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# Kildare County Council

## Kilcock Park & Ride

## Maynooth Road, Kilcock

## Flood Risk Assessment

January 2018

## Document Control

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# 1 Introduction

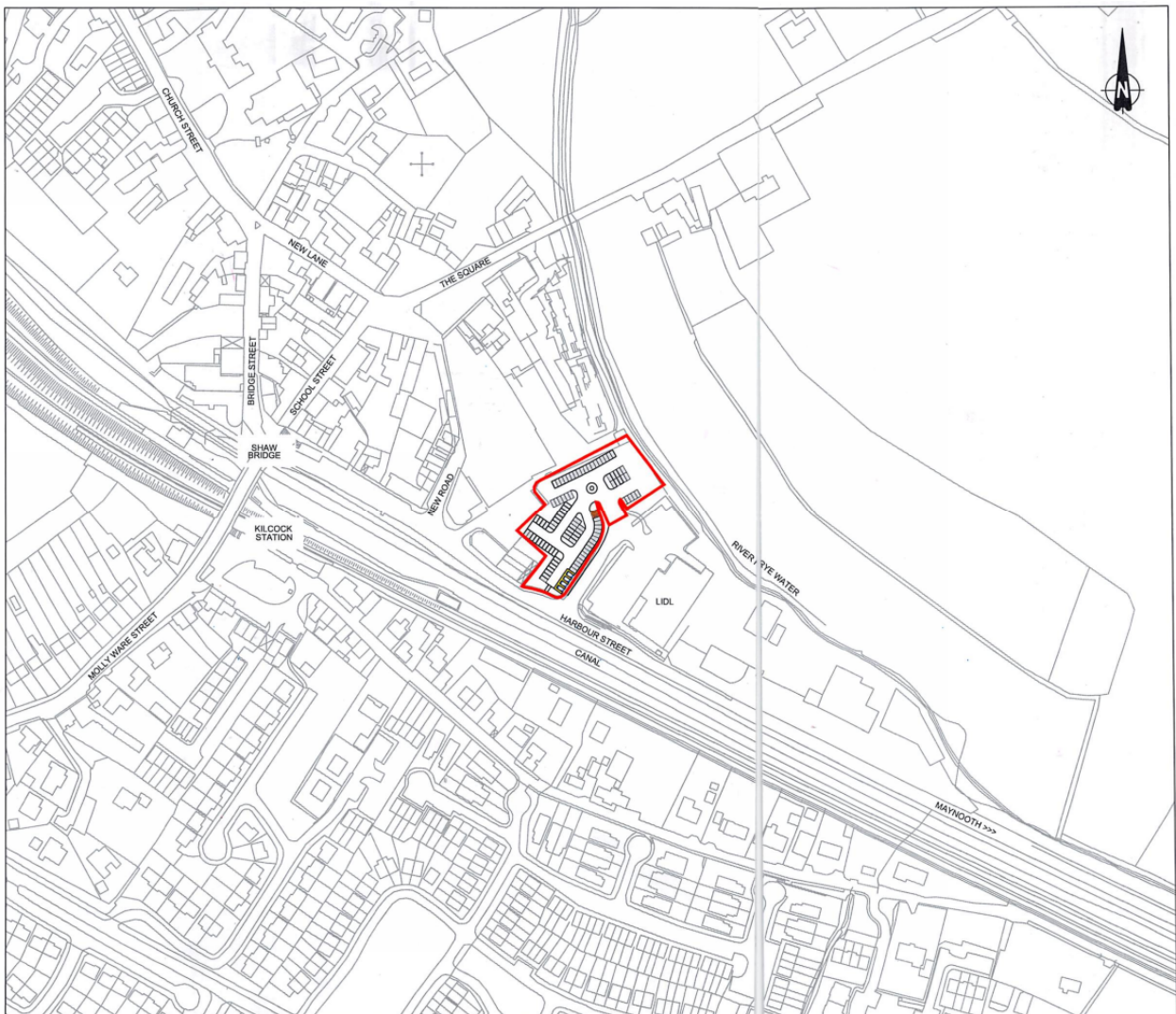
Donnachadh O'Brien & Associates (DOB&A) were commissioned by Kildare County Council to carry out a Flood Risk Assessment for the site of the proposed park & ride facility at Maynooth Road, Kilcock, Co. Kildare.

The Flood Risk Assessment was carried out in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' document by the Department of the Environment and The Office of Public Works.

## 2 The Site and Proposed Development

### 2.1 The Site

The site for the proposed facility is located on the Maynooth Road, Kilcock in Co. Kildare. It is bounded to the north and west by neighbouring developments, to the northeast by the Rye Water River, to the southeast by a shared access road to the Lidl shopping centre and to the south by the Maynooth Road. The site is currently a greenfield site. The topographical information indicates that the site generally falls from South (+65.539m) to Northeast (+63.62m at the top of the river bank).



**Figure 2.1 – Site Location Map**

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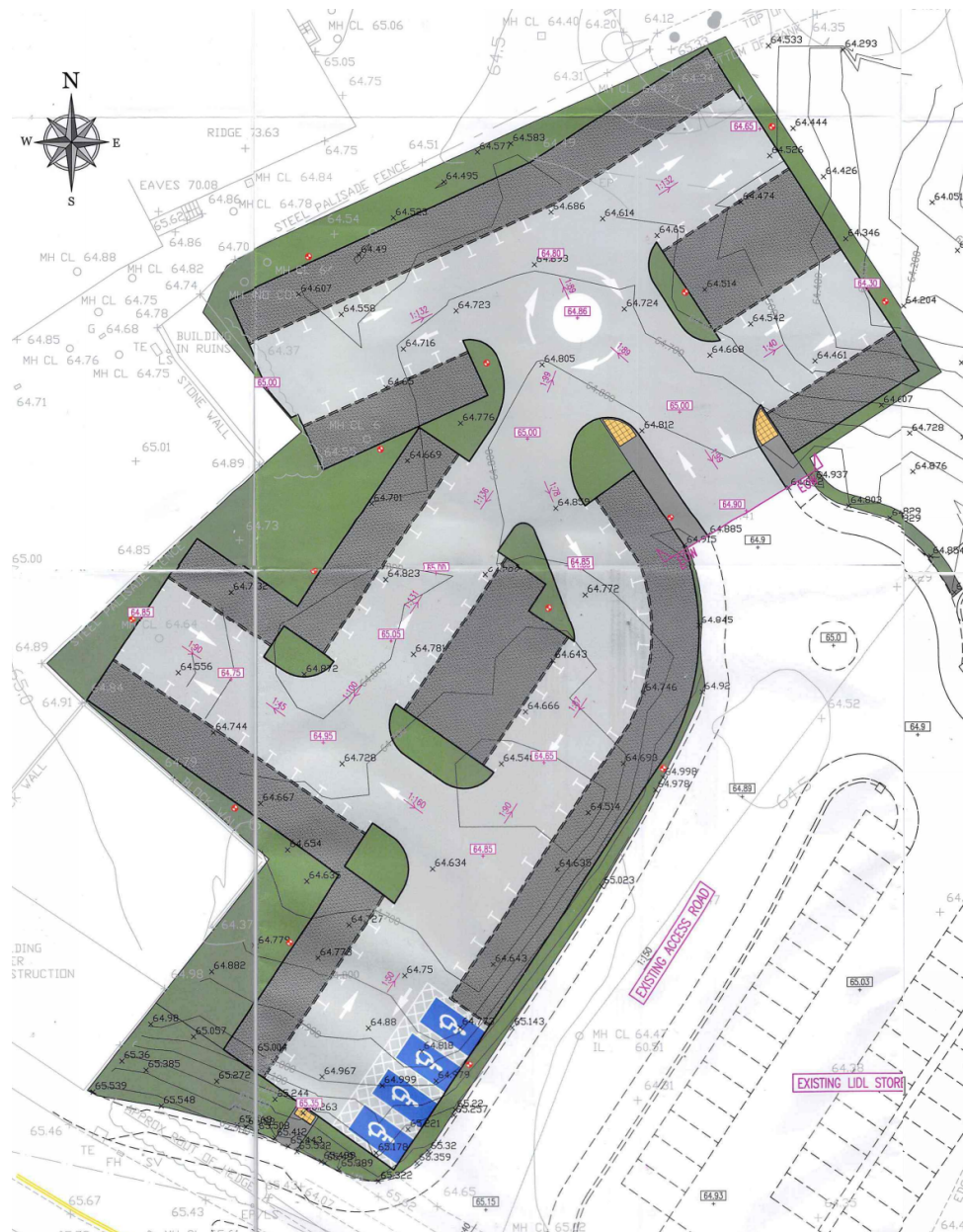
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## 2.2 Proposed Development

The proposed development at the site consists of a car park with 101 parking spaces incl. 4 disabled access spaces. The parking bays consist of permeable stone surfacing. The car park is to be accessed via the existing access road serving the adjacent Lidl shopping centre. The proposed car park development will not extend to the river bank. The edge of the proposed development is approx. 25m from the river bank. The proposed finished ground levels of the development are to match in generally with existing ground levels.



**Fig 2.2 – Proposed Site Layout**

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## 3 Site Flood History and Flood Data

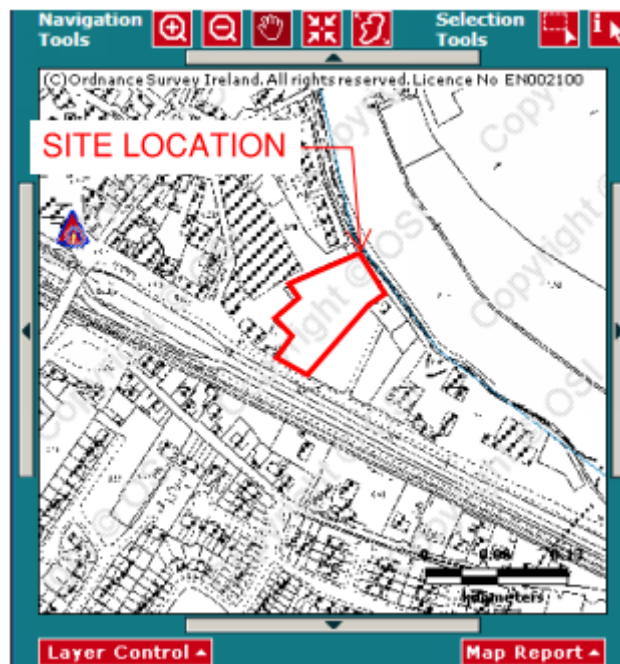
### 3.1 Site Flood History and Flood Data

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

- Historic flood maps and reports from the OPW [www.floodmaps.ie](http://www.floodmaps.ie)
- CFRAMS study
- Kilcock Local Area Development Plan

### 3.2 Floodmaps.ie

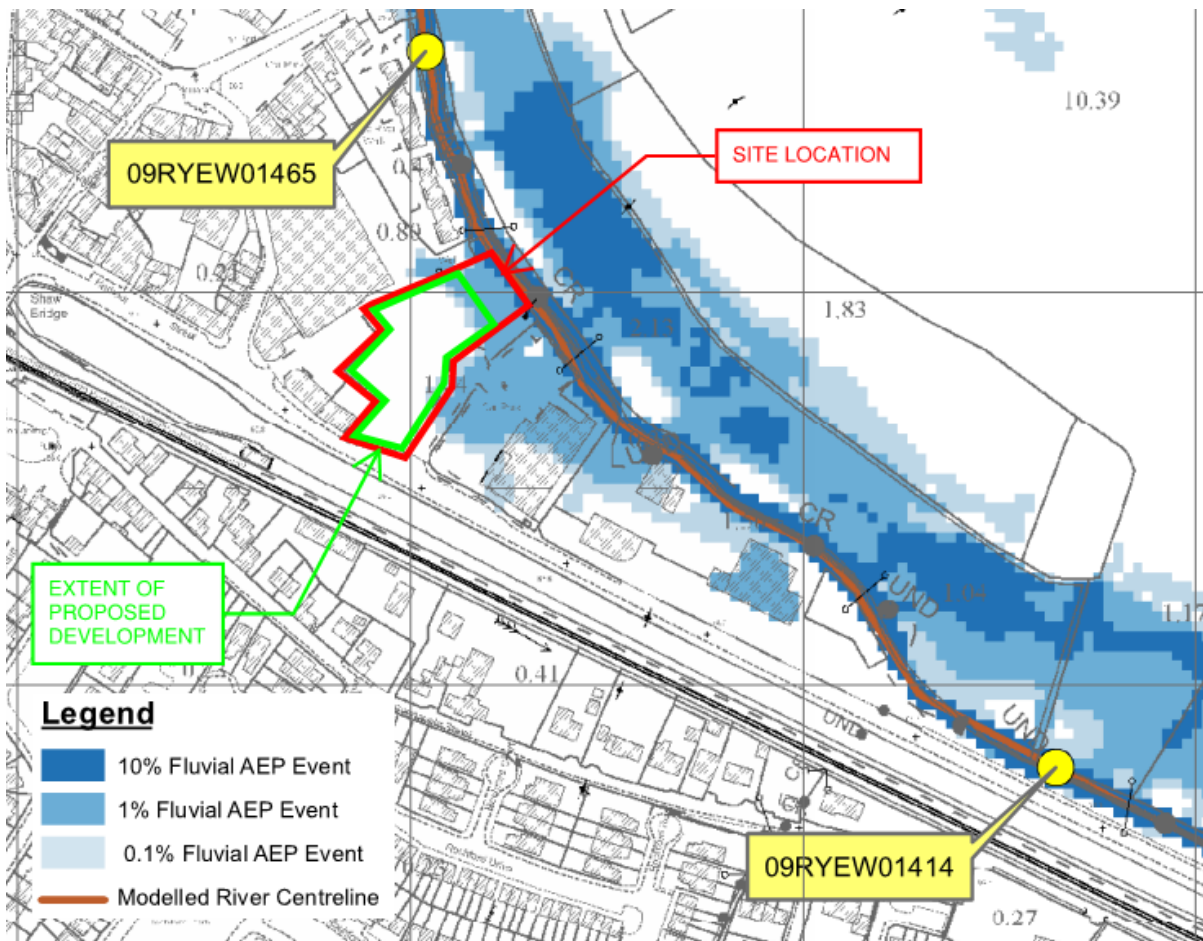
Fig 3.1 shows an extract from the OPW flood Hazard maps for the site area. While there is no evidence of historical flooding on the site in question, there is a general reference to annual flooding of low lying lands in the Kilcock area due to poor drainage following heavy rains in the KCC Area Engineer's report dated 22.03.2005 (Flood I.D. 1289).



**Figure 3.1 – Extract from Floodmaps**

### 3.3 CFRAMs

The subject site was identified as an area of potential flooding risk in the national Catchment Flood Risk Assessment and Management (CFRAM) study. Kilcock is included under the Eastern CFRAM Study. In this study the site was identified as potentially being at risk of partial flooding from the 1% Annual Exceedence Probability (AEP) fluvial flood event as can be seen in Figure 3.2 below. The source of the flooding is from the Rye Water River that runs along the northeast boundary of the site. The model indicates that the flooding is confined to the Northeast portion of the site. It is also noted that the shared access road into the Lidl and proposed car park is potentially at risk of flooding under the 1% A.E.P. event.



**Fig 3.2 - Extract from CFRAM mapping**



A predicted high water level is also identified nearby to the site. The marker 09RYEW01465 is approx. 125m upstream of the site and indicates a 0.1% AEP water level of +64.75m. An additional marker 09RYEW01414 is approx. 375m downstream of the site and indicates a 0.1% AEP water level of +63.84m.

Node Label	Water Level (OD) 10% AEP	Flow (m <sup>3</sup> /s) 10% AEP	Water Level (OD) 1% AEP	Flow (m <sup>3</sup> /s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m <sup>3</sup> /s) 0.1% AEP
09RYEW01509	64.91	N/A	65.03	N/A	65.17	N/A
09RYEW01465	64.52	19.80	64.65	39.80	64.75	61.69
09RYEW01414	63.74	N/A	63.79	N/A	63.84	N/A
09RYEW01364	63.16	N/A	63.20	N/A	63.25	N/A
09RYEW01323	62.32	18.05	62.39	29.11	62.48	38.26
09DOLA00156	66.13	N/A	66.32	N/A	66.42	N/A
09DOLA00104	63.93	N/A	64.22	N/A	64.40	N/A

**Fig 3.3 – Extract from CFRAMS study – High Water Levels**

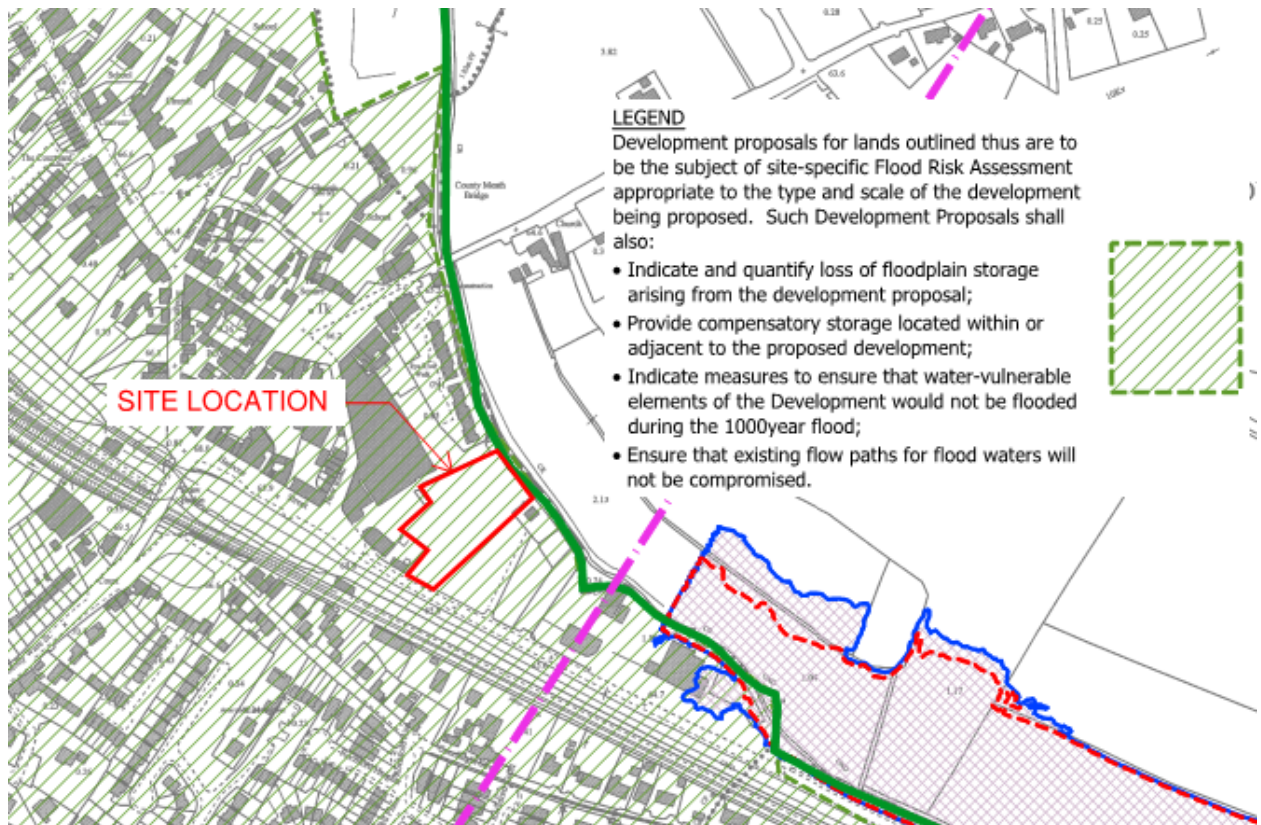
By linear interpolation we can calculate the approximate high water levels for Rye Water River at the subject site as follows:

- 10% AEP Event                    +64.325m
- 1% AEP Event                     +64.435m
- 0.1% AEP Event                 +64.523m

These levels compare well to the high water levels provided by RPS Consulting Engineers, the engineers who prepared the FRAMS study, in their site specific flood risk assessment for the adjacent Lidl development (Application Reference 11/37).

### 3.4 Kilcock Local Area Development Plan

The Kilcock Local Area Development Plan 2015 – 2021 has included the site in the areas requiring a site specific flood risk assessment. An extract of the area in which the site is included is shown below in figure 3.3



**Fig 3.3 – Local Area Plan Flood Risk Assessment**

### 3.5 Summary

The above sources indicate that the site has no history of flooding, however, is at risk of partial flooding under a 1% AEP fluvial event and more extensive flooding under the 0.1% AEP event. The source of the flooding to the site appears to be from the Rye Water River to the northeast of the site overflowing its banks.

The maximum water level for the 0.1% AEP flood event is approximately +64.523m

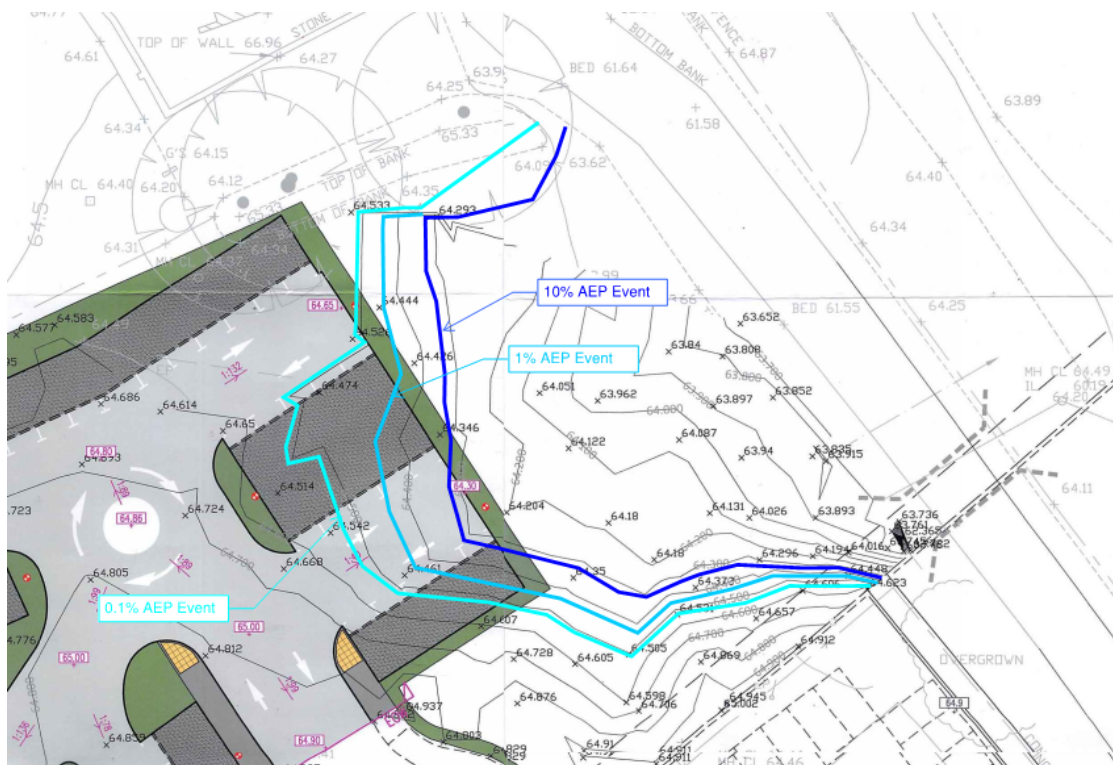
## 4 Site Level Survey & Comparison with CFRAMS

### 4.1 Fluvial Flood risk

The proposed site layout plan includes a topographical survey background. The survey indicates that the site generally falls from South (+65.539m) to Northeast (+63.62m). The proposed finished ground levels of the development are to match in generally with existing ground levels. The lowest level on the developed portion of the site is to be +64.204m as per the existing site levels.

The site specific topographical survey allows for a more accurate assessment of the flood plain compared to the CFRAMS mapping. Recent development of the Lidl site, car park and access road has also influenced the local topography slightly and the boundary of the flood extent is therefore slightly altered than that shown on the CFRAMS flood extent map.

The high water level of the 10%, 1% and 0.1% AEP events are higher than the bank of the river and the lowest level on the site (+63.62m) and therefore partial flooding of the site is expected during these events. The below figure indicates the extent of floodwater encroachment onto the site for the varying events.



**Figure 4.1 – Predicted Extent of flooding on site for 10%, 1% and 0.1% AEP events**

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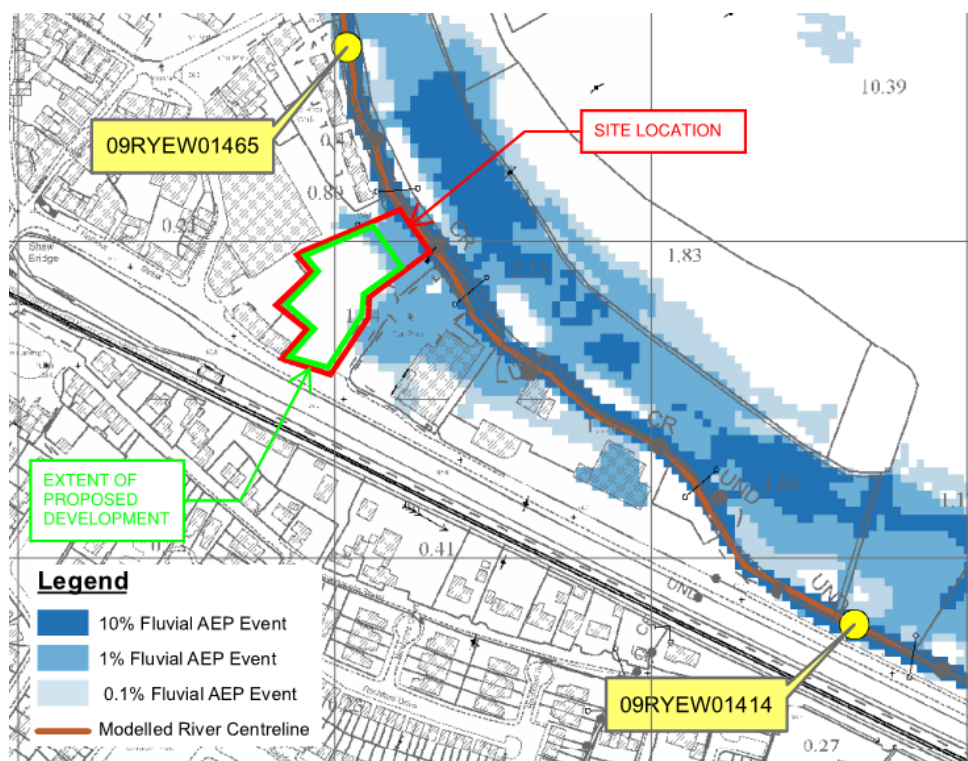
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As can be observed from the mapped information above the majority of the flooding on the site will occur outside of the proposed development with only minor flooding occurring on the development under extreme events.

It is noted that the extent of the 10% flooding is greater than that which is indicated to occur on the CFRAMS mapping. It appears that due to the development of the adjacent Lidl site and access road at raised levels the overall flooding in the vicinity of the site is marginally reduced compared with that indicated on the CFRAMS map.

The maximum depth of floodwater predicted on the site is approx. 320mm at the western most corner of the site.

As the proposed car park development is to be constructed at levels generally matching the existing ground levels there will be no loss of floodplain arising from the proposed car park. Also, the car park has already been designed to avoid development in the portion of the site closest to the Rye Water River and, therefore, the existing flood plain in this area of the site is unaffected by the proposed development.



**Fig 3.2 - Extract from CFRAM mapping**

#### 4.2 Pluvial Flood Risk

The proposed strategy for dealing with on-site surface water run-off is to provide permeable stone parking bays to provide for free flow of surface water run-off from hardstanding areas to ground. This is generally a suitable surface water strategy to ensure run-off is maintained at greenfield run-off rates in accordance with GSDS.

Infiltration tests should be carried out to ensure that there is adequate drainage to ground available on site. Additional infiltration trenches may be required on site to ensure adequate rates of surface water disposal and sufficient storage for extreme events are provided for within the site development extents.



## 5 Sequential Approach and Justification Tests

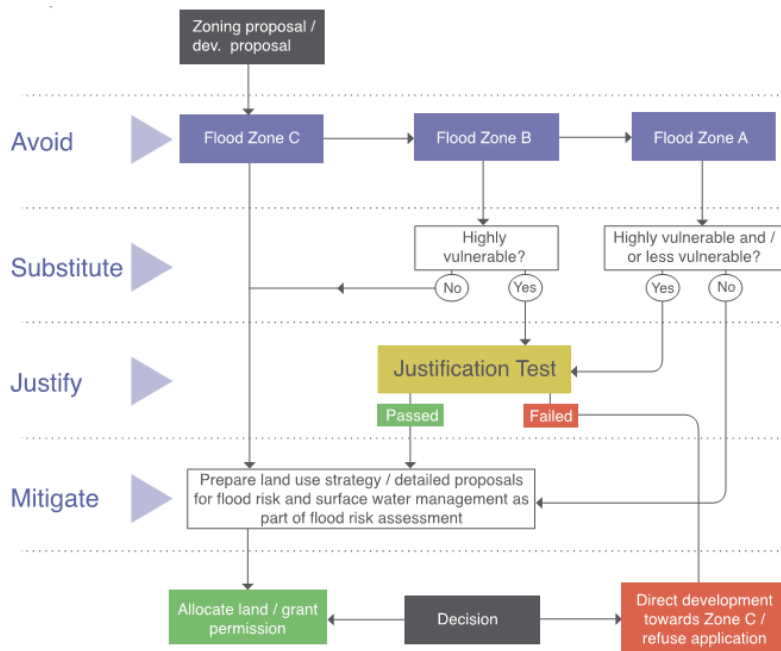
The sequential approach and Justification tests procedures are outlined in 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' 2009 and is summarised and adopted below.

### 5.1 Sequential Approach

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

Fig. 5.1 below sets out the mechanism for the use of the sequential approach to development in flood areas from the planning perspective.



**Fig. 5.1 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 sections below.

#### 5.1.1 Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three types or levels of flood zones defined for the purposes of the guidelines:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding)
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

The potential extent of flooding on the site varies depending on the severity of the flood event. Therefore the site can be separated into respective zones. The proposed development can be categorised as being partially located in a flood zone type 'A' and primarily located in a flood zone type 'C' based on the site specific survey information.

5.1.2 Vulnerability Classes

The vulnerability class of different types of developments are outlined in the below table (figure 5.2).

The proposed development use is classed as a 'Less Vulnerable' category (Local Transport Infrastructure).

Vulnerability class	Land uses and types of development which include*:
<b>Highly vulnerable development (including essential infrastructure)</b>	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.
<b>Less vulnerable development</b>	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.
<b>Water-compatible development</b>	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	

**Fig. 5.2 – Classification of Vulnerability of different types of development**

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

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	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 5.3 – Vulnerability of Development vs. Flood Zone**

In order to pass the first level of the sequential approach the site needs to be assessed under the avoidance criteria. This is outlined below:

The majority of the proposed development is located within flood zone C and, as the proposed development is of a 'Less Vulnerable' category, then the development can be considered appropriate to the site. The portion of the development site that is located within a flood zone 'A' is required to pass a justification test.

## 5.2 Justification Test

In accordance with figure 5.3 above the proposed development requires justification under the guidelines.

The Kilcock Local Area Plan (LAP) Strategic Flood Risk Assessment notes that the area of the site is zoned for town centre purposes. An adjacent site, (Dermot Kelly Motors) is similarly zoned and is deemed essential to facilitate the regeneration and expansion of Kilcock as it is located at the edge of the town centre and signifies the entrance to Kilcock.

It is considered that a similar argument is applicable to the subject site for the proposed use as a park and ride facility. The key factors to be considered as per the Dermot Kelly Motors site are:

- The land is currently zoned for town centre purposes. The continued zoning of the land will facilitate the regeneration and/or expansion of the centre.
- The subject site comprises underutilised and underdeveloped lands adjacent to the town centre
- The continued development of this land is essential in achieving compact and sustainable growth of Kilcock
- The proposed development is not considered to be particularly vulnerable to the effects of flooding
- The proposed development will not impact on existing flood plains or displace flood water / flow paths and can be designed to allow some flood storage on site in the event of a 0.1% AEP flood

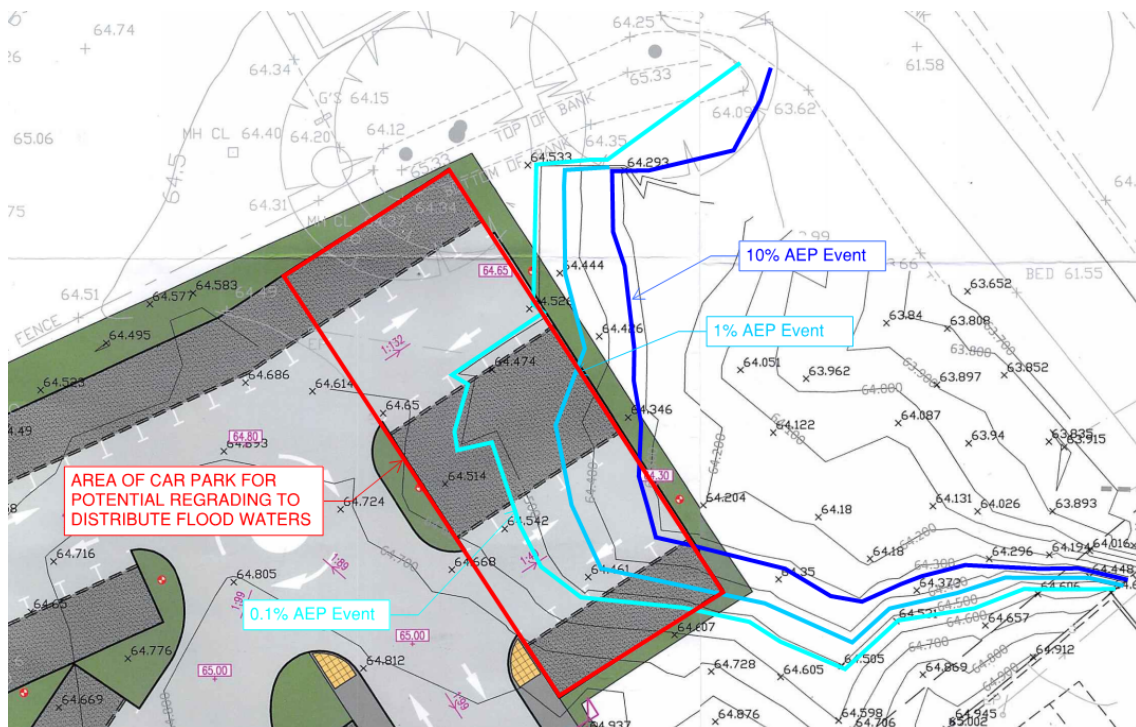
It is considered that the proposed development is justified for the subject site.

### 5.3 Mitigation Measures

It is considered that 90% the proposed development is not vulnerable to the effects of flooding and that the predicted flooding of the site is minimal and confined to a small area. A number of additional measures may be considered to provide additional protection to the site:

1. Based on the current layout the low lying portion of the proposed development will be flooded to a depth of 320mm (average 160mm) based on predicted high water levels. This amounts to approximately 24m<sup>3</sup> of water storage on the site over an area of approx. 146m<sup>2</sup>.

The lower portion of the site could potentially be regraded to increase the area of the flood plain but reduce the depth of the flood waters, maintaining 24m<sup>3</sup> of storage on the site and reducing the impact of extreme flood events on users of the car park. The area of the lower portion is 370m<sup>2</sup> which would reduce the flood depth to an average of 65mm.



2. Regrading of existing ground levels on site, between the proposed development and the river to provide for additional (min 24m<sup>3</sup>) flood water storage.
3. Removal of some or all of the proposed parking areas that are within a flood zone 'A' & 'B' and regrading of the existing ground levels to provide for additional (min 24m<sup>3</sup>) flood water storage.

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## 6 Conclusions

Based on the information gathered, it would appear that the site is subject to partial flooding under extreme rainfall events (10% AEP or greater).

The CFRAMS flood levels and site specific topographical survey indicate that 90% of the area of proposed development (construction of car park) is located in flood zone type 'C', and is considered appropriate to the site. The proposed development is subject to partial flooding at low lying areas (northern most portion) and is in a flood zone type 'A'.

The construction of the Lidl development adjacent to the subject site at raised levels appears to have reduced the extent of flooding in the vicinity, (when compared to the CFRAMS mapping) especially with regard to the access road into the proposed car park.

The proposed development is to be constructed generally at existing ground levels so as not to cause a loss of floodplain storage and therefore no addition compensatory storage is deemed to be required.

It is recommended that the proposed new car parking area be constructed with suitable infiltration trenches / soakaways to allow surface water run-off to infiltrate to ground.

It is considered that the proposed development is not particularly vulnerable to the effects of flooding and that the predicted flooding of the site is minimal and confined to a small area.

Additional mitigation measures have been recommended that could be considered at detailed design to further reduce the impact from and risk of flooding to the site.

Therefore, In our opinion, the proposed development is appropriate to the predicted flood zone and it's development, as outlined on the drawings and based on the information included in the Flood Risk Assessment, does not present any additional flooding risk to the development or adjoining properties.

## Appendix A – Proposed Site Layouts

## Appendix B – CFRAMS Map

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