16. SUMMARY OF MITIGATION MEASURES

For ease of reference and clarity, all mitigation measures contained in this EIAR have been summarised below. All measures included below form part of the proposed development and will be implemented in full.

16.1 Population & Human Health

Character of potential impact	Mitigation measure
Construction Phase	
Potential Impacts on Residential Amenity	• A construction management plan will be prepared to minimise impacts on adjacent residents. • A construction traffic management plan will be prepared to mitigate against any potential traffic delays and then facilitate the existing patterns of vehicular movement. • The mitigation measures in relation to construction, traffic, noise, air quality and landscaping as set out in this EIS will be carried out in full to minimise impacts on adjacent residencies.
Operational Phase	
Potential Impacts on Residential Amenity	The mitigation measures relating to the operation phase of the development concerning traffic, transport, noise, vibration, water, air and dust quality and landscaping as set out in this EIAR will be carried out in full to minimise impacts on adjacent residents, the university, and human health

16.2 Soils & Geology

Character of potential impact	Mitigation measure
Construction Phase	
Stripping of topsoil may expose underlying subsoil layers to the effects of weather and construction traffic and may result in subsoil erosion and generation of sediment laden runoff	A site-specific Construction & Environmental Management Plan will be developed and implemented during the construction phase. Implementation of the measures outlined in this plan will ensure that the potential impacts of the proposed development do not occur during the construction phase.
Rutting and deterioration of the topsoil layer exposing subsoil layers	
Accidental spills and leaks may result in contamination of the soils underlying the site.	
Surface water runoff during the construction phase may contain increased silt levels	
Operational Phase	

No impacts envisaged during operational phase	

16.3 Water: Hydrogeology & Hydrology

Character of potential impact	Mitigation measure
Construction Phase	
Surface water runoff during the construction phase may contain increased silt levels or become polluted by construction activities Discharge of rain water pumped from excavations may also contain increased silt levels Accidental spills and leaks associated with storage of oils and fuels, leaks from construction machinery Concrete runoff, particularly discharge of wash water from concrete trucks Cross contamination of potable water supply to construction compound Improper discharge of foul drainage from contractor's compound	• A site-specific Construction & Environmental Management Plan will be developed and implemented during the construction phase. Implementation of the measures outlined in this plan will ensure that the potential impacts of the proposed development do not occur during the construction phase. • Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to on-site settlement ponds where measures will be implemented to capture and treat sediment laden runoff prior to discharge of surface water at a controlled rate. • Weather conditions and typical seasonal weather variations will be taken account of when planning stripping of topsoil and excavations. • All oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area. Refuelling and servicing of construction machinery will take place in a designated hardstand area which is also remote from any surface water inlets (where not possible to carry out such activities off site). • Concrete batching will take place off site and wash down and wash out of concrete trucks will take place off site. • Discharge from any vehicle wheel wash areas will be directed to on-site settlement ponds. • The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply. Foul drainage discharge from the construction compound will be tankered off site to a licensed facility until a connection to the public foul drainage network has been established. • The construction compound's potable water supply will be protected from contamination by

	construction activities or materials.
Operational Phase	
Increased impermeable surface area will reduce local ground water recharge and potentially increase surface water runoff	As surface water drainage design will be carried out in accordance with the GDSDS and SuDS methodologies and implemented as part of a treatment train approach, there are no predicted impacts arising from the operational phase.
Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network	
Increased discharge to foul drainage network	
Increased potable water consumption	

16.4 Noise & Vibration

Character of potential impact	Mitigation measure
Construction Phase	
Noise	• In accordance with best practicable means, plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose • Avoid unnecessary revving of engines and switch off equipment when not required • Keep internal haul routes well maintained and avoid steep gradients • Use rubber linings in chutes and dumpers • Minimise drop height of materials • Start-up plant and vehicles sequentially • Where required, improved sound reduction methods, e.g. enclosures will be used • Site equipment will be located away from noise sensitive areas, as much as is feasible • Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery • Limit noisy construction works to 8am to 6pm weekdays with Saturday working from 8am to 1pm unless otherwise agreed with the local authority • Maintain ongoing contact with local residents to ensure complaints relating to construction phase noise can be addressed. Prior to any particularly noisy activities, local residents will be contacted

	• Monitoring typical levels of noise and vibration during critical periods and at sensitive locations • A Noise and Vibration Management Plan (NVMP) will be formulated which will deal specifically with onsite activities in a strategic manner to remove or reduce significant noise and vibration impacts associated with the construction works. • Construction site hoarding along noise sensitive boundaries
Operational Phase	
No significant impacts	No mitigation measures required.

16.5 Air, Dust & Climatic Factors

Character of potential impact	Mitigation measure
Construction Phase	
Dust deposition	• A Dust Management Plan will be formulated for the construction phase of the project. • A monitoring programme will be implemented • Roadways will be hard-standing wherever possible to minimise dust emissions • The construction compound area will have hard standing areas to minimise dust generation from wind-blow • Fixed and mobile water sprays will be used to control dust emissions • A daily inspection programme will be formulated and implemented in order to ensure that dust control measures are inspected to verify effective operation and management • Activities with potential for significant emissions will be located as far as possible from the nearest residential and commercial receptors where possible
Operational Phase	
Not significant	No mitigation measures required.

16.6 Biodiversity

Character of potential impact	Mitigation measure
Construction Phase	
Loss of habitat and Green Infrastructure	To offset the loss of higher significance hedgerow and treelines it is proposed to create new, biodiversity planting within areas of public open space and along both margins of the new link road. This is estimated to be 500m long and ~6m wide in total, providing a total area of new habitat of 3,000m2. The species to be planted include a wide range of native trees and shrubs while the maintenance plan is intended involve minimal interference – i.e. no use of herbicide sprays, no cutting or mowing - effectively allowing for new linear woodlands to emerge. This planting will effectively create a new biodiversity corridor which will provide connectivity for the species which are currently recorded in this location. While this woodland will take time to mature it will ultimately compensate for the loss of hedgerows and green infrastructure arising from the development.
Mortality to animals during construction	The removal of hedgerows or scrub should not take place from March to August inclusive as per the Wildlife Act. If this is unavoidable then vegetation subject to removal must first be inspected for signs of breeding birds. It is an offence to destroy or interfere with a bird's nest or eggs. If no nesting is occurring then vegetation can be removed within 48 hours. If nesting is found then vegetation can only be destroyed under licence from the NPWS. The buildings shall be checked for bats immediately prior to demolition by a bat specialist. If bats are found at this stage, a derogation must be sought from NPWS with any additional mitigation requirements. If bats are not found at this point but are found at any stage of the building work, NPWS must be contacted and any work that may affect bats (demolition, scaffolding etc.) must be halted until an agreed strategy with NPWS is in place. Work that would NOT affect bats must be agreed with a bat specialist as many operations that would not be considered harmful may have unexpected

Character of potential impact	Mitigation measure
	consequences.
Damage to hedgerows during the construction phase	To avoid this the developer will follow the guidance from the National Roads Authority in establishing root protection areas (RPA) along hedgerows to be retained. The NRA gives the following equation for calculating the root protection area (RPA) (NRA, unknown year): RPA(m2) = π(stem diameter mm 12)/1,000) x2 The RPA gives the area around which there should be no disturbance or compaction of soil. This will be calculated for the largest tree within each hedgerow. Prior to construction this area will be clearly labelled 'sensitive ecological zone', fenced off with durable materials and instruction given to construction personnel not to disturb this buffer zone. As a rule of thumb this buffer zone should extend at least to the canopy of the trees concerned.
Pollution to water courses	Although significant effects to freshwater courses are not predicted it is nevertheless appropriate that best site management practices will be in place to minimise pollution to the greatest degree feasible. As such, guidelines from Inland Fisheries Ireland (IFI, 2016) will be followed. This includes designating storage areas for dangerous substances (oils, fuels etc.) and ensuring that only silt-free run-off enters water courses. To this end, appropriately sized silt traps will be employed. These measures will be given in greater detail in a Construction Management Plan.
Operational Phase	
Impacts to species through the disruption of ecological corridors/green infrastructure	Lighting on the site will conform to Bat Conservation Ireland's guidance for minimising impacts to bats from artificial lighting (BCI, 2010). This will include minimising light spatially and temporally and avoiding the use of high pressure sodium or metal halide bulbs. The increasing use of LED lighting has energy-saving benefits but uncertain impacts to bats.
Pollution of water from surface water run-off	Various SUDS features have been incorporated into the proposed development as part of the sustainable urban drainage design. A new surface

Character of potential impact	Mitigation measure
	water network will be constructed and this will outfall to the Gollymochy Stream to the north-east of the site. This outfall will pass along rural roads and will not cross areas of semi-natural habitat. Run-off is to be attenuated in underground storage tanks prior to controlled release via an oil/grit interceptor. Permeable paving will reduce volumes entering this system.
Disturbance to species from increased human activity	• Lighting on the site will conform to Bat Conservation Ireland's guidance for minimising impacts to bats from artificial lighting (BCI, 2010). This will include minimising light spatially and temporally and avoiding the use of high-pressure sodium or metal halide bulbs. • Planned planting will include many species attractive to wildlife, and will provide new foraging habitat for bats
Creation of landscaped areas including areas of open space and landscaping of the road margin consisting of native species and non-native species	Alien and invasive species will be avoided in the creation of open areas and landscaping.

16.7 Landscape & Visual Impact Assessment

Character of potential impact	Mitigation measure
Construction Phase	
Existing trees and hedgerows will be removed as well as the removal of grass and vegetation to facilitate construction works	• Site engineering, drainage, ducts and other infrastructure has been designed to minimise impact. Replacement planting is proposed as part of the landscape plans • Protect trees to be retained, fell adjacent trees to be removed and grind out stumps • Implement tree protection measures for trees to be retained before any demolition or construction works proceed • Where required strip and store topsoil • Install proposed replacement and additional proposed planting and seeded areas • Maintain the character of the site by installing proposed planting in accordance with the proposed landscape plans • Install approximately 4000sqm of new habitat along

Character of potential impact	Mitigation measure
	the proposed R403-R407 Link Distributor Road
Site hoarding and temporary structures required for construction	Maintain restricted views of the site by installing proposed planting in accordance with the proposed landscape plans
Operational Phase	
Potential impact if landscape is not maintained appropriately in accordance with horticultural best practice	• Maintain and manage proposed specimen tree planting to ensure that it matures to match existing trees on site. • Site will be monitored regularly for signs of invasive species.
The Proposed Development does not constitute a visual obstruction, but will be a visual intrusion for some views	• Maintain all existing and proposed vegetation to ensure that sight lines are retained across the site; • Maintain and manage proposed specimen tree planting to ensure that it matures to match existing trees on site • Install replacement planting for any plants that fail during the 18-month maintenance and defects liability period

16.8 Material Assets: Traffic & Transport

Character of potential impact	Mitigation measure
Construction Phase	
Increased number of vehicles on the road network due to any construction traffic entering and leaving the site throughout the construction phase.	• A site-specific Construction & Environmental Management Plan will be developed and implemented during the construction phase. Implementation of the measures outlined in this plan will ensure that Construction traffic enters and leaves the site outside of peak hour times, preventing any potential increase in Peak Hour traffic that may be caused by the construction phase. • All construction related parking will be provided on-site
Operational Phase	
Increased Vehicular traffic is expected as a by-product of the proposed residential development in the operational phase, as	• Parking provisions for apartments have been provided at a rate less than those outlined in Kildare County Council's Development Plan (2017-2023),

Character of potential impact	Mitigation measure
residents are expected to make trips where required.	with dedicated pedestrian and cycle facilities proposed to provide permeability, safety and connectivity whilst supplementing vehicular trips for short to intermediate vehicles. • Cycle parking has been provided at a rate which exceeds Kildare County Development Plan (2017-2023) minimum standards • Junction upgrade works provide a roundabout as part of the Link Road which helps supplement any potential capacity issues that may arise between the R407 regional road and the proposed link road. • Development traffic will be accommodated by two purposed access junctions onto the neighbouring road network; a priority-controlled junction with R403 and a new roundabout junction with Capdoo L5078 local road and R407 College Road • The provision of dedicated pedestrian and cycle facilities acts to encourage the uptake of more sustainable modes of transport for short to intermediate journeys, thus reducing the reliance on private cars.

16.9 Water: Water Supply, Drainage & Utilities

Character of potential impact	Mitigation measure
Construction Phase	
• Surface water runoff during the construction phase may contain increased silt levels • Improper discharge of foul drainage from contractor's compound • Cross contamination of potable water supply to construction compound	A site-specific Construction & Environmental Management Plan will be developed and implemented during the construction phase. Implementation of the measures outlined in this plan will ensure that the potential impacts of the proposed development do not occur during the construction phase.
Relocation or diversions to existing overhead ESB lines may lead to loss of connectivity to and / or interruption of supply from the electrical grid.	Relocation of existing overhead ESB lines will be fully coordinated with ESB Networks to ensure interruption to the existing power network is minimised (e.g. agreeing power outage to facilitate relocation of cables). Ducting and / or poles along the proposed relocated route will be constructed and ready for rerouting of cables in advance of

	decommissioning of existing overhead power lines.
Potential loss of connection to the Gas Networks Ireland and Telecommunications infrastructure while carrying out works to provide service connections.	Similarly, connections to the existing gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.
Operational Phase	
Increased impermeable surface area will reduce local ground water recharge and potentially increase surface water runoff	As surface water drainage design will be carried out in accordance with the GDSDS and SuDS methodologies and implemented as part of a treatment train approach, there are no predicted impacts arising from the operational phase.
Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network	
Increased discharge to foul drainage network	
Increased potable water consumption	

16.10 Cultural Heritage & Archaeology

Character of potential impact	Mitigation measure
Construction Phase	
Impact on potential unidentified archaeological feature	This is a very large green field site within an area of low to moderate archaeological potential. No features of archaeological interest were identified; however the site is a large area on the edge of Clane and has the potential to contain previously unknown archaeology, topsoil stripping will be monitored by a suitably qualified archaeologist.
Operational Phase	
No significant impacts	No mitigation measures required.
NOTE: All mitigation measures expressed in respect of Archaeology are subject to the approval of The Department of Arts, Heritage Regional, Rural and Gaeltacht Affairs (DAHRRG) and the relevant local authorities. As the statutory body responsible for the protection of Ireland's archaeological and cultural heritage resource, the DAHRRG may issue alternative or additional recommendations.	