14.0 PRINCIPAL MITIGATION AND 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 was prepared by John Spain Associates Planning and Development Consultants and sets out a summary of the range of methods described within the individual chapters of the EIAR which are proposed as mitigation and for monitoring. It is intended that this chapter of the EIAR 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, 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.

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.

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).

14.2.4 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

A list of the mitigation and monitoring measures recommended in each chapter of the EIAR is provided below for ease of reference.

14.3.1 Project Description and Alternatives

Construction Phase

PDA CONST 1:	No development works (including demolition) shall take place outside the hours of 7am to 6pm Mondays to Fridays, and 8am to 2pm on Saturdays without the prior agreement of Kildare County Council.
PDA CONST 2:	No development works shall take place before a construction and demolition environmental management plan has been prepared by the relevant appointed contractor(s) and approved by Kildare County Council. The purpose of the plan shall be to ensure that all adverse environmental effects of construction are avoided or minimised. The approved construction and demolition environmental management plan shall be implemented and adhered to at all times by relevant contractor(s) and subcontractors unless otherwise agreed with Kildare County Council.

PDA CONST 3:	No development works shall take place before a construction traffic management plan has been prepared by the relevant appointed contractor(s) and approved by Kildare County Council. The purpose of the plan shall be to ensure the safe and smooth operation of the local road network and it shall be reviewed periodically to ensure its efficacy. The approved construction traffic management plan shall be implemented and adhered to at all times by relevant contractor(s) and subcontractors unless otherwise agreed with Kildare County Council

PDA CONST 4:	No development works shall take place before a construction and demolition waste management plan has been prepared by the relevant appointed contractor(s) and approved by Kildare County Council. The purpose of the plan shall be to ensure that best practice is followed in terms of waste management during demolition and construction, and to ensure that all adverse effects on the receiving environment, including local residents and future occupants of the proposed development, are avoided or minimised. The approved construction and demolition waste management plan shall be implemented and adhered to at all times by relevant appointed contractor(s) and subcontractors unless otherwise agreed with Kildare County Council.

Operational Phase

Not applicable.

Monitoring

Not applicable.

14.3.2 Population and Human Health

Construction Phase

A range of construction-related mitigation measures are proposed throughout this EIAR with reference to the various environmental topics examined and the inter-relationships between each topic. These measures are likely to result in any adverse effects on population and human health during the construction phase being avoided or suitably mitigated.

Operational Phase

The operational phase of development is anticipated to have positive effects on population and human health, particularly in relation to the provision of housing and high quality open space to cater for the demands of a growing population in accordance with the zoning objective pertaining to the site.

Monitoring

Not applicable.

14.3.3 Archaeology and Cultural Heritage

Pre-Construction

ACH PRE-CONST 1:	No development works shall take place before a programme of archaeological testing has been undertaken in the former garden area at the Officers' Mess in the vicinity of the former pump / sewage tank associated with the former hospital, in order to identify whether this location might have been used for burial purposes. This work should be carried out under the terms of an excavation licence issued by the DCHG.
ACH PRE-CONST 2:	Although no permanent structures were erected within Field 1, the presence of temporary enclosures / structures during the later 19th century and agricultural activities will have resulted in some disturbance. This is likely to have decreased the level of archaeological potential and would also affect the results of a geophysical survey. That said, the level of disturbance here may have been to a lesser extent than elsewhere in the Phase 1 development site. No development works in Field 1 shall therefore take place before a programme of archaeological testing has been undertaken within Field 1 to identify any previously unknown archaeological features or deposits that may survive (albeit truncated) below ground in this area. This work should be carried out under the terms of an excavation licence issued by the DCHG.
ACH PRE-CONST 3:	No development works shall take place before a programme of archaeological monitoring has been undertaken at the location of the former Lock Hospital to identify and record the surviving foundations.
ACH PRE-CONST 4:	No development works shall take place before a programme of archaeological monitoring has been undertaken in the former parade ground, with a view to establishing the date and function of the network and channels identified there. This monitoring should be carried out by an archaeologist with specialist knowledge of military / industrial archaeology.
ACH PRE-CONST 5:	No development works shall take place before a programme of archaeological monitoring has been undertaken at the site of the former gravel pit associated with the hospital, in order to identify (if possible in this disturbed location) whether this area might have been used for burial purposes.

In the event that archaeological remains are discovered during the monitoring, the National Monuments Service of the DCHG and the National Museum of Ireland will be informed and all construction works will cease in the vicinity of the remains and the area will be fenced off until a licensed archaeologist has resolved the archaeological issues in consultation with DCHG, who will advise on any remedial action it considers appropriate. The resolution of archaeological features involves the detailed recording (through drawings, photographs and written descriptions) and excavation by hand of archaeological materials and finds by a licensed archaeologist. The results are compiled in a report in accordance with national monuments legislation and submitted to DCHG who will advise on any further remedial action it considers appropriate.

The attention of the developer is drawn to the relevant parts of the National Monuments Acts (Appendix 4.1) which describe the responsibility of the site owners to report the finding of archaeological items if any should be discovered during construction works. The developer will also ensure that adequate provision is made to fund any archaeological work required.

Construction Phase

All archaeological and cultural heritage impact issues will be resolved at the pre-construction stage of the development.

Operational Phase

Not applicable.

Monitoring

There will be no requirement for monitoring post-construction. All physical archaeological and cultural heritage impact issues will be resolved at the pre-construction stage of the development and therefore no potential impacts are envisioned at the operation stage of the development.

14.3.4 Architectural Heritage

The proposed development will include the following design and landscaping features designed to reflect and increase awareness of the site's military heritage:

- The water tower clock is to be retained, refurbished and incorporated into the proposed Magee Square, which is located at the site entrance and the first element of the redevelopment which will provide an acknowledgement of the military history of the site through design, landscaping and interpretative measures;
- Parade Park, one of the proposed public open spaces, will be laid out in a formal manner, surrounded by proposed housing, and is located within part of the former parade ground;
- A dedicated exhibition / gallery space is proposed within the café unit proposed within the neighbourhood centre;
- A series of landscaping and design measures are incorporated to reflect the military history of the site. The detail of street furniture / hard and soft landscaped areas is proposed so as to evoke the memory / site heritage of the former barracks. Prefabricated metal panels modelled on former site gates are proposed for the entrance to Parade Park and boundary treatments also reflect the former use in various locations;
- All of the proposed street and place names reference people and places associated with the site's history;
- The architectural detailing and design reflects the existing buildings on site, and the site layout is arranged in a formal pattern to further reflect the former use; and
- A detailed photographic survey of all buildings to be demolished will be undertaken and it is proposed that the concrete, brick and stone of the existing structures be reused in the proposed development to evoke the memory of the historical built form. See Appendix 5.1 and the demolition drawings for details of the existing buildings to be demolished.

The following specific mitigation measures are recommended during the construction and operational stages.

Construction Phase

AH CONST 1:	The refurbishment and re-use of the water tower clock to be under the supervision of a conservation architect.
AH CONST 2:	All street furniture / landscaping features relating to military heritage to be agreed with KCC prior to construction.
AH CONST 3:	No demolition works shall take place until a survey of buildings aiming to identify material for reuse in the proposed development has been undertaken and approved by KCC.

Operational Phase

AH OPER 1:	Details of permanent exhibition relating to Magee Barracks within the gallery space to be agreed with KCC prior to commissioning.
AH OPER 2:	Street and open space names reflecting military heritage to be agreed with KCC

Monitoring

Not applicable.

14.3.5 Biodiversity

Pre-Construction

BIO PRE-CONST 1:	Where it is intended to retain trees and hedgerows within the development, trees to be retained shall be treated in accordance with British Standard BS5837:2012 *Trees in Relation to Design, Demolition and Construction' – Recommendations*, with protective fencing being installed prior to commencement of development.
BIO PRE-CONST 2:	Where practicable, the removal of trees and other features suitable for use by nesting birds shall 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 shall be undertaken by suitably experienced ecologists. If no active nests are recorded, vegetation clearance shall take place within 24 hours. In the event that active nests are observed, an appropriately sized buffer zone shall be maintained around the nest until such time as all the eggs have hatched and the birds have fledged. Once it is confirmed that the birds have fledged and no further nests have been built or occupied, vegetation clearance may take place.
BIO PRE-CONST 3:	Bat roosts have not been recorded at the Magee Barracks site 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, in line with good practice, no demolition or mature tree removal shall take place before the buildings and any mature trees on site scheduled for removal are first surveyed by a qualified bat specialist for the presence of bats. Any ivy-covered trees which require felling shall be left to lie for 24 hours after cutting to allow any bats beneath cover to escape. Trees with potential for bat roosting, i.e. those showing cavities, shall 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.

Construction Phase

All relevant biodiversity impact issues will be resolved at the pre-construction stage of the development. All site clearance and landscaping works will comply with current legislative requirements and best practice and ensure that no invasive species are introduced to the site.

Operational Phase

BIO OPER 1:	The planting proposed for the development shall, if appropriate given the site characteristics, comprise a mix of native trees and shrubs. The planting will also incorporate a range of species that will attract feeding invertebrates, including moths, butterflies and bees. It will take account of and implement the relevant objectives of the All-Ireland Pollinator Plan 2015-2020
BIO OPER 2:	All new lighting for the proposed development shall be designed and constructed taking account of the recommendations of Bat Conservation Ireland (2010). The lighting scheme for the proposed development shall adhere to the following lighting design characteristics: • The minimum level of appropriate / required lighting level will be provided within the developed / residential areas; • Light standards will be fitted with low intensity, horizontal cut-off LED light fittings employing a narrow directional light or cowled light. This will avoid the effect of light spill arising; • Light standards and associated lighting will be directed away from areas of open space; and • No floodlighting will be used in the development.
BIO OPER 3:	A total of 9 bat boxes (such as Schwegler 2F) shall be erected on mature trees to be retained as part of the Phase 1 and 2 development proposals, with advice from an experienced bat specialist.

Over time, the proposed planting will provide additional habitat of benefit to bats and birds that will continue to use the site. Details of proposed planting are included in the landscape drawings that accompany the planning application.

Monitoring

The bat boxes installed on the site will be checked annually for a period of five years post construction, to ensure that they continue to be accessible to bats.

14.3.6 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 Aboricultural 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 Aboricultural Method Statement is required.

L&V CONST 2 ***(Protection of Open Space during construction):***
Proposed open spaces 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 (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 monitoring includes:

- Tree and hedgerow removal (generally in accordance with BS 3998:2010 & BS 5837:2012);
- Tree and hedgerow retention and protection (generally in in accordance with BS 5837:2012);
- Invasive weed management and treatment (in accordance with the Invasive Species Management Plans provided at Appendix 6.1 of this EIAR)
- Topsoil stripping and storage (generally in in accordance with BS 3882:2015);
- Excavation / alteration of ground levels,
- Landscape build-up; profiling (generally in accordance with BS 4428:1989);
- Landscape finishing and implementation (generally in accordance with BS 4428:1989);

- Planting and grass seeding (generally in accordance with BS 4428:1989);
- All landscape areas to be taken-in-charge by the Planning Authority shall be maintained for a minimum period of 18 months (generally in accordance with appropriate sub-sections of BS 7370) prior to handover to the Planning Authority. Any plants which fail within this 18 month period shall be replaced by the developer.

Soil management and planting will be monitored in accordance with appropriate standards and good horticultural practice. All topsoil stripped from the site area during the construction period will be stored in stockpiles not exceeding 3m in height. Topsoil and subsoil shall be stored separately and soils will only be handled during dry weather.

All tree and shrub planting will be monitored during the defects period and any plant failures will be replaced. Areas of lawn that do not establish will be over-seeded.

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.

14.3.7 Land and Soils

Pre-Construction

LS PRE-CONST 1:	Where feasible, the extent of excavation works and depths for dwellings and roads shall be limited through design to minimise 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.
LS PRE-CONST 2:	No development works shall take place before a geophysical survey of areas of the site where buried ordnances may have been deposited has been undertaken. Any potential detections will followed by an environmental site investigation, risk assessment and the implementation of a remediation program. All such works shall be undertaken in consultation with Kildare County Council and validation of any remedial works required shall be provided to the Council prior to the commencement of development works.
LS PRE-CONST 3:	A detailed asbestos survey shall be undertaken within existing above ground structures and any asbestos identified shall be appropriately removed for off-site disposal by a licensed asbestos removal contractor and validation of the removal certified prior to the commencement of site demolition works.
LS PRE-CONST 4:	A number of potential sources of buried waste / contamination were identified that warrant further investigation prior to the commencement of development works. These include a former gravel pit, a former well, earthen embankments containing construction and demolition waste material and former fuel and artillery storage areas. In addition, asbestos within the existing made ground

	material across much of the site must be considered a possibility without more detailed site investigation information. These areas shall be investigated prior to the commencement of development works and suitable mitigation measures (including special environmental and human health contingency plans and procedures, following best-practice guidance) for the unexpected discovery of contaminated land or illegally deposited waste materials shall be developed and implemented as part of a detailed risk assessment under the direction of a contaminated land consultant / hydrogeologist.
LS PRE-CONST 5:	No development works shall take place before a site investigation programme has been carried out to assess identified potential sources of land contamination. Investigations shall include further trail pitting, borehole drilling and soil and water sampling.
LS PRE-CONST 6:	No development works shall take place before a soil sampling exercise has been undertaken in relation to areas where soils are to be excavated for off-site disposal. The soils shall be appropriately tested and classified in accordance with best practice and waste management legislation.
LS PRE-CONST 7:	Detailed plans to deal with the possibility of encountering contaminated land / materials during construction shall be developed and included within an overall Construction Environmental Management Plan (CEMP) to be approved in advance of the commencement of development works by Kildare County Council. In the event that contamination is encountered, the approved plans shall be adhered to at all times by relevant contractors and subcontractors.
LS PRE-CONST 8:	Monitoring prior to, during and post construction works of groundwater quality shall be undertaken to ensure minimum disturbance of water quality in the general vicinity of the site. During the construction phase, the monitoring programme shall include daily checks, weekly inspections and monthly audits to ensure compliance with the Construction and Demolition Waste Management Plan (CDWMP) and the CEMP. This shall be undertaken in consultation with Kildare County Council.

Construction Phase

LS CONST 1:	Suitable runoff and sediment control measures shall be designed and implemented prior to and during construction activities. These control measures depend upon weather conditions, site characteristics and construction activities and will ensure protection to the underlying subsoils and groundwater aquifer. Discharges or runoff to any surface water body are not anticipated as there are no surface water features present at or in close proximity to the site.
LS CONST 2:	Adequate security measures shall be installed on the construction site. Early assessment of sensitivities and risks will assist in the design of the site layout and security measures required. Security measures shall include secure fencing,

	secure site access, securing plant and equipment, secure storage of materials, sufficient warning signage and security lighting.
LS CONST 3:	Wheel wash facilities shall be provided close to the site entrance to reduce the deposition of mud, soils and other substances on the surrounding road network.
LS CONST 4:	Waste fuels and materials shall be stored in designated areas that are isolated from surface water drains or open waters (e.g. excavations). Skips shall be closed or covered to prevent materials being blown or washed away and to reduce the likelihood of contaminated water leakage. Hazardous wastes such as waste oil, chemicals and preservatives, shall be stored in sealed containers and kept separate from other waste materials while awaiting collection by a registered waste carrier. Fuelling, lubrication and storage areas and site offices shall not be located within 25m of drainage ditches, surface waters or open excavations. Fuel interceptor tanks shall be installed on the site to treat any runoff.
LS CONST 5:	All waste containers (including all ancillary equipment such as vent pipes and refuelling hoses) shall be stored within a secondary containment system (e.g. a bund for static tanks or a drip tray for mobile stores and drums). The bunds shall be capable of storing 110% of the tank capacity. Where more than one tank is stored, the bund shall be capable of holding 110% of the largest tank or 25% of the aggregate capacity (whichever is greater). Drip trays used for drum storage shall be capable of holding at least 25% of the drum capacity. Where more than one drum is stored the drip tray shall be capable of holding 25% of the aggregate capacity of the drums stored. Spill kits shall be kept in these areas in the event of spillages.
LS CONST 6:	All construction vehicles, plant and machinery shall be maintained on a weekly basis and checked daily to ensure any damage or leakages are corrected. Precautions shall be taken to avoid spillages, including: • Supervision of deliveries and refuelling activities; • Use of secondary containment e.g. bunds around oil storage tanks; • Use of drip trays around mobile plant; and • Designating and using specific impermeable refuelling areas isolated from surface water drains.
LS CONST 7:	All potentially hazardous materials shall be securely stored on site.
LS CONST 8:	Soils shall be reused on site where possible. Chemical analysis will be carried out to assess whether the backfill material is inert or presents a risk to human and / or environmental receptors. Suitable soil disposal routes and waste soil receiving facilities shall be determined and incorporated into the Construction & Demolition Waste Management Plan (C&DWMP) for the works.
LS CONST 9:	Excavated materials shall be visually assessed for signs of contamination. Should material appear to be contaminated or potentially contaminated, samples shall be analysed by an appropriate testing laboratory. Contaminated material

	shall be treated in accordance with the Waste Management Regulations. All excess fill and material considered unacceptable for reuse on site in terms of the residual risk posed to human health and to the environment shall be appropriately disposed of in accordance with the Waste Management Regulations.
LS CONST 10:	Surplus subsoil arisings caused by excavations for foundations, roads and drainage shall be minimised and where necessary, stockpiled and taken off-site to a licensed landfill facility. Any topsoil that is removed shall be used for re-grading at a later stage.
LS CONST 11:	Reusable excavated gravels, sands or rock shall be retained on-site for backfilling or drainage purposes to reduce the total volume of imported material.
LS CONST 12:	All imported soils and stones shall be sourced from a licenced / permitted facility with suitable documentation to confirm the material is inert and fit for purpose.
LS CONST 13:	Topsoil shall 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.
LS CONST 14:	Top-soiling and landscaping of the works shall be undertaken as soon as finished levels are achieved, in order to reduce weathering and erosion and to retain soil properties. Existing topsoil shall be retained on site to be used for the proposed development.
LS CONST 15:	The construction phase shall be monitored in relation to: • Prevention of oil and diesel spillages; • Adequate runoff control of potential stockpiles of contaminated subsoil; • Protection of topsoil stockpiled for re-use; and • Cleanliness of the adjoining road network.

Operational Phase

No mitigation measures are considered necessary during the operational phase of development if all pre-construction and construction phase mitigation measures are implemented.

Monitoring

Pre-construction site investigations will include the installation of boreholes and monitoring wells at the site, trial pitting, soil and groundwater sampling for chemical analysis and ground gas monitoring. In addition, a groundwater monitoring program comprising groundwater level monitoring and groundwater quality sampling over an extended period of time will be undertaken to confirm baseline hydrogeological conditions across the site and to provide an additional level of protection during development works.

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 and Demolition Waste Management Plan and Construction Environmental Management Plan.

A waste soil sampling exercise shall be undertaken in relation to areas where soils are to be excavated for off-site disposal. The soils shall be appropriately tested and classified in accordance with best practice and waste management legislation.

A dust management programme shall be implemented during the construction phase of development. The quantities of topsoil, subsoil and rock removed off site shall also be recorded.

14.3.8 Water

Pre-Construction

W PRE-CONST 1:	A number of potential sources of buried waste / contamination were identified that warrant further investigation prior to the commencement of development works. These include a former gravel pit, a former well, earthen embankments containing construction and demolition waste material and former fuel and artillery storage areas. These areas shall be investigated prior to the commencement of development works and suitable mitigation measures (including special environmental and human health contingency plans and procedures, following best-practice guidance) for the unexpected discovery of contaminated land or illegally deposited waste materials shall be developed and implemented as part of a detailed risk assessment under the direction of a contaminated land consultant / hydrogeologist.
W PRE-CONST 2:	Monitoring prior to, during and post construction works of groundwater quality shall be undertaken to ensure minimum disturbance of water quality in the general vicinity of the site. During the construction phase, the monitoring programme shall include daily checks, weekly inspections and monthly audits to ensure compliance with the Construction and Demolition Waste Management Plan (CDWMP) and the CEMP. This shall be undertaken in consultation with Kildare County Council.

Construction Phase

W CONST 1:	Adequate security measures shall be installed on the construction site. Early assessment of sensitivities and risks will assist in the design of the site layout and security measures required. Security measures shall include secure fencing, secure site access, securing plant and equipment, secure storage of materials, sufficient warning signage and security lighting.
W CONST 2:	All waste material (both soils and other) generated shall be temporarily stored in secure bunded areas thereby preventing the migration of leachate or contaminating substances from impacting on the surrounding environment.

W CONST 3:	Waste fuels and materials shall be stored in designated areas that are isolated from surface water drains or open waters (e.g. excavations). Skips shall be closed or covered to prevent materials being blown or washed away and to reduce the likelihood of contaminated water leakage. Hazardous wastes such as waste oil, chemicals and preservatives, shall be stored in sealed containers and kept separate from other waste materials while awaiting collection by a registered waste carrier. Fuelling, lubrication and storage areas and site offices shall not be located within 25m of drainage ditches, surface waters or open excavations. Fuel interceptor tanks shall be installed on the site to treat any runoff.
W CONST 4:	All waste containers (including all ancillary equipment such as vent pipes and refuelling hoses) shall be stored within a secondary containment system (e.g. a bund for static tanks or a drip tray for mobile stores and drums). The bunds shall be capable of storing 110% of the tank capacity. Where more than one tank is stored, the bund shall be capable of holding 110% of the largest tank or 25% of the aggregate capacity (whichever is greater). Drip trays used for drum storage shall be capable of holding at least 25% of the drum capacity. Where more than one drum is stored the drip tray shall be capable of holding 25% of the aggregate capacity of the drums stored. Spill kits shall be kept in these areas in the event of spillages.
W CONST 5:	Soils shall be reused on site where possible. Chemical analysis will be carried out to assess whether the backfill material is inert or presents a risk to human and / or environmental receptors. Suitable soil disposal routes and waste soil receiving facilities shall be determined and incorporated into the Construction & Demolition Waste Management Plan (C&DWMP) for the works.
W CONST 6:	All imported soils and stones shall be sourced from a licenced / permitted facility with suitable documentation to confirm the material is inert and fit for purpose.

Operational Phase

No mitigation measures are considered necessary during the operational phase of development if all pre-construction and construction phase mitigation measures are implemented.

An appropriately designed drainage system has been incorporated into the design of the proposed development. The system has been designed in accordance with accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the CIRIA SUDS Manual 2015 and Recommendations for Site Development Works for Housing Areas published by the Department of the Environment and Local Government. It involves ensuring that no reduction infiltration to groundwater will incur relative current site conditions and suitable protection measures of runoff infiltration to ground including permeable paving, gullies and catch pits, lined attenuation structures and oil-water interceptors.

Monitoring

Pre-construction site investigations will include the installation of boreholes and monitoring wells at the site and soil and groundwater sampling for chemical analysis. In addition, a groundwater monitoring

program comprising groundwater level monitoring and groundwater quality sampling over an extended period of time will be undertaken to confirm baseline hydrogeological conditions across the site and to provide an additional level of protection during development works.

14.3.9 Air Quality and Climate

Construction Phase

Air Quality

The greatest potential impact on air quality during the construction phase is from construction dust emissions, PM_{10}/$PM_{2.5}$ emissions and the potential for nuisance dust. Sensitive receptors which have the potential to be impacted by dust include the numerous housing estates surrounding the site, and shops and businesses opposite the site entrance.

In order to minimise dust emissions during construction, a series of recommended mitigation measures have been prepared in the form of a dust minimisation plan (see Appendix 10.2). Due to the sensitivity of the current residential receptors adjacent to the site, additional mitigation measures recommended in the Institute of Air Quality Management *Guidance on the Assessment of Dust from Demolition and Construction* for sensitive receptors have been included.

AQC CONST 1: No development works shall take place before a dust minimisation plan has been prepared by the relevant appointed contractor(s) and approved by Kildare County Council. The approved dust minimisation plan shall be implemented and adhered to at all times by relevant contractor(s) and subcontractors unless otherwise agreed with Kildare County Council.

The plan shall include, but not be limited to, measures such as:

- Sweeping of hard-surfaces to remove mud and other materials. The use of un-surfaced roads shall be restricted to essential site traffic;
- Watering of roads with potential to give rise to fugitive dust during dry and / or windy conditions;
- Use of a wheel wash facility for vehicles entering onto public roads;
- Speed restrictions on 20kph on un-surfaced roads, and on hard-surfaces as site management dictates;
- Covering or enclosure of vehicles carrying material with dust potential;
- Regular inspection and cleaning of public roads outside the site;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind; and
- Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Provided the dust minimisation measures outlined in the plan are adhered to, the air quality impacts during the construction phase should not be significant.

Climate

Construction traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the development. Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to short-term and temporary nature of these works, the impact on climate will not be significant.

However, some site-specific mitigation measures can be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods. Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

Operational Phase

Air Quality

Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants (Regulation (EC) No 715/2007) for passenger cars which was complied with in 2009 (Euro V) and 2014 (Euro VI).

TII guidance states that *'for the purpose of the EIS, it should be assumed that pollutant concentrations will decline in future years, as a result of various initiatives to reduce vehicle emissions both in Europe and in Ireland'*. A range of legislation in Europe over the period 1992 – 2013 has significantly reduced the allowable steady cycle emissions of both NO_X and PM from road vehicles with NO_X emission reductions for HDV (Heavy Diesel Vehicles) a factor of 20 and PM a factor of 36 over this period (Euro I to Euro VI). In relation to LDV (Light Diesel Vehicles) the reduction of NO_X and PM from road vehicles has also been significant with NO_X emission reductions from HDV a factor of 12 and PM a factor of 40 over this period (Euro I to Euro VI). Although actual on-road emission reductions will be less dramatic, significant reductions in vehicle-related NO_X and PM emissions are to be expected over the next 5-10 years as the fleet turns over.

Emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems.

Climate

Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fuelled vehicles and the introduction of cleaner fuels.

CO_2 emissions for the average new car fleet were reduced to 120 g/km by 2012 through EU legislation on improvements in vehicle motor technology and by an increased use of biofuels. This measure has

reduced CO_2 emissions from new cars by an average of 25% in the period from 1995 to 2008 / 2009 whilst 15% of the necessary effort towards the overall climate change target of the EU has been met by this measure alone.

Additional measures included in the National Climate Change Strategy include: (1) VRT and Motor Tax rebalancing to favour the purchase of more fuel-efficient vehicles with lower CO_2 emissions; (2) continuing the Mineral Oils Tax Relief II Scheme and introduction of a biofuels obligation scheme; (3) implementation of a national efficient driving awareness campaign, to promote smooth and safe driving at lower engine revolutions; and (4) enhancing the existing mandatory vehicle labelling system to provide more information on CO_2 emission levels and on fuel economy.

There is the potential for impacts, such as flooding, on the Magee Barracks due to Climate Change. In order to assess this, a site-specific flood risk assessment has been carried out and accompanies the planning application. Kildare County Development Plan 2017-2023 Strategic Flood Risk Assessment Report states that *'ground water flooding is not a significant risk for Kildare'*. All existing information has been reviewed regarding flood risk in the location of the proposed development. We are fully satisfied, based on the available information, that the site of this proposed development is located in Flood Zone C (low risk) for all sources of flood risk.

Monitoring

During the construction stage of the project dust emissions from site activities will have the greatest impact on air quality. AWN Consulting recommend that monitoring of dust deposition levels (via the Bergerhoff method) takes place at a number of locations at the site boundary of the proposed development to ensure that dust nuisance is not occurring at nearby sensitive receptors. This methodology will ensure that the dust mitigation measures outlined in the dust minimisation plan (Appendix 10.2) remain effective. As climate impacts during the construction stage are negligible, there is no monitoring necessary.

Impacts in relation to air quality and climate during the operational stage of the project are negligible and imperceptible; therefore there is no monitoring necessary during the operational stage of the project for either air quality or climate.

14.3.10 Noise and Vibration

Construction Phase

NV CONST 1:	Best practice noise and vibration control measures shall be employed by the relevant appointed contractor(s) and subcontractors during the construction phase in order to avoid significant impacts at the nearest sensitive buildings. The best practice measures set out in BS 5228 (2009) Parts 1 and 2 shall 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.

NV CONST 2:	The relevant appointed contractor(s) and subcontractors shall ensure construction noise levels at the closest sensitive locations are within relevant limits set out within the Kildare Local Authorities Second Noise Action Plan (2013 – 2018). The relevant contractor(s) shall be required to undertake noise monitoring at locations representative of the closest sensitive locations to ensure the relevant criteria are not exceeded. Noise monitoring shall be conducted in accordance with the International Standard ISO 1996: 2007: Acoustics – Description, Measurement and Assessment of Environmental Noise.

Detailed 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, limiting the hours of work and noise monitoring. This will specifically be required to protect neighbouring sensitive locations during the demolition works.

Selection of Quiet Plant

This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control 'at source'. This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

Referring to the key noise generating sources during the construction phases, the following best practice migration measures should be considered:

- For mobile plant items such as cranes, dump trucks, excavators and loaders, maintaining enclosure panels closed during operation can reduce noise levels over normal operation. Mobile plant should be switched off when not in use and not left idling.
- For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system.
- For percussive tools such as pneumatic concrete breakers, a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Erect localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures should be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.

- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Standard construction site hoarding with a mass per unit of surface area greater than 7 kg/m2 can provide adequate sound insulation.

Liaison with the Public

A designated noise liaison officer will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, prior to particularly noisy construction activity, e.g. demolition, breaking, piling, etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. If breaking works are in progress on a site at the same time as other works of construction or demolition that themselves may generate significant noise and vibration, the working programme will be phased so as to ensure noise limits are not exceeded due to cumulative activities.

Operational Phase

During the operational phase of the development, noise from building services equipment serving the commercial buildings will be selected such that the noise emission from any commercial building does not exceed 70dB(A) at 1m from the building facade.

Monitoring

The relevant contractor(s) will be required to ensure construction activities operate within the noise limits set out within Table 11.1. The relevant contractor(s) will be required to undertake regular noise monitoring at locations representative of the closest sensitive locations to ensure the relevant criteria are not exceeded.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2007: Acoustics – Description, Measurement and Assessment of Environmental Noise.

No noise or vibration monitoring is required once the development is operational.

14.3.11 Material Assets

Construction Phase

A range of construction-related mitigation measures are recommended in this EIAR with reference to the various environmental topics examined and the inter-relationships between each topic. These measures are considered likely to result in any adverse effects on material assets during the construction phase being avoided or suitably mitigated.

Operational Phase

No mitigation measures are considered necessary during the operational phase of development. The operational phase of development is anticipated to have generally positive effects on material assets, particularly in relation to urban settlements, ownership and access and transport infrastructure.

Monitoring

No ongoing monitoring is considered necessary in relation to the effect of the proposed development on material assets.