

14.0 SUMMARY OF EIA MITIGATION & MONITORING MEASURES

14.1 INTRODUCTION

The central purpose of EIA is to identify potentially significant adverse impacts at the pre-consent stage and to propose measures to mitigate or ameliorate such impacts. This chapter of the EIAR document has been prepared by **John Spain Associates** and sets out a summary of the range of methods described within the individual chapters of this EIAR document which are proposed as mitigation and for monitoring. It is intended that this chapter of the EIAR document will provide a useful and convenient summary to the competent/consent authority of the range of mitigation and monitoring measures proposed.

EIA related conditions are normally imposed by the competent/consent authority as part of conditions of planning consent and form a key part of the Impact Anticipation and Avoidance strategy. Conditions are principally used to ensure that undertakings to mitigate are secured by explicitly stating the location, quality, character, duration and timing of the measures to be implemented. A secondary role of EIA related conditions is to ensure that resources e.g. bonds / insurances will be available and properly directed for mitigation, monitoring or remedial action, in the event that the impacts exceed the predicted levels.

Monitoring of the effectiveness of mitigation measures put forward in the EIAR document, both by the competent authorities and the developer, is also an integral part of the process. Monitoring of environmental media and indicators arise either from undertakings or from conditions.

In the case of mitigation and monitoring measures it is important for all parties to be aware of the administrative, technical, legal and financial burdens that can accompany the measures proposed. It is also important to ensure that, where monitoring is provided for, it is clearly related to thresholds, which if exceeded cause a clearly defined set of actions to be implemented.

14.2 MITIGATION STRATEGIES

14.2.1 Introduction

There are three established strategies for impact mitigation - avoidance, reduction and remedy. The efficacy of each is directly dependent on the stage in the design process at which environmental considerations are taken into account (i.e. impact avoidance can only be considered at the earliest stage, while remedy may be the only option available to fully designed projects).

14.2.2 Mitigation by Avoidance

Avoidance is generally the fastest, cheapest and most effective form of impact mitigation. Environmental effects and consideration of alternatives have been taken into account at the earliest stage in the project design processes. The consideration of alternatives with respect to the development of the subject lands has been described in Chapter 2.

14.2.3 Mitigation by Reduction

This is a common strategy for dealing with effects which cannot be avoided. It concentrates on the emissions and effects and seeks to limit the exposure of the receptor. It is generally regarded as the "end of pipe" approach because it does not seek to affect the source of the problems (as do avoidance strategies above). As such this is regarded as a less sustainable, though still effective, approach.

14.2.4 Reducing the Effect

This strategy seeks to intercept emissions, effects and wastes before they enter the environment. It monitors and controls them so that acceptable standards are not exceeded. Examples include wastewater treatment, filtration of air emissions and noise attenuation measures.

14.2.5 Reducing Exposure to the Impact

This strategy is used for impacts which occur over an extensive and undefined area. Such impacts may include noise, visual impacts or exposure to hazard. The mitigation is effected by installing barriers between the location(s) of likely receptors and source of the impact (e.g. sound barriers, tree screens or security fences).

14.2.6 Mitigation by Remedy

This is a strategy used for dealing with residual impacts which cannot be prevented from entering the environment and causing adverse effects. Remedy serves to improve adverse conditions which exist by carrying out further works which seek to restore the environment to an approximation of its previous condition or a new equilibrium.

14.3 MITIGATION AND MONITORING MEASURES

The following provides a list, for ease of reference, of the mitigation and monitoring measures recommended in each chapter of the EIAR.

14.3.1 Project Description & Alternatives Examined

Construction Phase

PD&AE CONST 1: It will be necessary for the appointed contractor to prepare and implement a construction management plan (including traffic management) to reduce the impacts of the construction phase on local residents and ensure the local road network is not adversely affected during the course of the construction project.

PD&AE CONST 2: The appointed contractor should prepare a Construction and Operational Waste Management Plan for the proposed development as part of their contractual responsibilities. The Waste Management Plan should meet the requirements of the Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects.

Operational Phase

Not applicable.

Monitoring

Not applicable.

14.3.2 Population and Human Health

Construction Phase

POP & HH CONST 1: In order to protect the amenities enjoyed by nearby residents, premises and employees a full Construction Management Plan (including traffic management) should be prepared by the contractor and implemented during the construction phase.

Operational Phase

Not applicable.

Monitoring

Not applicable.

14.3.3 Archaeology, Architectural and Cultural Heritage

Pre-Construction Phase

Proposed Ecopark

CH PRE-CONST 1: *Consultation and Monitoring*

It is likely that the National Monuments Service (NMS), Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs (DAHRRGA) will require a conservation plan detailing the proposals for the preservation- *in situ* of the Pale boundary. The document will ensure that the Pale Boundary is preserved and integrated within the development area and will set out measures to ensure that any future maintenance plans or any activity carried out within the area is cognisant of the sensitivity therein.

It is recommended that a buffer zone be established 10m beyond the outer edge of the Pale ditch and its possible continuation in advance of construction to protect the feature and any features that may be associated with it. This area should be cordoned off to protect it from construction activities and all contractors on site shall be made aware of its presence.

No excavation work should be undertaken in the sensitive area around the Pale Ditch without prior consultation with and approval from the Department. This work must be carried out in consultation with and under the relevant licence/consent to the Department.

Proposed Link Road Bridge Crossing (Pale Boundary)

CH PRE-CONST 2: *Proposed Link Road Bridge Crossing - Archaeological excavation*

It is recommended that an area measuring 47.2m east–west x 15m north–south (Fig. 4.8) and centred on the probable line of the Pale boundary and the be excavated in full. The excavation will be carried out under licence

to the DAHRRGA. The granting of the excavation licence will be subject to the provision of a detailed method statement approved by the Department and confirmation that developer will make a provision to allow for and to fund the archaeological works, including the post excavation analysis and the preparation of any reports arising from that work including, should the results warrant it, publication.

During construction, the construction area for the bridge will be cordoned off so no inadvertent damage to the remaining sections of the boundary to the east and west would be impacted.

Archaeological Area 2- Central Area of the Application Lands

CH PRE-CONST 2: Archaeological excavation

An area measuring 20m x 20m is recommended for excavation of the features in trench 8 (2A), and two areas measuring 10m x 10m are recommended for the features in trenches 9 and 10 (2B and 2C). There is potential for further features to be uncovered outside of these areas and monitoring of topsoil stripping should be carried out with provision made to deal with any further features that may be uncovered. Excavation will be carried out in advance of any construction work at these locations under licence to the Department according to the requirements of the NMS. The developer will fund the onsite excavation work and post excavation analysis.

Archaeological Area 3 – Southeastern Area of the Application Lands

CH PRE-CONST 2: Preservation in Situ

This green space includes a development buffer of 10m beyond the outer edge of the ditch in order to protect any features that may be associated with the enclosure. It is further recommended that this site be protected from construction activities by way of fencing. As above, it is likely that the Department will require a conservation plan detailing the proposals for the preservation- in situ of the Pale boundary. The document will ensure that the enclosure is preserved and integrated within the development area and will set out measures to ensure that any future maintenance plans or any activity carried out within the area is cognisant of the sensitivity therein.

Construction Phase

CH CONST 2: General Mitigation

Given the rich archaeological assemblage in the surrounding area, it is recommended that all topsoil stripping for the proposed development be archaeologically monitored with provision made to deal with any archaeological features that may be uncovered. This will ensure the full recognition of, and the proper excavation and recording of all archaeological soils, features, finds and deposits which may be disturbed below the ground surface.

In the event that archaeological remains are uncovered works will cease in that area pending a decision on how best to deal with the remains. The National Monuments Section, will advise on whether preservation *in situ* or preservation by record is the most suitable means of mitigation. The developer must make provision to fund any archaeological work that may take place during construction of the proposed development, the offsite post excavation analysis and the preparation of any reports arising from that work. All mitigation practices will be carried out in accordance with current best practice. The developer will make a provision to allow for and to fund the archaeological works.

Operational Phase

CH OPER 2: *Landscaping in the vicinity of the Pale Boundary and Archaeological Area 3*

The final treatment for the Pale Boundary and its likely continuation and Archaeological Area 3 can be agreed by the authorities so that it is both appropriate and designed with sensitivity. To avoid inadvertent damage to these sites occurring in the future it will be necessary to create a local awareness of the site and to highlight its position within the landscape (perhaps in the form of illustrative displays). This should be approved as part of the landscape plan.

It is recommended that removed section of probable line of the Pale boundary should be reflected on the bridge structure, possibly in the form of a different colour surface showing the continuation of the alignment so the users of the Ecopark can trace where the route would have run.

All recommendations are subject to approval by the National Monument Section of the Heritage and Planning Division, Department of Arts, Culture and the Gaeltacht.

Monitoring

Post development monitoring is not applicable in terms of the archaeological, architectural or cultural heritage

14.3.4 Biodiversity (Flora & Fauna)

Construction Phase

BIO CONST 1: *Habitats*

As it is proposed to change the site from an agricultural to an urban character, it is not possible to mitigate all of the potential impacts on local ecological receptors. The installation of the bridged link between Phase 1 and Phase 2 will require the temporary use of a hardstanding platform and the removal of a section of the trees both along Ballyogan Stream and along the ridgeline between the Ecopark and Phase 2.

In order to mitigate this habitat loss, and in order to maximise the biodiversity value of the retained habitat and to ensure that habitat connectivity in the wider area is maintained, significant new planting will be incorporated into the landscape design for the proposed development. This planting will, wherever possible, comprise an appropriate mixture of native trees and shrubs, preferably of local provenance, and including species attractive to pollinators. Refer to Table 5.1 and Chapter 6 Landscape and Visual Assessment. In particular, the significant areas of open space that form part of the Phase 2 development will be planted and managed in a way that maximises the biodiversity value of these areas. For example a significant area of c.1.2ha of open space will be provided to the north of the development area. The open space runs along the southern side of the tree-lined hedgerow and potential line of the pale ditch. This open space backs onto and extends the proposed Ecopark being delivered under the Phase 1 permission. A densely planted habitat creation area will be provided within the western portion of this open space. In addition, a large area of c. 1.4ha of open space will be provided as a central spine through the development area directly connecting the centre of the development area to the Phase 1 Ecopark. The open space is designed to provide for informal 'play in the landscape', exercise opportunities, social activity, seating, however it will also serve to enhance local biodiversity by including creation of a stream corridor with wetland features.

The planting will, over time, provide replacement habitat of benefit to the bats and birds that will continue to use the site and its boundaries.

Connectivity to the Ecopark will be maintained, and, with the exception of the c.50m wide bridge corridor working way leave, the Ecopark will be largely unaffected by – and fenced off from – the proposed development. This will ensure retention of large areas of undisturbed habitat, including grassland, trees, hedgerows and associated scrub planting, all of which will be subject to long-term management, following the guidance set out in Appendix 5.2.

All site clearance and landscaping works will comply with current legislative requirements and best practice. In particular, trees to be retained will be treated in accordance with British Standard BS5837:2012 *Trees in Relation to Design, Demolition and Construction* – *Recommendations*, with protective fencing being installed around all trees and hedgerows to be retained, prior to commencement of development. All planting plans and landscaping proposals will further ensure that no invasive species are introduced, either deliberately or inadvertently, to the site.

A Habitat Management Plan (HMP) has been developed and is included in Appendix 5.1 of this report. In addition to the measures set out in this chapter, all works will comply with the requirements of the HMP, particularly in relation to reinstating the grassland habitat within the Ecopark post-construction (on removal of the temporary hardstanding area associated with the construction of the bridge), and maintaining the bankside habitat in the vicinity of the proposed bridge.

BIO CONST 2: Fauna

As part of the provision of the new bridge measures will be implemented to ensure that passage along the Ballyogan Stream corridor and the Ecopark is maintained for birds, mammals (such as otters, badgers and bats) and aquatic fauna.

Where feasible and practicable, the removal of trees and other features suitable for use by nesting birds will be undertaken outside the bird nesting season (avoiding the period 1st March to 31st August). Should the construction programme require vegetation clearance between March and August bird nesting surveys will be undertaken by suitably experienced ecologists. If no active nests are recorded, vegetation clearance will take place within 24 hours. In the event that active nests are observed, an appropriately sized buffer zone will be maintained around the nest until such time as all the eggs have hatched and the birds have fledged – a period that may be three weeks from the date of the survey. Once it is confirmed that the birds have fledged and no further nests have been built or occupied, vegetation clearance may take place immediately.

No bat roosts have been recorded at Clay Farm Phase 2 and it will not be necessary to apply for a derogation licence under Regulation 54 or 55 of *the European Communities (Birds and Natural Habitats) Regulations 2011* (S.I. 477/2011). However any mature tree scheduled for removal will first be surveyed by a qualified bat specialist for the presence of bats. Any ivy-covered trees which require felling should be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape. Trees with potential for bat roosting i.e. those showing cavities, should be felled in the presence of a bat specialist in case bats are present. If found, such animals should be safely retained in an escape-proof container until nightfall then released onsite;

A total of Six Schwegler 2F bat boxes will be erected, with advice from an experienced bat specialist, on mature trees as part of the development. In addition a minimum of eight triple cavity swift boxes (such as Schwegler 17A)

will also be installed on buildings as part of the development, including four within the structure of the bridge crossing the Ecopark (assuming that they can be installed a minimum of 6m from the ground).

All new lighting for the proposed development at Clay Farm Phase 2 will be designed and constructed taking account of the recommendations of Bat Conservation Ireland (2010). In summary, the following measures are proposed:

- No floodlighting will be used – this causes a large amount of light spillage into the sky. The spread of light will be kept below the horizontal.
- Hoods, louvres, shields or cowls will be fitted on the lights if necessary to reduce light spillage if high intensity lighting is required or to protect trees or other potential roosts from light overspill.
- Lights should be of low intensity. It is better to use several low intensity lights than one strong light spilling light across the entire area.
- Lights away from essential areas such as major roads should be motion sensitive rather than permanently lit and attached to a timer system to switch off quickly in the absence of sustained movement.
- Narrow spectrum lighting should be used with a low UV component. Glass also helps reduce the UV component emitted by lights.

The lighting scheme for the proposed development, designed by Penston MEP, adheres to these lighting design characteristics. In particular, the following measures have been designed:

- Luminaire selection limits upward light spill;
- Dimming lights by 30% post-curfew will reduce running and maintenance cost;
- As bat feeding periods are from dusk to dawn, dimming lights by 30% post-curfew will reduce the impact of artificial lighting on the existing fauna and flora in the area;
- The lighting scheme achieves the recommended lux levels in accordance with current regulations and standards;
- The lighting scheme achieves good uniformity throughout the development to ensure good visibility at night;
- The inclusion of baffles/shields on luminaires positioned within the eco-park;
- Co-ordination with the landscape developers will ensure light positions do not clash with tree position, limiting light obstruction and future maintenance costs.

No badger setts will be directly affected by the proposed development, and all setts are at a sufficient distance from all construction works to ensure that they will be unaffected for example by vibration caused by piling or other construction work. The setts, all of which are located to the north of the Phase 2 area along the ridgeline, will be retained intact and undisturbed, with an undeveloped buffer zone, planted where appropriate with thorny shrubs to minimise human disturbance. Nevertheless, should it be required, for example if any new badger setts are recorded within the area proposed for development, any such setts on development lands will be closed and excluded under licence from NPWS. Such works will be undertaken outside the breeding season (that is, outside the period 1st December to 31st June) and will involve appropriate mitigation of any impacts. It is not currently necessary to apply for such a licence.

Any ponds present in the fields to be disturbed will be inspected by a suitably experienced ecologist prior to works being undertaken. Should any frog spawn or tadpoles be discovered, a licence to remove frog spawn may be required from NPWS.

BIO CONST 3: Aquatic Environment and Watercourses

Together with the Construction Management Plan (which has been prepared for both the overall residential development and construction of the bridge linking the phase 1 and Phase 2 lands), as well the Fisheries Protection/Construction Method Statement, the following Best Practice measures, where relevant based on the Irish Fisheries document 'Guidelines on Protection of Fisheries During Construction Works In and Adjacent to Waters' and the CIRIA *Guidelines: Control of Water Pollution from Linear Construction Projects: Technical Guidance (C648)* (CIRIA, 2006) will be adopted:

- Ballyogan Stream and tributaries and the newly constructed storm water systems will be protected from ingress of silt, debris and deleterious material during all phases of construction;
- An appropriately designed silt fence will be installed along the downslope boundary of individual construction areas and the Ecopark and will be regularly maintained and retained in situ for the duration of the construction phase, until such time as all proposed permanent surface water protection measures are installed and operational;
- In addition to the silt fence, geotextile membranes, cut-off drains, temporary cut-off trenches, settlement ponds and hydrocarbon interceptors will also be employed as appropriate;
- Discharge Licences – It will not be permitted to discharge into any newly constructed storm water systems or watercourse without adhering to the conditions of the discharge licence and agreeing the same with the Site Manager and Local Authority Area Engineer;
- Discharge of surface water from the construction site will be via silt/sediment trap and temporary hydrocarbon interceptors and will be monitored to meet any requirements set by the Local Authority/Environmental Protection Agency;
- No discharge will occur where there is a risk of cement or residue in the discharge;
- Concrete Washout – The washing out of concrete trucks on site will not be permitted as they are a potential source of high alkalinity in watercourses. Consequently it is a requirement that all concrete truck washout takes place back in the ready-mix depot;
- Control of spoil and other materials to prevent spillage, and through appropriate handling and selection of spoil/material storage locations;
- No water abstraction from Ballyogan Stream;
- Careful siting and bunding of fuel storage facilities and any areas used for the storage of potentially hazardous materials;
- Appropriate construction techniques will seek to ensure that groundwater seepage into excavated areas does not take place.

The strategy for controlling and mitigating potential adverse environmental during construction will also include the following, as appropriate:

- All site clearance and landscaping works will comply with current legislative requirements and best practice. Trees to be retained, both within the site and on the boundary, will be treated in accordance with British Standard BS5837:2012 *Trees in Relation to Design, Demolition and Construction* – Recommendations, with protective fencing being installed around all trees and hedgerows to be retained, prior to commencement of development;
- If required, sampling and testing of excavated spoil in order to assess the suitability of materials for reuse on site;
- The use of piling systems designed to minimise impacts on the groundwater;
- Dust suppression from soils by the regular use of water sprays during any dry conditions, sheeting of haulage vehicle loads, use of wheel washers;

- the siting of wheel wash facilities will be designed to minimise associated potential safety, health and environmental risks;
- No invasive/noxious weed-type materials have been recorded on site at Clay Farm, however, should any be found, they will be treated as controlled waste and disposed of off-site at a landfill site that is licensed to receive such material;
- The storage of hazardous liquids (fuels and chemicals) will be avoided in so far as is possible. The handling and storage of any potentially hazardous liquids on site will be controlled and best practice guidance such as that published by the EPA, will be followed. Storage tank/container facilities will be appropriately bunded within designated compound areas and sited as far as possible from any watercourse or surface drain;
- If hazardous liquids escape during the works, the bunds and other protective measures will contain the spillage until remedial action, which will be taken as soon as possible;
- Procedures will be drawn up to control all potentially contaminating materials brought on site.

The implementation and effectiveness of these standard best-practice mitigation measures will be inspected and recorded regularly during the construction period and where deficiencies or faults are identified they will be remedied immediately by the contractor.

Operational Phase

BIO OPER 1: Foul Drainage Network

Foul sewage from the completed development will be piped to Shanganagh Wastewater Treatment Works (approximately 2km to the east) for treatment and ultimate discharge to St. George's Channel in the Irish Sea, which, according to information provided by the EPA (<http://gis.epa.ie/Envision/>), is classified as unpolluted.

Shanganagh Wastewater Treatment Works has been upgraded as part of the Shanganagh Bray Wastewater Project, to cater for existing and all projected future catchment development flows. It has the capacity to treat effluent from 186,000 population equivalent with the potential to increase capacity to 248,000 in the future.

The capacity available at Shanganagh Wastewater Treatment Works is sufficient to accommodate the inflow arising from the proposed development at Clay Farm Phase 2, as well as other developments in the area and it will therefore be possible to maintain the unpolluted status of the coastal waters.

BIO OPER 2: Surface Water Drainage Network

The design of the surface water drainage network for the proposed development incorporates a number of SuDS measures, including permeable paving, bio retention, green roofs (which will be applied to over 60% of the area of the apartment blocks) as well as underground storage. After attenuation it is proposed to discharge the storm water runoff from the proposed development via two separate outfalls to Ballyogan Stream. No further mitigation is required.

Monitoring

It is not expected that badger setts or bat roosts will be removed as part of the proposed Clay Farm Phase 2 development. The active badger setts present in the ridgeline to the north of the proposed development area will require monitored protection, in line with the parameters set out in the National Roads Authority's *Guidelines for*

the Treatment of Badgers Prior to the Construction of National Road Schemes (NRA, 2006), for the entire duration of the construction Phase. Should any additional badger setts be discovered within the Phase 2 lands (e.g. that establish at a later stage but prior to construction) it may be necessary to exclude and close these setts, under licence from NPWS. However, to date no such setts have been discovered.

Regular monitoring of all construction works will take place in accordance with the requirements of the Habitat Management Plan (HMP) and Fisheries Protection/Construction Method Statement (Refer to Appendix 5.1).

14.3.5 Landscape and Visual Impact

Construction and Operational Phase

L&V CONST 1: *Protection of Trees and Hedgerows during construction*

Tree and hedgerow protection measures will be provided for all such features to be retained in accordance with BS: 5837:2012: *Trees in relation to design, demolition and construction. Recommendations*. A specific Arboricultural Method Statement shall be prepared for any works required within the root protection area of any tree or hedgerow to be retained. All such measures shall be drafted, erected and maintained in consultation with a qualified Arborist, who shall also supervise any works for which an Arboricultural Method Statement is required.

L&V CONST 2: *Protection of Open Space during construction:*

Proposed open spaces as indicated on BSM Drawing Number 6289-300 shall be fenced off prior to commencement of development. Any works required within fenced off areas shall be subject to a works method statement and to reinstatement proposals. All such measures shall be drafted and maintained in consultation with a qualified Landscape Architect.

L&V CONST 3: *Open Space, Play and Landscape Proposals:*

Details of landscape materials, play and exercise equipment, lighting, seating, planting species, specification and aftercare for open spaces shall be submitted to and agreed with the Planning Authority prior to the commencement of development.

L&V CONST 4: *Phase 1 Ecopark*

Proposals for reinstatement of any areas disturbed within the Phase 1 Ecopark shall be submitted to and agreed with the Planning Authority prior to the commencement of development.

L&V CONST 5: *Planting Plans*

Detailed planting plans for all areas to be taken-in-charge by the Planning Authority shall be submitted to and agreed with the Planning Authority prior to the commencement of development.

L&V OPER 1 : *Maintenance*

All landscape areas to be taken-in-charge by the Planning Authority shall be maintained for a minimum period of 18 months prior to handover to the Planning Authority. Any plants which fail within this 18 month period shall be replaced by the developer.

Monitoring

Monitoring of landscape-related works is an integral aspect of the proposed scheme, this includes monitoring of:

- Tree and hedgerow removal and retention and protection,
- Topsoil stripping and storage,
- Disturbance by site works, services etc.,
- Excavation / alteration of ground levels,
- Landscape build-up; profiling,
- Landscape finishing and implementation,
- planting and grass seeding,
- 18 months aftercare of landscape measures.

All works associated with trees to be removed and retained shall be approved and monitored by a qualified Arborist.

All works associated with soil stripping and movement; landscape build-up and finishing and landscape implementation shall be approved and monitored by a qualified Landscape Architect.

All works associated with the Ecopark shall be approved and monitored by a qualified Ecologist and Landscape Architect.

14.3.6 Land and Soils

Construction Phase

L&S CONST 1:

- Existing topsoil should be retained on site to be used for the proposed development. Topsoil should be stored in an appropriate manner on site for the duration of the construction works and protected for re-use on completion of the main site works.
- Top-soiling and landscaping of the works should take place as soon as finished levels are achieved, in order to reduce weathering and erosion and to retain soil properties.
- The provision of wheel wash facilities close to the site entrance to reduce the deposition of mud, soils and other substances on the surrounding road network.
- The construction phase should be monitored, in particular in relation to the following;
 - Protection of topsoil stockpiled for re-use;
 - Adequate protection from contamination of soils for removal;
 - Cleanliness of adjoining road network;
 - Prevention of oil and petrol spillages;
 - Dust control.
- Where feasible, the extent of excavation works and depths for dwellings and roads should be limited through design to minimize disturbance of the original soil and subsoil formations and to retain soil structure. This will also help to reduce the volumes of backfill and material to be removed off-site.
- Reusable excavated gravels, sands or rock should be retained on-site for backfilling or drainage purposes to reduce the total volume of imported material.
- Excavated materials should be visually assessed for signs of contamination. Should material appear to be contaminated, soil samples should be analysed by an appropriate testing laboratory. Contaminated material should be treated in accordance with the Waste Management Regulations, 1998.

- Excess fill, unsuitable material and suitable material will be removed off-site. Removal should be in accordance with the relevant Waste Management Regulations.
- Oil and fuel stored on site should be stored in designated areas. These areas shall be bunded and should be located away from surface water drainage.
- Refuelling of construction machinery shall be undertaken in designated areas located away from surface water drainage. Spill kits shall be kept in these areas in the event of spillages.
- Hazardous waste shall be dealt with in accordance with the Waste Management (Hazardous Waste) Regulations, 1998.
- All potentially hazardous materials shall be securely stored on site.

Operational

L&S OPERAT 1: The surface water run-off from the development should be collected by an appropriately designed system. This system should ensure that contaminants are removed prior to discharge e.g. via a light liquids separator or by an appropriate treatment train of Sustainable Urban Drainage Systems as outlined in the Greater Dublin Strategic Drainage Study (GDSDS). Any separators and drainage systems should be maintained and operated by the facilities management company (prior to taking in charge by the Local Authority) in accordance with the manufacturers recommendations.

L&S OPERAT 2: All waste generated by the everyday operation of the development should be securely stored within designated collection areas. These should have positive drainage collection systems to collect potential run off. Operational waste should be removed from site using licensed waste management contractors.

Monitoring

Soil removed during the construction phase is to be monitored to maximise potential for re-use on site. Monitoring of any hazardous material stored on-site will form part of the proposed Construction & Waste Management Plan. A dust management/monitoring programme should be implemented during the construction phase of the development. The quantities of topsoil, subsoil and rock removed off site will be recorded

14.3.7 Water

Construction Phase

WT CONST 1: A detailed method statement would be prepared and agreed with the Local Authority prior to any works commencing on the bridge. The method statement would address how to mitigate the risk of contaminating watercourse and to mitigate against any temporary reduction in the flood plain storage due to the construction works.

WT CONST 2: Dewatering measures should only be employed where necessary;

WT CONST 3: Basement excavations should be kept to a minimum to reduce impacts to the groundwater. Undercroft/basement car parks are proposed for each of the apartment blocks to the north to minimise the impact of excavations and levels are set to work with existing ground levels as closely as possible. Two undercroft car parks are proposed under Blocks E8 and E9, which would involve less excavation works than the construction of full depth basement car parks in these locations.

WT CONST 4: In the event of groundwater being encountered during the construction phase, mitigation measures will include dewatering by pumping to an appropriate treatment facility prior to discharge. Other measures would include excluding contaminating materials such as fuels and hydrocarbons from sensitive parts of the site i.e. highly vulnerable groundwater areas.

WT CONST 5: Surface water storage systems will include 'soakaway' type systems where possible e.g. permeable paving, bioretention areas, swales etc to enable ground water recharge, thus replenishing the water table.

WT CONST 6: Mitigation measures should be put in place by the contractor in relation to storage of fuels and other materials and general maintenance of the site.

WT CONST 7: Surface water collecting in excavations should be directed to on-site settlement ponds, where silt removal will be facilitated prior to discharge to the further reduce the possibility of contaminants entering the local water system. Periodic testing of the surface water discharge might also be undertaken.

WT CONST 8: If concrete mixing is carried out on site, the mixing plant should be sited in a designated area with an impervious surface.

WT CONST 9: When it is necessary to store diesel or oil fuels on site, they should be stored in appropriate containers in bunded storage areas.

WT CONST 10: Any hazardous construction materials shall be stored appropriately;

WT CONST 11: Existing surface drainage channels within the lands that serve adjacent lands should be retained to prevent causing increased flooding impacts.

WT CONST 12: Ensure finished road levels direct overland flood water for rainfall events exceeding 1%AEP towards open space areas and the Ballyogan Stream and ensure runoff is retained within the site.

WT CONST 13: In order to reduce the risk of defective or leaking sewers, all new sewers should be laid in accordance with the relevant standards, pressure tested and CCTV surveyed to ascertain any possible defects

WT CONST 14: There is a risk that ground water could become contaminated with lime from cement which subsequently finds its way into the local adjacent watercourses. The measures proposed to be put in place to mitigate any potential damage from the effluent of contaminated ground water would be to create an exclusion zone, as far as reasonably practicable, by the erection of a visible 1.0m high barrier along the watercourse. This will be formed by means of steel road pins, which will be used to support a PVC 'orange' barrier with warning signs appropriately fixed at regular intervals. The signs shall read 'NOTICE – NO DISCHARGE OF ANY KIND IS PERMITTED IN THIS VICINITY OR BEYOND THIS EXCLUSION ZONE'

WT CONST 15: Adjacent watercourses/groundwater need to be protected from sedimentation and erosion due to direct surface water runoff generated onsite during the construction phase. To prevent this from occurring surface water discharge from the site will be managed and controlled for the duration of the construction works until the permanently attenuated surface water drainage system of the proposed site is complete. A temporary positive drainage system shall be installed prior to the commencement of the construction works to collect surface water runoff by the site during construction. A Series of geotextile lined cascading, high level outfall, settling basins will

be installed upstream of the agreed discharge point. This temporary surface water management facility will throttle runoff and allow suspended solids to be settled out and removed before being discharged in a control manner to the agreed outfall. All inlets to the cascading settling basins will be rippapped to prevent scour and erosion in the vicinity of the inlet.

Operational

WT OPERAT 1: The design proposal for the bridge linking the proposed Phase 1 development and the future development of the Phase 2 lands, allows for an increase in the cross sectional area through the bridge by 0.5m² to accommodate the same pre and post-development flows. An outline of the pre and post development flows and bridge design are outlined in the standalone report by DBFL Consulting Engineers entitled '*Hydraulic Analysis of Future Bridge for Phase 2*'.

WT OPERAT 2: Stormwater storage structures and drainage systems should incorporate infiltration to promote the potential for ground water recharge.

WT OPERAT 3: A properly designed surface water system incorporating SuDS and designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) would minimise the overall impact of the development on the existing environment.

WT OPERAT 4: Surface water discharge rates should be limited to existing Greenfield run-off rates to prevent increased flood risk.

WT OPERAT 5: Ensure that the recommendations and mitigation measures outlined in the Site Specific Flood Risk Assessment (SSFRA) by DBFL, are implemented in full.

WT OPERAT 6: All surface water ditches within the development site should be left open where possible. Where ditch systems cross proposed roads, they will be culverted.

WT OPERAT 7: Regular inspection of the hydro-brake, gullies and petrol interceptor will be required to prevent contamination and increased runoff from the site.

WT OPERAT 8: It is envisaged that the development would take place and be occupied over a reasonable time period, and therefore the downstream foul sewerage system (foul sewer network and wastewater treatment facility) would be gradually loaded.

WT OPERAT 9: No remedial works would be required to the existing foul sewerage system after the introduction of development generated flows.

WT OPERAT 10: Water conservation methods such as the use of low flush toilets and grey water reuse should be incorporated into dwellings to reduce water volumes and related treatment and abstraction costs of the development.

Monitoring

All drainage works will be approved by Dun Laoghaire Rathdown County Council, Sanitary Services Division, and will be carried out in accordance with the GDR COP (Greater Dublin Regional Code of Practice for Drainage Works).

Hydrogeology

Although no specific monitoring will be required as part of the proposed development it is envisaged that EPA Monitoring will continue in the area through the life of the development.

It is proposed to carry out baseline water quality monitoring of the Ballyogan Stream prior to the construction stage to ascertain the current Q value of the watercourse. Monitoring of the watercourse would also be carried out during the construction phase of the works ascertain if there is any negative impact on water quality due to the construction works.

Surface Water

The surface water system will be monitored by way of observation of any flooding events if such occur and the establishment of a proper maintenance programme for all sewers / drains / SuDS elements etc.

Foul Sewerage

No specific monitoring measures are required.

Water Supply

On-going water usage within the proposed development will be monitored by bulk water meters at the connections to the public mains and individual dwelling meters where appropriate. The network will be developed as a district metered area (DMA) subject to the requirements of the local authorities. Water usage will be continually monitored to avoid waste, leakage etc. All watermains will be constructed in accordance with Irish Water's Code of Practice for water infrastructure.

14.3.3.8 Air Quality & Climate

Construction Phase

AQ CONST 1: *Air Quality Mitigation Measure*

- Avoid unnecessary vehicle movements and manoeuvring, and limit speeds on site so as to minimise the generation of airborne dust.
- Use of rubble chutes and receptor skips during construction activities.
- During dry periods, dust emissions from heavily trafficked locations (on and off site) will be controlled by spraying surfaces with water and wetting agents.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only.
- Re-suspension in the air of spillages material from trucks entering or leaving the site will be prevented by limiting the speed of vehicles within the site to 10kmh and by use of a mechanical road sweeper.
- The overloading of tipper trucks exiting the site shall not be permitted.

- Aggregates will be transported to and from the site in covered trucks.
- Where the likelihood of windblown fugitive dust emissions is high and during dry weather conditions, dusty site surfaces will be sprayed by a mobile tanker bowser.
- Wetting agents shall be utilised to provide a more effective surface wetting procedure.
- Exhaust emissions from vehicles operating within the construction site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised by routine servicing of vehicles and plant, rather than just following breakdowns; the positioning of exhausts at a height to ensure adequate local dispersal of emissions, the avoidance of engines running unnecessarily and the use of low emission fuels.
- All plant not in operation shall be turned off and idling engines shall not be permitted for excessive periods.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- Material stockpiles containing fine or dusty elements shall be covered with tarpaulins.
- Where drilling or pavement cutting, grinding or similar types of stone finishing operations are taking place, measures to control dust emissions will be used to prevent unnecessary dust emissions by the erection of wind breaks or barriers. All concrete cutting equipment shall be fitted with a water dampening system.
- A programme of air quality monitoring shall be implemented at the site boundaries for the duration of construction phase activities to ensure that the air quality standards relating to dust deposition and PM₁₀ are not exceeded. Where levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented.
- A complaints log shall be maintained by the construction site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

Operational

The Operational Phase of Clay Farm Phase 2 site will not generate air emissions that would have an adverse impact on local ambient air quality or local human health and as such there are no mitigation measures specified for the Operational Phase.

Monitoring

This section describes the dust monitoring methodologies that shall be implemented at the site during the construction phases to ensure that dust generated by site activities does not cause nuisance or cause detrimental health effects to residential areas and sensitive receptors located in the vicinity of the site boundaries.

Dust Deposition Monitoring Methodology

Dust deposition levels will be monitored on a regular basis in order to assess the impact that site construction site activities may have on the local ambient air quality and to demonstrate that the environmental control measures in place at the site are effective in minimising the impact of construction site activities on the local receiving environment including the Stepside Park and Cruagh residential estates, the Ballyogan Stream habitat and Stepside Golfcourse. Dust deposition measurements shall be conducted to determine the potential for dust nuisance or complaint to arise from local residents' adjacent site works areas. The following procedure shall be implemented at the site on commencement of site activities:

The dust deposition rate will be measured by positioning Bergerhoff Dust Deposit Gauges at strategic locations near the boundaries of the site for a period of 30 +-2 days. Monitoring shall be conducted on a quarterly basis during periods when the highest levels of dust are expected to be generated ie, during site preparation works and soil stripping activities. The proposed monitoring locations (D1 – D5) are presented below in Figure 9.3.

The selection of sampling point locations will be completed after consideration of the requirements of *Method VDI 2119* with respect to the location of the samplers relative to obstructions, height above ground and sample collection and analysis procedures. The optimum locations will be determined by a suitably qualified air quality expert to ensure that the dust gauge locations are positioned in order to best determine potential dust deposition in the vicinity of the site boundaries and existing on-site buildings.

After each (30 +-2 days) exposure period, the gauges will be removed from the sampling location, sealed and the dust deposits in each gauge will be determined gravimetrically by an accredited laboratory and expressed as a dust deposition rate in mg/m²-day in accordance with the relevant standards.

Technical monitoring reports detailing all measurement results, methodologies and assessment of results shall be subsequently prepared and maintained by the Site Manager.

A dust deposition limit value of 350 mg/m²-day (measured as per German Standard Method VDI 2119 – Measurement of Particulate Precipitations – Determination of Dust Precipitation with Collecting Pots Made of Glass (Bergerhoff Method) or Plastic. is commonly specified by Local Authorities and by the EPA to ensure that no nuisance effects will result from specified activities and it is to this Best Practice standard method that this programme of dust monitoring and control has been prepared.

The *German Federal Government Technical Instructions on Air Quality Control - TA Luft* specifies an emission value for the protection against significant nuisances or significant disadvantages due to dustfall. This limit value is 350 mg/m²-day and it is to this limit value that all measured dust deposition levels shall be assessed. This limit value is commonly specified by Local Authorities at construction sites.

14.3.3.9 Noise & Vibration

Construction Phase

N&V CONST 1: In order to protect the amenities enjoyed by nearby residents, premises and employees a full Construction Management Plan (including traffic management) should be put in place prior to the commencement of development. This will need to have regard to the mitigation measures set out in Section 10.8.3 of the EIA Report.

Operational

N&V OPERA 1: External noise can enter rooms within dwellings through windows, ventilators, walls, roof and doors. In most cases, however, windows provide the main path and therefore, mitigation by design has focussed on this building element to ensure that their insulation is adequate. All external windows shall be triple glazed acoustically rated window and frames or equivalent double glazing reaching the same level to prevent breakthrough of external noise. In addition, passive air vents on all external walls shall be acoustically rated baffle filters to reduce the breakthrough of external noise.

Acoustic Design requirements for residential buildings

Windows

In order to ensure a sufficient level of sound insulation is provided for all dwellings within the development, the following lists the minimum sound insulation performance of windows and window frame sets in terms of the weighted sound reduction index (R_w):

40dB R_w for Living rooms & Bedrooms

37dB R_w for Kitchen – Dining Rooms.

The acoustic performance specifications detailed are the minimum requirements which shall apply to the overall glazing system when installed on site. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc. All exterior wall and door frames should be sealed tight to the exterior wall construction.

Ventilation Systems

The ventilation strategy for the development will be in accordance with Part F of the Building Regulations and will be finalised at the detailed design stage. BS 8233 notes that where openable windows cannot be relied upon for ventilation, sound attenuating trickle ventilators or attenuated acoustic ventilation units are available for insertion in external walls. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice. Options which will be considered in order to achieve compliance with background ventilation requirements will be adjustable hit and miss acoustic ventilators or trickle vents built into the façade or window frames respectively.

Wall Constructions

The wall construction typically provides the highest level of sound insulation performance to a residential building. The residential dwellings will be built using either masonry or a timber framed construction. The minimum sound insulation performance of the chosen wall construction will be 55dB R_w .

Roof Construction

The insulated roof constructions proposed across the site will provide an adequate level of sound insulation to the properties within the development site. A minimum sound insulation value of 40dB R_w should be used for roof spaces. This can nominally be achieved using tiled pitched roof with 100mm acoustic insulation and plasterboard ceiling.

Monitoring

This section describes the noise and vibration monitoring methodologies that shall be implemented at the site to ensure that construction site activities do not cause excessive nuisance or cause cosmetic or structural damage to properties in the vicinity of the site.

Proposed Noise Monitoring Programme During Site Construction

On commencement of the site construction activities, routine noise monitoring shall be conducted in the vicinity of the site to assess the impact that site activities may have on local external noise levels and on ambient noise levels on local receptors.

It is proposed to conduct routine noise monitoring surveys to establish the noise impacts of site activities at the closest receptors to the site (baseline monitoring locations) and to ensure that control measures are implemented if elevated noise levels are recorded.

All noise monitoring data will be compiled into a technical monitoring report which will include a full assessment of the potential noise impacts arising from site construction activities.

The environmental noise measurements will be completed in accordance with the requirements of *ISO 1996: Acoustics – description and measurement of environmental noise*. The measurement parameters to be recorded include wind speed, temperature, L_{Aeq} , L_{A90} , L_{A10} and L_{Amax} .

Noise Monitoring Locations

The monitoring locations selected for the noise monitoring survey will be at residential noise sensitive receptors adjacent to the site boundaries and as identified in the baseline noise assessment..

Proposed Vibration Monitoring Programme During Site Construction

In order to ensure that site construction activities are conducted to minimise the vibration impacts on the receiving environment, it is proposed that structural vibration monitoring may be implemented during the course of the construction phase if and as required.. It is proposed that vibration monitoring will be conducted at adjacent properties opposite the site boundaries as required using calibrated vibration monitors and geophones and that audible and visual alarm units may be installed to ensure that if vibration levels approach or exceed specified warning and limit values, site personnel will be alerted to cease at the earliest instance and appropriate mitigation measures may then be implemented to minimise the vibrational impacts of protected structures.

Vibration Monitoring Locations

The monitoring points chosen for locating the geophone of the vibration measuring instrument will be chosen according to the guidelines in British Standard *BS 7385: Evaluation and measurement for vibration in buildings, Part1 1990 Guide for measurement of vibrations and evaluation of their effects on buildings* and *Part 2 1993 Guide to damage levels arising from groundborne vibration*.

14.3.10 Wind

Construction Phase

WD CONST 1: The positioning of entrances and walkways away from the corners of apartment blocks and, in particular, where the apartment block is exposed to northwesterly and southeasterly winds;

WD CONST 2: Where high wind speeds at the corners of a building are unavoidable, the provision of substantial planting or windbreaks are recommended to reduce their impact. In addition, consideration should be given to redirecting walkways, where appropriate;

WD CONST 3: Use landscape techniques to maintain ground roughness in any open parts of the site, and to provide local wind shelter for buildings and open spaces; earth mounding, trees, bushes, fences and open or porous walls can all contribute. Mature trees with open space around their trunks may need extra, low-level

planting to avoid channelling wind at ground level. The mature clumps of trees around the edge of the site will also be beneficial at sheltering the development from the wind;

WD CONST 4: While winter gardens and recessed balconies are most effective at sheltering occupants from the wind. The provision of 1.8m high pervious wind screens or shielding on balcony sides to provide shelter against the wind and, in particular, where balconies are situated near building corners. It should be noted wind screens will be ineffective where balconies extend around the corner of the building. In the development, there are no balconies that extend around corners.

Operational Phase

Not applicable.

Monitoring

The building heights are relatively low level ranging from 2 storeys to 6 storeys across the Clay Farm site. The taller buildings are built into the escarpment such that overall the buildings are a similar height across the development. It is anticipated that the development will be constructed using conventional methods. It is recommended that the local weather conditions should be reviewed routinely, particularly for construction works carried out at a height. It is not considered necessary to undertake any formal wind speed and direction monitoring on site during the construction or operational phases.

14.3.11 Material Assets

Construction Phase

MA CONST 1: The proposed development should comply with the provisions of the Construction and Operational Waste Management Plan with respect to construction waste.

MA CONST 2: A construction management plan, including traffic management, should be implemented by the contractor for the construction stage to protect local amenities and the integrity and operation of the local road network during the construction phase.

MA CONST 3: Provision of utilities should be carried out in accordance with the recommendations of the relevant statutory bodies (ESB, Gas Networks Ireland, Irish Water, Eircom, DLRCC etc.)

MA CONST 4: Water Metering should be included in each unit to record consumption;

Operational Phase

Not applicable.

Monitoring

Monitoring measures will be in accordance with provisions outlined elsewhere in this EIAR document.