Kildare Co. Co. Architectural Services

Proposed Residential Development at Glandore, Athy, Co. Kildare

Site Specific Flood Risk Assessment (SSFRA)

2251-DOB-XX-XX-RP-C-0002

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1 Introduction

Donnachadh O'Brien & Associates Consulting Engineers Ltd. (DOBA) have been instructed by the Client, Kildare Co. Co. Architectural Services, to prepare a Site-Specific Flood Risk Assessment (SSFRA) to accompany a Planning Application to Kildare County Council (KCC) for the proposed infill residential development at Glandore, Athy, Co. Kildare. This SSFRA is structed as follows;

- **Section 2** summarises the attributes of the **Existing Site**,
- **Section 3** provides a description of the **Proposed Development**,
- **Section 4** summarises **The Flood Risk Planning Policies and Objectives** of the Kildare County Development Plan 2017 – 2023 and the Athy Local Area Plan 2021 –2027
- **Section 5** addresses the components considered in the identification and assessment of flood risk through the **Source-Pathway-Receptor Model** used to assess and inform the management of the flood risk at the proposed development. The likelihood, consequence, risk and residual risk associated with Tidal, Fluvial, Pluvial, Ground Water and Human/ Mechanical Error components are assessed along with the provision of mitigation measures.
- Finally, **Section 6** outlines how the **Sequential Approach** has been applied to the proposed development in accordance with the **'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (2009)**.

2 Existing Site

The proposed residential in-fill development, as outlined in **Figure 1** below, is to be located on an existing c. 0.192Ha site which is bound by existing residential developments to the north and east by Castle Park, the west by Woodstock Road and to the south by the Green Hills Road. The site topography is relatively flat with elevation on site ranging averaging +58.50mOD.

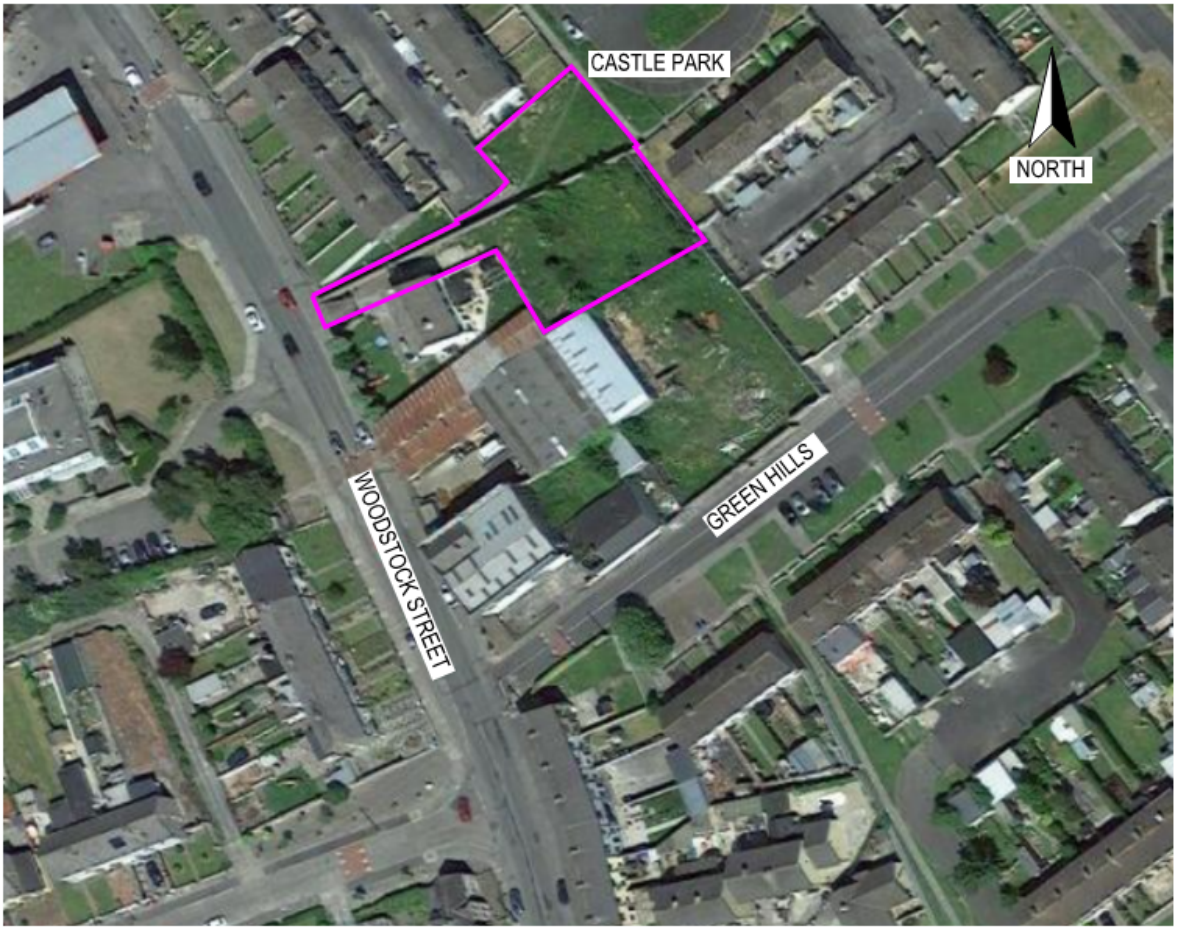


Figure 1 Application Lands outlined in pink (source: Google Maps)

3 Proposed Development

The proposed development comprises:

- A terrace block consisting of 2 no. 1-bed Single Storey dwelling, 2 No. 1-bed
- Apartments Two Storey, and 1 no. 2-bed Two Storey dwelling.
- Demolition and alterations to the existing boundary walls and construction of new boundary walls to the proposed site.
- Demolition of existing walls bounding:
- Glandour House, including entrance gate wall to Glandour House, and laneway connecting Woodstock Street with Castle Park housing estate.
- Widening of existing lane way and construction of new wall bounding Glandour House Site.
- Associated site development works including landscaping, drainage, public lighting, new paths and hard landscaping, ancillary site services and site development works above and below ground.

Figure 2 Proposed development (source: Kildare Co. Co. Architectural Services)

4 Flood Risk Planning Policies & Objectives

4.1 Data Collection

The following data and information have been reviewed as part of the Flood Risk identification process;

- Kildare County Development Plan 2017 – 2026
- Athy Local Area Plan 2021 – 2027
- Athy Local Area Plan 2021 – 2027 - Strategic Flood Risk Assessment
- Existing Topographical Survey
- Local Hydrological features and existing drainage
- Historical Flood Maps
- Flood Risk Management Plan – River Barrow 2018
- Fluvial Flood Risk
- Tidal Flood Risk
- Pluvial Flood Risk
- Ground Water Flood Risk

4.2 Kildare County Development Plan 2017 – 2026

The Kildare County Development Plan 2017 – 2026 sets out policies and objectives for the sustainable development of the County and the following extracts summarise the relevant policies contained within the CDP focusing on Flood Risk Management;

- To manage protect and enhance surface water quality to meet the requirements of the EU Water Framework Directive.
- To incorporate Flood Risk Management into the spatial planning of the County, to meet the requirements of the EU Floods Directive and the EU Water Framework Directive.
- To support and co-operate with the Office of Public Works (OPW) in delivering the Catchment Based Flood Risk Assessment and Management Programme in particular the Eastern and South Eastern CFRAM studies and associated Flood Management Plans (FRMP). The recommendations and outputs arising from these studies shall be incorporated in preparing plans and assessing development proposals.
- To support the implementation of the EU Flood Risk Directive (2007/60/EC) on the assessment and management of flood risks and the Flood Risk Regulations (SI No 122 of 2010)
- To manage flood risk in the County in accordance with the requirements of the Planning System and Flood Risk Management Guidelines for Planning Authorities, DECLG and OPW (2009) and circular PL02/2014 (August 2014), in particular when preparing plans and programmes and

assessing development proposals. For lands identified in the Strategic Flood Risk Assessment (SFRA) a site-specific Flood Risk Assessment to an appropriate level of detail, addressing all potential sources of flood risk, is required, demonstrating compliance with the aforementioned Guidelines or any updated version of these guidelines, paying particular attention to residual flood risks and any proposed site-specific flood management measures.

- To ensure effective management of residual risks for development permitted on floodplains.
- To maintain and enhance the existing surface water drainage systems in the County and promote and facilitate the development of Sustainable Urban Drainage Systems (SuDS) including integrated constructed wetlands and to promote and support the retrofitting of SUDS in established urban areas.
- To incorporate Sustainable Urban Drainage Systems (SuDS) as part of all plans to address the potential for sustainable urban drainage at district or site level.
- To limit the surface water runoff from new developments through the use of Sustainable Urban Drainage Systems (SUDS). These systems should not adversely impact on open space provision in residential areas.
- To liaise with the Office of Public Works (OPW) in delivering on flood management works and schemes, as may arise, through the OPW Non-coastal Minor Works Programme and through the OPW's Capital Programme
- To ensure that all towns, villages and settlements are provided with adequate flood alleviation measures within the limits of cost effectiveness and the availability of finance.
- To ensure that flood risk management is incorporated into the preparation of Local Area Plans in accordance with 'The Planning System and Flood Risk Management - Guidelines for Planning Authorities (2009)'.
- To ensure that the Justification Test for Development Management is applied to proposals for development in areas at a high or moderate risk of flooding where the development proposed is vulnerable to flooding and would generally be inappropriate as set out in Table 3.2 of the 'The Planning System and Flood Risk Management - Guidelines for Planning Authorities (2009)'.
- To seek to ensure that development will not interfere with or interrupt existing surface water drainage systems.
- To ensure that the reasonable requirements of Inland Fisheries Ireland are adhered to in the construction of flood alleviation measures in the County.
- To recognise the important role of bog land and other wetland areas in flooding patterns. Development in these areas shall therefore be subject of a Flood Risk Assessment in accordance with the relevant guidance.
- To require development proposals which may affect canals and their associated infrastructure to prepare a flood risk assessment in accordance with the relevant guidance.

- To ensure development proposals in rural areas (excluding one-off rural housing) demonstrate compliance with the following:
    - the ability of a site in an un-serviced area to accommodate an on-site waste water disposal system in accordance with the County Kildare Groundwater Protection Scheme, and any other relevant documents and legislation as may be introduced during the Plan period.
    - the ability of a site in an un-serviced area to accommodate an appropriate on-site surface water management system in accordance with the policies of the Greater Dublin Strategic Drainage Study (2005), in particular those of Sustainable Urban Drainage Systems (SuDS).
    - the need to comply with the requirements of 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' published by the Minister for the Environment, Heritage and Local Government in November 2009.
- To liaise with the Office of Public Works (OPW) in delivering flood management and alleviation programmes to include, but not limited to, the following:
    - South Eastern CRFRAMS and the recommendations therein.
    - Eastern CFRAMS and the recommendations therein.
    - Newbridge Surface Water Improvement Schemes.
    - Morrell River Flood Management Scheme.
    - Hazelhatch Flood Management Scheme.
- To develop and resource a multi-annual programme for the maintenance of river channels under the responsibility of Kildare County Council, to include but not limited to:
    - Barrow Drainage District.
    - Greese Drainage District.
    - Lerr Drainage district.
- To ensure that rural one-off residential developments maintain existing drainage systems, particularly at access points to the property.

The following extracts summarise the relevant objectives contained within the CDP focusing on Flood Risk Management;

- To continually monitor and review the water quality standards of Kildare County Council in light of European Communities (Drinking Water) Regulations 2007 (SI 278 of 2007), as may be amended and to ensure continuing compliance.
- To acknowledge the strategic policy recommendations in relation to flood risk identified in the Regional Planning Guidelines for the Greater Dublin Area 2010-2022.
- To liaise with adjoining Local Authorities, all relevant departments and agencies in the alleviation of flood risk in the County.

- To promote rain water harvesting in all developments and in particular in larger schemes.
- To liaise with Irish Water to promote the sustainable development of water supply and drainage infrastructure in the County and the Region, in accordance with the objectives and recommendations set out in the Greater Dublin Drainage Study, Irish Water's Water Services Strategic Plan and the Eastern and Midlands Water Supply Project.
- To present business cases to Irish Water to secure capital investment for required infrastructural projects in the County based on the Core Strategy.
- To protect the natural resources of the County which are the foundation for the Green Infrastructure network and a basis for growth and competitive advantage in the tourism, food and fisheries sectors.
- To work in conjunction with Irish Water to identify and facilitate the timely delivery of the water services required to realise the development objectives of this Plan.

4.3 Athy Local Area Plan 2021 – 2027 and Strategic Flood Risk Assessment 2021 – 2027

The Kildare County Development Plan 2017-2023 outlines surface water and flooding flood risk management policies and objectives for the entire county. The Athy Local Area 2021 - 2027 will implement these policies to ensure flood risk and surface water management is considered during the planning process for development within the LAP boundary. According to the Athy Strategic Flood Risk Assessment 2021 – 2027, the main source of flooding in the town is fluvial. Fluvial flooding within the town occurs primarily from the Barrow and Moneen Rivers. It can be seen from **Figure 3** that there is no history of flooding in the vicinity of the proposed development.

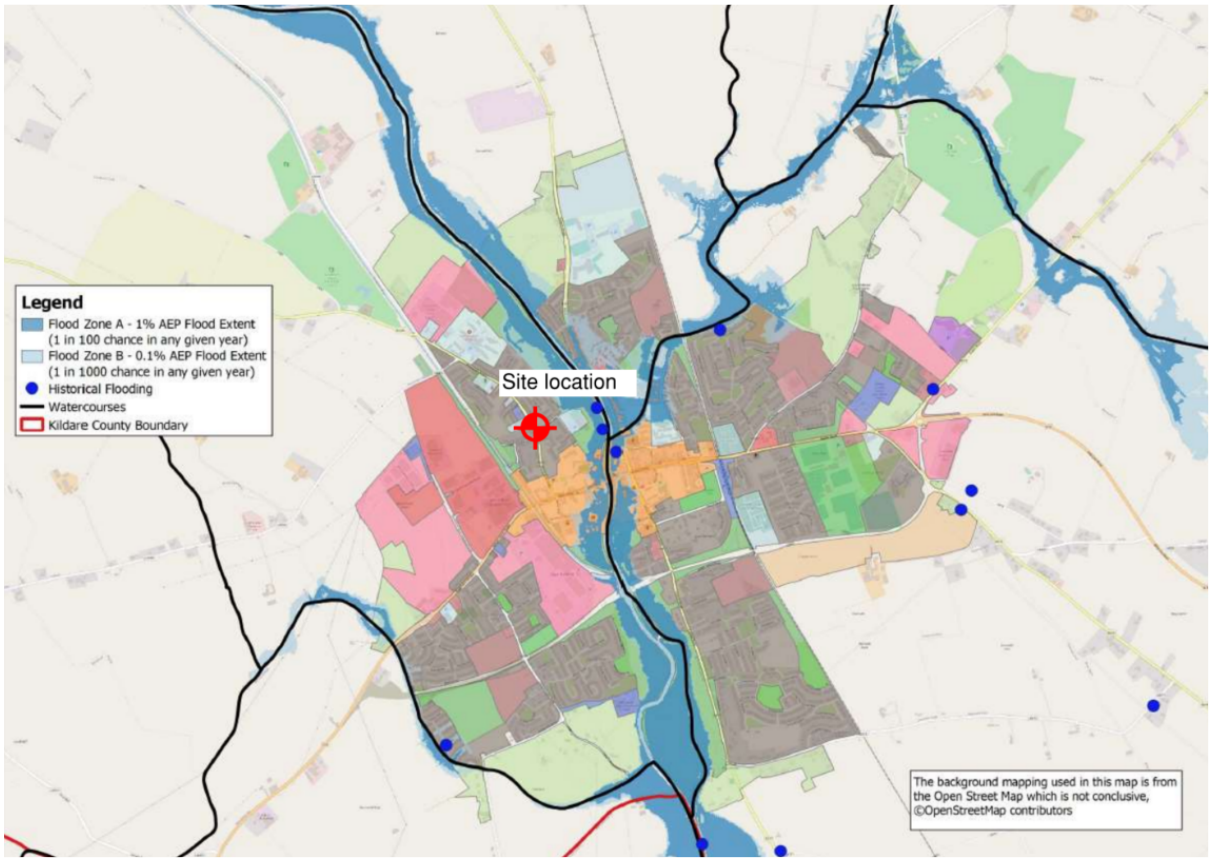


Figure 3 Extract from Athy Local Area Plan 2021 – 2027 - Strategic Flood Risk Assessment (site highlighted in red)

The Athy Strategic Flood Risk Assessment 2021 – 2027 strategic flood risk map identifies the proposed development site is zoned as Existing Infill / Residential as illustrated in **Figure 4** and is located in Flood Zone C.

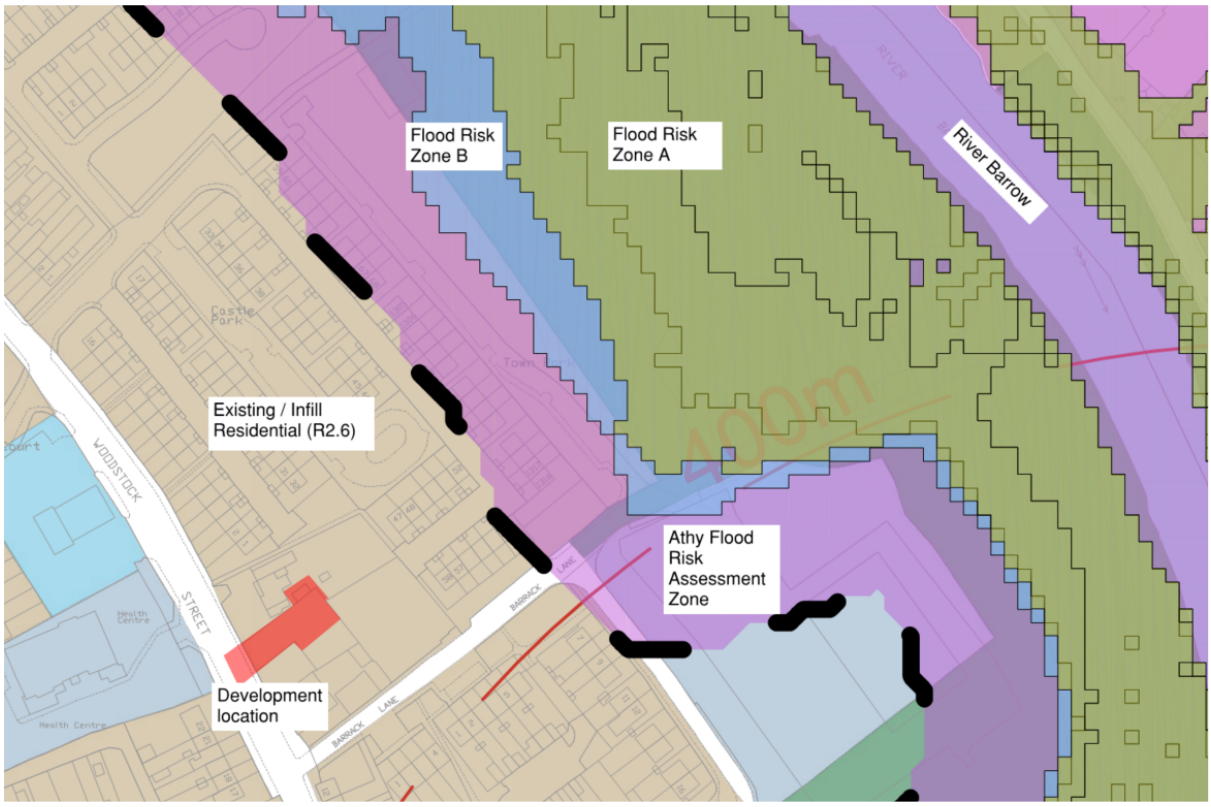


Figure 4 Extract from Athy Local Area Plan 2021 – 2027 - Strategic Flood Risk Assessment (site highlighted in red)

4.4 Flood Risk Management Plan for the River Barrow – 2018

A Flood Risk Management Plan for the River Barrow was completed by the OPW in 2018 and it identifies Athy to be at risk from Fluvial flooding as shown in Table ES-1 from the plan. Extract below.

COUNTY	COMMUNITY NAME	SOURCE(S) OF FLOOD RISK
Kildare	Allenwood	Fluvial
Kildare	Athy	Fluvial
Carlow	Carlow	Fluvial
Kildare	Castledermot	Fluvial
Offaly	Daingean	Fluvial
Kilkenny/Carlow	Graiguenamanagh	Fluvial
Carlow	Leighlinbridge	Fluvial
Kildare	Monasterevin	Fluvial
Laois	Mountmellick	Fluvial
Wexford	New Ross & Environs	Fluvial & Coastal
Laois	Portarlington	Fluvial
Laois	Portlaoise	Fluvial
Kildare	Rathangan	Fluvial
Kildare	Suncroft	Fluvial

Table 1 Table ES-1 from River Barrow Flood Risk Management Plan

The Flood Risk Management Plan sets out sets out potentially viable measures for Athy under section 7.4.3 including building hard defences for at risk properties in Athy, consisting of flood embankments and walls. These hard defences would be set back from the river channel where possible and would protect to the 1% AEP fluvial flood event with an estimated average height of 1.2m and length of 2.9km. As the proposed development is located in Flood Zone C it is outside of the extend of the proposed measures.

5 Site Specific Flood Risk Assessment

This SSFRA has been prepared in accordance with the requirements of the following:-

- DoEHLG/ 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (2009), identifying and assessing the flood risk pertinent to this subject site,
- Kildare County Development Plan 2017 – 2026
- Athy Local Area Plan 2021 – 2027
- Athy Local Area Plan 2021 – 2027 - Strategic Flood Risk Assessment
- Flood Risk Management Plan – River Barrow 2018

The following assessment has been based on the sources of information outlined below:-

- OPW www.floodmaps.ie
- Irish Water and KCC Existing Drainage Records
- Geological Society of Ireland (GSI) Maps

In accordance with Table A1 of the DoEHLG/ OPW guidelines, the components to be considered in the identification and assessment of flood risk are as follows:-

- Tidal – flooding from high sea levels
- Fluvial – flooding from water courses
- Pluvial – flooding from rainfall/ surface water
- Ground Water – flooding from springs/ raised ground water
- Human/ mechanical error - flooding due to human or mechanical error.

For each component, the Source-Pathway-Receptor Model is used to assess and inform the management of the flood risk. The likelihood, consequence and risk associated with each component is assessed while mitigation measures are also outlined in the following sections.

5.1 Tidal

Tidal flooding occurs when normally dry, low-lying land is flooded by seawater. The extent of tidal flooding is a function of the elevation inland flood waters penetrate, which is controlled by the topography of the coastal land exposed to flooding.

5.1.1 Source

The extract in **Figure 5** below from the OPW CFRAMs study www.floodmaps.ie have been reviewed and demonstrates that there is not risk of tidal flooding in the area.

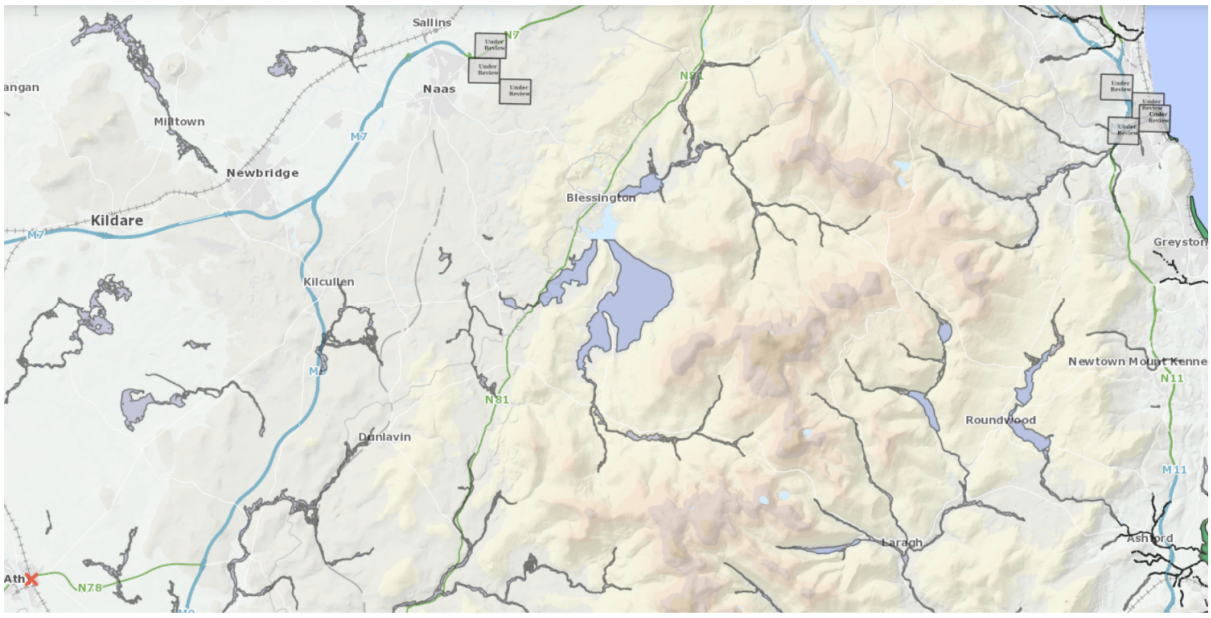


Figure 5 OPW CFRAMS Extract (site marked in red) (Source: www.floodmaps.ie)

5.1.2 Pathway

The nearest coastline is the Irish Sea, approximately 63km east of the site therefore the site is not located in an area at risk from coastal flooding.

5.1.3 Receptor

The site is not located in an area at risk from coastal flooding.

5.1.4 Likelihood

Based on a review of the coastal flood risk mapping available, it can be seen that the subject site and proposed development are significantly west of the nearest coast and are outside the extent of coastal flooding. Therefore, the subject site and proposed development are at no risk from Coastal Flooding as per the CFRAM Mapping.

5.1.5 Consequence

The site is not located in an area at risk from coastal flooding.

5.1.6 Risk

The site is not located in an area at risk from coastal flooding.

5.1.7 Flood Risk Management

The site is not located in an area at risk from coastal flooding.

5.1.8 Residual Risk

The site is not located in an area at risk from coastal flooding.

5.2 Fluvial

Fluvial flooding, as defined by the OPW, occurs when rivers and streams break their banks and water flows out onto the adjacent low-lying areas. Fluvial flooding can arise where the runoff from heavy rain exceeds the natural capacity of the river channel.

5.2.1 Source

Information from the following sources has been reviewed in order to identify any existing flood risk to the site and proposed development:

- OPW CFRAM study maps www.floodmaps.ie
- Kildare County Development Plan 2017 – 2026
- Athy Local Area Plan 2021 – 2027
- Athy Local Area Plan 2021 – 2027 - Strategic Flood Risk Assessment
- Flood Risk Management Plan – River Barrow 2018

5.2.1.1 OPW Floodmaps.ie

The CFRAM flood maps for the site as shown in **Figure 6** below demonstrate that the site in question is outside of the low, medium and high probability flood zones.

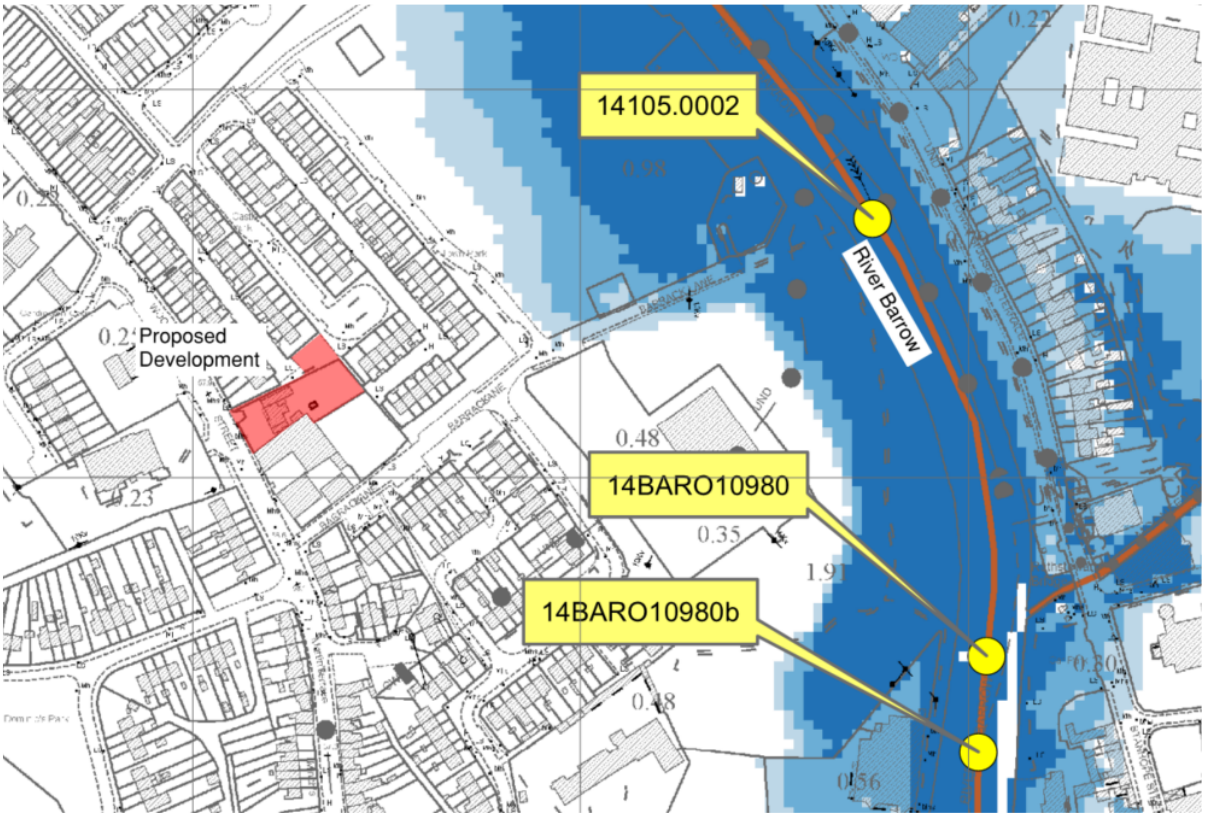


Figure 6 OPW CFRAMS Extract (site highlighted in red) (Source: www.floodmaps.ie)

5.2.2 Pathway

The likelihood of Fluvial Flooding occurring on the site from the River Barrow is negligible as the site is located outside the low medium and high probability risk areas. The 0.1% AEP flood level at the nearest upstream node on the Barrow 14105.0002 is +55.100m. The lowest floor level is +58.25mOD while the overflow high level drainage outfall to the adjacent Castle Park residential development is 57.75m. Therefore, the lowest building FFL is 3.15m above the 0.1% AEP flood level while the drainage overflow is 2.65m above the 0.1% AEP flood level.

5.2.3 Receptor

The site is not located in an area at risk from fluvial flooding.

5.2.4 Likelihood

The site is not located in an area at risk from fluvial flooding.

5.2.5 Consequence

The site is not located in an area at risk from fluvial flooding.

5.2.6 Risk

The site is not located in an area at risk from fluvial flooding.

5.2.7 Flood Risk Management

The site is not located in an area at risk from fluvial flooding.

5.2.8 Residual Risk

The site is not located in an area at risk from fluvial flooding.

5.3 Pluvial

Pluvial flooding is the result of rainfall-generated overland flows which arise before run-off can enter any watercourse or sewer. It is usually associated with high intensity rainfall and flood risk from pluvial sources exists in all areas.

5.3.1 Source

Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. The resulting water follows natural valley lines, creating flow paths along roads and through and around developments and ponding in low spots, which often coincide with fluvial floodplains.

Although having potentially severe consequences, pluvial flooding can generally be managed through site design, layout and drainage

5.3.2 Pathways & Receptors

During periods of extreme prolonged rainfall, pluvial flooding may occur through the following pathways: -

Table 2 Pathway & Receptors

	Pathway	**Receptor**
1	Surcharging of the proposed internal drainage systems during heavy rainfall events leading to flooding	Proposed development – properties and roads
2	Surcharging from the existing surrounding drainage system leading to flooding within the subject site by surcharging surface water pipes	Proposed development – properties and roads
3	Surface water discharging from the site leading to flooding of downstream properties	Downstream properties and roads
4	Overland flooding from surrounding areas flowing onto the subject site	Proposed development – properties and roads
5	Overland flooding from the subject site flowing onto surrounding areas	Downstream properties and roads

- Run-off from each house roof discharges to a rain garden. In the event of exceedance or an extreme rainfall event, an overflow has been provided to a linear infiltration trench which has been designed to cater for storms up to and including a 1:100-year storm event + 30% Climate Change + 10% urban creep applied to the roof areas.
- Run-off from the hardstanding footpaths to the front of the units shall drain to unlined permeable paving. Again, in the event of exceedance or an extreme rainfall event, an

overflow has been provided to a linear infiltration trench which has been designed to cater for storms up to and including a 1:100-year storm event + 30% Climate Change + 10% urban creep applied to the roof areas.

- Run-off from the very small area of impermeable concrete footpaths to the rear of the houses discharges over ground to the adjacent green strip.
- Run-off from the impermeable hardstanding car parking area discharges to a tree pit and bioretention area. In the event of exceedance or an extreme rainfall event, an overflow has been provided to a linear infiltration trench which has been designed to cater for storms up to and including a 1:100-year storm event + 30% Climate Change.
- Finally, run-off from the access road discharges to a linear filter drain which in turn discharges to a linear infiltration trench. Catchpits will also be provided downstream of the infiltration trenches to provide primary treatment. The granular material and geotextile filter material will provide interception and act as a secondary treatment in preventing ingress of fine material from paved areas.

5.3.3 Likelihood

The likelihood of each of the 5 pathway types are addressed individually in the following sub-sections.

5.3.3.1 Surcharging of the proposed on-site surface water drainage network

The proposed surface water drainage network will be designed and adequately sized in accordance with GDSDS and best practice SUDS to accommodate flows in peak rainfall events. The drainage system will be designed for 1:30 and 1:100-year high intensity short duration storm events plus 30% Climate Change plus 10% Urban Creep applied to the roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management. Therefore, the likelihood of surcharging the on-site drainage system is considered low.

5.3.3.2 Surcharging of the existing surrounding drainage system

Where the proposed surface water network is to connect to the to the existing KCC storm sewer system, a non-return valve shall be installed on the discharge manhole to ensure that in the event of the public system surcharging, flows will not back up and enter into the proposed private drainage network. The likelihood of surcharging of the existing surrounding drainage systems is low.

5.3.3.3 Surface water discharge from the subject site

Nature Based SuDS (NBS) measures including rain gardens, bioretention areas and tree pits will be introduced which shall reduce the time of entry of surface water into the developments surface water network. The surface water drainage design and associated SuDS proposals will serve to significantly reduce the surface water discharge from the site. Therefore, the likelihood of surface water discharge from the site leading to downstream flooding is low and is therefore a positive impact on the area.

5.3.3.4 Overland flooding from surrounding areas

The proposed surface water network will be designed for a 1:30 and 1:100-year high intensity short duration storm events plus 30% Climate Change plus 10% Urban Creep applied to roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management and no surcharging or pluvial ('out of manhole') flooding occurs on the site in any manhole during each of the rainfall events modelled. Therefore, the likelihood of overland flooding from the surrounding areas is considered low.

5.3.3.5 Overland flooding from the subject site

Nature Based SuDS (NBS) measures including rain gardens, bioretention areas and tree pits will be introduced which will serve to serve to intercept and slow down the rate of run-off from the site to the surface water network which has been adequately sized in accordance with GDSDS and best practice SUDS to accommodate flows in peak rainfall events. The drainage system has been designed to cater for a 1:30 and a 1:100-year high intensity short duration storm events plus 30% Climate Change plus 10% Urban Creep applied to roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management. Surface water overflows from the NBS elements have been provided in the event of exceedance to a linear infiltration trench which has been designed to store run-off up to and including a 1:100-year storm plus 30% Climate Changehe likelihood of pluvial overland flooding from the subject site is low. In the event of a storm exceeding the above criterion, an overflow has been provided to the adjacent surface water network in the existing Castle Park residential development.

5.3.4 Consequence

The **Engineering Calculations** for the linear infiltration trench located in **Appendix B** of the **SSDR 2251-DOB-XX-SI-RP-C-0001** demonstrates that there is sufficient volume provided in the trench to accommodate run-off in addition to the trench emptying in less than 24 Hrs. Therefore, no pluvial out-of-manhole flooding occurs on site.

5.3.5 Risk

5.3.5.1 Surcharging of the proposed on-site drainage systems

The risk of surcharging of the proposed on-site drainage system is low. The drainage system has been designed to cater for a 1:30 and a 1:100-year high intensity short duration storm event plus 30% Climate Change plus 10% Urban Creep applied to the roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management. Where the proposed surface water network is to connect to the to the existing KCC storm sewer system as a high-level overflow, a non-return valve shall be installed on the discharge manhole to ensure that in the event of the public system surcharging, flows will not back up and enter into the proposed private drainage network.

5.3.5.2 Surcharging of the existing surrounding drainage system

The risk of surcharging of the existing surrounding drainage system is low. A non-return valve shall be fitted to the high-level overflow manhole prior to entering the KCC public surface water system.

5.3.5.3 Surface water discharging from the subject site

The risk of surface water discharge from the site leading to downstream flooding is low. The proposed SuDS features will intercept and slow the time of entry of the surface water into the private surface water network.

5.3.5.4 Overland flooding from the surrounding areas

Proposed site grading will prevent overland flows entering onto the site while the gullies will intercept overland flows and direct them to the surface water network. Engineering calculations will be submitted as part of design work to demonstrate that the proposed surface water network has been designed for the 30 and 100 year high intensity short duration storm events plus 30% Climate Change plus 10% Urban Creep applied to roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management and no surcharging or pluvial ('out of manhole') flooding occurs on the site in any manhole during each of the rainfall events modelled. Therefore, the risk of overland flooding from the surrounding areas is considered low.

5.3.5.5 Overland flooding from the subject site

The drainage system has been designed to cater for a 1:30 and a 1:100-year high intensity short duration events plus 30% Climate Change plus 10% Urban Creep applied to the roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management. The risk of surface water discharge from the site leading to downstream flooding is low.

5.3.6 Mitigation Measures & Flood Risk Management

5.3.6.1 Surcharging of the proposed on-site drainage systems.

The drainage system has been designed to cater for a 1:30 and a 1:100-year high intensity short duration storm events plus 30% Climate Change plus 10% Urban Creep applied to roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management. It will be designed such that there will be no surcharging or pluvial ('out of manhole') flooding on the site in any manhole during these events. The Nature Based SuDS measures include rain gardens, bioretention areas and tree pits which will serve to significantly slow down the amount of surface water runoff from the roofs and hardstanding areas.

5.3.6.2 Surcharging of the existing surrounding drainage system

The risk of surcharging of the existing surrounding drainage system is low. A non-return valve shall be fitted to the high-level overflow manhole prior to entering the KCC public surface water system.

5.3.6.3 Surface water discharging from the subject site

The risk of surface water discharge from the site leading to downstream flooding is low. The proposed SuDS features will intercept and slow the time of entry of the surface water into the private surface water network.

5.3.6.4 Overland flooding from the surrounding areas

The drainage system has been designed to cater for a 1:30 and a 1:100-year high intensity short duration events plus 30% Climate Change plus 10% Urban Creep applied to the roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management. The risk of surface water discharge from the site leading to downstream flooding is low.

5.3.6.5 Overland flooding from the subject site

The drainage system will be designed to cater for a 1:30 and a 1:100-year high intensity short duration storm events plus 30% Climate Change plus 10% Urban Creep applied to roof areas in line with the 'precautionary approach' principle adopted in the Flood Risk management and no surcharging or pluvial ('out of manhole') flooding occurs on the site in any manhole during each of the rainfall events modelled.

5.3.7 Residual Risk

As a result of the design measures detailed above, there is a low residual risk of flooding from each of the pluvial flood risks. The flood risk management measures as proposed as part of the development will minimize any pluvial flood risk.

5.4 Ground Water

5.4.1 Source

During periods with prolonged rainfall the groundwater may seep to above ground level due to the susceptibility of groundwater levels to diurnal, seasonal and climatic variations over an extended period. Information from the following sources has been reviewed in order to identify any existing flood risk to the site and proposed development

- Geological Survey Ireland (GSI)
- IGSL Site Investigation - 2006

5.4.2 Pathway

During periods of prolonged rainfall there is a low possibility that the groundwater level may rise level due to the susceptibility of groundwater levels to diurnal, seasonal and climatic variations over an extended period. This could result in ground water seeping to the ground surface.

5.4.3 Receptor

Buildings, roads, underground services and landscaped areas.

5.4.4 Likelihood

IGSL carried out a site investigation at the development site in October 2006 and ground water was only noted in one trial at 21.5m BEGL. The linear infiltration trenches have been designed as 1.5m dp. with 0.5m cover and therefore are situated 500mm above ground water level. The ground water vulnerability map from GSI shows that the site is in an area of moderate vulnerability and the historic ground water flooding map shows that there has been no history of ground water flooding in the area. Refer to **Figure 7 and 8.**

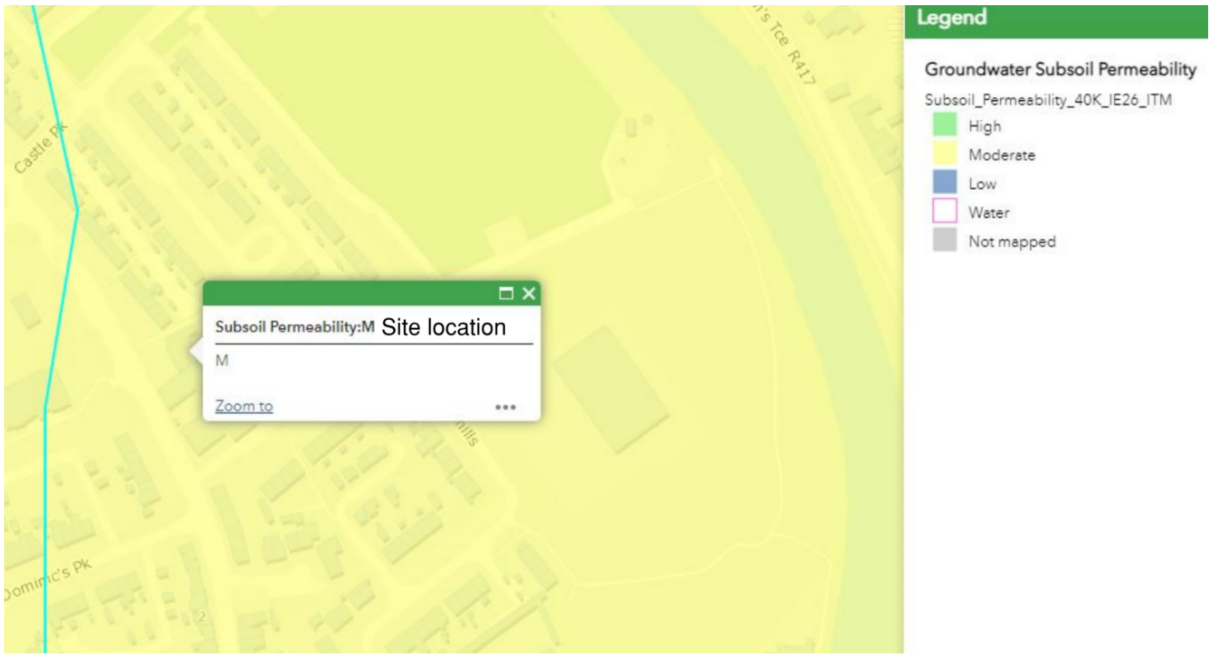


Figure 7 Extract from GSI Vulnerability maps (source: www.gsi.ie/en-ie/data-and-maps)

Figure 8 Extract from GSI Historical Ground Water Flooding maps (source: www.gsi.ie/en-ie/data-and-maps)

As the entire site falls within an area of moderate groundwater vulnerability and with no known history of ground water/ springs seeping through the ground in this area, the likelihood of ground water flooding is moderate / low.

5.4.5 Consequence

The consequence of ground water flooding would be some minor temporary seepage of ground water through the ground around the proposed buildings and landscaped areas. Underground services could also be inundated from high water tables. Therefore, the consequence of ground water flooding occurring at the proposed development is considered low.

5.4.6 Risk

There is a low risk of ground water flooding.

5.4.7 Flood Risk Management

The minimum habitable building Finished Floor Levels (FFLs) will be set to ensure that any seepage of ground water onto the development does not flood into the blocks.

5.4.8 Residual Risk

There is a low residual risk of groundwater flooding.

5.5 Human/ Mechanical Error

5.5.1 Source

The subject site will be drained by an internal private storm water drainage system discharging to a linear infiltration trench design with appropriate factors of safety at situated above the ground water level. A high level over flow in the event of exceedance has been provided to connect to the existing adjoining Castle Park surface water network. The internal surface water networks are a source of possible flooding if they were to become blocked.

5.5.2 Pathway

Blockage of the surface water drainage network.

5.5.3 Receptor

The receptors are the proposed buildings, roads and landscaped areas.

5.5.4 Likelihood

Low possibility of flooding of the subject site if the surface water network was to block.

5.5.5 Consequence

The combined / surface water network would surcharge and overflow through gullies and manhole lids. It is therefore considered that the consequence of such flooding is low.

5.5.6 Risk

There is a low risk of surface water overflowing onto the site.

5.5.7 Flood Risk Management

The site will be designed such that in the event of the drainage system surcharging, combined / surface water can still escape from the site by overland flood routing without damaging buildings. In conjunction with this mitigation measure, all floor levels will be set above the internal and external road levels. The drainage network (drains, gullies, manholes, SuDS devices) will need to be regularly maintained. A suitable maintenance regime of inspecting and cleaning will be included in the safety file for the proposed development.

5.5.8 Residual Risk

As a result of the flood risk management outlined above, there is a low residual risk of flooding from human/ mechanical error.

5.6 Summary

The table below summarises the Source-Pathway-Receptor Model used to assess and inform the management of the flood risk. The likelihood, consequence and risk associated with each component have been assessed and mitigation measures are also summarised.

Table 1 Summary of Source-Receptor-Pathway model assessment

Source	Pathway	Receptor	Likelihood	Consequence	Risk	Flood Risk Management	Residual Risk
Tidal	Irish Sea	Proposed Development	No Risk	No Risk	No Risk	N/A	No Risk
Fluvial	River Barrow	Proposed Development	No Risk - Located in Flood Zone C	No Risk	No Risk	N/A	No Risk
Pluvial	Underground Surface Water Networks	Proposed Development	Low	Low	Low	Appropriate drainage & SuDS design incl'g 30% Climate Change plus 10% Urban Creep, Building FFLs.	Low
Ground Water	Ground	Proposed Development	Low	Low	Low	Appropriate drainage design including 30% Climate Change plus 10% Urban Creep and setting of floor levels	Low
Human/ Mechanical Error	Drainage network	Proposed Development	Low	Low	Low	Appropriate drainage & SuDS design incl'g 30% Climate Change plus 10% Urban Creep, Building FFLs.	Low

6 Sequential Approach and Justification Test

The Sequential Approach and Justification Tests procedures are outlined in 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (2009) and is summarised and adopted below. A sequential approach is a key tool in ensuring that development, particularly new development, is first and foremost directed towards land that is at low risk of flooding. The philosophy used in this approach is

1. Avoid – preferably choose lower risk flood zones for new development
2. Substitute – Ensure the type of development proposed is not especially vulnerable to the adverse impact of flooding
3. Justify – Ensure that the development is being considered for strategic reasons
4. Mitigate – Ensure flood risk is reduced to minimal levels
5. Proceed – Only where Justification Test passed and emergency planning measures are in place

Figure 9 sets out the mechanism for the use of the sequential approach to development in flood areas from the planning perspective.

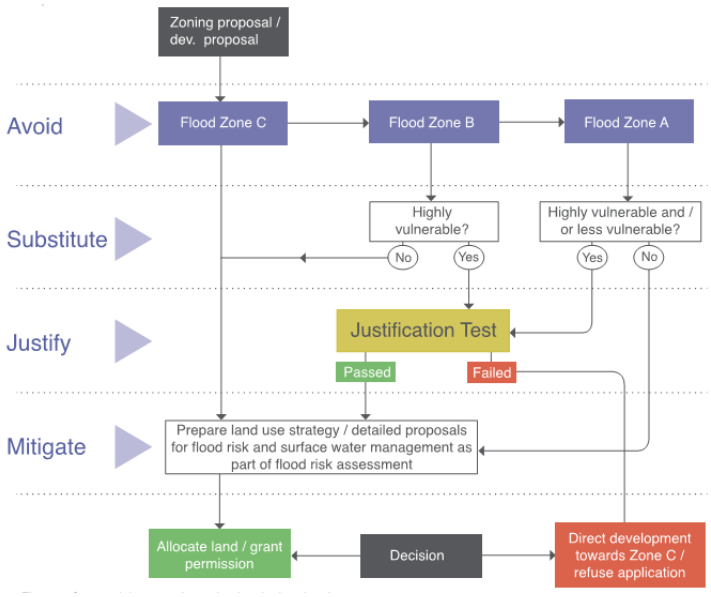


Figure 9 Sequential approach mechanism in the planning process

The sequential approach makes use of flood risk assessment and of prior identification of flood zones for river and coastal flooding and classification of the vulnerability to flooding of different types of development as outlined in the figures below

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

*Uses not listed here should be considered on their own merits

Figure 10 Classification of Vulnerability of different types of development

Figure 11 below illustrates those types of development which would be appropriate to each flood zone and those which would be required to meet the Justification test.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

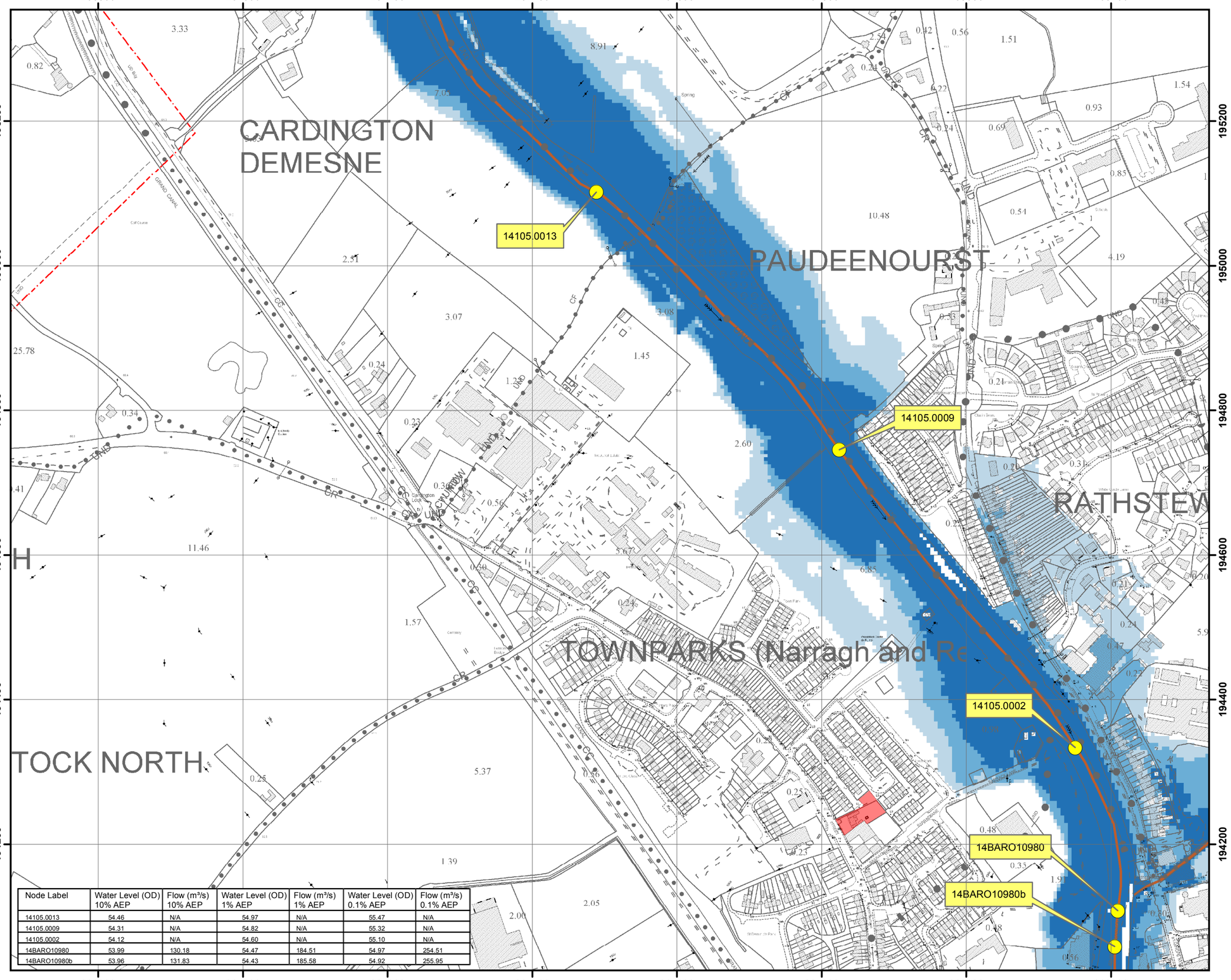
Figure 11 Vulnerability of Development vs. Flood Zone

As the site is located within Flood Zone C, the development is appropriate and there is no requirement for a justification test.

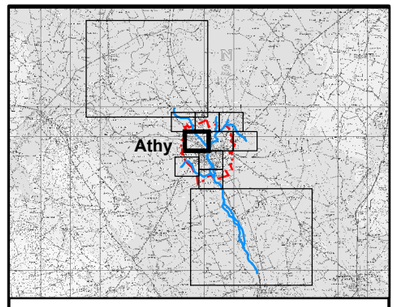
7 Summary and Conclusion

In accordance with the planning guidelines, flood risk identification was carried out as required to identify if there are any flooding or surface water management issues related to the proposed development site that may warrant further investigation. Due to the location of the proposed development within Flood Zone C, a Justification Test was not required therefore, the development as proposed shall not result in an adverse impact to the existing hydrological regime of the area nor increase flood risk to areas outside of the landowners' holdings, nor create unacceptable levels of flood risk within the proposed development and is therefore considered to be appropriate from a flood risk perspective.

Appendix A OPW Floodmaps.ie Report



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
14105.0013	54.46	N/A	54.97	N/A	55.47	N/A
14105.0009	54.31	N/A	54.82	N/A	55.32	N/A
14105.0002	54.12	N/A	54.60	N/A	55.10	N/A
14BARO10980	53.99	130.18	54.47	184.51	54.97	254.51
14BARO10980b	53.96	131.83	54.43	185.58	54.92	255.95



IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:

SOUTH EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

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Map: Athy Fluvial Flood Extents

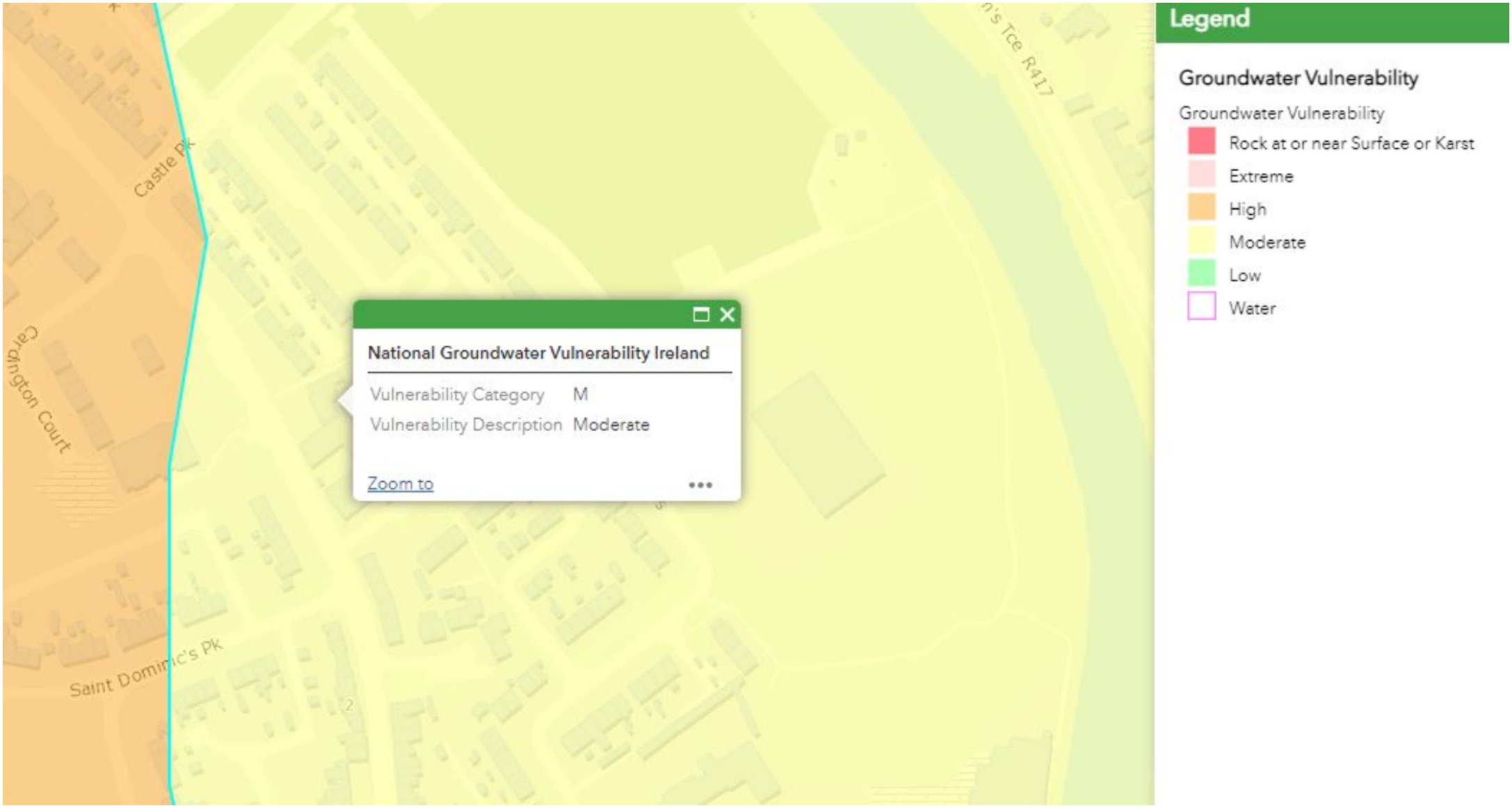
Map Type:	EXTENT		
Source:	FLUVIAL		
Map Area:	HPW		
Scenario:	CURRENT		
Drawn By :	F.M.C.	**Date :**	18 July 2016
Checked By :	T.D.	**Date :**	18 July 2016
Approved By :	S.P.	**Date :**	18 July 2016

Drawing No. : O14ATY_EXFCD_F0_03

Map Series : Page 3 of 11

Drawing Scale : 1:5,000 @A3

Appendix B GSI Groundwater Vulnerability


Legend
Groundwater Vulnerability
Groundwater Vulnerability
Rock at or near Surface or Karst
Extreme
High
Moderate
Low
Water
National Groundwater Vulnerability Ireland
Vulnerability Category M
Vulnerability Description Moderate
Zoom to
Castle Pk
Grangton Court
Saint Dominic's Pk
n's Tce R417

Appendix C IGSL Site Investigation

Report on a Site Investigation
At
Woodstock Lodge Athy
for
Kildare County Council
and
Kavanagh Mansfield and Partners
Consulting Engineers

Report No; 12126 October 2006

1 Introduction

The proposed development of the site at Woodstock Lodge in Athy is to be undertaken by Kildare County Council

On the instructions of the project consulting engineers, Kavanagh Mansfield and Partners, a series of trial pits were opened under geotechnical engineering supervision to examine the suitability of the sub soils for foundation purposes, to determine the dimensions of some existing foundations and to establish permeability of the sub soils for drainage purposes.

Following completion of the trial pits and examination and logging of samples it was decided to carry out a number of dynamic probes in accordance with BS 1377 (Eurocode 7) to confirm the pattern of soil strength with depth.

In all, five trial pits were opened to establish geotechnical data. Three pits were opened to examine foundations and two pits excavated for Soakaway Testing. Dynamic probing was carried out at nine positions to determine soil strength.

This report details the findings of the investigation and comments on the results relative to foundation construction.

2 Fieldwork

The exploratory locations are noted on the site plan enclosed in Appendix VI to this report.

The site is located in Athy on Woodstock Road in the grounds of Woodstock House.

a. Trial Pits

A JCB excavator was provided and excavations were made at five locations to give an overall site coverage. The work was supervised by an experienced geotechnical engineer who logged the stratification, recovered representative samples, noted excavation stability and recorded ground water where encountered. Detailed trial pit records are contained in Appendix I to this report.

Trial pits noted surface top soil or fill overlying silty sandy gravel or sandy gravelly silt or clay. The material is described as medium dense to dense in situ, becoming very dense with boulders and cobbles in some locations.

Trial Pits were terminated at depths between 1.60 and 2.60 metres, ground water was noted at 2.50 metres only in TP 3.

Excavations remained generally stable during the short-term excavation period.

b. Foundation Inspection

The foundations of the existing house were examined by opening pits at three locations. Details of the findings are noted in Appendix II

c. Percolation to BRE Digest 365

Two percolation tests were carried out in locations nominated by the engineer. Testing was in accordance with the requirements of BRE Digest 365. Test data is contained in Appendix III.

d. Dynamic Probing

Probing was in accordance with the heavy-duty probe specification of BS 1377: Part 9: 1990. In these tests, the soil resistance is measured in terms of the number of drop-hammer blows required to drive the test probe through each 100 mm increment of penetration. Probing is terminated when the blow count exceeds 25/100mm to avoid damage to the apparatus. Where loose material is present a single blow count may drive the apparatus in excess of 100mm. In this instance blow counts of zero may be recorded.

The results are presented in both graphical and tabular form in Appendix 1.

The probes indicate that the upper 0.50 metres of soil is loosely compacted. Increasing probe resistance below this level confirms a strength increase to medium dense and dense. Probe refusal on very dense soil at depths between 1.00 and 2.50 metres.

3. Laboratory Testing.

Samples were taken from each trial pit and tests carried out to confirm soil classification, grading, sulphate content and CBR value. All laboratory data is contained in Appendix V to the report.

Sulphate and pH levels were determined for two samples. Results indicate low sulphate concentration and neutral pH. No special protection for foundation concrete is required.

CBR values range from 18.3 to 29% indicating that the shallow soils are suitable for road and pavement construction.

4 Discussion

The trial pit and probe investigation has been carried out to determine ground conditions in the area of a proposed new development. The proposed structures are understood to be relatively lightly loaded single or two storey units.

The soils encountered consist generally of granular material, gravelly sand and gravelly silt underlying shallow surface fill or top soil. The deposits probably represent the flood plain deposition of the River Barrow and are fairly typical of this part of Athy. Ground water was noted at 2.50 metres BGL.

Dynamic Probes were taken at nine locations and at a depth of about 1.00 metres below ground the cone resistance indicates medium dense to dense compaction with N_{100} values generally in excess of 6.

An allowable bearing pressure of the order of 150 kN/sq.m. is therefore indicated for conventional reinforced strip or pad foundations at a formation depth of about 1.00 metres.

Settlement of the order of 15 mm can be expected under this load intensity. Settlement should however be uniform and immediate.

Percolation tests have been carried out to BRE Digest 365 in two locations with results indicating a low percolation rate.

CBR tests confirm the suitability of the soil for pavement construction.

IGSL/JC
October 2006

Appendix I – Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy
TRIAL PIT NO.	TP1
SHEET	Sheet 1 of 1
CO-ORDINATES(_)	GROUND LEVEL (m)
DATE STARTED	15/09/2006
DATE COMPLETED	15/09/2006
CLIENT	Kavanagh Mansfield and Partners
ENGINEER	Kavanagh Mansfield and Partners
EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Medium dense mottled grey brown sandy gravelly SILT with some cobbles and occasional boulders.Gravel is subrounded to rounded and sub angular		0.30			Y0706	CBR	0.50-0.50		
Medium dense mottled grey brown very gravelly coarse SAND with some cobbles and occasional boulders.Gravel is subrounded to rounded and sub angular		1.50			Y0707 Y0708	B D	1.50-1.50 1.50-1.50		
End of Trial Pit at 2.30m		2.30			Y0709 Y0710	B D	2.30-2.30 2.30-2.30		

1.0
2.0
3.0
4.0

Groundwater Conditions

Stability
STABLE

General Remarks

IGSL TP LOG 12126.GPJ IGSL.GDT 21/9/06

TRIAL PIT RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy
CO-ORDINATES(_)	GROUND LEVEL (m)
CLIENT	Kavanagh Mansfield and Partners
ENGINEER	Kavanagh Mansfield and Partners
TRIAL PIT NO.	TP2
SHEET	Sheet 1 of 1
DATE STARTED	15/09/2006
DATE COMPLETED	15/09/2006
EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30							
Loose - Medium dense mottled grey brown sandy very gravelly SILT.Gravel is rounded to subrounded to subangular					Y0701	CBR	0.50-0.50		
1.0									
Loose - Medium dense mottled grey brown sandy gravelly SILT with some cobbles.Gravel is rounded to subrounded and sub angular		1.40			Y0702 Y0703	B D	1.50-1.50 1.50-1.50		
Loose -medium dense wet mottled grey sandy slightly gravelly SILT with some cobbles and occasional boulders.Gravel is subrounded to rounded and sub angular		1.80							
2.0									
End of Trial Pit at 2.50m		2.60			Y0704 Y0705	B D	2.50-2.50 2.50-2.50		
3.0									
4.0									

Groundwater Conditions

Stability
STABLE

General Remarks

IGSL TP LOG 12126.GPJ IGSL.GDT 21/9/06

TRIAL PIT RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy
CO-ORDINATES(_)	GROUND LEVEL (m)
CLIENT	Kavanagh Mansfield and Partners
ENGINEER	Kavanagh Mansfield and Partners
TRIAL PIT NO.	TP3
SHEET	Sheet 1 of 1
DATE STARTED	15/09/2006
DATE COMPLETED	15/09/2006
EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE comprised concrete and gravel		0.40							
Loose to medium dense mottled grey brown very gravelly SAND with some cobbles with occasional boulders.Gravel is subrounded to rounded to sub angular					Y0718	B	0.50-0.50		
1.0					Y0719	B	1.50-1.50		
Loose wet brown slightly gravelly coarse SAND.Gravel is subrounded to sub angular		1.90							
2.0				1					
End of Trial Pit at 2.50m		2.50			Y0720	B	2.50-2.50		
3.0									
4.0									

Groundwater Conditions
water at 2.5m

Stability
STABLE

General Remarks

IGSL TP LOG 12126.GPJ IGSL.GDT 21/9/06

TRIAL PIT RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy
CO-ORDINATES(_)	GROUND LEVEL (m)
CLIENT	Kavanagh Mansfield and Partners
ENGINEER	Kavanagh Mansfield and Partners
TRIAL PIT NO.	TP4
SHEET	Sheet 1 of 1
DATE STARTED	15/09/2006
DATE COMPLETED	15/09/2006
EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
TOPSOIL		0.30							
Dense brown very gravelly fine SAND with some cobbles.Gravel is sub angular to angular		1.20			Y0711	CBR	0.50-0.50		
Dense brown very gravelly coarse SAND with some cobbles.Gravel is rounded to subrounded		1.70			Y0712	B	1.50-1.50		
Loose-medium dense brown sandy GRAVEL with some cobbles.Gravel is rounded to subrounded to sub angular		2.10			Y0713	B	2.10-2.10		
End of Trial Pit at 2.10m									

0.0 1.0 2.0 3.0 4.0

Groundwater Conditions

Stability
STABLE

General Remarks

IGSL TP LOG 12126.GPJ IGSL.GDT 21/9/06

TRIAL PIT RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy
CO-ORDINATES(_)	GROUND LEVEL (m)
CLIENT	Kavanagh Mansfield and Partners
ENGINEER	Kavanagh Mansfield and Partners
TRIAL PIT NO.	TP5
SHEET	Sheet 1 of 1
DATE STARTED	15/09/2006
DATE COMPLETED	15/09/2006
EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30							
Loose -medium dense mottled orange/brown silty SAND					Y0721	CBR	0.50-0.50		
					Y0722	B	0.50-0.50		
Very dense grey slightly gravelly silty SAND.		0.90							
1.0									
End of Trial Pit at 1.50m		1.60			Y0723	B	1.50-1.50		
2.0									
3.0									
4.0									

Groundwater Conditions

Stability
STABLE

General Remarks

IGSL TP LOG 12126.GPJ IGSL.GDT 21/9/06

Appendix II – Foundation Pit Records

TRIAL PIT RECORD /FOUNDATION INSPECTION

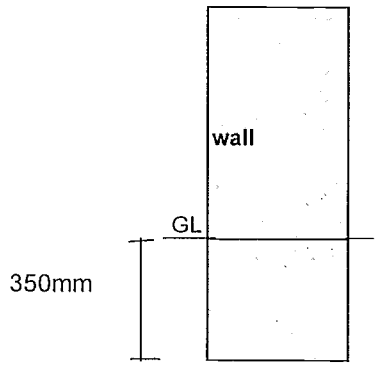
I.G.S.L.

Contract:**Woodstock Lodge Athy**
No:**12126**
Location:**Athy**
Client:**Kavanagh Mansfield and Partners**
Date:**17/09/2006**

PIT No. **TP1**
Sheet **1of 1**
Excavation method:
Hand pit
Ground Level

Description	Red. Level	Legend	Depth	samples Ref. No.	Type	Depth	Remarks
MADE GROUND(Comprised of sand gravel with some cobbles			0-0.60				

Foundation Details:



Observations	Groundwater Conditions
Backfilled with arising.Foundation did not step out	No groundwater encountered
	Logged by: FEMI

TRIAL PIT RECORD /FOUNDATION INSPECTION

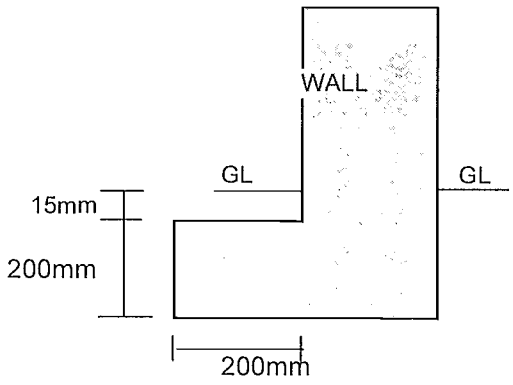
I.G.S.L.

Contract:**Woodstock Lodge Athy**
No:**12126**
Location:**Athy**
Client:**Kavanagh Mansfield and Partners**
Date:**15/09/06**

PIT No. **TP2**
Sheet **1of1**
Excavation method: **Hand pit**
Ground Level

Description	Red. Level	Legend	Depth	samples Ref. No.	Type	Depth	Remarks
MADE GROUND Concrete MADE GROUND(comprised of sand,gravel and some cobbles			0-0.15 0.15-0.70				

Foundation Details:



Observations	Groundwater Conditions
Backfilled with arising Foundation is underlain by sand and gravels with some cobbles	DRY
	Logged by: FEMI

TRIAL PIT RECORD /FOUNDATION INSPECTION

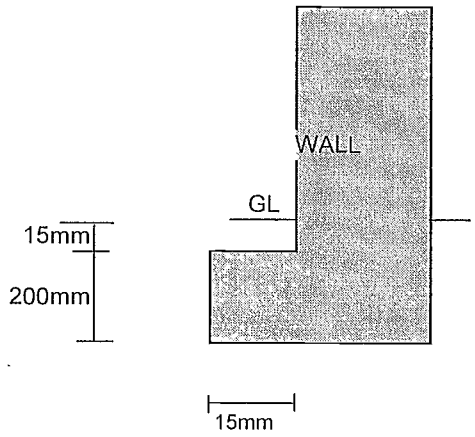
I.G.S.L.

Contract:**Woodstock Lodge Athy**
No:**12126**
Location:**Athy**
Client:**Kavanagh Mansfield**
Date:**17/09/2006**

PIT No. **TP3**
Sheet **1of 1**
Excavation method:
Hand pit
Ground Level

Description	Red. Level	Leg end	Depth	samples Ref. No.	Type	Depth	Remarks
MADE GROUND Concrete			0-0.15				
MADE GROUND(comprised of sand,gravel and some cobbles			0.15-0.60				

Foundation Details:



Observations	Groundwater Conditions
Backfilled with arisings Foundation is underlain by sand and gravel with some stones	
	Logged by: FEMI

Appendix III – Soakaway Test Results

Soakaway Design f -value from field tests IGSL

Contract: Woodstock Lodge Athy Contract No. 12126
Test No. PT1
Client
Date: 15-Sep

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	
0.30	1.00	Medium dense brown gravelly fine SAND	
1.00	2.00	Medium dense brown gravelly fine SAND with some cobbles and occasic	

Field Data

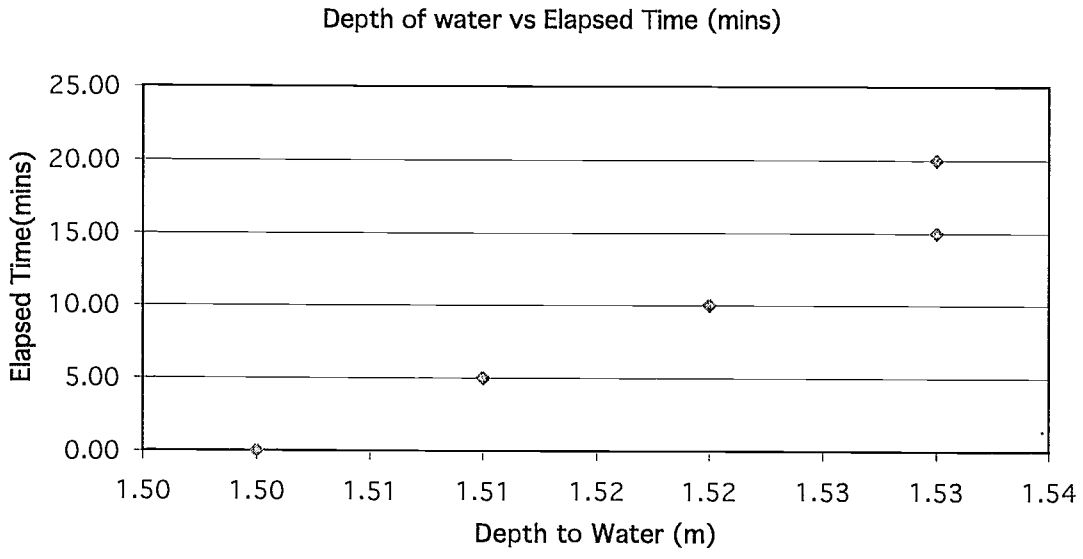
Depth to Water (m)	Elapsed Time (min)
1.50	0.00
1.51	5.00
1.52	10.00
1.53	15.00
1.53	20.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	1.30	m
Length of Pit (L)	1.70	m
Initial depth to Water =	1.50	m
Final depth to water =	1.53	m
Elapsed time (mins)=	15.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	2.21	m2
*Av. side area of permeable stratum over test period=	2.91	m2
Total Exposed area =	5.12	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00086 m/min or 1.4388E-05 m/sec



Soakaway Design f -value from field tests IGSL

Contract: Woodstock Lodge Athy Contract No. 12126
Test No. PT2
Client
Date: 15-Sep

Summary of ground conditions

from	to	Description	Ground water
0.00	0.30	TOPSOIL	
0.30	1.80	Medium dense brown silty very gravelly SAND with some cobbles and oc	

Field Data

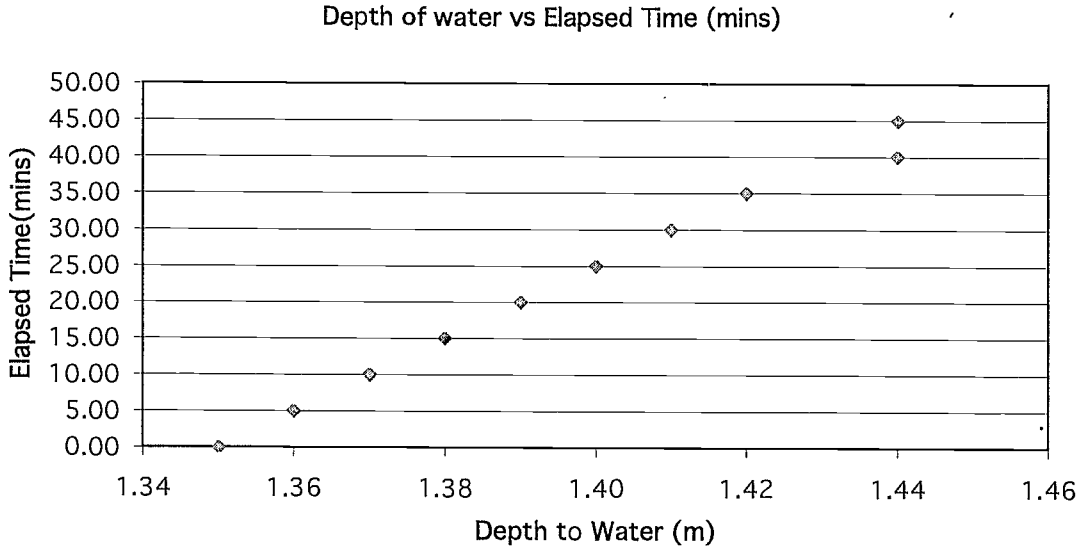
Depth to Water (m)	Elapsed Time (min)
1.35	0.00
1.36	5.00
1.37	10.00
1.38	15.00
1.39	20.00
1.40	25.00
1.41	30.00
1.42	35.00
1.44	40.00
1.44	45.00

Field Test

Depth of Pit (D)	1.80	m
Width of Pit (B)	1.30	m
Length of Pit (L)	2.00	m
Initial depth to Water =	1.35	m
Final depth to water =	1.44	m
Elapsed time (mins)=	45.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	2.6	m2
*Av. side area of permeable stratum over test period=	2.673	m2
Total Exposed area =	5.273	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00099 m/min or 1.6436E-05 m/sec



Appendix IV – Dynamic Probe Records

DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP01
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)		DATE STARTED	02/10/2006
	GROUND LEVEL (m)	DATE COMPLETED	02/10/2006
	HAMMER MASS (kg) 50		
CLIENT	Kavanagh Mansfield and Partners	INCREMENT SIZE (mm) 100	
ENGINEER	Kavanagh Mansfield and Partners	FALL HEIGHT (mm) 500	PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	1
						0.10	3
						0.20	5
						0.30	5
						0.40	6
						0.50	6
						0.60	4
						0.70	7
						0.80	9
						0.90	22
1.0						1.00	25
	End of Probe at 1.10 m						
2.0							
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

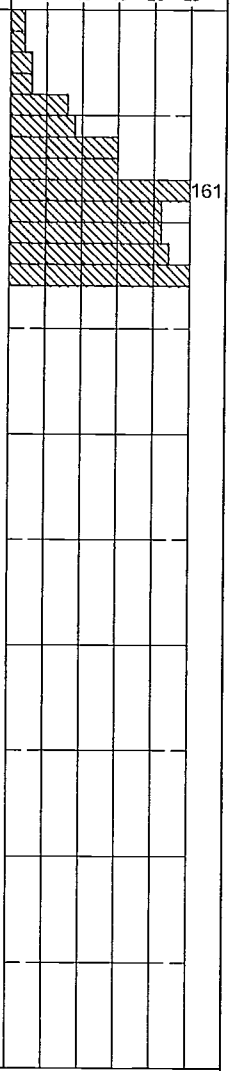
DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP02
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)		DATE STARTED	02/10/2006
	GROUND LEVEL (m)	DATE COMPLETED	02/10/2006
	HAMMER MASS (kg) 50		
CLIENT	Kavanagh Mansfield and Partners	INCREMENT SIZE (mm) 100	
ENGINEER	Kavanagh Mansfield and Partners	FALL HEIGHT (mm) 500	PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	2
						0.10	2
						0.20	3
						0.30	3
						0.40	8
						0.50	9
						0.60	15
						0.70	15
						0.80	161
1.0						0.90	21
						1.00	21
						1.10	22
	End of Probe at 1.30 m					1.20	25
2.0							
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP03
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)		DATE STARTED	02/10/2006
	GROUND LEVEL (m)	DATE COMPLETED	02/10/2006
	HAMMER MASS (kg) 50		
CLIENT	Kavanagh Mansfield and Partners	INCREMENT SIZE (mm) 100	
ENGINEER	Kavanagh Mansfield and Partners	FALL HEIGHT (mm) 500	PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	4
						0.10	2
						0.20	3
						0.30	4
						0.40	6
						0.50	6
						0.60	3
						0.70	12
						0.80	25
1.0	End of Probe at 0.90 m						
2.0							
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP04
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)	GROUND LEVEL (m)	DATE STARTED	02/10/2006
	HAMMER MASS (kg) 50	DATE COMPLETED	02/10/2006
CLIENT Kavanagh Mansfield and Partners	INCREMENT SIZE (mm) 100		
ENGINEER Kavanagh Mansfield and Partners	FALL HEIGHT (mm) 500	PROBE TYPE	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	1
						0.10	1
						0.20	3
						0.30	10
						0.40	10
						0.50	15
						0.60	25
	End of Probe at 0.70 m						
1.0							
2.0							
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

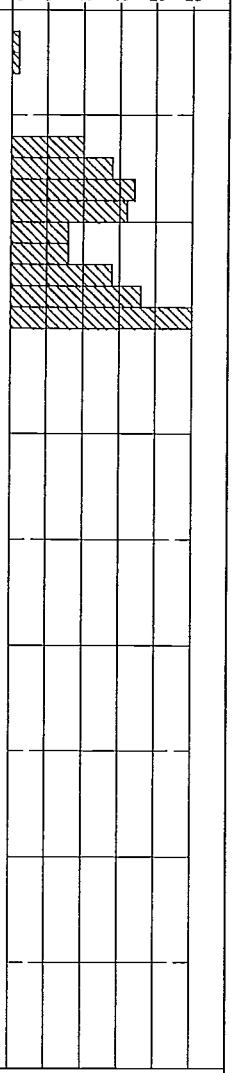
DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP05
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)		DATE STARTED	02/10/2006
GROUND LEVEL (m)		DATE COMPLETED	02/10/2006
HAMMER MASS (kg)	50		
CLIENT	Kavanagh Mansfield and Partners	INCREMENT SIZE (mm)	100
ENGINEER	Kavanagh Mansfield and Partners	FALL HEIGHT (mm)	500
		PROBE TYPE	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	1
						0.20	1
						0.30	0
						0.40	0
						0.50	0
						0.60	10
						0.70	14
						0.80	17
						0.90	16
1.0						1.00	8
						1.10	8
						1.20	14
						1.30	18
						1.40	25
	End of Probe at 1.50 m						
2.0							
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP06
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)		DATE STARTED	02/10/2006
	GROUND LEVEL (m)	DATE COMPLETED	02/10/2006
	HAMMER MASS (kg) 50		
CLIENT	Kavanagh Mansfield and Partners	INCREMENT SIZE (mm) 100	
ENGINEER	Kavanagh Mansfield and Partners	FALL HEIGHT (mm) 500	PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	2
						0.10	3
						0.20	5
						0.30	5
						0.40	6
						0.50	8
						0.60	16
						0.70	25
	End of Probe at 0.80 m						
1.0							
2.0							
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP07
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)		DATE STARTED	02/10/2006
	GROUND LEVEL (m)	DATE COMPLETED	02/10/2006
	HAMMER MASS (kg) 50		
CLIENT	Kavanagh Mansfield and Partners	INCREMENT SIZE (mm) 100	
ENGINEER	Kavanagh Mansfield and Partners	FALL HEIGHT (mm) 500	PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	1
						0.20	1
						0.30	1
						0.40	1
						0.50	1
						0.60	3
						0.70	15
						0.80	15
						0.90	19
1.0						1.00	25
	End of Probe at 1.10 m						
2.0							
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

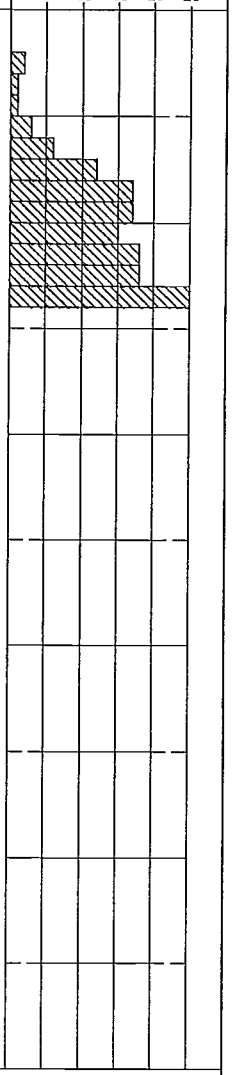
DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP08
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)	GROUND LEVEL (m)	DATE STARTED	02/10/2006
	HAMMER MASS (kg) 50	DATE COMPLETED	02/10/2006
CLIENT Kavanagh Mansfield and Partners	INCREMENT SIZE (mm) 100		
ENGINEER Kavanagh Mansfield and Partners	FALL HEIGHT (mm) 500	PROBE TYPE	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	2
						0.30	1
						0.40	1
						0.50	3
						0.60	6
						0.70	12
						0.80	17
1.0						0.90	17
						1.00	15
						1.10	18
						1.20	18
	End of Probe at 1.40 m					1.30	25
2.0							
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

DYNAMIC PROBE RECORD

REPORT NUMBER 12126

CONTRACT	Woodstock Lodge Athy	PROBE NO.	DP09
		SHEET	Sheet 1 of 1
CO-ORDINATES(_)	GROUND LEVEL (m)	DATE STARTED	02/10/2006
	HAMMER MASS (kg) 50	DATE COMPLETED	02/10/2006
CLIENT Kavanagh Mansfield and Partners	INCREMENT SIZE (mm) 100		
ENGINEER Kavanagh Mansfield and Partners	FALL HEIGHT (mm) 500	PROBE TYPE	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	0
						0.30	0
						0.40	5
						0.50	6
						0.60	6
						0.70	5
						0.80	3
1.0						0.90	3
						1.00	3
						1.10	3
						1.20	3
						1.30	4
						1.40	4
						1.50	4
						1.60	4
						1.70	3
2.0						1.80	3
						1.90	3
						2.00	4
						2.10	3
						2.20	7
						2.30	5
						2.40	10
	End of Probe at 2.60 m					2.50	25
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 12126DP.GPJ IGSL.GDT 3/10/06

Appendix V – Geotechnical Laboratory Records

Summary of Classification Tests

BS1377:Part 2:1990, clauses 3.2, 4.3, 5.3 & 5.4

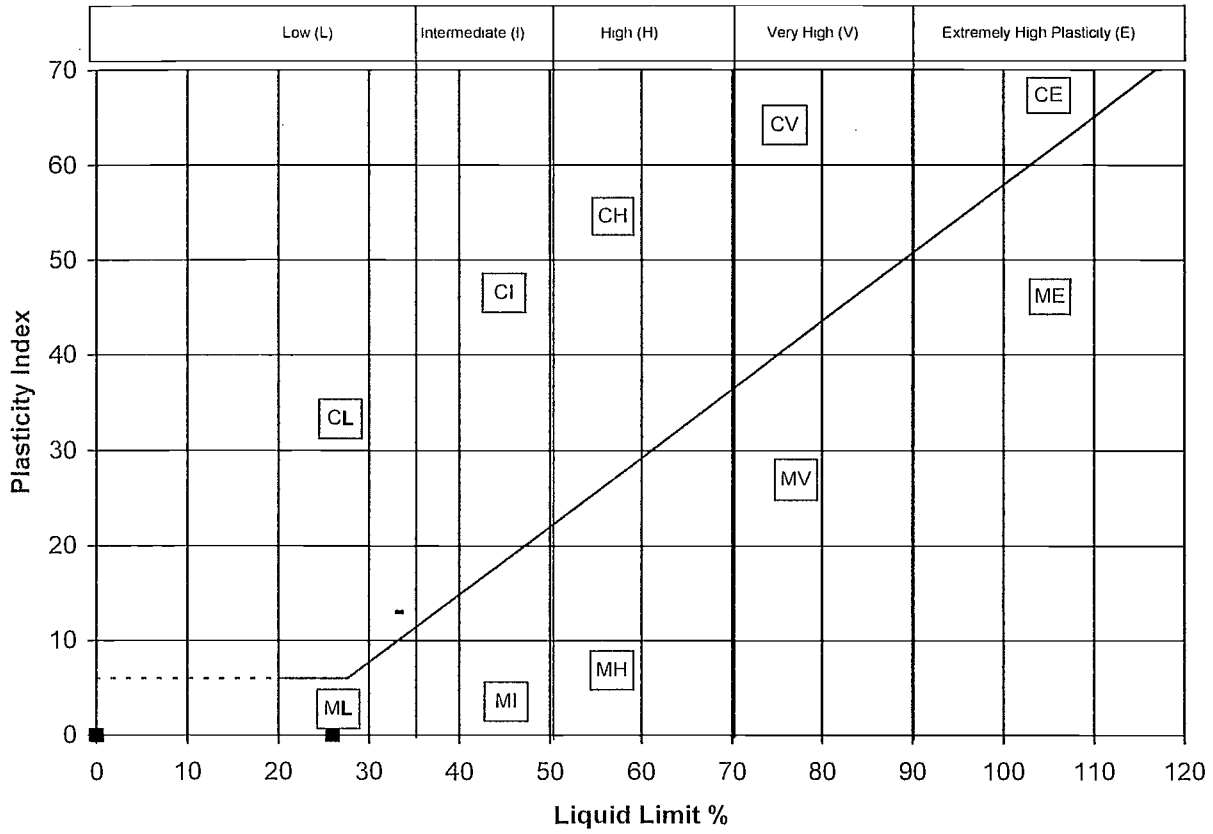
BH/TP No.	Sample No.	Depth (m)	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	<425µm %	Preparation	Description	Classification
TP 1	Y0706	0.50	D	10.8	33	20	13	44.3	WS	Grey brown slightly sandy slightly gravelly CLAY with root hairs & pieces	C L
TP 2	Y0704	2.50	D	21.5	26	NP		90.9	WS	Grey brown sandy SILT	M L

Notes: NAT - tested as received WS - Wet sieved (425µm) NP - Non Plastic

IGSL	Contract	WOODSTOCK LODGE ATHY			Contract No. 12126
	Issued By	Date		Date	Page
		09/10/2006			of

Plasticity Chart - Summary of Liquid & Plastic Limit Tests
BS1377:Part 2:1990, clauses 3.2, 4 & 5
Chart in accordance with BS5930:1999, fig.18

Contract No. 12126 Contract: WOODSTOCK LODGE ATHY



Code	BH/TP	Sample	Depth (m)	MC%	LL%	PL%	PI%	%<425µm	Description
-	TP 1	Y0706	0.50	10.8	33	20	13	44.3	Grey brown slightly sandy slightly gravelly CLAY with root hairs & pieces of glass
■	TP 2	Y0704	2.50	21.5	26	NP	0	90.9	Grey brown sandy SILT
●									
◆									
❹									
🗍									
⑥									
□									
-									
■									
●									
◆									
❹									
🗍									
⑥									
□									

NP denotes specimen is non-plastic.

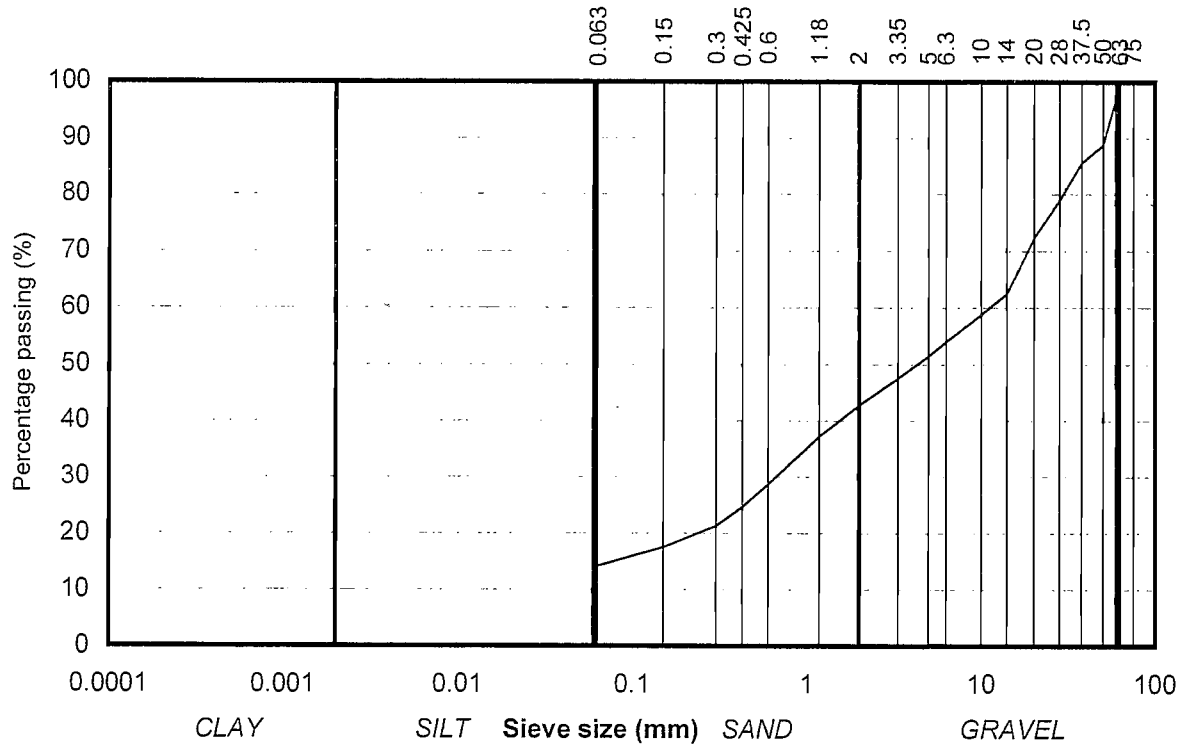
	Issued by	Date		Date	Page
IGSL		########			

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	GRAVEL
50	89	
37.5	86	
28	79	
20	72	
14	62	
10	59	
6.3	54	
5	52	
3.35	48	
2	43	SAND
1.18	37	
0.6	29	
0.425	25	
0.3	21	
0.15	18	
0.063	14	SILT/CLAY
0.042	#N/A	
0.030	#N/A	
0.019	#N/A	
0.011	#N/A	
0.008	#N/A	
0.004	#N/A	
0.002	#N/A	

Contract No: 12126
Contract: WOODSTOCK LODGE ATHY
BH/TP No: TP 1
SAMPLE No.: Y0707
DEPTH (m): 1.50
TEST METHOD: Wet sieve
DESCRIPTION: Grey brown clayey/silty, very sandy, GRAVEL



IGSL	Issued By	Date:			Page no:
		09/10/2006			

IGSL LIMITED, UNIT F, M7 BUSINESS PARK, NAAS, CO.KILDARE. PSD V3.1 12.01

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	91	GRAVEL
50	91	
37.5	91	
28	84	
20	75	
14	70	
10	65	
6.3	60	
5	57	
3.35	53	
2	50	SAND
1.18	48	
0.6	42	
0.425	37	
0.3	30	
0.15	19	
0.063	13	SILT/CLAY
0.042	#N/A	
0.030	#N/A	
0.019	#N/A	
0.011	#N/A	
0.008	#N/A	
0.004	#N/A	
0.002	#N/A	

Contract No: 12126

Contract: WOODSTOCK LODGE ATHY

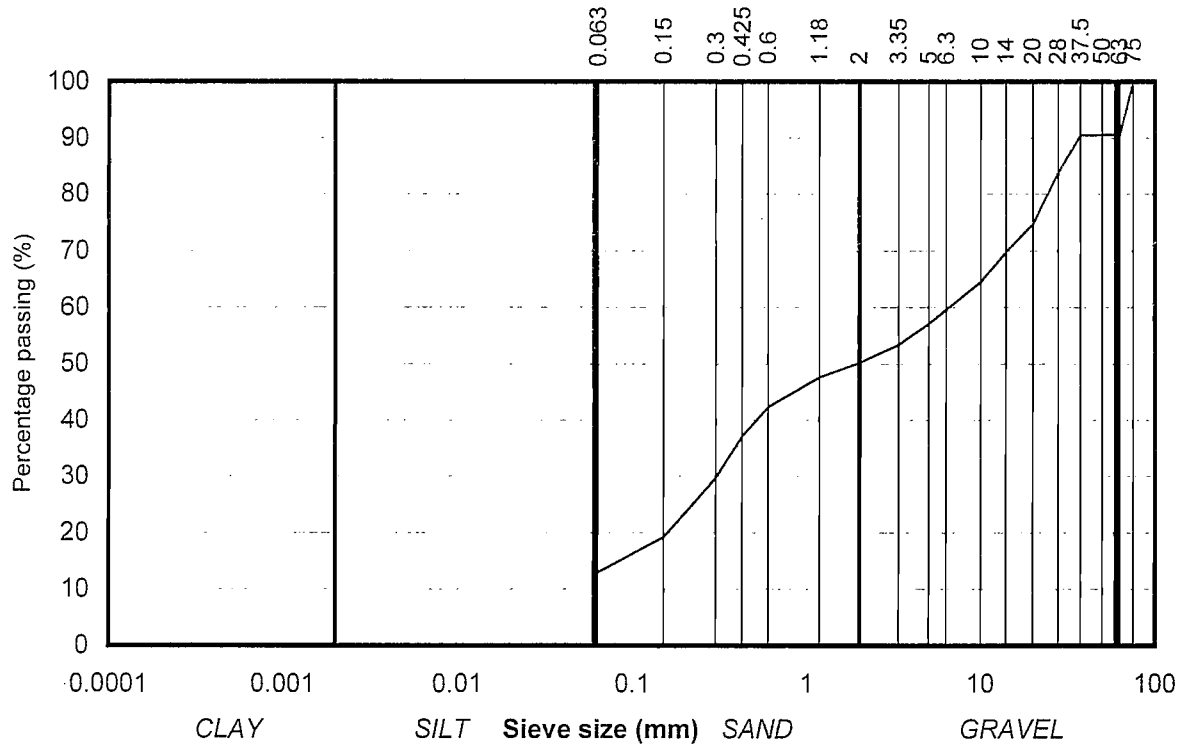
BH/TP No: TP 3

SAMPLE No.: Y0719

DEPTH (m): 1.50

TEST METHOD: Wet sieve

DESCRIPTION: Grey brown clayey/silty, very sandy, GRAVEL with some cobbles



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		09/10/2006			

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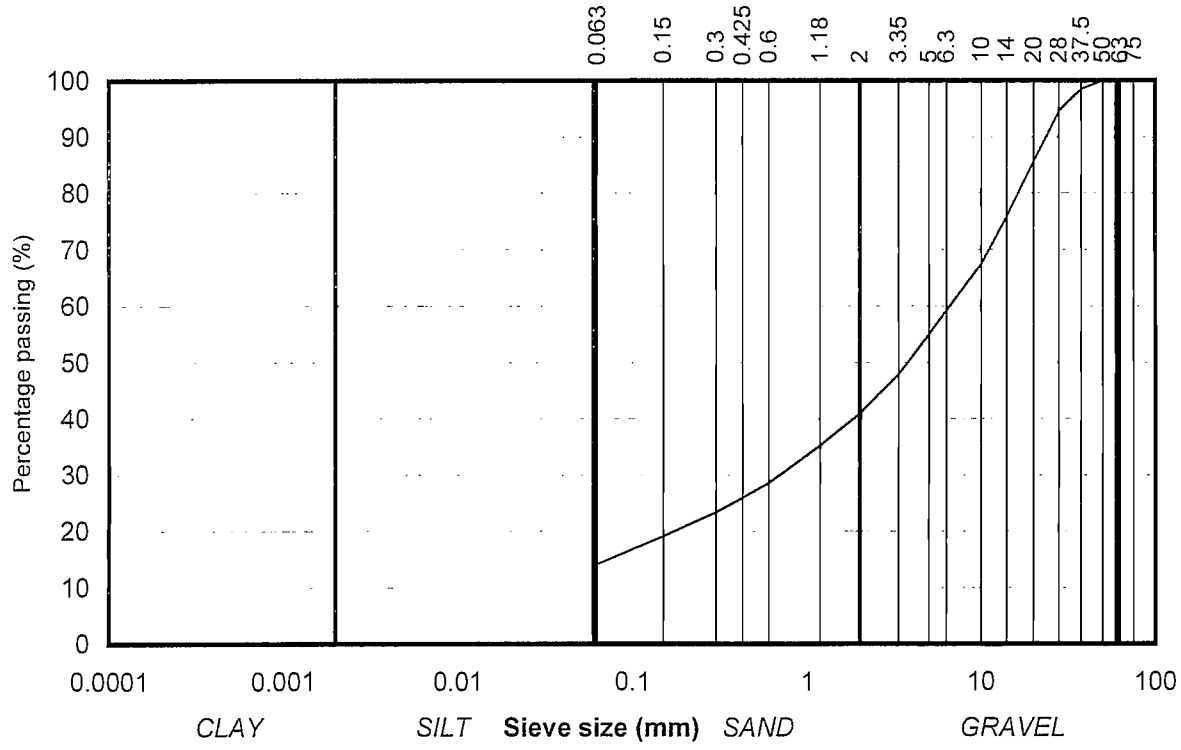
Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	GRAVEL
50	100	
37.5	99	
28	95	
20	86	
14	76	
10	67	
6.3	59	
5	55	
3.35	48	
2	41	SAND
1.18	35	
0.6	29	
0.425	26	
0.3	23	
0.15	19	
0.063	14	SILT/CLAY
0.042	#N/A	
0.030	#N/A	
0.019	#N/A	
0.011	#N/A	
0.008	#N/A	
0.004	#N/A	
0.002	#N/A	

Contract No: 12126
Contract: WOODSTOCK LODGE ATHY
BH/TP No: TP 4
SAMPLE No.: Y0712
DEPTH (m): 1.50
TEST METHOD: Wet sieve
DESCRIPTION: Grey brown clayey/silty, very sandy, GRAVEL with root hairs



IGSL	Issued By	Date:			Page no:
		09/10/2006			

IGSL LIMITED, UNIT F, M7 BUSINESS PARK, NAAS, CO.KILDARE. PSD V3.1 12.01

Determination of Particle Size Distribution

BS1377:Part2:1990 , clauses 9.2

particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	99	
20	98	GRAVEL
14	97	
10	95	
6.3	92	
5	91	
3.35	88	
2	85	
1.18	82	
0.6	78	SAND
0.425	75	
0.3	72	
0.15	63	
0.063	52	
0.042	#N/A	
0.030	#N/A	
0.019	#N/A	SILT/CLAY
0.011	#N/A	
0.008	#N/A	
0.004	#N/A	
0.002	#N/A	

Contract No: 12126

Contract: WOODSTOCK LODGE ATHY

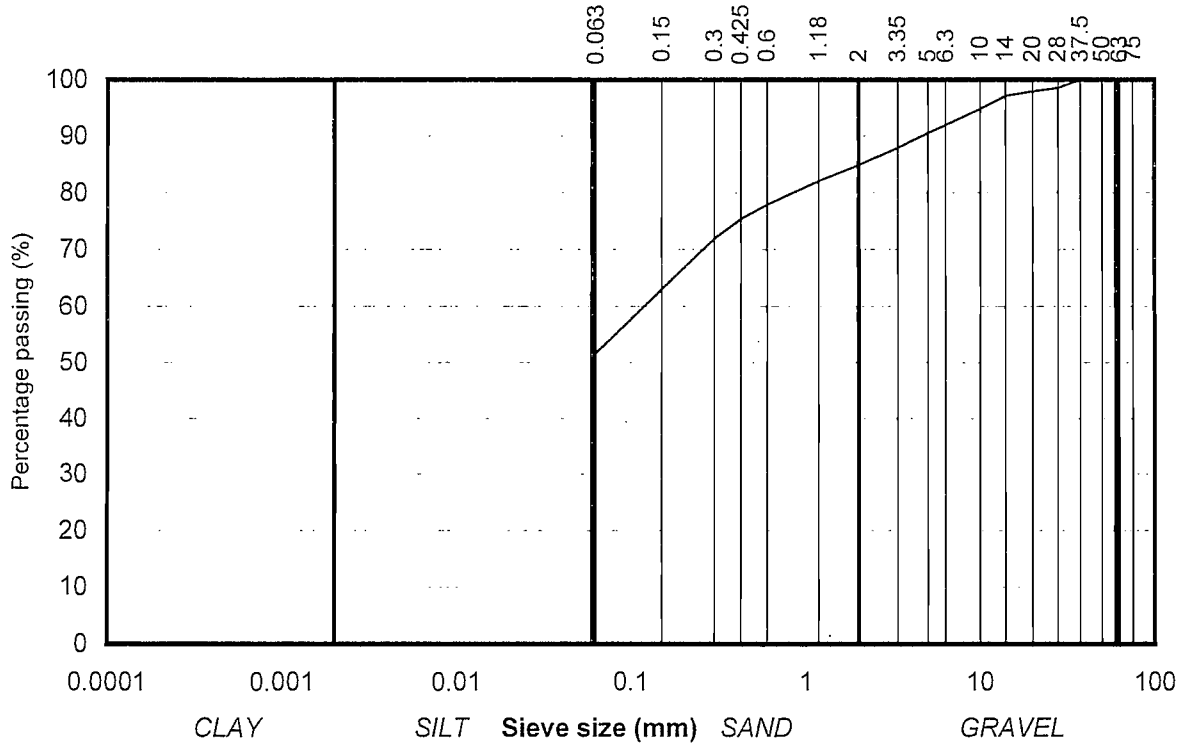
BH/TP No: TP 5

SAMPLE No.: Y0723

DEPTH (m): 1.50

TEST METHOD: Wet sieve

DESCRIPTION: Grey brown slightly sandy, slightly gravelly, SILT/CLAY with root hairs



IGSL	Issued By	Date:			Page no:
		09/10/2006			

Report No. 12126	SULPHATE CONTENT & pH					IGSL
Contract: ATHY						
Location TP	Depth (m)	Reference No.	Description	WATER Parts per 100,000	SOIL Percentage Sulphates	pH
3	0.50	718	Silty Gravelly SAND		0.06	8.0
5	1.50	723	Silty SAND		0.02	7.8
Note:				SO4 = SO3 x 1.2		

Report No.

CALIFORNIA BEARING RATIO

I.G.S.L.

Contract: WOODSTOCK LODGE ATHY

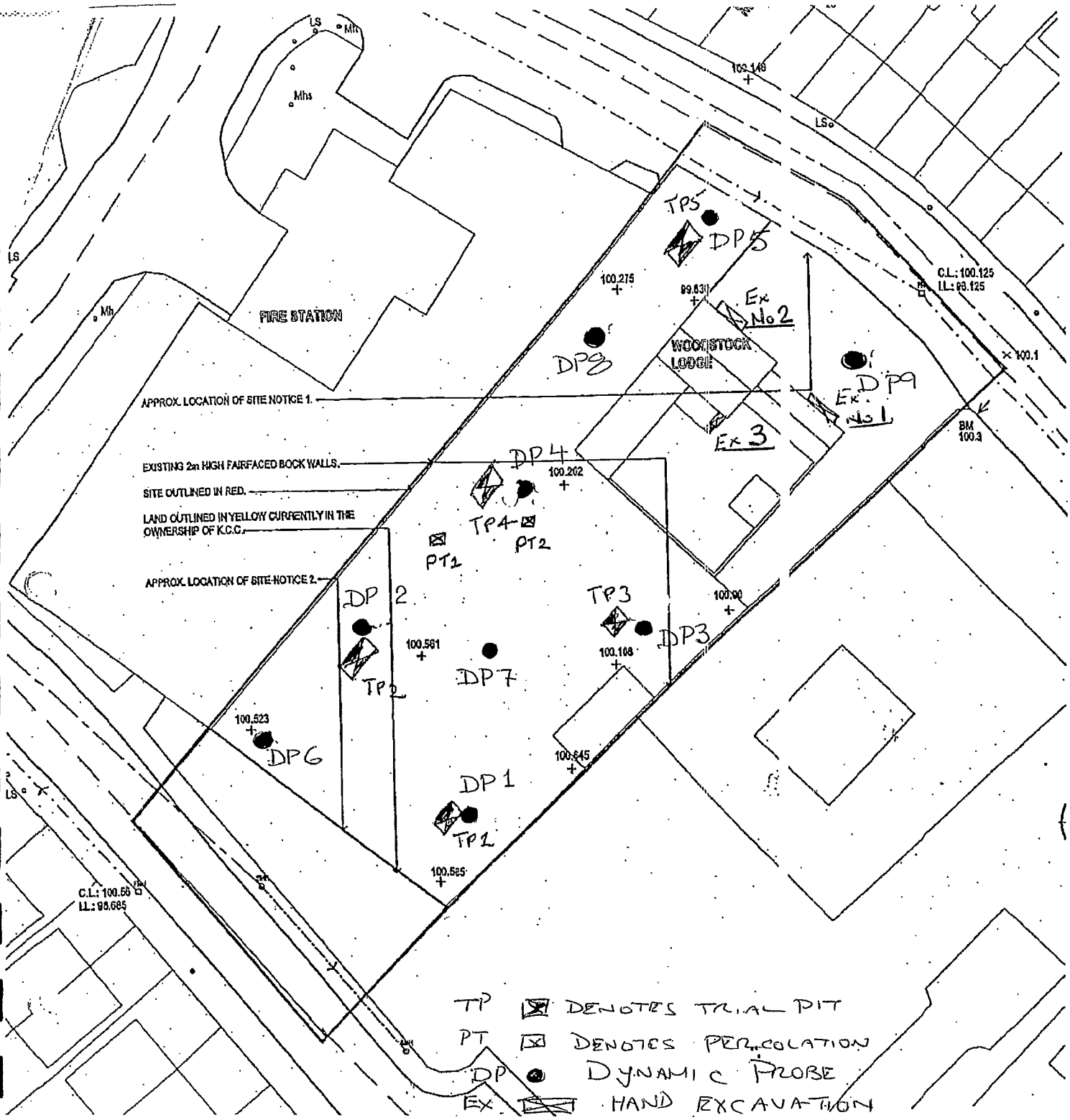
DATE 09/10/2006

CONTRACT No 12126

Location	Sample No.	Depth of Sample	Sample Description	Water Content %	Test Code	Water Content Top %	Water Content Bottom %	Bulk Density Mg/M3	% Passing 20mm	C.B.R. Top %	C.B.R. Base %	C.B.R. Average %
TP 1	Y0706	0.50	Brown slightly sandy slightly gravelly SILT/CLAY	11.9	L/St	11.9	11.9	1.94	93.3	20.8	15.9	18.3
TP 2	Y0701	0.50	Brown slightly sandy slightly gravelly SILT/CLAY with root hairs	10.3	L/St	10.0	10.5	1.94	95.4	32.6	25.4	29.0
TP 5	Y0721	0.50	Brown slightly sandy slightly gravelly SILT/CLAY	14.4	L/St	14.2	14.6	2.02	97.5	19.8	17.7	18.8

Test Code U.-Undisturbed Sample L.-2.5Kg. Rammer A/5.-5% Air Voids Ratio V.- Vibrating Hammer
D.-Dynamic Compaction H.-4.5Kg. Rammer A10.-10% Air Voids Ratio M.- Method Number
St.-Static compaction RN29.- Road Note 29 (St. 95% H.)

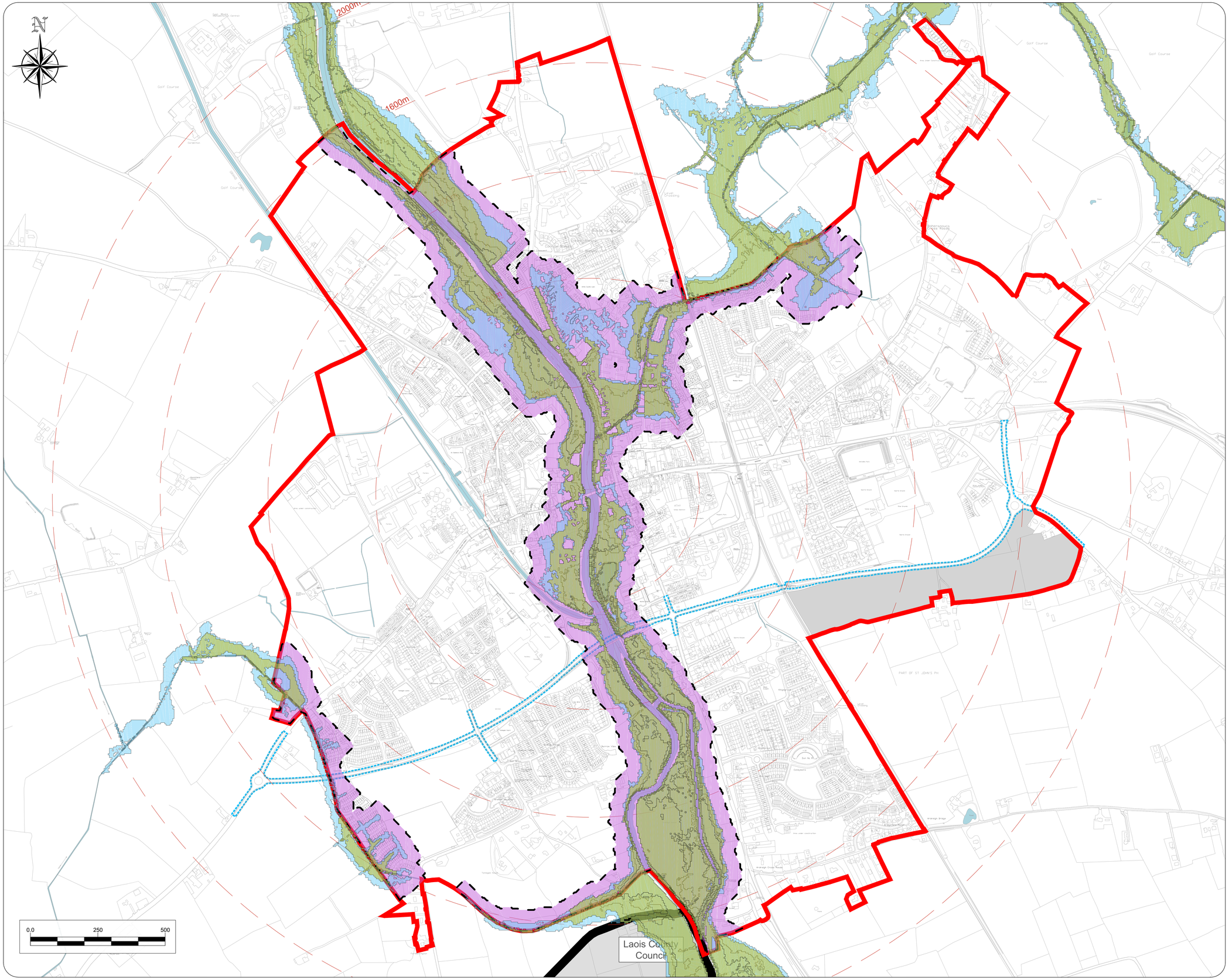
Appendix VI – Site Plan



WOODSTOCK HOUSE ATHY

SITE LOCATION PLAN

Appendix D Strategic Flood Risk Map (Athy LAP)



Kildare County Council
Planning & Strategic
Development Department
Áras Chill Dara,
Devoy Park, Naas, Co Kildare.

Athy Local Area Plan 2021 - 2027

Legend :

- Local Area Plan Boundary
- County Boundary
- Athy Distributor Road
- River / Canal / Lakes
- Distance from Town Centre (at 400m intervals)
- Athy Flood Risk Assessment Zone
- Flood Risk Zone A (1% AEP)
- Flood Risk Zone B (0.1% AEP)

Stage	Date	Description
Plan Effective	13/09/2021	Date the plan comes into effect
Plan Adopted	03/08/2021	Plan Adopted
Draft	17/12/2020	Draft Plan

Strategic Flood Risk Map

Scale: N.T.S.

Map Ref.: 2

Date: August 2021

Drawing No.: 200/21/1116

Drawn by:	Checked by:	Approved by:
M O'Loughlin	L Crawford	D Jordan
Date: 04/08/2021	Date: 08/09/2021	Date: 08/09/2021

This drawing is to be read in conjunction with the written statement