it the potential to spread further either within the proposed development sites, or in the nearby vicinity.

The movement of invasive plant material off-site, requires a licence from the NPWS, as per the Birds and Natural Habitats Regulations. Invasive species (particularly roots, flower heads or seeds) must be disposed of at licensed waste facilities or composting sites, appropriately buried, or incinerated having regard to relevant legislation (e.g. Waste Management Act, as amended, Section 4 of Number 6 of 1987 – Air Pollution Act, 1987, relevant local authority bylaws and any other relevant legislation). All disposals must be carried out in accordance with the relevant waste management legislation, as ublic te Guidelines for the Management of Waste from National Road Construction Projects (TII, 2017).

It is important to note that some invasive species plant material or soil (vector material) containing residual herbicides may be classified as either ‘hazardous waste’ or ‘non-hazardous waste’ under the terms of the Waste Management Act, as amended, and both categories may require special disposal procedures or permissions. Advice will be sought from a suitably qualified waste expert regarding the classification of waste and the suitability of different disposal measures.

Measures to be Implemented During the Application of Herbicides

If the application of herbicides is the expert advice given and then implemented during the lifespan of the proposed developments sites then a suitably qualified pesticides advisor, registered with the Department of Agriculture, Food and the Marine must be employed.

The appointed contractor is required to refer to the appropriate guidance documents, including but not limited to those listed at the beginning of this ISMP sub-section, which provide detailed recommendations for the control of invasive species and noxious weeds. The appointed contractor (or specialist license holder) will update the final ISMP in accordance with current and relevant guidelines before commencing works; and

It is important to note that where a chemical treatment is to be used, there is a risk of contaminating a watercourse. The choice of herbicide is typically limited to formulations of Glyphosate or 2,4-D amine that are approved for use near water. Full details of any chemical used, where required and as advised by a registered pesticides advisor, will be included in the final ISMP prepared in advance of construction of the proposed developments sites.

Post-construction Monitoring

Following the construction of the proposed developments sites, there may be ongoing treatment programmes which extend for a number of years (length of programme is dependent on the effectiveness of treatment) into the operational stage. In the operational stage, the management of the infrastructure will be the responsibility of the local authority and the control of invasive species will be as per their plans and procedures, and responsibilities under The Birds and Natural Habitats Regulations.

The above measures are important for all First Schedule non-native invasive species, and in particular Japanese Knotweed, where it occurs, as maintenance works associated with landscaping, such as mowing and hedge cutting have the potential to spread this plant via the dispersal of very small amounts of shredded plant material. If invasive plants are found, then they shall be treated as per the measures outlined in the ISMP and any species-specific guidelines.

The appointed INNS contractor will provide a detailed post-construction section within the Monitoring Plan and Programme within the final Invasive Species Management Plan.

Assessment of Management Options for First Schedule Invasives Species

The general measures included in the sections above are required to ensure good on-site practices in respect of known or potential First Schedule invasive species as per Regulations 2024 [S.I. 374/2024]. The following sections further identify practical management controls. It is acknowledged that more than one potential control measure exists and that a single or combination of measures may be required.

The recommendations presented in this ISMP provide the minimum requirements for the likely control measures and the measures outlined in this ISMP shall be developed (with further detail on methodology used at each location, timing, practical management etc.) by the appointed contractor(s) (or the specialist as appropriate) by way of producing and implementing the final ISMP.

The use of chemical treatments is recognised as a potential treatment option. However, the services of a registered herbicide advisor must be employed in the specifying of named chemicals including those rated for use adjacent to aquatic environments where required, treatment type, dosage, and timing etc., and / or use of pesticides in the management of potential First Schedule invasive species within the proposed development sites.

Selected Management Controls

The selected management control to be defined for each invasive species stand within the three proposed developments sites will depend on:

- Results of the pre-construction survey;
- Construction requirements – timing of works at specific locations, level of infestation and practical considerations such as reducing disturbance to road users / homeowners; and

- Feasibility of control measure, where possible the most practicable method (with regards to the environmental impact and human health) will be used e.g.; if mechanical methods of removal are not feasible due to access. Then a step back and assess approach will be employed to remove INNS.

The ISMP, which will be updated (in the form of the final ISMP) following on from the pre-construction surveys, may require the utilisation of a number of controls that are described below.

The Site-specific Mitigation sub-section provide the specific invasive species mitigation measures required for the invasive species within and immediately adjacent to Sites 3, 4 and 5.

Tree Protection Measures

The tree protection measures detail how sensitive operations are to be achieved in proximity to trees to be retained within and adjacent to the three development sites. A list of tree-based habitat mitigation measures (Order of operations) are outlined below:

- Pre commencement Site meeting;
- Preliminary tree works;
- Site Briefing for Site personnel;
- Installation of protective fencing and ground protection as required;
- Demolition and enabling works including utility diversions;
- Re-adjustment of protective fencing and ground protection as required;
- Construction operations;
- Re-adjustment of protective fencing and ground protection as required;
- Installation of new hard surfaces and hard landscaping;
- Site signed off on agreed completion of significant works;
- Dismantling of tree protection measures; and
- Soft landscaping works within the Root Protection Area of retained trees.

Rare and Protected Floral Mitigations

Protected and/or Red-listed Flora: Lesser Centaury

Pre-construction surveys will be conducted for Lesser Centaury across the Site 3, 4 and 5 to observe the existing populations where present, as well as to identify the potential new colonisation of Lesser Centaury within new sections of the three sites. All the data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor the populations before their relocations to a suitably undisturbed area within the locality (i.e. the northern riparian zone of the Kilmahuddrick Stream, where there will be no public access or maintenance), prior to the commencement of the construction stage. The EcoW will apply and obtain a Licence to Take or Interfere with Protected Plant Species for Scientific, Educational, or Other Such Purposes from the NPWS, prior to the relocation of this protected floral species. In this new location, the Lesser Centaury will be sectioned (rope / tape fence) off with a 1m buffer to prevent stray machinery or site personnel entering their immediate vicinity, ensuring no physical impacts. The sectioning off will be carried out under the supervision of the EcoW.

Uncommon / Rare Flora: Pyramidal Orchid and Bee Orchid

Pre-construction surveys will be conducted for Pyramidal Orchid and Bee Orchid, (and other potential emerging uncommon/rare flora), across the Site 3, 4 and 5 to observe the existing populations where present, as well as to identify the potential new colonisation of Pyramidal Orchid and Bee Orchid within new sections of the three sites. All data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor the potential spread of Orchid species during the site enabling works / early construction stages.

Additionally, the EcoW will relocate any newly sprouted Orchid species from work areas to be cleared of vegetation into suitable areas, that will not undergo any future vegetation clearance, e.g. the riparian zone of the Kilmahuddrick Stream. In this new location, the Orchid(s) will be sectioned (rope / tape fence) off with a 1m buffer to prevent stray machinery or site personnel entering their immediate vicinity, ensuring no physical impacts. The sectioning off will be carried out under the supervision of the EcoW.

Rare and Protected Fauna Mitigations

Otter

Pre-construction surveys (four in total to account for potential seasonal use) in the year prior to the commencement of the construction stage will be required to monitor the use of Site 4 and the Grand Canal section to the south by the local Otter population. The main aim of these surveys is to ensure that any potential new holt is identified and accounted for within the construction mitigations before commencement of site works. All data from the pre-construction surveys will be provided to the appointed EcoW, who will briefed in detail by the pre-construction study team. The EcoW will then continue to monitor any new Otter holt within the disturbance zone of the site during the construction stage.

The works have the potential to impact local Otters via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements have the potential to impact the health of the local Otter population. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality.

Standard mammal mitigation measures will be adhered to including the covering of all excavations to prevent accidental trapping or the use of mammal ramps in larger excavations to allow for escape as well as the use of exclusionary fencing where appropriate to prevent mammals from entering any potentially dangerous areas.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the local Otters and where they are likely to potentially encounter them within works area (i.e. the Grand Canal and Kilmahuddrick Stream, and their respective banks).

The EcoW will monitor site lighting along the banks of the Grand Canal and Kilmahuddrick Stream during the construction stage, in order to ensure that there is no light spillage into these watercourses, which may disturb the commuting and foraging activities of Otter along these two watercourses.

Non-volant Mammals

Pre-construction surveys will be conducted for non-volant mammals, such as Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew, to check if these species have increased their presence or expanded their respective ranges into the proposed development sites, including the formation of new setts, dens, and hibernacula within the disturbance buffer of the proposed development sites. All data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor the potential expansion of these non-volant mammal species into the site areas during the construction stage.

The construction works at the development sites have the potential to impact the local Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew populations via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements have the potential to impact the health of the Badger, Pine Marten, Irish Stoat, Hedgehog and Pygmy Shrew populations. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local non-volant mammal populations, and their associated habitats.

Standard mammal mitigation measures will be adhered to including the covering of all excavations to prevent accidental trapping or the use of mammal ramps in larger excavations to allow for escape as well as the use of exclusionary fencing where appropriate to prevent mammals from entering any potentially dangerous areas.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the terrestrial mammals known to frequent the works area, as well as those that may expand their range into the works area (e.g. Badger and newly excavated potential setts).

Additionally, in the event one of the above mammals establishes a resting place e.g. sett etc., within the proposed works area, the EcoW will be required to adjust the mitigation measures within the area of the new resting place in order to safeguard the mammal species in question. Furthermore, the EcoW will be responsible for performing checks within areas to immediately undergo vegetation clearance, in order to safely disturb / relocate mammal species, such as Irish Hare, so that they may vacant the area before machinery enters the area. Moreover, the EcoW will also have to check the vegetation and relocate any Hedgehog hibernacula present (hibernation nests formed under hedges, tree roots, and piles of deadwood / leaves / grass).

Bats

The proposed development sites' construction works have the potential to impact local bat populations via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements have the potential to impact the health of the local bat species. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local bat populations and their prey base.

Additionally, regular (seasonal) pre-construction surveys will be required for monitoring of newly formed potential bat roost features within structures and trees present within the boundaries of Sites 3, 4 and 5. If the event that suitable potential bat roost features are formed, subsequent endoscopic examinations will need to be performed, with further follow-up through emergence activity surveys. At the time of writing of this chapter, no bat roosts have been recorded within or the lands immediately adjacent to the proposed development sites, therefore no derogation licence will be accompanying the submission of this EIAR.

Site lighting required during construction stage will be installed in a manner that it is positioned, directed and cowled away from any dark corridors (e.g. neighbouring treelines / hedgerows / waterbodies (Grand Canal)) or high-quality foraging areas (e.g. wetland habitats) located beyond the construction compound / immediate works area, therefore avoiding any unnecessary light spill and disturbance to bat activities. The site lux levels at suitable foraging and commuting habitats for local bat species will not be increased above 1lux in important dark corridors or baseline levels in secondary habitats (amenity grasslands) as a result construction activities within the locality of the proposed development sites. Furthermore, wherever reasonably possible, works will be carried out in daylight hours in order to reduce the need for lighting on site (outside of compound areas). The appointed EcoW will be present when site lighting is initially set up in a works area and will regularly monitor the lux levels to ensure that they are not impacting dark corridors or secondary foraging locations. The EcoW will also familiarise themselves with the following best practice documentation in order to ensure that they are correctly fulfilling their role in respect to lighting mitigation:

- Bats and Lighting in the UK – Bats and the Built Environment Series (BCT, 2008);
- Bats & Lighting – Guidance Notes for Planners, Engineers, Architects and Developers (BCI, 2010); and
- Guidance Notes for the Reduction of Obtrusive Light GN01 (ILP, 2011).

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the bat species known to frequent the works area, in the event the personnel encounter a downed / or stunned bat during the works period.

Wintering Birds

Migrant wintering bird populations have the potential to establish new foraging areas within the ZoI of the proposed development sites after the time of writing of this EIAR. In order to address this potential future data limitation, pre-construction wintering bird surveys will be conducted during the winter periods up until the commencement of the enabling works / construction stage of the proposed developments, ensuring that mitigation measures can be adjusted accordingly in the event that wintering bird species establish new foraging areas within the ZoI of the three sites. All data from the pre-construction surveys will be provided to the appointed EcoW (and extended survey team in this instance), who will continue to monitor these migrant wintering bird populations during the construction stage.

The works have the potential to impact wintering birds via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements have the potential to impact the health of wintering birds. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the migrant wintering bird populations and their associated habitats.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the wintering bird species known to frequent the works area; with a particular focus on their sensitivity to audible and visual disturbance.

Breeding Birds

Pre-construction surveys will be conducted for breeding birds to check if the local species have built new nests within trees due to be felled as a result of the works. All data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor the presence of previously recorded and new breeding bird nests during the construction stage.

The works have the potential to impact wintering birds via the following pathways: surface water, groundwater-to-surface water and air (dust)-to-surface water pollution impacts. Additionally, the consumption of food items containing polluting elements have the potential to impact the health of local breeding bird species. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local breeding bird populations, and their associated nesting habitats and prey base.

The seasonal restriction on the removal of vegetation is in place from March till August (inclusive), in order to safeguard breeding bird species utilising scrub and wooded vegetation for nesting purposes. If a scenario presents itself where vegetation must be cleared within the breeding bird season, the appointed EcoW will be required to undertake a breeding bird nest-check survey in advance of the works to ensure that there will be no impacts on nesting birds. If nests are found, they will be safeguarded, with the nests' hedge / tree left untouched by trimming or removal works, until the chicks have successfully fledged.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the breeding bird species known to frequent the works area, with a focus on nests, fallen nests and hatchlings / fledglings.

Amphibians

Pre-construction surveys will be conducted for both Common Frog and Smooth Newt to check if their respective local populations have expanded the range of habitats they utilise within the proposed development sites; as well as their continued presence within habitats they have previously been recorded in. All data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor these amphibian populations during the construction stage.

Deleterious pollutants accidentally introduced via surface water pathways into the habitats located on-site and adjacent, during the construction stage, will reduce the capacity of these habitats to

support the foraging activities of amphibians. Common Frog and Smooth Newt may also be subjected to disturbance-based impacts, which have the potential to negatively impact their foraging and commuting activities, as well as potential loss of life for individuals within the construction site (e.g. accidental trappings), after failure to exclude entry. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local amphibian populations, and their associated habitats and prey base.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the Common Frog and Smooth Newt and where they are likely to encounter them within the works area. The EcoW will also perform checks prior to vegetation clearance within meadow, scrub and woodland areas, in order to ensure that any hibernating Common Frog and Smooth Newt individuals within the area are relocated safely to another suitable location to continue their hibernation period.

Fish

Adverse impacts may arise in the form of accidental introduction of pollutants, such as hydrocarbons, into the local surface water network. A number of fish species are known to bioaccumulate pollutants within the marine and freshwater environment, damaging their physiological health, as well as introducing the toxin into the lowest trophic level of the local food web. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local amphibian populations, and their associated aquatic habitats and prey base.

Seasonal restrictions will be in place for works along the Kilmahuddrick Stream and its riparian zone (10m from the top of the bank), as per IFI best practice. These seasonal works restrictions will be in place from July to September for all construction-based works; other small-scale work types, i.e. invasive species management, may be conducted during this seasonal time period given the seasonal treatment restrictions for specific invasive non-native species, such as Japanese Knotweed.

Terrestrial Invertebrates

The works have the potential to impact upon terrestrial invertebrates via the following pathways: surface water, ground water, air (dust) and disturbance. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local terrestrial invertebrate populations, and their associated habitats.

There will also be a toolbox talk given to the site personnel by the appointed EcoW about the terrestrial invertebrates, in particular the identification of tree, shrub, grass-tussock or subterranean based bee and wasp hives. While the EcoW will conduct pre-clearance checks of vegetated areas to be cleared, it is still possible for hives to be established in the works area following clearance. Where reasonably practicable, prior to clearance, hives will be relocated by the qualified apiarist under supervision of the EcoW to nearby suitable habitat, safe from any future clearance, thus safeguarding the local hive-based bee and wasp species.

Additionally, prior to vegetation clearance the EcoW will check for any larval stage pollinators located in large groupings upon host-flora (food plants), e.g. Peacock Butterfly caterpillars on Nettle or Cinnabar Moth caterpillars on Ragwort. The EcoW will then relocate these larval groups to another area containing the larvae's respective host-flora, that will not be subject to any future clearance within that summer (flight period).

Freshwater Aquatic Invertebrates

Adverse impacts may arise in the form of accidental introduction of pollutants, such as hydrocarbons, into the local surface water network. A large range of freshwater invertebrate species are known to bioaccumulate pollutants within the freshwater environment, damaging their physiological health, as well as introducing the toxin into the lowest trophic level of the local food web. Therefore, there will be strict adherence to the mitigation measures outlined in the CEMP, and

the management plans therewithin, which pertain to best practice guidance and the protection surface water, groundwater and air quality, in order to safeguard the local freshwater aquatic invertebrate populations, and their associated habitats.

Operational Stage

The operational stage mitigation sections below will address remedial planting, operational surface water run-off management and woodland enhancement for local fauna. Much of operational mitigations were pre-emptively accounted for and planned into the drainage, landscape and lighting designs (Design Incorporated Mitigation). This strategy helps ensure neutral and positive residual impacts wherever possible.

Remedial Planting (Design Incorporated Mitigation)

Listed below are remedial mitigation actions to be carried out for selected habitats, as part of the landscape design for the three proposed development sites.

Meadows

Amenity grassland (Meadow grass)

Areas within the landscape plan are set aside to be flowering lawns, this is referred to as 'Meadow Grass' within the planting schedule. Species in this area include grasses for a lawn and Meadow Buttercup, White Clover, and Red Clover. This will be maintained in a short flowering meadow methodology to keep the area visually like a lawn but will some flowering aspect to provide pollen for invertebrates. Short flowering meadows are formed when the mowing of the grassland is limited to every 4-6 weeks. After the mowing of the grass the cuttings are to be lifted away from the site to reduce the nutrients available in the soil which promotes more wildflower species than grass species.

This management will be staggered throughout the site to ensure that some areas of meadow are always in flower throughout the summer. This will provide a constant source of pollen for terrestrial invertebrates during the summer when they will be most actively foraging. Furthermore, this will specifically benefit the local red-listed Gypsy Cuckoo-bee, as well as its local host species, White-tailed Bumblebee Additionally, this management practice will increase the abundance of invertebrate species which will also provide more foraging potential for local bat and bird populations.

Dry meadows and grassy verges (Grassy Habitat)

Areas of grassland verges that are incorporated into the landscape plans, referred to as 'Grass Habitat' in the landscape plan, have the potential to support a variety of floral species which are beneficial to local invertebrate species. This will create foraging potential for local bird populations, as well as refuge habitat along with material for nest building.

The species to be planted within the landscape plan include Cow Parsley Anthriscus sylvestris, Crocus and Grape Hyacinth. The project ecology team recommends the sowing of False Oat-grass; Meadow Foxtail and Smooth Meadow-grass Poa pratensis for the grass component. For the herbaceous aspect of the planting, the project ecology team recommends the sowing of Nettle; Common Knapweed; Field Scabious Knautia arvensis; Bush Vetch; Meadow Vetchling; and Yellow Rattle Rhinanthus minor. The Yellow Rattle will play a salient role in maintaining the balance between herbaceous wildflowers and the meadow grasses, as this species will parasitise the grass species present; and prevent the wildflowers from being overgrown by the grasses within areas not under regular maintenance, i.e. areas under a yearly mowing regime.

Ideally maintenance of this habitat will be carried out twice a year, mowing this grassland area in the autumn (September) and end of winter (February), lifting the cuttings from the area to reduce the nutrients that are in the soil over a prolonged time and promote a greater wildflower composition within the grassland.

Hedgerows and Treelines

The planting of new linear (screening) native hedging and trees within the three sites, along with soils from the cleared hedgerow areas (to preserve existing seedbank / local flora genetics), will help

remedy the loss experience by the hedgerow and treeline habitat during the construction stage. When these new hedges and tress have matured, they will mirror the ecological diversity and ecosystem services (e.g. refuge; nesting opportunities for birds; and wildlife commuting corridors) of the existing hedgerow and treeline sections to be removed.

Scrub

The proposed landscape plans for the three development sites include the creation of new shrub areas (of varying height) scattered throughout the sites, which will in part include maintenance-suitable scrub species. The landscaping will also prioritise the planting of shrub species that will provide multiple ecosystem services (e.g. refuge; nesting opportunities for birds; and wildlife commuting corridors) and be pollinator-friendly.

Operational Sustainable Drainage Systems (Design Incorporated Mitigation)

As previously mentioned within the operational impacts section, the proposed range of SuDS design features to be installed within and adjacent to Sites 3, 4 and 5, including permeable paving; tree pits; conveyance swales; and bioswales / ponds will collectively provide surface water run-off attenuation, infiltration, and in-situ retention of sediments (and associated nutrients), metals, and hydrocarbons (Jurries, 2003; Anderson et al., 2016), safeguarding the terrestrial, wetland and aquatic habitats (i.e., the Kilmahuddrick Stream) from deleterious urban run-off during the operations of the three proposed developments.

Lighting Design and Specifications (Design Incorporated Mitigation) – Nocturnal Fauna

The below incorporated specifications within the lighting design described herein will ensure that operational lighting levels will not significantly affect the activities of nocturnal species, primarily the local bat species, though these design elements will also ensure no disruption to Otter, Badger, Pine Marten, Hedgehog, Common Frog and Smooth Newt activities; in the event they increase their frequency within the site or expand their respective ranges into the three proposed development sites.

Light Levels and type

Operational site lighting that meets the lowest light levels permitted under health and safety is preferable for bats in the vicinity. The specification and colour of light treatments, such as single bandwidth lights and no UV light are essential. LED luminaires are ideal and will be used where possible due to their sharp cut-off, lower intensity, and dimming capability. A warm white spectrum (3000K) will be used in the lighting located along the adjacent to dark corridors within the proposed development sites, to reduce the blue light component.

Column Heights of Lamp Posts

In order to reduce the amount of light spillage where it is not needed, the height of lamp columns located adjacent to dark corridors will be restricted to a height of 6m to avert negative light spillage impacts from three proposed development sites.

Dark Corridor Connectivity

Placement of lamp posts was considered in cases where road infrastructure bisected dark corridors within and adjacent to the three proposed development sites. The ecological review of lamp post placements allowed for relocations, where necessary, in order to help minimising any bottlenecking of the future dark corridors. As this was of particular concern for local bat species, where notable bottlenecks did occur as result of road and pedestrian health and safety requirements, it was ensured that a dark “V” or elevated section was still present for local bats to commute through the dark corridor bottleneck.

Checks for Vulnerable Fauna Prior to Maintenance Works

Within the maintained green areas, checks for Hedgehogs prior to any maintenance grass or scrub trimming on-site during the Hedgehog hibernation period from November-February and their breeding period from June-September, when the young hoglets will be particularly vulnerable within their nests and not yet ready to venture into exposed areas with potential predator species.

Deadwood Piling

The logs / large branches that were used to provide Otter with a sheltered commuting corridor along the Kilmahuddrick Stream will be re-used for habitat enhancement (see Site 4 specific Protected Fauna Mitigations sub-section), as well as other native tree and shrub species felled during the construction stage. The logs and branches will be cut into shorter, more manageable segments. These shorter deadwood segments are to be incorporated into the new and existing woodland areas as discrete deadwood piles. The placement of these deadwood piles will be overseen by the appointed EcoW. The addition of the deadwood piles will be beneficial for local amphibians, which may utilise them as a hibernation location; as well as for terrestrial invertebrates, such as detritivore species and wood-burrowing solitary bee species.

Proposed Development – Site 3 (Construction Stage Mitigations)

Site-specific Habitat Mitigations

Management of Habitat Loss

During the construction stage there will be large scale clearance of most habitat types across Site 3. In particular for the grassland and scrub, with a smaller degree of habitat clearance for woodland and treelines. By following the SDCC Policy Objective: NCBH1 Objective 1, the project will retain and incorporate existing natural features where possible. In order to facilitate the retention and continuation of the on-site vegetative communities, mitigation is required to accommodate this retention. This will include:

- The relocation of the existing dry meadow and grassy verge habitat to the areas of the landscape plan designated for 'meadow grass' and 'grassy habitat'. During construction this will involve setting the soil from these areas aside to be used during the installation of the landscaping of the proposed development.
- The integration of small sections of the existing hedgerow and treelines, along with the topsoil, to the planned 'double staggered native hedgerow' within the landscape plan for Site 3. This will maintain the established symbiosis within the soil that has developed within the site and allow the newly planted hedgerows to benefit from this. During the construction phase this will involve the storing of these trees and soil to be incorporated into the landscape plan where possible.

Site-specific Rare and Protected Flora Mitigations

Pyramidal Orchid and Bee Orchid

Pre-construction surveys will be conducted for orchid species across Site 3 to observe the existing populations where present, as well as to identify the potential new colonisation of new orchid species within new sections of Site 3.

The Pyramidal Orchid and Bee Orchid must be relocated from their current Site 3 habitats, prior to clearance of the site for construction. Suitable locations will be chosen within the northern section of the safeguarded ecological corridor within Site 4, as the operational Site 3 landscape will not possess any suitable habitats that are also sectioned off from the public, which is essential given the vulnerability of these species to trampling. It is important that the individuals are immediately relocated to their new habitat after, in order to minimise the likelihood of relocation failure.

The associated mycorrhizae for Orchid species is essential for successful germination, this mycorrhizae will be within the soil surrounding the Orchid individuals; therefore, these soils are to be translocated along with their associated Orchid species, in order to ensure optimal reestablishment of these species within their new habitat.

Lesser Centaury

Pre-construction surveys will be conducted for Lesser Centaury across the Site 3 to observe the existing populations where present, as well as to identify the potential new colonisation of Lesser Centaury within new sections of Site 3. All the data from the pre-construction surveys will be

provided to the appointed EcoW, who will continue to monitor the populations before their relocations to a suitably undisturbed area within the locality (i.e. the safeguarded northern riparian zone of the Kilmahuddrick Stream in Site 4, where there will be no ublicc access or maintenance), prior to the commencement of the construction stage.

The Lesser Centaury individuals within Site 3 will be relocated to the northern section of the suitable safeguarded ecological corridor within Site 4 (see Site 4: Site-specific Rare and Protected Flora Mitigations for further details), as Site 3 will not possess any suitable habitats that are also sectioned off from the public, which is essential given the vulnerability of this species to trampling and its protection status.

Site-specific Protected Fauna Mitigations

Hedgehog, Pygmy Shrew and Breeding Birds

The clearance of any tall meadow, woodland, treelines, hedgerows or scrub is to be conducted between mid-September and late October; which is a time that is both outside of the breeding bird nesting period and the hibernation period of Hedgehogs. Vegetation will be removed in sections working in a consistent direction to prevent entrapment of protected fauna potentially present (e.g. Hedgehog and Pygmy Shrew).

Where this seasonal restriction cannot be observed, a check for active nests or hibernating Hedgehogs (depending on the season) will be carried out immediately prior to any site clearance by an appropriately qualified ecologist and repeated as required to ensure compliance with legislative requirements. If active nests are recorded, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged. Additionally, any leaf piles and deadwood piles will be checked for Hedgehogs before moving or interfering the surrounding detritus or vegetation.

Site-specific Invasive Species Management

Winter Heliotrope

Winter Heliotrope is located along the existing paths within the northern section of Site 3, this species is highly transferable via construction activities and the tyres of vehicles. To limit the spread of this species it is recommended that it is to be mechanically removed from Site 3 prior to clearance. This will require an EcoW to identify areas to be cleared prior to the works to ensure that all areas of Winter Heliotrope are removed from site to prevent the spread during construction activities.

Butterfly-bush

Butterfly-bush was recorded within Site 3, this invasive species may also be mechanically removed from the site prior to clearance of the site. This species can spread via construction vehicles and activities, removal of this species prior to the clearance will limit the spread of this species within the site and externally. An EcoW will be required to identify the plants of Butterfly-bush within the site and direct those who will remove it to ensure that all the Butterfly-bush within the site is removed.

Japanese Knotweed

There is on-going treatment of the Japanese Knotweed on Site 3. This is crucial for the site prior to clearance as Japanese Knotweed spreads incredibly quickly and effectively when disturbed by machinery.

Japanese Knotweed is a high impact invasive species that is particularly effective at colonising disturbed ground (e.g. construction sites) and can spread by the re-growth of cut fragments or root material. Therefore, if it is broken up during site clearance or other earthworks, it can readily re-grow in new areas to which contaminated soil is moved. Japanese Knotweed reproduces asexually (in Ireland insofar as only female plants have been recorded) and regrowth can occur from plant material weighing as little as 0.7g (grams) of viable material. It is acknowledged to be very difficult to effectively control and even more difficult to fully eradicate.

Given the nature of Japanese Knotweed, chemical treatments are often preferred over physical methods as they can, if implemented properly, reduce the disturbance of the plant / population,

thus reducing the chances of its spread. If herbicide is applied as the treatment option, it will need to be reapplied for up to five years after the first application to ensure the plant control measures have been effective or monitored for a minimum of two years during which no regrowth is recorded. However, physical removal may be necessitated when timely interventions are required.

Table 6-34 (Table 18.1 below) assessed the potential management methods for Japanese Knotweed with colour coding of the potential to implement on the proposed project. The methods to be used will be fully detailed in the contractors final ISMP after the recommended pre-construction survey of Site 3 has been undertaken.

Approach	Treatment Options	Comment	Potential for Implementation on the proposed Developments sites
Physical	Dig and dispose offsite, under licence	This option requires that all plant material (above and below ground) is excavated along with soil and disposed of to a facility authorized to accept it. In addition to waste permits / authorizations, a wildlife licence issued by NPWS is required for the transport of First Schedule invasive species offsite. Depending on the nature of the excavation the proximity of services etc, the use of root barrier membrane may be required.	Likely – given the nature of the developments sites, there may be a need to excavate soil and plant material to enable construction works to go ahead in timely manner.
	Dig and dispose onsite. - Shallow burial - Deep burial	Wildlife licence from NPWS is not ordinarily required if the burial of collected material is proposed for within the consented proposed project. Shallow burial in a constructed pit such as a dedicated sealed cell within a constructed berm will allow for periodic monitoring and of easy chemical treatment of any regrowth. Deep burial entails a dedicated sealed cell within a constructed excavation, that is at least 2m below the surface of the ground. The landscaping regime will not specify trees or scrub to be planted above. Either shallow or deep options may require the use of root barrier membrane. The use of chemical pretreatment of deep / shallow cells may also be required	Unlikely – given the lack of suitable lands within the largely developed metropolitan area.
	Screen on site – remove fragments offsite and reuse soil.	A control option that can be used to reduce the volume of soil / sediment to be moved elsewhere for burial, this option requires suitable plant, adequate space and volumes of soil to make the operation at a location cost effective. This option often requires the use of root barrier membrane owing to reuse of screened soil. The use of chemical pre-treatment of deep / shallow cells may also be required.	Possible but unlikely given the space requirements for a screener (unless a bespoke small-scale screener is available).
	Cutting and / or strimming	Not recommended and does not apparently diminish vigour of plants over time. Largely cosmetic and can result in considerable spread of viable vegetative material that can readily regenerate on suitable conditions.	Not Recommended
Chemical	Spot	Used for isolated plants – knapsack or weep sprayers. Chemical treatments for infestations	Chemical treatments are often a preferred

Approach	Treatment Options	Comment	Potential for Implementation on the proposed Developments sites
		near water will be rated for use near aquatic locations.	option for treating Japanese Knotweed, but the process can take between 3 to 5 years before eradication can be guaranteed and requires at least 2-year post implementation monitoring. However, given the nature of the proposed Developments sites, the use of chemical treatment alone is unlikely to be adequate unless treatment regime begins a number of years before construction commencement.

Table 18.1: Assessment of Management Methods for Japanese Knotweed (Site 3)

Root Barrier Membrane

Following the excavation of Japanese Knotweed, there may be a need to install a root barrier membrane. These are specialised products that can provide protection to structures / services etc. from regrowth from within or outside a site, if suitably rated and properly installed. Thereafter, any small adjacent infestation can be more readily treated with chemical treatment for example. This durable material can be used to line spoil pits and prevent rhizome lateral root spread or effective growth in the plant and can keep it contained to an area where suitable chemical treatment can be undertaken.

Reseeding Following Eradication

This is not strictly a control method. However, where treated ground is not being built upon, planting or resowing mixtures of native grass species helps to restore the original vegetation and aids post-control management of affected sites. A grass sward established in autumn will compete with germinating Japanese Knotweed seedlings in the following spring.

Proposed Development – Site 3 (Operational Stage Mitigations)

The operational stage site-specific mitigation sections below will address ecological corridor enhancement via landscaping features (planting and remedial features for fauna) and vegetation management during the operational stage of Site 3.

Site-specific Landscape Mitigation (Design Incorporated Mitigation)

A combination of ecologically-minded landscape management and specifically targeted measures to enhance the operational habitats of Site 3 for local fauna will be enacted to ensure the persistence of valued species (as detailed within the Biodiversity Management Plan Appendix 6.3).

Safeguarding of the Eastern Ecological Corridor

The eastern ecological corridor (mixed broadleaved / conifer woodland and dry meadow verge) will be fenced off from the public, both north and south of the access road, with a 1.5m height wooden fence, with chicken-wire mesh that will have occasional gaps in the mesh to allow passage for local fauna in and out of the eastern wildlife corridor.

The exclusion of public footfall will allow the woodland habitat to develop a more typical woodland ground flora composition unhindered; as well as minimising littering of this important wildlife corridor and disturbance to fauna, which find refuge within.

Operational Vegetation Management

Following the removal of invasive flora, planting of new shrub / tree vegetation and erection of fencing, the eastern ecological corridor is to be unmaintained, bar overhanging vegetation, broken limbs and fallen trees along the western boundary of the wildlife corridor. This will further aid in the establishment of optimal woodland wildlife corridor, with a complex internal structure that provides ample refuge for local fauna.

Installation of Remedial Features for Fauna

Non-volant Mammals

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Hedgehog and Pygmy Shrew across Site 3, ensuring landscape connectivity for these smaller non-volant mammal species.

Non-volant Mammals – Hedgehog

Large-scale habitat loss and/or alteration of scrub and woodland habitat will reduce the availability of potential nesting and hibernation sites for the local Hedgehog population. Providing small log and leaf piles to increase nesting options for local Hedgehogs during the spring, summer and early autumn. These will be installed within the eastern corridor woodland (north and south sections) and the north-western woodland patch, which will not be open to the public, towards the site of Site 3. This will also create refugia for terrestrial invertebrates, which in turn will boost prey species abundance for local Hedgehogs. In addition to these measures, to mitigate the loss of hedgehog hibernation habitat, artificial / built Hedgehog hibernacula will be installed in the same locations listed above. These can be created from wooden planters or storage boxes. While the hibernacula will be primarily utilised by Hedgehog, they may potentially also be utilised by Pygmy Shrew.

Bats

To offset some of the loss of commuting and foraging habitat that the proposed development will incur for local bat populations, it is recommended that a minimum of eight bat boxes are to be installed on the trees within eastern ecological corridor. The lighting of Site 3 along with the existing urban spaces make it difficult to incorporate bat features within the site, utilising the existing woodland which creates a natural darker corridor.

Where possible, these bat boxes will be south facing and at least 4m off the ground. When erecting on a tree, the placement must be free from Ivy with not branches within a 1m radius around the location of the bat box.

Within the Irish context, the Vincent's Wildlife Trust's reporting on Irish Bat Box schemes highlighted that 1FF Schwegler boxes are recommended for use by Pipistrelle spp., whereas Leisler's Bat displayed no preference for bat box type (McAney and Hanniffy, 2015), therefore the 1FF Schwegler boxes will be suitable to house all bat species which frequent Site 3.

Breeding Birds

Site 3 supports nine species of breeding bird of conservation concern, two of which can be accommodate for through artificial means.

While the proposed trees to planted as part of the landscape plan will provide some nesting potential for local bird populations; it is recommended that additional bird boxes are placed within the site to allow for additional nesting opportunities during the ecological lag period (while the newly planted trees mature).

Bird boxes will be hung with the face of the box orientated between north and south-east, and at a height of at least 2-3m from ground level to avoid potential predation. Based on the breeding bird species of conservation concern (which utilise artificial nests) recorded within Site 3, the bird box types (five each) to be installed within Site 3 are:

- For House Sparrow: a 32mm diameter oval opening for entry. Bird boxes can be hung from trees or nailed to the trunk at a height of 2-4 metres, and it is preferred that the bird boxes are faced in a way to avoid the brunt of prevailing direct wind or rain. House Sparrows will also utilise terraced nest boxes, facilitating two or three nest boxes in one installation; and
- For Starling: a 45mm entrance hole, with height 51cm, width 16cm and depth 18cm (may also be used by local Great Spotted Woodpecker).

Amphibians

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Common Frog across Site 3, ensuring continued landscape connectivity.

Wetland and drainage ditch / swale habitats are not to undergo maintenance (clearance of vegetation or dredging) during sensitive amphibian life stages for both Common Frog.; therefore, such maintenance will only be conducted between June and late September.

Terrestrial Invertebrates

The Site 3 development will lead to the direct loss of nesting habitat for local terrestrial invertebrate species, potentially displacing species from the locality. To help remedy this loss, insect refugia will be installed in shrub, hedgerow and woodland habitats within Site 3. These can include log and leaf piles, as well as stone piles and old bricks with holes in them.

Proposed Development – Site 4 (Construction Stage Mitigations)

Site-specific Habitat Mitigations

Eroding / upland rivers (Kilmahuddrick Stream) and connected Drainage Ditches

Silt Fence Layout

The general silt fence layout for Site 4 is displayed in Figure 18-37 and Figure 18-38 below. The silt fence layout also accounts for the relocation of the silt fences following the creation of the stream overflow basin in the northern section of the site. These approximate locations do not include the detailed set-up required for the installation of the culverted stream section within the north-east corner of the site. These more precise details and locations will need to be outlined at the detailed design stage. An example of suitable silt-fencing installation is displayed in Figure 18-39.

Figure 18.1: Approximate silt fence locations in northern section of Site 4

Figure 18.2: Approximate silt fence locations in southern section of Site 4

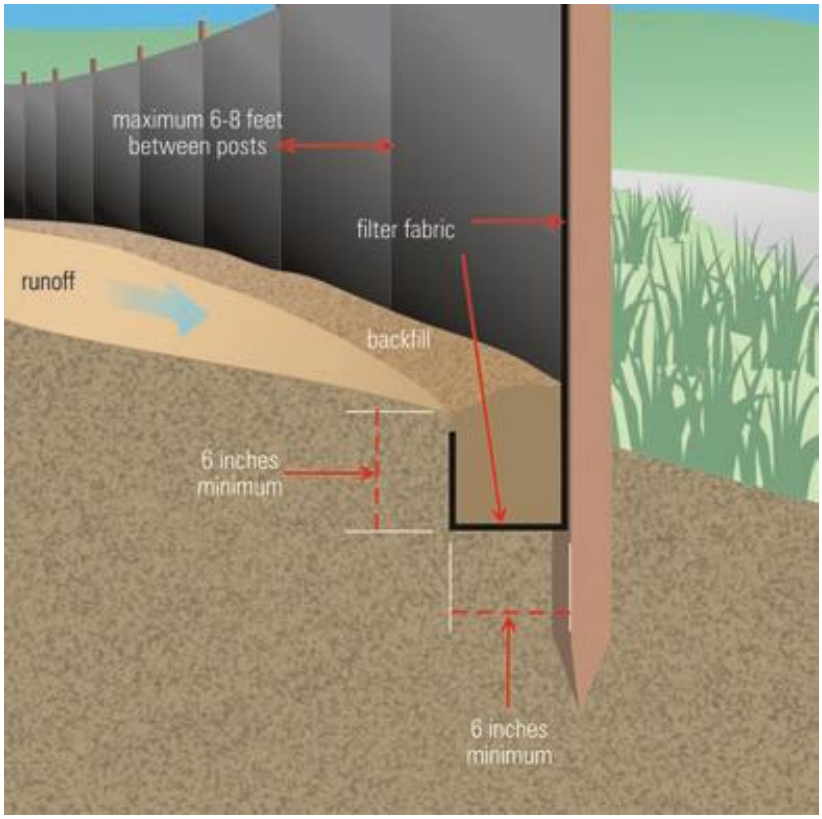

Figure 18.3: Example of suitable silt fence mitigation ensuring maximum safeguarding efficiency

Mitigations for Installation of the Overflow Basin

After completion of the overflow basin and relocation of the silt fence to its southern border, the basin will remain offline until it the proposed landscaping has been planted and the ground flora re-established. This will ensure that there will not be an excessive input of lose sediments from the basin into the Kilmahuddrick Stream during the first flood event, which will result in the operations of the overflow basin.

Mitigations for Installation of the Kilmahuddrick Stream Culvert Section

The instream works are to be scheduled between July and September, in order to minimise adverse impacts on the local fish species (e.g. Three-spined Stickleback) and protected fish species downstream (e.g. Lamprey spp.; European Eel; and Atlantic Salmon).

The following measures will be implemented to prevent liquid concrete/ cement-based dust entering the riparian habitats during the culvert installation phases:

- Wherever reasonably possible, pre-cast concrete bridge features should be utilised to minimise the risk of a concrete-based pollution event.
- Concrete delivery, concrete pours and related construction methodologies will be part of the procedure agreed with the contractor to mitigate any possibility of spillage or contamination of the local environment. Particular attention will be paid during the pouring process in order to avoid leakages or spills of concrete.
- Washout of concrete plant will occur off site at a designated impermeable area with waste control facilities.
- Raw, uncured or waste concrete will be stored appropriately prior to disposal by licenced contractor.

- The contractor's construction methodology will require the use of precast elements where practical; the use of secondary protection shuttering for concrete pours; all pours to be carried out in dry weather conditions; and that all trucks be cleaned prior to leaving respective depots.
- The contractor will be required to use experienced operators for the work; provide an appropriate level of continuous monitoring during any concrete pours by experienced management; and have method statements approved by the client prior to commencing works. Works will be carried out using recommendations from current guidance and relevant codes of practise as outlined in EA (2011) – Managing concrete wash waters on construction sites: good practice and temporary discharges to ground or to surface waters.

The mitigations for the culvert installation and stream realignment will be split into the following two phases.

- Phase 1: Dry Cell Establishment and Electro-fishing

Before the excavations for the foundations of the culvert can take place, dry cells extending 5m up and downstream of culvert section point be established through the use of geotextile sandbag dams (double layered). The stream flow will be over-pumped along the bankside in order to maintain the hydrological regime of the Kilmahuddrick Stream. The pump ends will be fitted with mess filters in order to prevent the accidental introduction of fish into the pump inlets and outlets.

The collection of fish within the dry cell section will be required as not all fish would be able to relocate themselves upstream or downstream before the dry cell area is secure. A trained aquatic ecologist will conduct electro-fishing within the dry cell area within the Kilmahuddrick Stream, and any fish encountered will be transferred downstream of the dry cell section.

Water will be pumped downstream of the dry cell section as the freshwater invertebrates present in the water were part of the food base of the fish that have already been relocated downstream. Once the dry cell is empty of water, works on the culvert and associated soil works, road and pedestrian infrastructure may proceed. Pre-cast concrete options should be utilised wherever reasonably practical; otherwise, the concrete procedures outlined earlier within this section will need to be strictly adhered to

- Phase 2: Re-establishment of Streambed / Hydromorphological Features

Once the culvert section works are complete, substrate (sand, gravel, cobble and small boulders) will be used to reestablish the streambed within the dry cell section. The EcoW on-site will oversee the creation of riffle, pool, glide along the streambed length, with the addition of the occasional small boulders splitting the flow. The EcoW will also oversee the installation of a Grey Wagtail nest box into the eastern bank south of the new culvert section. Before the flow can be established within the channel the downstream geotextile sandbag dam will be removed; and in its place a straw silt-screen will be staked into place across, in order to mitigate the influx of suspended sediments that will occur when the stream flows through the dried-out channel section. Once the above is completed, the stream's flow will be allowed to return to the channel in the dry cell selection, with the removal of the geotextile sandbag dams and the water-pump.

Management of Habitats to be Removed

During the construction stage there will be large scale clearance of the majority of habitat types across Site 4. By following the SDCC Policy Objective: NCBH1 Objective 1, the project will retain and incorporate existing natural features wherever possible. In order to facilitate the retention and continuation of the on-site vegetative communities, mitigation is required to accommodate this retention. This will include:

- Excavated material from the meadow section including any topsoil removed during the clearance of vegetation will be incorporated back into the meadow strips within the Site 4 landscaping.
- The initial gathering of sods / topsoil and plants with their core rooting systems from the existing woodland, treeline and scrub will begin and be completed before the entire removal of any of these habitats. This relocation of soil (seed banks) and juvenile shrub / trees will be done to retain the local genetic integrity of floral populations as long as possible and minimise

the ecological lag time of the habitats that will receive these sods / top soil and juvenile shrubs /trees. The sods / topsoil and extracted plants will be transferred directly to areas of outside of major construction works, i.e., the future neighbouring parklands (west and east of Site 4) and vegetated site boundaries, provided the major earthwork / landscape regrading has been completed.

Site-specific Rare and Protected Flora Mitigations

Pyramidal Orchid

Pre-construction surveys will be conducted for orchid species across the Site 4 to observe the existing populations where present, as well as to identify the potential new colonisation of new orchid species within new sections of Site 4. All the data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor the populations before their relocations to a suitably undisturbed area within the locality (i.e. the northern riparian zone of the Kilmahuddrick Stream, where there will be no public access or maintenance), prior to the commencement of the construction stage.

The Pyramidal Orchid (and any other new orchid species) must be relocated from their current Site 4 habitats, prior to clearance of the site for construction. Suitable relocation areas will be chosen within the northern section of the safeguarded ecological corridor within Site 4. It is important that the individuals are immediately relocated to their new habitat after unearthing, in order to minimise the likelihood of relocation failure.

Additionally, the associated mycorrhizae for Orchid species is essential for successful germination, this mycorrhizae will be within the soil surrounding the Orchid individuals; therefore, these soils are to be translocated along with their associated Orchid species, in order to ensure optimal reestablishment of these species within their new habitat.

Lesser Centaury

Pre-construction surveys will be conducted for Lesser Centaury across the Site 4 to observe the existing populations where present, as well as to identify the potential new colonisation of Lesser Centaury within new sections of Site 4. All the data from the pre-construction surveys will be provided to the appointed EcoW, who will continue to monitor the populations before their relocations to a suitably undisturbed area within the locality (i.e. the northern riparian zone of the Kilmahuddrick Stream, where there will be no public access or maintenance), prior to the commencement of the construction stage.

The ECoW will apply and obtain a Licence to Take or Interfere with Protected Plant Species for Scientific, Educational, or Other Such Purposes from the NPWS, prior to the relocation of this protected floral species. In this new location, the Lesser Centaury will be sectioned (rope / tape fence) off with a 1m buffer to prevent stray machinery or site personnel entering their immediate vicinity, ensuring no physical impacts. The sectioning off will be carried out under the supervision of the EcoW.

Site-specific Protected Fauna Mitigations

Otter

Given that bankside vegetation clearance that will take place along the Kilmahuddrick Stream during the construction stage, the provision of replacement commuting shelter will be required. In order to achieve this trees and hedging due to due to be felled in the immediate locality will be cut to into segments, bundled and installed along the cleared sections of the riparian zone. These bundles will form segmented walls of vegetative cover along the riparian zone in Site 4, providing a degree of shelter that will allow Otters to commute these affected stream sections with reduced disturbance.

Hedgehog, Pygmy Shrew and Breeding Birds

The clearance of any treelines, hedgerows or scrub is to be conducted between mid-September and late October; which is a time that is both outside of the breeding bird nesting period and the hibernation period of Hedgehogs. Vegetation will be removed in sections working in a consistent

direction to prevent entrapment of protected fauna potentially present (e.g. Hedgehog and Pygmy Shrew).

Where this seasonal restriction cannot be observed, a check for active nests or hibernating Hedgehogs (depending on the season) will be carried out immediately prior to any site clearance by an appropriately qualified ecologist and repeated as required to ensure compliance with legislative requirements. If active nests are recorded, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged. Additionally, any leaf piles and deadwood piles will be checked for Hedgehogs before moving or interfering the surrounding detritus or vegetation.

Site-specific Invasive Species Management

Japanese Knotweed

Japanese Knotweed is a high impact invasive species that is particularly effective at colonising disturbed ground (e.g. construction sites) and can spread by the re-growth of cut fragments or root material. Therefore, if it is broken up during site clearance or other earthworks, it can readily re-grow in new areas to which contaminated soil is moved. Japanese Knotweed reproduces asexually (in Ireland insofar as only female plants have been recorded) and regrowth can occur from plant material weighing as little as 0.7g (grams) of viable material. It is acknowledged to be very difficult to effectively control and even more difficult to fully eradicate.

Given the nature of Japanese Knotweed, chemical treatments are often preferred over physical methods as they can, if implemented properly, reduce the disturbance of the plant / population, thus reducing the chances of its spread. If herbicide is applied as the treatment option, it will need to be reapplied for up to five years after the first application to ensure the plant control measures have been effective or monitored for a minimum of two years during which no regrowth is recorded. However, physical removal may be necessitated when timely interventions are required.

Table 6-35 (Table 18.2 below) assessed the potential management methods for Japanese Knotweed with colour coding of the potential to implement on the proposed project. The methods to be used will be fully detailed in the contractors final ISMP after the recommended pre-construction survey of Site 4 has been undertaken.

Approach	Treatment Options	Comment	Potential for Implementation on the proposed Developments sites
Physical	Dig and dispose offsite, under licence	This option requires that all plant material (above and below ground) is excavated along with soil and disposed of to a facility authorized to accept it. In addition to waste permits / authorizations, a wildlife licence issued by NPWS is required for the transport of First Schedule invasive species offsite. Depending on the nature of the excavation the proximity of services etc, the use of root barrier membrane may be required.	Likely – given the nature of the developments sites, there may be a need to excavate soil and plant material to enable construction works to go ahead in timely manner.
	Dig and dispose onsite. - Shallow burial - Deep burial	Wildlife licence from NPWS is not ordinarily required if the burial of collected material is proposed for within the consented proposed project. Shallow burial in a constructed pit such as a dedicated sealed cell within a constructed berm will allow for periodic monitoring and of easy chemical treatment of any regrowth. Deep burial entails a dedicated sealed cell within a constructed excavation, that is at least 2m below the surface of the ground. The landscaping regime will not specify trees or scrub to be	Unlikely – given the lack of suitable lands within the largely developed metropolitan area.

Approach	Treatment Options	Comment	Potential for Implementation on the proposed Developments sites
		planted above. Either shallow or deep options may require the use of root barrier membrane. The use of chemical pretreatment of deep / shallow cells may also be required	
	Screen on site – remove fragments offsite and reuse soil.	A control option that can be used to reduce the volume of soil / sediment to be moved elsewhere for burial, this option requires suitable plant, adequate space and volumes of soil to make the operation at a location cost effective. This option often requires the use of root barrier membrane owing to reuse of screened soil. The use of chemical pre-treatment of deep / shallow cells may also be required.	Possible but unlikely given the space requirements for a screener (unless a bespoke small-scale screener is available).
	Cutting and / or strimming	Not recommended and does not apparently diminish vigour of plants over time. Largely cosmetic and can result in considerable spread of viable vegetative material that can readily regenerate on suitable conditions.	Not Recommended
Chemical	Spot	Used for isolated plants – knapsack or weep sprayers. Chemical treatments for infestations near water will be rated for use near aquatic locations.	Chemical treatments are often a preferred option for treating Japanese Knotweed, but the process can take between 3 to 5 years before eradication can be guaranteed and requires at least 2-year post implementation monitoring. However, given the nature of the proposed Developments sites, the use of chemical treatment alone is unlikely to be adequate unless treatment regime begins a number of years before construction commencement.

Table 18.2: Assessment of Management Methods for Japanese Knotweed (Site 4)

Root Barrier Membrane

Following the excavation of Japanese Knotweed, there may be a need to install a root barrier membrane. These are specialised products that can provide protection to structures / services etc. from regrowth from within or outside a site, if suitably rated and properly installed. Thereafter, any small adjacent infestation can be more readily treated with chemical treatment for example. This durable material can be used to line spoil pits and prevent rhizome lateral root spread or effective

growth in the plant and can keep it contained to an area where suitable chemical treatment can be undertaken.

Reseeding Following Eradication

This is not strictly a control method. However, where treated ground is not being built upon, planting or resowing mixtures of native grass species helps to restore the original vegetation and aids post-control management of affected sites. A grass sward established in autumn will compete with germinating Japanese Knotweed seedlings in the following spring.

Butterfly-bush

For physical control, hand-picking of young plants is feasible but should be undertaken with care to avoid soil disturbance which can give rise to a flush of new seedlings (NRA, 2010). For larger stands, mechanical excavation/ cutting may be employed. Deadhead specimens will be handled with great care as seeds can rapidly germinate and grow in different habitats.

Snowberry

Snowberry, being a low-impact invasive species, lacks any species-specific guidelines for management and control. The management of Snowberry within the site will follow the guidelines of Butterfly-bush outlined in NRA (2010). Under these management guidelines, physical control, hand-picking of young plants is feasible but should be undertaken with care to avoid soil disturbance which can give rise to a flush of new seedlings (NRA, 2010). For larger stands, mechanical excavation/ cutting may be employed. Deadhead specimens will be handled with great care as seeds can rapidly germinate and grow in different habitats.

Proposed Development – Site 4 (Operational Stage Mitigations)

The operational stage site-specific mitigation sections below will address road collision mitigation measures and ecological corridor safeguarding via landscaping features (fencing, planting alignment and remedial features for fauna) and vegetation management during the operational stage of Site 4.

Road Collision Mitigation (Design Incorporated Mitigation)

In order to maintain commuting corridors for terrestrial and semi-aquatic fauna through the site, and along the Kilmahuddrick Stream riparian corridor, a wildlife shelf has been designed into the culverted section of the stream in the north-east corner of Site 4. This shelf will allow fauna such as, Otter, Badger, Pine Marten, Stoat, Hedgehog, Pygmy Shrew, Common Frog and Smooth Newt to safely pass under the proposed pedestrian and roadway infrastructure while navigating the riparian corridor. This mitigation by design measure will notably decrease the risk of vehicular collisions, resulting in injuries or fatalities, for these protected faunal species.

Site-specific Landscape Mitigation (Design Incorporated Mitigation)

A combination of ecologically-minded landscape management and specifically targeted measures to enhance the operational development for local fauna will be employed to ensure the persistence of rare and protected flora and fauna within Site 4 (as detailed within the Biodiversity Management Plan Appendix 6.3).

Safeguarding of the Northern Ecological Corridor

The northern ecological corridor (Kilmahuddrick Stream riparian zone) will be fenced off from the public with a 1.5m height wooden fence, with chicken-wire mesh that will have occasional gaps in the mesh to allow passage for local fauna in and out of the northern wildlife corridor. The fencing will run from the north-western corner along the southern riparian zone boundary across to the north-eastern in road culvert section. A gate will be incorporated into the fence to allow for maintenance of the road culvert. This gate will be able to accommodate the passage of small machinery.

The exclusion of the public from this wildlife corridor will help ensure that the relocated Lesser Centaury will persist within this location. The exclusion of public footfall will also allow the marsh

habitat to expand into the new flood overflow section unhindered; as well as minimising littering of the stream and disturbance to fauna which find refuge within this wildlife corridor.

Operational Vegetation Management

Following the relocations, removal of invasive flora, planting of new shrub / tree vegetation and erection of fencing, the northern ecological corridor is to be unmaintained, bar removal of stream blockages and overhanging vegetation along the southern boundary of the wildlife corridor. This will protect the relocated Lesser Centaury and ensure the fauna within the corridor remain undisturbed year-round.

Following the relocations, removal of invasive flora, planting of new shrub / tree vegetation and erection of fencing, the secure woodland and pond area to the south of Site 4 is to be minimally maintained, bar removal of ditch blockages and the vegetation extending outward into the surrounding public access and private areas. This will ensure minimal disturbance to the fauna that will reside / take refuge within this small woodland area.

Installation of Remedial Features for Fauna

Non-volant Mammals

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Hedgehog and Pygmy Shrew across Site 4, ensuring landscape connectivity for these smaller non-volant mammal species.

Non-volant Mammals – Hedgehog

Large-scale habitat loss and/or alteration of scrub and woodland habitat will reduce the availability of potential nesting and hibernation sites for the local Hedgehog population. Providing small log and leaf piles to increase nesting options for local Hedgehogs during the spring, summer and early autumn. These will be installed within the woodland and pond area, which will not be open to the public, towards the site of Site 4, as well as the upper banks of the riparian zone along the Kilmahuddrick Stream. This will also create refugia for terrestrial invertebrates, which in turn will boost prey species for local Hedgehogs.

In addition to these measures, to mitigate the loss of hedgehog hibernation habitat, artificial / built Hedgehog hibernacula will be installed in Site 4, within the secure woodland and pond area and the north-eastern and north-western corners of Site 4, north of the Kilmahuddrick Stream. These can be created from wooden planters or storage boxes. While the hibernacula will be primarily utilised by Hedgehog, they may potentially also be utilised by Pygmy Shrew.

Bats

In the interest of remedying the loss of potential future roosting features within the site for the local bats, a minimum of eight bat boxes will be installed on-site. Where possible, these bat boxes will be south-facing and at least 4m off the ground. When erecting on a tree, the placement must be free from Ivy with no branches within a 1m radius around the location of the bat box.

Within the Irish context, the Vincent's Wildlife Trust's reporting on Irish Bat Box schemes highlighted that 1FF Schwegler boxes are recommended for use by Pipistrelle spp., whereas Leisler's Bat displayed no preference for bat box type (McAney and Hanniffy, 2015), therefore the 1FF Schwegler boxes will be suitable to house all bat species which frequent Site 4.

Breeding Birds

The notable loss of mature and semi-mature trees within Site 4 will reduce the nesting habitat on site for local breeding bird species. To mitigate the loss of nesting habitat, bird boxes will be installed on the retained the mature and semi-mature trees present within Site 4. Bird boxes will be hung with the face of the box orientated between north and south-east, and at a height of at least 2-3m from ground level to avoid potential predation. Based on the breeding bird species of conservation concern (which utilise artificial nests) recorded within Site 4, the bird box types (five each) to be installed within Site 4 are:

- For Starling: 45mm entrance hole, with height 51cm, width 16cm and depth 18cm (may also be used by local Great Spotted Woodpecker); and
- For Spotted Flycatcher: semi-open nest box style (will also be used by local Blackbird, Robin and Wren).
- For Goldcrest: a brushwood style nest, 28m diameter oval opening with dimensions 290 x 145 x 110 mm for the nest (may also be used by Wren and Treecreeper

Amphibians

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Common Frog and Smooth Newt across Site 4, ensuring continued landscape connectivity.

Wetland, drainage ditch and pond habitats are not to undergo maintenance (clearance of vegetation or dredging) during sensitive amphibian life stages for both Common Frog and Smooth Newt.; therefore, such maintenance will only be conducted between July and late September.

Terrestrial Invertebrates

The development of Site 4 will lead to the direct loss of nesting habitat for local terrestrial invertebrate species, potentially displacing species from the locality. To help remedy this loss, insect refugia will be installed in shrub, hedgerow and woodland habitats within Site 4. These can include log and leaf piles, as well as stone piles and old bricks with holes in them.

Proposed Development – Site 5 (Construction Stage Mitigations)

Site-specific Habitat Mitigations

Management of Habitats to be Removed

During the construction stage there will be large scale clearance of habitats across the whole of Site 5. In particular for the grassland and scrub, with a smaller degree of habitat clearance for some hedgerows and treelines. By following the SDCC Policy Objective: NCBH1 Objective 1, the project will retain and incorporate existing natural features where possible. In order to facilitate the retention and continuation of the on-site vegetative communities, mitigation is required to accommodate this retention. This will include:

- Excavated material from the grassland section including any topsoil removed during the clearance of vegetation to be stored within the north / north-eastern park area, where it will later be incorporated back into the grassland habitats within the park area.
- The initial gathering of sods / topsoil and plants with their core rooting systems from the existing hedgerows and scrub will begin and be completed before the entire removal of any of these habitats. This relocation of soil (seed banks) and juvenile shrub / trees will be done to retain the local genetic integrity of floral populations as long as possible and minimise the ecological lag time of the habitats that will receive these sods / top soil and juvenile shrubs /trees. The sods / topsoil and extracted plants will be transferred directly to areas of outside of major construction works, i.e., the future parklands and vegetated site boundaries, provided the major earthwork / landscape regrading has been completed.

Site-specific Faunal Mitigations

Hedgehog, Pygmy Shrew and Breeding Birds

The clearance of any treelines, hedgerows or scrub is to be conducted between mid-September and late October; which is a time that is both outside of the breeding bird nesting period and the hibernation period of Hedgehogs. Vegetation will be removed in sections working in a consistent direction to prevent entrapment of protected fauna potentially present (e.g. Hedgehog and Pygmy Shrew).

Where this seasonal restriction cannot be observed, a check for active nests or hibernating Hedgehogs (depending on the season) will be carried out immediately prior to any site clearance by

an appropriately qualified ecologist and repeated as required to ensure compliance with legislative requirements. If active nests are recorded, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged. Additionally, any leaf piles and deadwood piles will be checked for Hedgehogs before moving or interfering the surrounding detritus or vegetation.

Site-specific Invasive Species Management

Butterfly-bush

For physical control, hand-picking of young plants is feasible but should be undertaken with care to avoid soil disturbance which can give rise to a flush of new seedlings (NRA, 2010). For larger stands, mechanical excavation/ cutting may be employed. Deadhead specimens will be handled with great care as seeds can rapidly germinate and grow in different habitats.

Proposed Development – Site 5 (Operational Stage Mitigations)

The operational stage site-specific mitigation sections below will address remedial features for local fauna during the operational stage of Site 5.

Site-specific Landscape Mitigation (Design Incorporated Mitigation)

Installation of Remedial Features for Fauna

Non-volant Mammals

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Hedgehog and Pygmy Shrew across Site 5, ensuring landscape connectivity for these smaller non-volant mammal populations.

Non-volant Mammals – Hedgehog

Large-scale habitat loss and/or alteration of scrub and woodland habitat will reduce the availability of potential nesting and hibernation sites for the local Hedgehog population. Providing small log and leaf piles to increase nesting options for local Hedgehogs during the spring, summer and early autumn. These will be installed within the wooded parkland section, adjacent to the wetland planting in the north-east section of Site 5. This will also create refugia for terrestrial invertebrates, which in turn will boost prey species abundance for local Hedgehogs. In addition to these measures, to mitigate the loss of hedgehog hibernation habitat, artificial / built Hedgehog hibernacula will be installed in the same location. This can be created from wooden planters or storage boxes. While the hibernacula will be primarily utilised by Hedgehog, they may potentially also be utilised by Pygmy Shrew.

Bats

To offset some of the loss of commuting and foraging habitat that the proposed development will incur for local bat populations, it is recommended that a minimum of eight bat boxes are to be installed on the trees within eastern ecological corridor. The lighting of Site 5 along with the existing urban spaces make it difficult to incorporate bat features within the site, utilising the existing woodland which creates a natural darker corridor.

Where possible, these bat boxes will be south facing and at least 4m off the ground; and not adjacent to any lighting columns. When erecting on a tree, the placement must be free from Ivy with not branches within a 1m radius around the location of the bat box.

Within the Irish context, the Vincent's Wildlife Trust's reporting on Irish Bat Box schemes highlighted that 1FF Schwegler boxes are recommended for use by Pipistrelle spp., whereas Leisler's Bat displayed no preference for bat box type (McAney and Hanniffy, 2015), therefore the 1FF Schwegler boxes will be suitable to house at least three of four bat species which frequent Site 5.

Note that some bat box designs (that are enclosed at the base) require annual cleaning out, which must be carried out by a Bat Specialist or NPWS Ranger.

Breeding Birds

The Site 5 area currently supports a number of breeding bird species of conservation concern, three of which can be accommodated for through artificial means.

While the proposed trees to planted as part of the landscape plan will provide some nesting potential for local bird populations; it is recommended that additional bird boxes are placed within the site to allow for additional nesting opportunities during the ecological lag period (while the newly planted trees mature).

Bird boxes will be hung with the face of the box orientated between north and south-east, and at a height of at least 2-3m from ground level to avoid potential predation. Based on the breeding bird species of conservation concern (which utilise artificial nests) recorded within Site 3, the bird box types (five each) to be installed within Site 3 are:

- For House Sparrow: a 32mm diameter oval opening for entry. These bird boxes can be hung from trees or nailed to the trunk at a height of 2-4 metres, and it is preferred that the bird boxes are faced in a way to avoid the brunt of prevailing direct wind or rain. House Sparrows will also utilise terraced nest boxes, facilitating two or three nest boxes in one installation; and
- For Starling: a 45mm entrance hole, with height 51cm, width 16cm and depth 18cm (may also be used by local Great Spotted Woodpecker).
- For Goldcrest: a brushwood style nest, 28m diameter oval opening with dimensions 290 x 145 x 110 mm for the nest (may also be used by Wren and Treecreeper)

Amphibians

Installation of passage holes /gaps at the base of the walls / solid fences / and mesh-based fencing to provide access for Common Frog across Site 5, ensuring continued landscape connectivity.

Wetland and drainage ditch / swale habitats are not to undergo maintenance (clearance of vegetation or dredging) during sensitive amphibian life stages for both Common Frog.; therefore, such maintenance will only be conducted between June and late September.

Terrestrial Invertebrates

The construction of Site 5 will lead to the direct loss of nesting / hive-building habitat for local terrestrial invertebrate species, potentially displacing species from the locality. To help remedy this loss, insect refugia will be installed in shrub, hedgerow and woodland habitats within Site 5. These can include log and leaf piles, as well as stone piles and old bricks with holes in them.

18.2.3 Land, Soils, Geology & Hydrogeology (Chapter 7)

Incorporated Design Mitigation

The site layout has been designed to minimise impact on the land and soil environment. The design has evolved to minimise environmental impact throughout the various design stages.

The vertical and horizontal alignment of the road and development levels have been optimised to minimise cut and fill requirements and seek to obtain a balance of cut and fill materials (within constraints of road design criteria and landscape considerations).

Sufficient space has been provided within the works area for segregated spoil storage.

Pre-construction soils testing has been carried out to determine if any contamination exists.

Construction Phase

A preliminary Construction and Environmental Management Plan (prepared by DBFL Consulting Engineers) is included with the planning application. A Construction and Environmental Management Plan (CEMP) will be put in place by the Contractor to implement the mitigation measures from the EIAR. The plan will be resubmitted to the planning authority prior to construction to incorporate any conditions and/or modifications imposed by the local authority and the plan will be maintained by the contractor during the construction phase. The Outline Construction

Management Plan includes a range of site-specific measures which will include the following mitigation measures in relation to geology, soils, land:

LS_1: Stripping of topsoil and asphalt will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development.

LS_2: At any given time, the extent of topsoil strip (and consequent exposure of subsoil) will be limited to the immediate vicinity of active work areas. Topsoil stripping will not take place during inclement weather.

LS_3: Topsoil stockpiles will be protected for the duration of the works and not located in areas where sediment laden runoff may enter existing surface water drains. Topsoil stockpiles will also be located so as not to necessitate double handling.

LS_4: The design of site levels has been carried out in such a way as to minimise the interaction with rock. Rock will likely be encountered during the installation of drainage due to the topography of the subject site and levels of drainage outfalls.

LS_5: The duration that rock layers are exposed to the effects of weather will be minimised by back filling excavations as soon as practicable after construction.

LS_6: Stockpiles of excavated and crushed rock will be protected for the duration of the works.

LS_7: Measures will be implemented to capture and treat sediment laden surface water runoff (e.g. sediment retention ponds, surface water inlet protection and earth bunding adjacent to water bodies).

LS_8: Earthworks plant and vehicles exporting soil and delivering construction materials to site will be confined to predetermined haul routes around the site.

LS_9: Vehicle wheel wash facilities will be installed in the vicinity of any site entrances and road sweeping implemented as necessary in order to maintain the road network in the immediate vicinity of the site.

LS_10: Dust suppression measures (e.g. dampening down) will be implemented as necessary during dry periods.

LS_11: In order to mitigate against spillages contaminating underlying soils and geology, all oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area.

LS_12: Refuelling and servicing of construction machinery will take place in a designated hardstand area which is also remote from any surface water inlets (when not possible to carry out such activities off site).

LS_13: An emergency response plan detailing the procedures to be undertaken in the event of a spillage of chemical, fuel or hazardous wastes will be prepared prior to construction.

LS_14: Pouring of concrete including wash down and washout of concrete from delivery vehicles will be controlled in an appropriate facility to prevent contamination.

LS_15: Regular samples will be taken from soils affected by earthworks which shall be analysed for contamination.

LS_16: All materials exported from site to be in accordance with the Waste Management Acts.

LS_17: Imported materials (including imported materials) to be suitably separated to avoid contamination or mixing.

LS_18: Any potential for use of surplus material within local sites shall be pursued at construction and detailed design stage (subject to compliance with Waste Management Acts). If any material is to be reused on another site as a by-product (and not as waste), this will be done in accordance with Article 27 of the Waste Directive Regulations.

Operational Stage

Once the development is completed, risks to geology, soil and land will be from loss of soil value and pollution of soils/subsoils due to accidental spills. The following mitigation measures will be implemented:

LS_20: A detailed landscape plan will be prepared and constructed in accordance with good practice and design standards to ensure slope stability.

LS_21: Earthworks will be designed and constructed in accordance with good practice and design standards to ensure slope stability.

LS_22: All new drainage on the proposed sites will be pressure tested and have a CCTV survey carried out prior to being made operational to ensure it is adequately constructed.

LS_23: Oil interceptors will be installed on all surface water drainage networks.

LS_24: Vegetated Sustainable urban drainage systems will be installed to treat run-off.

18.2.4 Water (Chapter 8)

Incorporated Design Mitigation

The project layout design has evolved in order to avoid conflict with the water environment. Design evolution to minimise environmental impact has been prioritised throughout the various design stages to prevent significant adverse impacts on the local water environment/hydrology. These measures will seek to avoid or minimise potential effects, in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

All new foul drainage lines will be constructed in accordance with Uisce Éireann Standards. Foul sewers will be pressure tested and will be subject to a CCTV survey in order to identify any possible defects prior to being made operational.

The design of proposed site levels (roads, buildings etc.) has been carried out in such a way as to replicate existing surface gradients where possible, therefore replicating existing overland flow paths, and not concentrating additional surface water flow in a particular location.

SuDS features such as permeable paving parking spaces, bioretention area, and brown roofs, to provide additional storage and promote infiltration of and treatment of surface water run-off, have been provided in landscaped areas.

All new surface water drainage on the proposed sites will be pressure tested and will have a CCTV survey carried out prior to being made operational. The site is attenuated to mimic the greenfield scenario as part of the overall SDZ.

Due to the inter-relationship between surface water and soils, hydrogeology and ecology, the mitigation measures discussed are also considered applicable to these sections and this chapter should be read in conjunction with Chapter 6 Biodiversity and Chapter 7 Land and Soils.

Construction Stage

The nature of the proposed development dictates that the greatest potential impact on surface waters associated with the development will be in the construction stage. In order to prevent / minimise potential impacts, it is necessary to devise mitigation measures to be adopted as part of the construction works on site.

A Preliminary Construction Management Plan (prepared by DBFL Consulting Engineers) is included with the planning application. A Construction and Environmental Management Plan will be put in place by the Contractor to implement the mitigation measures from the EIAR. The plan will be resubmitted to the planning authority prior to construction to incorporate any conditions and/or modifications imposed by the local authority and the plan will be maintained by the contractor during the construction stage. The Preliminary Construction Management Plan includes a range of site-specific measures which will include the following mitigation measures.

Erosion and Sediment Control

The following measures are proposed for erosion and sediment control:

H_1: Measures will be implemented to capture and treat sediment laden surface water runoff (e.g. sediment retention ponds, surface water inlet protection, fencing and signage around).

H_2: Specific exclusion zones and earth bunding adjacent to any open drainage ditches prior to discharge of surface water at a controlled rate.

H_3: Groundwater pumped from excavations will be directed to on-site settlement ponds.

H_4: Discharge from any vehicle wheel wash areas will be directed to on-site settlement ponds.

H_5: On-site settlement ponds will include geotextile liners and riprapped inlets and outlets to prevent scour and erosion.

H_6: Surface water discharge points during the construction stage will be agreed with South Dublin County Council's Environment Section prior to commencing works on site.

H_7: Weather conditions and seasonal weather variations will be considered when planning excavations and the stripping of topsoil, with an objective of minimizing soil erosion.

Accidental Spills and Leaks

The following measures are proposed for accidental spills and leaks:

H_8: In order to mitigate against spillages contaminating the underlying soils and geology, all oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area.

H_9: Refuelling and servicing of construction machinery will take place in a designated hardstand area which is also remote from any surface water inlets (when not possible to carry out such activities off site).

H_10: An Emergency Response Plan prepared by the contractor prior to construction will detail the procedures to be undertaken in the event of a spillage of chemicals, fuels or hazardous wastes. Spillage kits will be available and construction staff will be familiar with the emergency procedures and use of the equipment.

H_11: Pouring of concrete including wash down and washout of concrete from delivery vehicles will be controlled in an appropriate facility to prevent contamination.

H_12: Regular samples will be taken from soils affected by earthworks which shall be analysed for contamination.

H_13: An emergency first aid kit will be provided in a designated area within the site compound.

Operational Stage

The operational stage of this development is unlikely to have any significant adverse impacts on the local water environment/hydrology due to the environmental design considerations incorporated into the development. These measures will seek to avoid or minimise potential effects, in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

18.2.5 Air (Noise & Vibration) (Chapter 9)

Construction Stage

The assessment detailed in Section 9.5.1.3 has determined that construction activities can largely operate within the adopted construction noise threshold levels at the closest off-site NSLs for the majority of the construction phase, due to the distance from the works and the construction activities involved. At the closest NSLs, the CNT values have the potential to be exceeded at NSLs adjacent to site 3 during the site clearance and ground preparation works.

Vibration levels at the closest neighbouring buildings are expected to be orders of magnitude below the limits set out in section 9.2.1.5 to avoid any cosmetic damage to buildings.

Best practice noise and vibration control measures will be employed by the contractor during the construction phase in order to avoid exceedance of the adopted construction noise threshold values at the nearest NSLs. The best practice measures set out in BS 5228 (2009 +A1 2014) Parts 1 and 2 will be complied with. This includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- Selection of quiet plant;
- Noise control at source;
- Screening; and
- Liaison with the Public.

Further comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, hours of work, and noise monitoring, where required.

Selection of Quiet Plant

The potential for any item of plant to result in exceedance of construction noise thresholds will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever practicable (e.g. plant items with sound attenuation incorporated). Should a particular item of plant already on the site be found to exceed the construction noise thresholds, the first action will be to identify whether the item can be replaced with a quieter alternative.

The appointed contractor will evaluate the choice of excavation, breaking, piling or other working method taking into account various ground conditions and site constraints. Where alternative lower noise generating equipment are available that will provide equivalent structural / excavation results, these will be selected to control noise within the relevant thresholds, where it is practicable to do so.

Noise Control at Source

The following measures will be implemented, if required, by the appointed contractor to control noise at source. These measures relate to specific site considerations:

- For mobile plant items such as dump trucks, cranes, excavators and loaders, the installation of an acoustic exhaust, utilising an acoustic canopy to replace the normal engine cover and / or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB. Mobile plant will be switched off when not in use and not left idling.
- For percussive tools such as pneumatic concrete breakers and tools a number of noise control measures include fitting a muffler or sound reducing equipment to the breaker “tool” and ensuring any leaks in the air lines are sealed.
- Where compressors, generators and pumps are located in proximity to NSLs and have the potential to exceed the construction noise thresholds, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Resonance effects in panel work or cover plates can be reduced through stiffening or the application of damping compounds, while other noise nuisance can be controlled by fixing resilient materials in between the surfaces in contact.
- For all materials handling, ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.

Screening

Screening is an effective method of reducing CNLs at a receiver locations and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both

the source and receiver. Standard construction site hoarding (2.4 m in height) with a mass per unit of surface area greater than 7 kg/m2 can provide adequate sound insulation. This is recommended as a minimum around the northern site boundaries of the proposed development site.

Erection of localised demountable enclosures or screens will be used around piling rigs, breakers or drill bits, as required, when in operation in proximity to NSLs with the potential to exceed the construction noise thresholds. Annex B of BS 5228–1 (Figures B1, B2 and B3) provides typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on-site from standard materials. A well placed and designed mobile temporary screen around a pile, breaker or excavation can effectively reduce noise emissions by 10 dB(A).

In addition, careful planning of the construction site layout will also be considered. The placement of site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening.

Hours of Work

Working hours for the three sites are set out below and in their respective CEMPs. Sunday, Bank Holiday work or out of hours work will only take place periodically by agreement with South Dublin County Council.

Liaison with the Public

A designated Community Liaison Officer (CLO) will be appointed to site during construction works. Any noise complaints will be logged and followed up in a prompt fashion by the CLO. In addition, prior to particularly noisy construction activity, the CLO will inform the nearest NSLs of the time and expected duration of the noisy works.

Monitoring

During the construction phase the contractor will carry out noise monitoring at representative NSLs to evaluate and inform the requirement and / or implementation of noise management measures. Noise monitoring will be conducted in accordance with ISO 1996–1 (ISO 2016) and ISO 1996–2 (ISO 2017).

Vibration Control

The likely vibration levels associated with construction activities associated with the proposed development are not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or cosmetic damage to buildings.

Vibration from construction activities will be limited to the values set out in Table 9.4 to avoid any form of potential cosmetic damage to buildings and structures. Monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values in Table 9.4.

Operational Stage

Traffic Along Surrounding Road Network

Changes to traffic flows will result in a not significant increase in noise level in the surrounding environment. Therefore, no mitigation measures are necessary in this case.

Mechanical Plant and Services

With consideration at the detailed design stage, the selection and location of plant items within the proposed development and associated buildings will ensure that noise emissions from any mechanical and electrical building services plant do not exceed the relevant noise criteria within Section 9.2.2.1; therefore no further mitigation is required. In addition, noise emissions should be broadband in nature and should not contain any tonal or impulsive elements.

Once operational noise emissions are controlled within the development site, there will be no perceptible noise impact at sensitive receivers off-site.

Retail and Creche Noise

As outlined within Section 9.5.2.3, noise related to the proposed plaza and creche will result in a not significant effect. Notwithstanding this, the operation of both the creche and plaza will be limited to within daytime hours and shall not cause noise nuisance that exceeds the internal noise criteria presented within Section 9.2.2.1.

Inward Impact

Mitigation is listed by the way of minimum sound insulation requirements within Table 9.26. Notwithstanding this, as part of the detailed design of all residential blocks, the specifics in terms of octave band SRI performances will be reanalysed to take account of the finalised room layouts, room volumes and glazing dimensions, as well as any additional road layouts within the SDZ.

18.2.6 Climate (Air Quality) (Chapter 10)

Construction Stage

The proposed development has been assessed as having at most a high risk of dust soiling impacts and a low risk of dust related human health impacts and a medium risk of dust-related ecological impacts during the construction phase as a result of demolition, earthworks, construction and trackout activities (see Section 10.5.1.1.1). Therefore, the following dust mitigation measures shall be implemented during the construction phase of the proposed development. These measures are appropriate for sites with a high risk of dust impacts and aim to ensure that no significant nuisance occurs at nearby sensitive receptors. The mitigation measures draw on best practice guidance from Ireland (DCC (2018), DLRCC (2022)), the UK (IAQM (2024), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). These measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) prepared for the site. The measures are divided into different categories for different activities.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement includes explaining the nature and duration of the works to local residents and businesses.
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details.

Site Management

- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. Dry and windy conditions are favourable to dust suspension therefore mitigations must be implemented if undertaking dust generating activities during these weather conditions.
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.

- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.

Operating Vehicles / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 kph haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures Specific to Demolition

- Prior to demolition blocks should be soft stripped inside buildings (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- During the demolition process, water suppression should be used, preferably with a hand-held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction should be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.

- Only remove the cover in small areas during work and not all at once.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.

Measures Specific to Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- A speed restriction of 15 kph will be applied as an effective control measure for dust for on-site vehicles.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

Monitoring

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results in the site inspection log. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Operational Stage

No site-specific mitigation measures are proposed for the operational phase as impacts are predicted to be not significant.

18.2.7 Climate (Climate Change) (Chapter 11)

Construction Stage

Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. During the construction phase the following best practice measures shall be implemented on site to prevent significant GHG emissions and reduce impacts to climate:

- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods.
- Ensure all plant and machinery are well maintained and inspected regularly.
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site. A construction waste management plan will be implemented to minimise construction waste sent to landfills. Recycling of materials will be promoted to and reduce the environmental footprint of the site.
- Sourcing materials locally will be prioritised. This will help to reduce transport related CO2 emissions and helps support local suppliers, further promoting economic sustainability.
- Material choices and quantities will be reviewed during detailed design, to identify and implement any lower embodied carbon options, where feasible. For example a 30% minimum clinker replacement in cement may be utilised in line with the requirements for public bodies.

In terms of impact on the proposed development due to climate change, during construction the Contractor will be required to mitigate against the effects of extreme rainfall/flooding through site risk assessments and method statements. The Contractor will also be required to mitigate against the effects of extreme wind/storms, temperature extremes through site risk assessments and method statements. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. Temperatures can affect the performance of some materials, and this will require consideration during construction. During construction, the Contractor will be required to mitigate against the effects of fog, lighting and hail through site risk assessments and method statements.

Operational Stage

A number of mitigation measures have been incorporated into the design of the development to reduce the impact on climate wherever possible. A Climate Action and Energy Statement was prepared by M and E Consulting Engineers in relation to Site 3. Metec Consulting Engineers prepared the Climate Action and Energy Statement in relation to Site 4. OCSC prepared the Energy and Sustainability Report in relation to Site 5.

Site 3

The Climate Action and Energy Statement in relation to Site 3 states that the development will be a Nearly Zero Energy Building (NZEB) in accordance with the 2022 Part L requirements and the relevant sustainability policies within the South Dublin County Development Plan 2022-2028.

The residential units will aim to achieve a Building Energy Ratio (BER) of A2/A3. The dwellings shall include several energy conservation measures to achieve a high energy rating for each dwelling:

- High-performance thermal envelope with low U-values for the fabric.
- Low thermal bridging construction details.
- Airtight construction.
- Energy efficient ventilation system.
- Energy efficient heating and hot water generation system.
- Energy efficient lighting to be used throughout.

Additionally, the following measures will be reviewed at the detailed design stage:

- It is proposed to consider the use of Air Source Heat Pump units and Exhaust Air Heat Pump (EAHP) units in individual heating systems subject to further assessment at the detailed design stage.

- It is proposed to use Solar PV collectors for this project subject to further assessment at the detailed design stage.
- The requirements for low flow sanitary ware (water restrictors) in each dwelling shall be considered during the detailed design stage to allow for water conservation.

Site 4

As per the Climate Action and Energy Statement, the development will be a Nearly Zero Energy Building (NZEB) in accordance with the 2022 Part L requirements and the relevant sustainability policies within the South Dublin County Development Plan 2022-2028.

The residential units and commercial spaces will aim to achieve a Building Energy Ratio (BER) of A3 or better. The residential units will have an energy performance coefficient (EPC) that complies with NZEB (maximum permitted under NZEB requirements is <0.3). The units will also have a carbon performance coefficient (CPC) and renewable energy ratio (RER) that comply with NZEB requirements (maximum permitted CPC under NZEB requirements is <0.35 and RER is 0.20). Similar to the residential units, the non-domestic spaces will also comply with the NZEB requirements. The EPC will comply with the NZEB requirements (maximum permitted under NZEB requirements is <1.0). The units will also have a CPC and RER that comply with NZEB requirements (maximum permitted CPC under NZEB requirements is <1.15 and RER is 0.20).

The Climate Action and Energy Statement outlines that the design of the development has incorporated the principles of the energy hierarchy which are:

The Climate Action and Energy Statement outlines that the design of the development has incorporated the principles of the energy hierarchy which are:

1. Be Lean – this encourages a passive strategy whereby space heating, cooling and lighting energy demand is minimised through a fabric first approach.
2. Be Clean – this stage encourages that energy supplied to the development, such as heating or domestic hot water is delivered efficiently through communal or highly efficient systems.
3. Be Green – this stage ties in with the Renewable Energy Ratio requirement of Part L 2022, whereby any remaining requirements are addressed through on-site renewable energy or low zero carbon technologies.

The following measures will ensure the development minimises the impact to climate during its operation: -

- The fabric specification will ensure compliance with the NZEB and Part L requirements for thermal bridging, air permeability and thermal comfort.
- Centralised Heating with Air Source Heat Pumps (ASHP), ASHP and EAHP options.
- Energy efficient LED lighting.
- The feasibility and appropriateness of PV solar panels will be investigated at the detailed design stage.
- Efficient water fittings to sanitaryware such as flow restrictors will be investigated as to their feasibility to reduce water consumption.
- Electric vehicle (EV) charging points will be incorporated into the parking areas for the proposed development.

Site 5

The Energy and Sustainability Report in relation to Site 5 states that the proposed development will be NZEB compliant in line with the Part L requirements. A BER of A2/A3 has been targeted.

The residential units will have an energy performance coefficient (EPC) that complies with NZEB (maximum permitted under NZEB requirements is <0.3). The units will also have a carbon performance coefficient (CPC) and renewable energy ratio (RER) that comply with NZEB requirements (maximum permitted CPC under NZEB requirements is <0.35 and RER is 0.20). Similar

to the residential units, the non-domestic spaces will also comply with the NZEB requirements. The EPC will comply with the NZEB requirements (maximum permitted under NZEB requirements is <1.0). The units will also have a CPC and RER that comply with NZEB requirements (maximum permitted CPC under NZEB requirements is <1.15 and RER is 0.20).

The Climate Action and Energy Statement outlines that the design of the development has incorporated the principles of the energy hierarchy which are:

1. Be Lean – this encourages a passive strategy whereby space heating, cooling and lighting energy demand is minimised through a fabric first approach.
2. Be Clean – this stage encourages that energy supplied to the development, such as heating or domestic hot water is delivered efficiently through communal or highly efficient systems.
3. Be Green – this stage ties in with the Renewable Energy Ratio requirement of Part L 2022, whereby any remaining requirements are addressed through on-site renewable energy or low zero carbon technologies.

Additionally the development will incorporate the following measures:

- Energy efficient LED lighting.
- The proposed ventilation strategy for the non-residential areas will be natural ventilation where possible and/or mechanical ventilation. The mechanical ventilation system will be a high efficiency, variable speed drive system that also incorporates heat recovery and CO2 control.
- The feasibility and appropriateness of PV solar panels will be investigated at the detailed design stage.
- The feasibility of air source heat pumps and exhaust air heat pumps will be investigated at the detailed design stage.
- the proposed development will incorporate measures to reduce water usage through the appropriate selection of low consumption sanitary fittings, leak detection systems and water monitoring facilities.
- The development will incorporate bicycle parking and E.V charging facilities to promote more sustainable transport methods.

The above measures for Site 3, Site 4 and Site 5 will assist in optimising the energy consumed by the development and will also have the benefit of reducing the impact to climate during the operational phase of the development.

Some measures have been incorporated into the design of the development to mitigate the impacts of future climate change. For example, adequate attenuation and drainage have been incorporated to avoid potential flooding impacts due to increased rainfall events in future years. These measures have been considered when assessing the vulnerability of the proposed development to climate change (see Section 11.5.2).

18.2.8 Landscape and Visual Impact (Chapter 12)

Design Phase

The mitigation and potential negative landscape and visual impacts has influenced the design and layout of the scheme from the beginning of the design process. As a result, the following design decisions have been made:

Hard landscape elements

The surface finish throughout the development will work with the proposed building finish to provide a high-end public realm, with a visual consistency across the entire site area, in doing so knitting the external landscape areas together to develop an address for the developed lands.

Soft landscape elements

The plant material for the proposed development will be chosen based on their long-term suitability and aesthetic appeal. The site planting can be categorised into the following key areas and types:

- Feature Trees within public open space,
- Smaller trees more suited to limited space/constrained planting zones (including over podiums),
- Street trees (columnar/ fastigiate in form),
- Hedging,
- Ornamental shrub planting,
- Ornamental herbaceous planting,
- Bulb planting.

The key planting elements for the site can be largely broken down into the above plant categories. Detailed landscape plans illustrating proposed species, sizes, locations, and types have been prepared by Doyle + O'Troithigh for Site 3, Bernard Seymour Landscape Architects for Site 4 & LDA Design for Site 5 as part of the Part X planning application to An Bord Pleanala.

Construction Stage

As described under the *Potential Impact of the Proposed Development* above, the initial construction operations created by clearance of the site and the construction of the buildings, and roads will give rise to temporary or short-term impacts on the landscape character, through the introduction of new structures, plant, machinery etc. and the removal of vegetation. The conversion of some areas of the site from agricultural fields with hedgerows to a building site is likely to be perceived in the short-term as a negative loss of landscape character, particularly by section of the local community closest to it.

The introduction of the elements described under *Potential Impact of the Proposed Development* will have an impact on the amenity value of the surrounding areas. The construction compounds, temporary car parking and storage facilities etc will be located sensitively to avoid any visual sensitive areas. As the site is located on the edge of the existing urban areas the visual elements associated within construction would be considered part of the urban landscape. With this considered the visual impact on the landscape character during construction would be neutral, slight in magnitude and short term in its duration.

Operational Stage

The landscape design post construction will provide year-round visual interest, accessibility and usability providing the residents with the opportunity to develop a heightened experience of nature within the development. The completed landscape will be functional, comfortable, and distinct to the development.

Grass cutting, tree, shrub and hedge maintenance and leaf and litter clearing are the primary landscape operations required. These will be supported with soil aeration, fertiliser application and regular tree, shrub and hedgerow assessment to provide for mitigation measures to the potential visual impacts of the proposed development.

Cumulative

<u>Construction Phase</u>

Consideration shall be made to mitigate any potentially adverse construction related impacts on the surrounding lands. The normal operations at construction phase would include the erection of visually sensitive site hoarding, site excavation followed by a period of construction activity.

The operation of a well-managed organised and planned construction site following a specific Construction Management Plan, with adequate control of construction traffic and working activity, will be key to avoiding and or minimising impact. Other control measures will include:

- Adequate measures to protect the existing vegetation and retained features on site and on neighbouring lands.
- Warning signage as per the Traffic Management Plan.
- Use of hoarding for screening works as appropriate.
- Ensure all construction operations are carried out during daylight hours but where site lighting is required it will be directed away from adjoining roadways and dwellings.

Operational Phase

Grass cutting, tree, shrub and hedge maintenance and leaf and litter clearing are the primary landscape operations required. These will be supported with soil aeration, fertiliser application and regular tree, shrub and hedgerow assessment to provide for mitigation measures to the potential visual impacts of the proposed development.

18.2.9 Material Assets (Transportation) (Chapter 13)

Construction Stage

The Construction Management Plan (CMP) (which is a standalone report and included in the planning documentation) in addition to the application's accompanying Construction and Waste Management Plan will incorporate a range of integrated control/ mitigation measures and associated management initiatives with the objective of mitigating the impact of the proposed development's on-site construction activities.

The Contractor's CMP will be prepared prior to the commencement of construction work on site. This plan will be prepared in consultation with SDCC and submitted for approval in order to agree on monitoring measures (in advance of works commencing) on mitigation measures, some of which are outlined below:

1: All works on site will be undertaken during hours of the day in accordance with SDCC requirements.

2: During the pre-construction phase, the site will be securely fenced off from adjacent properties, public footpaths and roads.

3: The surrounding road network will be signed to define the access and egress routes for the development including dedicated haul routes to/from the development site.

4: The traffic generated by the construction phase of the development will be strictly controlled in order to minimise the impact of this traffic on the surrounding road network and local properties. All HGV trips could potentially be restricted from traveling to / from the development during the local road network's peak hours.

5: All road works will be adequately signposted and enclosed to ensure the safety of all road users and construction personnel.

6: All employees and visitors' vehicle parking demands will be accommodated by a permeable hardstand carparking area within the construction compound. The exact location of the construction compound is to be confirmed in advance of commencement of the works. On-street parking of construction vehicles and construction personnel vehicles will be discouraged.

7: A programme of street cleaning across the local street and identified haul routes will be implemented.

8: A construction Mobility Management Plan will be developed by the appointed contractor to encourage all construction personnel to utilise the vast range of sustainable travel options available when travelling to/from the proposed development site.

The Contractor's CMP will contain the relevant construction mitigation measures set out in this chapter and EIAR and any relevant conditions of a decision to grant permission.

Construction of the proposed scheme will cause temporary short-term traffic impacts on the local road network. Enforcement of a CMP will ensure that construction traffic impacts are minimized through the control of site access / egress routes and site access locations and any necessary temporary lane closure requirements.

Operational Stage

A management regime will be implemented by the development's management company to control access to the on-site car parking spaces thereby actively managing the availability of on-site car parking for residents of the development.

Infrastructure measures identified to reduce reliance on private vehicles include the provision of ample secure cycle parking on site and ensuring a design which promotes permeability for pedestrians and cyclists to, through and from the development. The high level of high-frequency public transport facilities (Dublin Bus, Irish Rail) will also act as a powerful mobility management measure, as residents can rely on public transport over the private vehicle.

With the objective of mitigating the potential impact of the proposed development, as predicted in Section 13.5.2 during its operational stage, and with the objective of promoting sustainable travel for all residents, workers, and visitors to the development, the following initiatives have been identified and subsequently form an integral part of the subject development proposals.

With the objective of mitigating the potential impact of the proposed development as predicted in Section 13.5 during its operational stage, and with the objective of promoting sustainable travel for all residents, workers, and visitors to the development; the following initiatives have been identified and subsequently form an integral part of the subject development proposals.

9: Strategic Employment Centres

The location of the subject development in close proximity to the R136 Grange Castle Road corridor provides the unique ability for many of Dublin's strategic employment zones to achieve many of their sustainability obligations particularity in regard to staff accessibility, health and sustainable modes of travel. Beyond the obvious ease of access to Dublin City Centre and Dublin Docklands provided by both LUAS and bus services, the proximity of the proposed development to a number of strategic employment areas has the potential to address existing staff access and recruitment issues at the following locations. Accordingly, a specific focus of the development's mobility strategy will be encouraging the uptake of sustainable travel options for the development's residents' 'commuter' trips to / from the local employment centres:

- Clondalkin Industrial Estate / Fonthill Retail Park – both located within walking and cycling distance of the subject site; and
- Park West / Liffey Valley / Western Industrial Estate / JFK Industrial Estate / Cherry Orchard Industrial Estate / Grange Castle Business Park / Cookstown Industrial Estate / Tallaght / Ballymount Industrial Estate / Greenogue Business Park – all located within cycling distance and with direct public transport connections to / from the subject site.

10: Management – Mobility Management (MMP)

A Mobility Management (MMP) is to be rolled out with the aim of guiding the delivery and management of a range of coordinated initiatives by the scheme promotor. The MMP ultimately seeks to encourage sustainable travel practices for all journeys to and from the proposed development site. The MMP will be developed in partnership with SDCC to specifically consider the opportunities of shaping all journeys and promoting sustainable transport habits at the proposed residential scheme. The Mobility Management Plan is included in Appendix 13.4.

11: Management – Car Park Management Strategy

The availability of parking spaces is a key determinant of mode choice and car usage. With the objective of minimizing travel by car and encouraging the use of sustainable modes instead, it is proposed to limit the car parking provision and promote a "car lite" scheme. This is considered an appropriate approach considering the site's excellent accessibility characteristics (e.g. walking, cycling, bus, coach and rail opportunities) to places of work, education and essential services. This

"car lite" approach will help to reduce car dependency in Dublin, reduce traffic congestion and pollution levels, improve the quality of the environment and help tackle climate change in addition to encouraging sustainable travel.

12: Bicycle Parking Facilities

In addition to facilitating and encouraging bicycle use, increasing the number of cycle parking provision on-site is considered best practice in situations such as when reducing car parking spaces. A total of 2928 no. cycle spaces are proposed within the development sites as long term and short-term facilities.

13: Infrastructure (by others)

Planning infrastructure investment that will further enhance the sites sustainable accessibility credentials include:

- The latest BusConnects network redesign includes a number of routes that will benefit the subject site and provide access to locations including, Dublin City Centre, Clongriffin, Liffey Valley Shopping Centre, Clondalkin, Blanchardstown Shopping Centre and Tallaght. The routes in close proximity to the subject site include orbital routes W2 and W4 as well as branch routes C1, C2, D1, D3 and G2.
- The Clonburris SDZ Transport Assessment and Transport Strategy – September 2017 proposes a number of bus services that will serve the Clonburris SDZ, including two orbital bus services operating from Tallaght to Blanchardstown and two local bus routes, Lucan – Park West and Grange Castle – Liffey Valley.
- The Clonburris SDZ Transport Assessment and Transport Strategy – September 2017 proposes the existing Grand Canal and Griffeen Valley Greenways will be complemented by a series of interconnecting and dedicated cycle routes linking the residential areas to key attractions, both internal and external to Clonburris.
- The proposed GDA cycling network plan will also encourage a greater uptake in walking and cycling amongst residents, staff and visitors.
- The DART Expansion Programme will see the DART system expanded, providing fast, high-frequency electrified services to Drogheda on the Northern Line, Hazelhatch on the Kildare Line, Maynooth and M3 Parkway on the Maynooth Line and to Greystones on the South-Eastern Line. The subject site is ideally located to access these DART services via the Kishoge Station.
- The SDZ lands can be potentially served by the Lucan Luas that is currently planned under the NTA's Transport Strategy for the Greater Dublin Area 2016 – 2035. Under this strategy, the future Lucan Line would serve Lucan, Liffey Valley and Ballyowen; however, the Luas Line could extend towards the Clonburris SDZ lands and would in turn expand the Luas transport users including the residents and employees in Clonburris.

14: Car Sharing

Car sharing is also known as lift-sharing, car-pooling or ridesharing. Car sharing offers people a cost effective and a more sustainable way of travelling by car when other forms of transport are not viable. Car sharing schemes encourage individuals to share private vehicles for particular journeys. Car sharing can be both formal and informal. Informal car sharing operates between individuals and neighbours and formal car sharing is defined by a more elaborate approach to trip matching, often focussed on the commuting journey. Car sharing has the aim of reducing the number of car trips made and participants have the opportunity to meet other members in the community. A National Car Sharing database is now available at www.carsharing.ie. It is an all-island service for the public and is free of charge to use. Car sharing has a number of benefits including reducing transport costs, reducing the number of cars on the road which results in less pollution, less congestion and fewer parking issues, and reducing the need for a private car. The proposed development website would have a section dedicated to the car share scheme and residents would have an option to register. To encourage take up of car sharing, the MMP Coordinator would host events to introduce prospective car sharers to each other and would help "break the ice" as it is always more likely that

people will share, particularly for the journey "home", with somebody that they have met rather than a complete stranger.

15: Car Clubs

Car clubs are membership-based schemes providing shared cars for hire. A car club can play an important role in reducing costs, congestion and environmental impact. Members have flexible access to the hire of a vehicle. Vehicles are parked in reserved parking spaces close to homes, town centres or workplaces and can be used and paid for on an hourly rate, daily or weekly basis. Individuals can join a car club; alternatively, an organisation may have a corporate package with one of the car club providers. Car sharing clubs in Dublin have experienced significant growth in recent years. The facility allows members' access to a shared car in the local area for an hourly fee. This facility could be an attractive option for those who choose to start walking or cycling to work but may require access to a car at short notice. Residents can obtain further information at www.gocar.ie and also www.yuko.ie.

16: Walking

The development has been designed to ensure that there are a number of access points / gateways to facilitate permeable walking through the site. The feasibility of measures that promote walking will be influenced by factors such as the safety and ease of walking to and from the site and the age profile of commuters. Generally speaking, a distance of up to 3km is considered reasonable for walking. This distance is only indicative but can help to define target groups. The health benefits of walking are a key element in promoting MMPs. Walking improves cardiovascular fitness and burns calories. Walking will also increase muscle tone, boost metabolism, ease stress, raise energy levels and improve sleep, which combined can also help with weight loss. Regular walking can also reduce the risk of coronary heart disease, diabetes, stroke, high blood pressure, cancer, osteoporosis and arthritis. Walking will mainly be self-promoting, and initiatives should focus on making people aware of the routes available to them. A map showing the walking routes should be prepared and placed at key locations within the development. These could be stand-alone signs or maps on notice boards. This information would also be available on the community website. It is important to ensure that pedestrians are safe and are satisfied with the facilities available and their maintenance. It should be noted that:

- Walking is truly the most-sustainable form of transportation.
- All trips, regardless of mode, begin and end on foot.
- Walking needs to have a greater level of priority in most cities, like walk-signal times, safer well-lit / marked crosswalks and pedestrian zones.
- Walking is an easy mode of travel for distances under 2km. Most people are prepared to walk between 800m to 1km to a train station or bus stop.

17: Cycling

The proposed development is well located for cycling journeys and this mode of travel should be encouraged with the provision of a wide range of routes within the development and new links to existing and future major routes in the local area. A distance of up to 10km is considered reasonable for cycling. This distance is only indicative but can help to define target groups. A total of 2928 no. cycle spaces are proposed within the development to accommodate residents and visitors to the site. The on-site cycle facilities will be linked to the existing off-site cycle routes. Also, improved cycle infrastructure is proposed under the GDA Cycle Network Plan routes, which run in close proximity to this site. As with many measures relating to cycling, the aim is a mixture of support, through incentives and facilities, and encouragement, through information and marketing.

18: Public Transport (Bus)

The proposed development will be well served by Dublin Bus services, with bus routes available along New Nangor Road, Grange Castle Road, Adamstown Avenue, Ninth Lock Road and Fonthill Road, as well as BusConnects proposals for new routes which are proposed to pass close to the subject site along Grange Castle Road, Ninth Lock Road, St. Cuthbert's Road and New Nangor Road. At present, the bus stops are located in close proximity with the closest bus stops located along New

Nangor Road, Grange Castle Road, Adamstown Avenue, Ninth Lock Road and Fonthill Road, which offer the subject site a variety of frequent services operating daily. The subject site is located close to the proposed Bus Connects C1, C2, D1, D3, G2, W2 and W4 routes, which will provide enhanced levels of accessibility and mobility.

19: Public Transport (Rail)

The proposed development is situated near the Kildare railway line and has two railway stations in close proximity, the Kishoge Railway Station and the Clondalkin-Fonthill Station. Both stations are served by commuter services to Heuston Station and following the recent upgrading of the Phoenix Park Tunnel, services calling at Clondalkin-Fonthill Station now offer connections to Drumcondra, Connolly, Tara Street, Pearse and Grand Canal Dock. The DART Expansion Programme will see the DART system expanded, providing electrified services to locations such as Drogheda, Hazelhatch, Maynooth and Greystones. The proposed development can be potentially served by the Lucan Luas, which could extend towards the Clonburris SDZ lands and would in turn expand the Luas transport users including the residents and employees in Clonburris.

18.2.10 Material Assets (Waste) (Chapter 14)

This section outlines the measures that will be employed in order to reduce the amount of waste produced, manage the wastes generated responsibly, and handle the waste in such a manner as to minimise the effects on the environment.

The concepts of the 'circular economy and 'waste hierarchy' are employed when considering all mitigation measures.

The CE is a sustainable alternative to the traditional linear (take-make-dispose) economic model, reducing waste to a minimum by reusing, repairing, refurbishing and recycling existing materials and products. The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling / recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal.

Construction Stage

The following mitigation measures will be implemented during the construction stage of the proposed development:

Waste Management (WM)_1:

As previously stated, a project specific RWMP has been prepared in line with the requirements of the requirements of the EPA 'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021) and is included as4.1. The mitigation measures outlined in the RWMP will be implemented in full and form part of the mitigation strategy for the site. The mitigation measures presented in this RWMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the excavation and construction stages of the proposed development.

- Prior to commencement, the appointed Contractor(s) will be required to refine / update the RWMP (Appendix 14.1) in agreement with SDCC and in compliance with any planning conditions, or submit an addendum to the RWMP to SDCC, detailing specific measures to minimise waste generation and resource consumption, and provide details of the proposed waste contractors and destinations of each waste stream.
- The Contractor will implement the RWMP throughout the duration of the proposed excavation and construction stages.

WM_2:

A quantity of topsoil and sub soil will need to be excavated to facilitate the proposed development. The Development Engineers have estimated that the majority excavated material will need to be removed off-site. Correct classification and segregation of the excavated material is required to

ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site.

WM_3:

- Building materials will be chosen to 'design out waste'.

WM_4:

- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery. The following waste types, at a minimum, will be segregated:
    - Concrete rubble (including ceramics, tiles and bricks);
    - Soil and stones;
    - Concrete, bricks, tiles and ceramics;
    - Wood, glass and plastics;
    - Metals;
    - Gypsum-based construction material;
    - Paper and cardboard;
    - Mixed construction and demolition (C&D) waste;
    - Chemicals (solvents, paints, adhesives, detergents etc.).

WM_5:

- Left over materials (e.g. timber off-cuts, broken concrete blocks / bricks) and any suitable construction materials shall be re-used on-site, where possible (alternatively, the waste will be sorted for recycling, recovery or disposal).

WM_6:

- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site.

WM_7:

- Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required).

WM_8:

- A Resource Manager will be appointed by the main Contractor(s) to ensure effective management of waste during the excavation and construction works.

WM_9:

- All construction staff will be provided with training regarding the waste management procedures.

WM_10:

- All waste leaving site will be reused, recycled or recovered, where possible, to avoid material designated for disposal.

WM_11:

- All waste leaving the site will be transported by suitably permitted contractors and taken to suitably registered, permitted or licenced facilities.

WM_12:

- All waste leaving the site will be recorded and copies of relevant documentation maintained.

WM_13:

Nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, if required. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Regulation 27 (By-products), as amended, European Union (Waste Directive) Regulations 2011-2020. EPA approval will be obtained prior to moving material as a by-product.

These mitigation measures will ensure that the waste arising from the construction stage of the proposed development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations and the Litter Pollution Act 1997 and the NWCPE. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will promote more sustainable consumption of resources.

Operational Stage

The following mitigation measures will be implemented during the operational stage of the proposed development:

WM_14:

All waste materials will be segregated into appropriate categories and will be temporarily stored in appropriate bins or other suitable receptacles in a designated, easily accessible areas of the site.

WM_15:

As previously stated, a project specific OWMP has been prepared and is included as Appendix 14.2. The mitigation measures outlined in the OWMP will be implemented in full and form part of the mitigation strategy for the site. Implementation of this OWMP will ensure a high level of recycling, reuse and recovery at the development. All recyclable materials will be segregated at source to reduce waste contractor costs and ensure maximum diversion of materials from landfill, thus achieving the targets set out in the NWMPCE , Waste Action Plan for a Circular Economy – Waste Management Policy in Ireland and the SDCC waste bye-laws.

The Residents of the site during the operational stage will be responsible for ensuring the ongoing implementation of this OWMP and the abiding of SDCC waste bye-laws, ensuring a high level of recycling, reuse and recovery at the site of the proposed development.

WM_16:

- On-site segregation of all waste materials into appropriate categories including (but not limited to):
    - Organic waste;
    - Dry Mixed Recyclables;
    - Mixed Non-Recyclable Waste;
    - Glass;
    - Waste electrical and electronic equipment (WEEE);
    - Batteries (non-hazardous and hazardous);
    - Cooking oil;
    - Light bulbs;
    - Cleaning chemicals (pesticides, paints, adhesives, resins, detergents, etc.);
    - Furniture (and from time to time other bulky waste); and
    - Abandoned bicycles.

WM_17:

- The Residents will ensure that all waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly identified with the approved waste type to ensure there is no cross contamination of waste materials.

WM_18:

- The Residents will ensure that all waste collected from the site of the proposed development will be reused, recycled or recovered, where possible, with the exception of those waste streams where appropriate facilities are currently not available; and

WM_19:

- The Residents will ensure that all waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.

These mitigation measures will ensure the waste arising from the development is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter Pollution Act 1997*, *The NWMPCE* and the SDCC waste bye-laws. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

18.2.11 Material Assets (Utilites) (Chapter 15)

Construction Stage

Connections to the existing gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.

A GPR utility survey (and slit trench investigation as required) will be carried out in advance of commencing road works to confirm the location of the power and telecommunication infrastructure.

Operational Stage

On completion of the construction phase no further mitigation measures are proposed in relation to the electrical, gas and telecommunications infrastructure.

18.2.12 Cultural Heritage (Archaeological & Architectural) (Chapter 16)

Construction Stage

Site 3

All stripping of remaining topsoil within Site 3, which is associated with the proposed development, will be subject to archaeological monitoring. This will be carried out by a suitably qualified archaeologist and if any archaeological remains are identified, further mitigation may be required, such as preservation by record or in-situ. Any further mitigation will require agreement from the National Monuments Service of the DoHLGH.

A written and photographic record of the section of townland boundary in the southwest portion of the development area will be compiled and the removal of the boundary will be subject to archaeological monitoring.

Site 4

All stripping of remaining topsoil within Site 4, which is associated with the proposed development, will be subject to archaeological monitoring. This will be carried out by a suitably qualified archaeologist and if any archaeological remains are identified, further mitigation may be required, such as preservation by record or in-situ. Any further mitigation will require agreement from the National Monuments Service of the DoHLGH.

A written and photographic record of the section of the former townland boundary in the northern portion of the development area will be compiled and the removal of the boundary will be subject

to archaeological monitoring.

A written and photographic record will be made of the recessed entrance to Grange House, which dates to the early 20th century, prior to its removal as part of the development.

Site 5

All stripping of remaining topsoil within the northern portion of Site 5, which is associated with the proposed development, will be subject to archaeological monitoring. This will include the site of the townland boundary that previously crossed the site. Monitoring is not required in the central or southern portions of this site due to the level of ground disturbances that have occurred. Monitoring will be carried out by a suitably qualified archaeologist and if any archaeological remains are identified, further mitigation may be required, such as preservation by record or in-situ. Any further mitigation will require agreement from the National Monuments Service of the DoHLGH.

A written and photographic record of the section of the former townland boundary in the northern portion of the development area will be compiled and the removal of the boundary will be subject to archaeological monitoring.

Operational Stage

Site 3

No mitigation measures are required for the operation stage of the development.

Site 4

A written and photographic record will be made of the current landscape context of Grange House, prior to the commencement of development. It is not possible to fully mitigate the indirect impacts on the house during operation, due to the proximity of the required infrastructure and surrounding residential development.

Site 5

No mitigation measures are required for the operation stage of the development.

18.2.13 Risk Management (Major Accidents & Disasters) (Chapter 17)

Construction Phase

The mitigation measures relevant to each environmental factor outlined in Chapters 5 – 16 of the EIAR, as well as the CEMP, will be implemented during the Construction Phase of the development and will collectively mitigate the risk of major accidents and disasters during this time.

The Construction Phase of the Proposed Development will be carried out in accordance with best practice site management measures relating to health and safety and emergency response. These measures are described in the CEMP

Operational Phase

No mitigation or monitoring measures are identified for the proposed development, specific to reducing the risk of major accident / disaster occurring at Kishoge Train Station, during the operational phase.