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Project Description:	Flood Risk Assessment Report for a propose Circular Economic Hub at Huntstown/Coldwinters, Fingal, Co Dublin
Project Number:	22-039
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Client:	Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited
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FLOOD RISK ASSESSMENT

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1. Introduction

Coyle Civil & Structural Ltd have been engaged to carry out a Flood Risk Assessment for Phase 1 of the proposed 9.863 ha Huntstown Circular Economy Hub comprising Materials Recovery Facility, Food Container Cleaning Plant & ancillaries buldings at Huntstown/Coldwinters Td, Fingal, Co. Dublin for Rathdrinagh Land, t/a Irish Recycling Limited.

This report has been prepared to assess the existing flood risk to the site.

2. Methodology

2.1 Introduction

This report has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' herein referred to as 'The Guidelines' as published by the Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLG) in 2009.

2.2 Definition of Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event and is then normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding.

To fully assess flood risk an understanding of where the water comes from (i.e. the source), how and where it flows (i.e. the pathways) and the people and assets affected by it (i.e. the receptors) is required. Figure 2.1 below shows a source-pathway-receptor model.

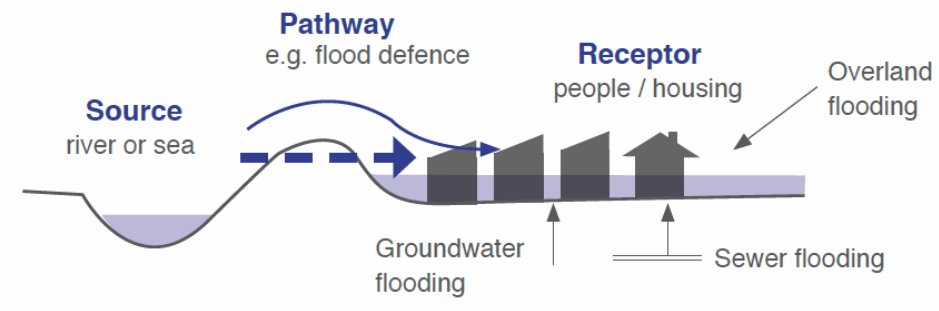

Figure 2.1 Source-Pathway-Receptor Model

The principal sources of flooding are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

The guidelines set out a staged approach to the assessment of flood risk with each stage carried out only as needed. The stages are listed below:

- Stage I Flood Risk Identification – to identify whether there may be any flooding or surface water management issues.
- Stage II Initial Flood Risk Assessment – to confirm sources of flooding that may affect an area or proposed development, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps.
- Stage III Detailed Flood Risk Assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

2.3 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as a return period or annual exceedance probability (AEP). A 1% AEP flood indicates a flood event that will be equalled or exceeded on average once every hundred years and has a return period of 1 in 100 years. Annual Exceedance Probability is the inverse of return period as shown in Table 2.1 below.

Table 2.1 Correlation between return period and AEP

Return Period (years)	Annual Exceedance Probability (%)
1	100
10	10
50	2
100	1
200	0.5
1000	0.1

2.4 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and are split into three categories in The Guidelines:

Flood Zone A
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); Most types of development would be considered inappropriate in this zone. Development in this zone should be avoided and/or only considered in exceptional

circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the Justification Test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation, would be considered appropriate in this zone.

Flood Zone B
Flood Zone B where the probability of flooding 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 or 0.5% or 1 in 200 for coastal flooding);
Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met. Less vulnerable development, such as retail, commercial and industrial uses, sites used for short-let for caravans and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone. In general however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to and from the development can or will adequately be managed.

Flood Zone C
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 plan areas which are not in zones A or B.

Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations.

It is important to note that when determining flood zones the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

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 2.2 OPW The Planning System and Flood Risk Management, Classification of vulnerability of different types of development

2.5 Objectives and Principles of the Planning Guidelines

The principle actions when considering flood risk are set out in the planning guidelines and are summarised below:

- *"Flood hazard and potential risk should be determined at the earliest stage of the planning process..."*
- *"Development should preferentially be located in areas with little or no flood hazard thereby avoiding or minimising the risk...."*
- *"Development should only be permitted in areas at risk of flooding when there are no alternative, reasonable sites available..."*
- *"Where development is necessary in areas at risk of flooding an appropriate land use should be selected"*
- *A precautionary approach should be applied, where necessary, to reflect uncertainties in flooding datasets and risk assessment techniques..."*
- *"Land required for current and future flood management... should be pro-actively identified..."*
- *"Flood risk to, and arising from, new development should be managed through location, layout and design incorporating Sustainable Drainage Systems (SuDS) and compensation for any loss of floodplain..."*
- *Strategic environmental assessment (SEA) of regional planning guidelines, development plans and local area plans should include flood risk as one of the key environmental criteria..."*

2.6 The Sequential Approach and Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 2.2 below. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach. However, this is not always possible as many town and city centres are within flood zones and are targeted for development.

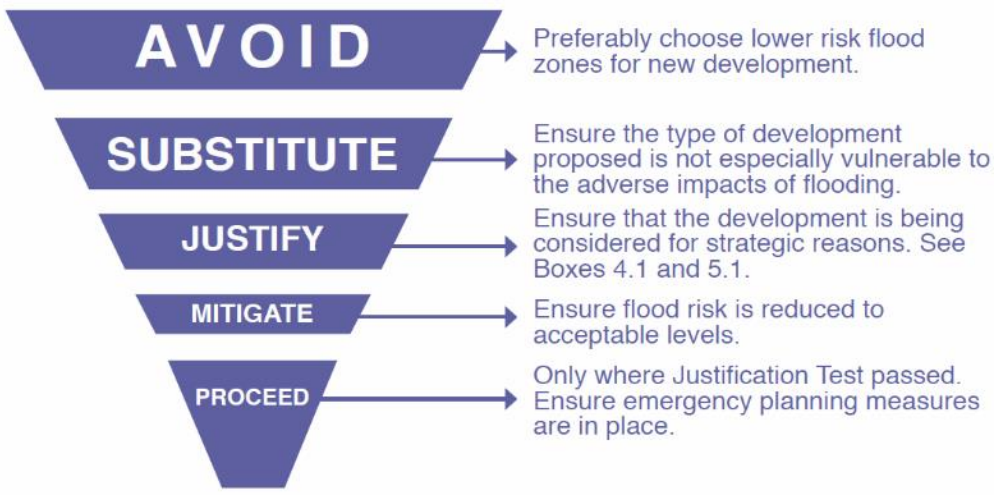

Figure 2.3 Sequential Approaches (Source: The Planning System and Flood Risk Management)

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

- The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.
- The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

Table 2.2 below illustrates the types of development that would be required to meet the Justification Test.

Table 2.2 Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test (Source: The Planning System and Flood Risk Management)

	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

3. Study area

The development involves construction of Phase 1 of the proposed 9.863 ha Huntstown Circular Economy Hub comprising Materials Recovery Facility, Food Container Cleaning Plant & Ancillaries at Huntstown Td / Coldwinters Td, Fingal, Co. Dublin for Flood Risk Assessment Report for Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited.

Site Location is shown in Figure 3.1., proposed Site Layout is shown in Figure 3.2.

Full Site Layout drawings are shown in Appendix A

Figure 3.1 – Site Location

Figure 3.2 – Site Layout and extent of proposed works.

4. Stage 1 – Flood Risk Identification

4.1 General

This Stage I Flood Risk Identification includes a review of the existing information and the identification of any flooding or surface water management issues in the vicinity of the proposed site.

4.2 Information Sources Consulted

The following information sources were consulted as part of the Stage I Flood Risk Identification:

Source	Comments
OPW Flood Info maps consulted	Fluvial, Pluvial, Coastal and Groundwater flooding examined; http://www.floodinfo.ie/map/floodplans/ https://www.floodinfo.ie/map/floodmaps/
Catchment Flood Risk Assessment and Management Study (CFRAM)	https://www.floodinfo.ie/map/floodmaps/
OPW flood records	www.floodmaps.ie
Geological Survey of Ireland (GSI) Maps	GSI Teagasc subsoils map consulted to identify if alluvium is present at development site that may indicate the presence of a watercourse and floodplain

Table 4.1 Information Sources Consulted

4.2.1 Catchment Flood Risk Assessment and Management Study

Information provided by the CFRAM programme led by the OPW is not available for the study location. As per Fig 4.1 below there is no evidence of estimated flooding within or in the vicinity of the site.

Figure 4.1 CFRAM River Flood Extend – Present Day - All Probabilities

4.2.2 National Indicative Fluvial Mapping (NIFM) River Flood Extend

This data shows the modelled extent of land that might be flooded by rivers (fluvial flooding) during a theoretical or 'design' flood event with an estimated probability of occurrence, rather than information for actual floods that have occurred in the past.

The Present Day Scenario is also referred to as the Current Scenario. Present Day Scenario data was generated using methodologies based on historic flood data, without taking account of potential changes due to climate change. The potential effects of climate change have been separately modelled and reported on.

Data has been produced for catchments greater than 5km2 in areas for which flood maps were not produced under the National CFRAM Programme and should be read in this context. River reaches that have been modelled are indicated by the NIFM Modelled River Centrelines dataset.

Flooding from other reaches of river may occur, but has not been mapped, and so areas that are not shown as being within a flood extent may therefore be at risk of flooding from unmodelled rivers (as well as from other sources).

From Fig 4.2 below taken from the Floodinfo.ie there is no evidence of any estimated flooding within or in the vicinity of the site.

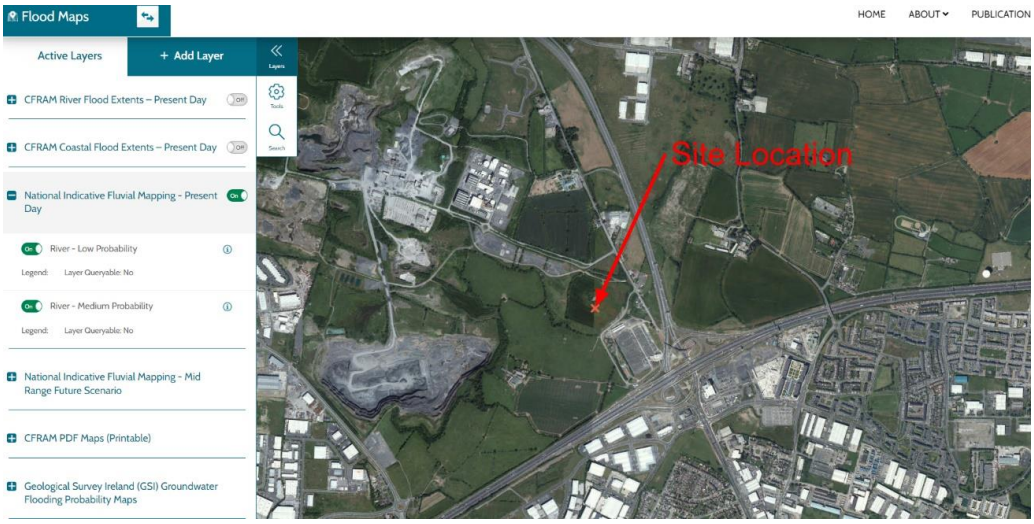

Figure 4.2 National Indicative Fluvial Mapping – Present Day, Low and Medium Probability

The Mid-Range Future Scenario extents where generated taking in the potential effects of climate change using an increase in rainfall of 20%.

Similar to the Fig 4.2 above Fig 4.3 below shows no evidence of any estimated flooding within or in the vicinity of the site.

It should be noted that the nearest site which shows evidence of fluvial flooding is located over 3km away along the Siloge River at J5 - Ballymun on the M50.

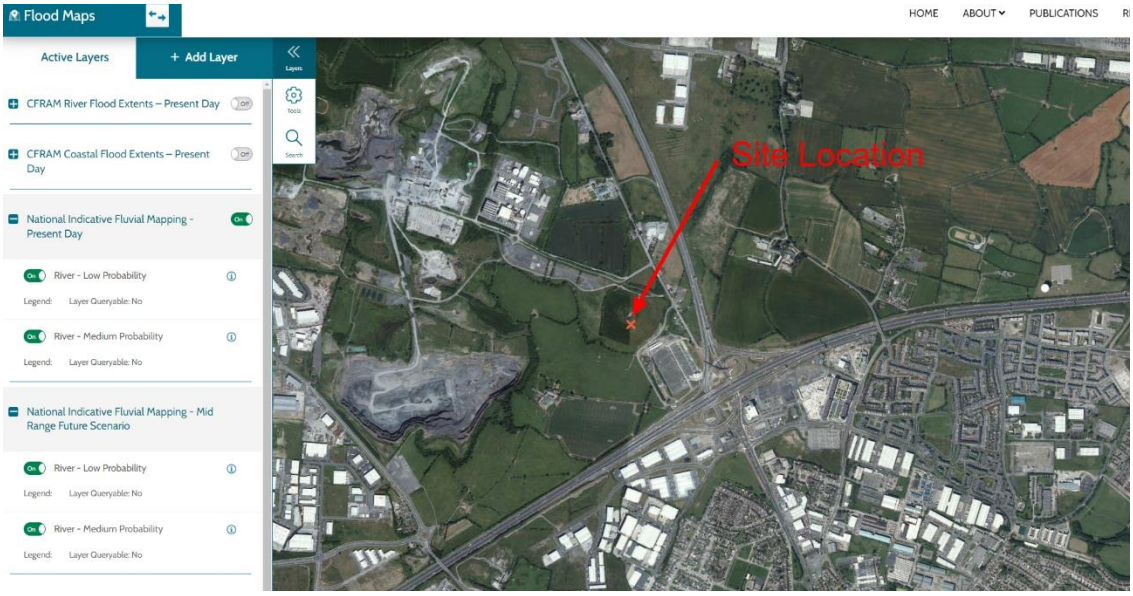

Figure 4.3 NIFM – Mid-Range Future Scenario, Medium Probability (1% AEP)

4.2.3 Arterial Drainage Scheme Channels

Arterial Drainage Schemes were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes weirs and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water and various other work was carried out under Part II of the Arterial Drainage Act, 1945. The purpose of the schemes was to improve land for agriculture, to ensure that the 3 year flood was retained in bank, this was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Flood protection in the benefiting lands was increased as a result of the Arterial Drainage Schemes.

Evidence of Arterial Drainage Scheme Channels within vicinity of the site are shown below in Fig 4.4. It should be noted that there are no Arterial Drainage Schemes located within the vicinity of the site, the only Arterial Drainage Scheme located near the site is there of the Broadmeadow and Ward scheme located over 500m to the north of the site which in turn flows away from the site in the northern direction.

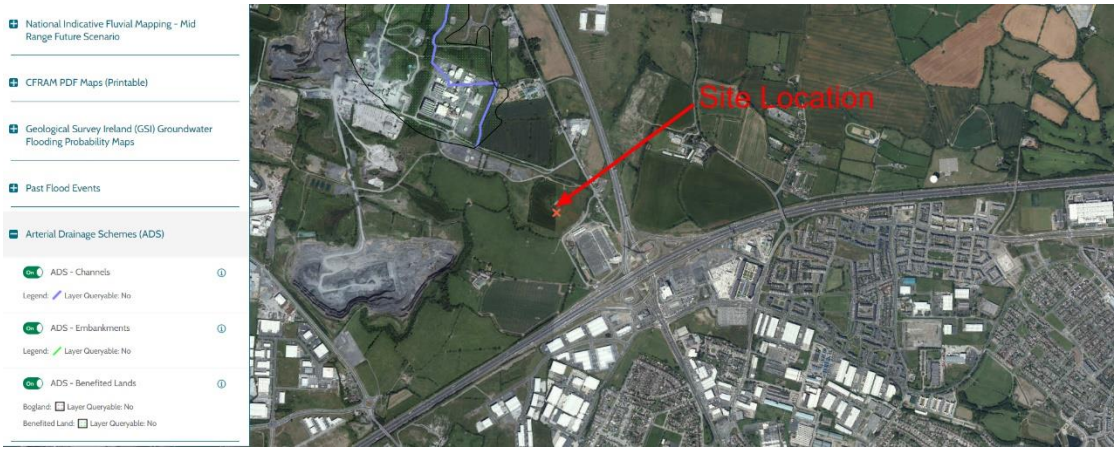

Figure 4.4 – Arterial Drainage Scheme (ADS)

4.2.4 Past Flood Events

A Past Flood Event is defined as the occurrence of recorded flooding at a given location on a given date or on a recurring basis. The event is derived from available flood information documentation including flood event reports, news articles, archive information and photos.

Past flood events are represented on the map in three different ways. Where the boundary of a flood has been mapped, the flood is shown as a shaded area with a blue border defining the extent of the flood. Most floods cannot be shown in this way because the extent of the flood was not mapped at the time. Therefore, floods without extent information are represented with a point symbol at the approximate location of the flood. A flood point symbol is placed at any location mentioned in a report giving details of a flood event. Where more than one flood has occurred in the same location, and to denote a location with recurring flooding, a multiple flood point symbol is used.

Flood boundary marks the approximate extent of a past flood. The Flood Point symbol marks the approximate location of a past flood. A Multiple / Recurring Flood Point symbol marks the approximate location of an area that has been affected by more than one Flood Event.

Fig 4.5 below indicates that there is no evidence of past flood events within or in the vicinity of the site.

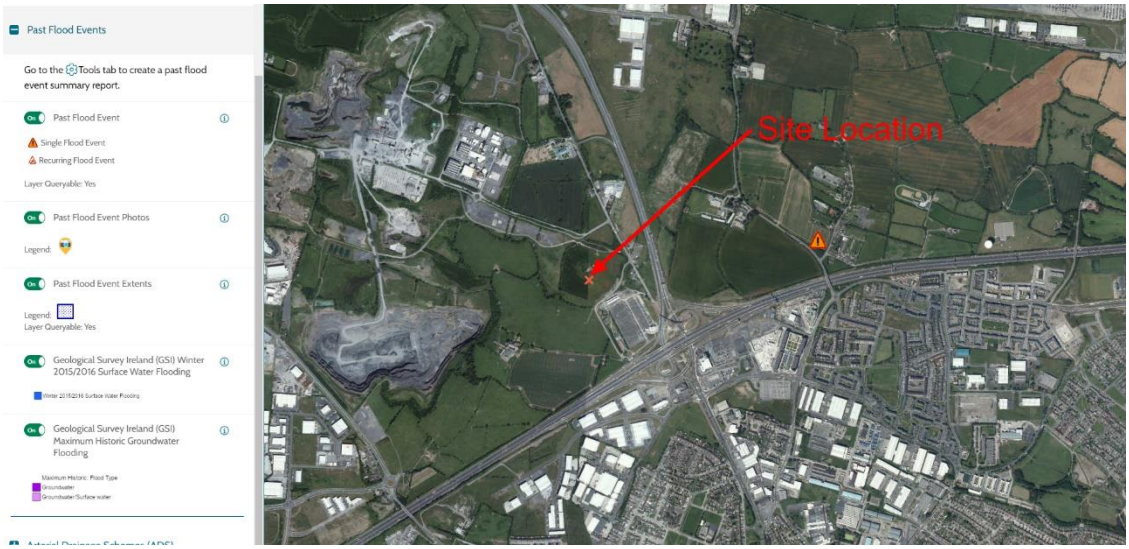

Figure 4.5 Past Flood Events.

4.2.5 Other Sources

The following sources were also examined to identify areas that may be liable to flooding:

Table 4.2 Other Sources

GSI Maps	GSI Teagasc subsoils map shows the proposed development site is underlain by made ground. No evidence of Karst features has been identified within the vicinity of the site.

Extract from GSI map Viewer is shown below at Figures 4.6

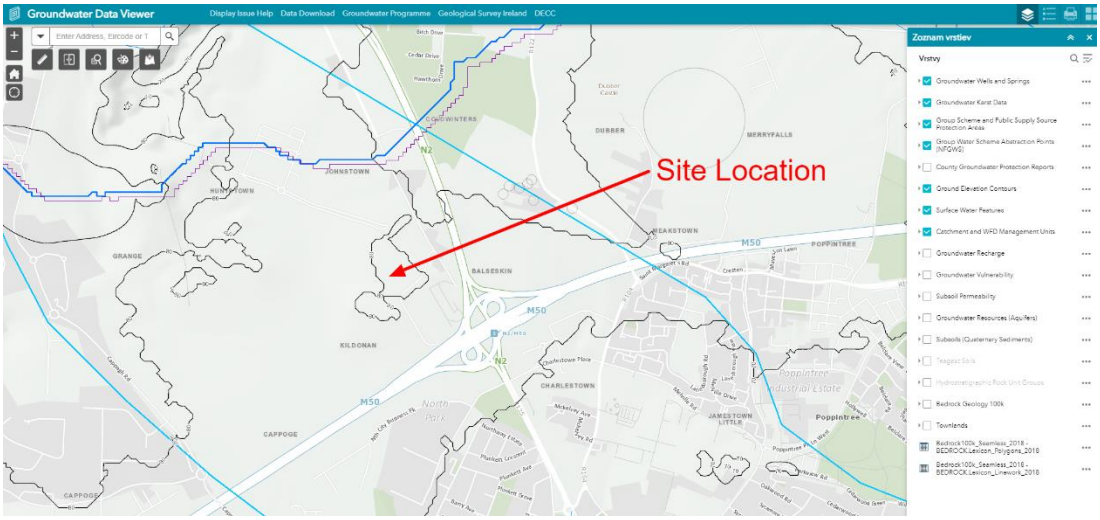

Figure 4.6 Extract from the GSI Map Viewer.

5. STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

5.1 General

A Stage 2 FRA (initial flood risk assessment) was undertaken to:

- Confirm the sources of flooding that may affect the subject site;
- Appraise the adequacy of existing information as identified by the Stage 1 FRA

5.2 Sources of Flooding

Groundwater Flooding

Ground water flooding is a result of upwelling in occurrences where the water table or confined aquifers rise above the ground surface. This tends to occur after long periods of sustained rainfall and/or very high tides. High volumes of rainfall and subsequent infiltration to ground will result in a rising of the water table. Groundwater flooding tends to occur in low - lying areas, where with additional groundwater flowing towards these areas, the water table can rise to the surface causing groundwater flooding.

The sources consulted such as the CFRAM mapping are not available for this location, available GSI records show no indication that the proposed site location is subject to Groundwater derived flooding. As such the proposed site is not considered to require a detailed flood risk assessment with respect to groundwater flooding.

The nearest available record of groundwater flooding is at Cherryhound (Flood ID 21,838), the water level for the flood event is not available. Cherryhound is approx 3.5km from the proposed site and given the minimum 78.700m finished floor level of the designed buildings the proposed location is not deemed to be at risk of flooding.

It is further noted that site investigation carried out to the site included the drilling of 3no boreholes to a maximum depth 72.210m some 6.49m below the proposed finished floor levels and no ground water was encountered.

Pluvial Flood Risk

Pluvial flooding results from heavy rainfall that exceeds ground infiltration capacity or more commonly in Ireland where the ground is already saturated from previous rainfall events. This causes ponding and flooding at localized depressions. Pluvial flooding is commonly a result of changes to the natural flow regime such as the implementation of hard surfacing and improper drainage design.

The sources consulted such as the OPW Flood Maps and OPW Rainfall Flood Plans mapping show no indication that the proposed site is subject to pluvial derived flooding.

The proposed drainage design allows for an attenuated storage and on site soakaway, with the storm water storage provided allowing for 2407m3 capacity including 75m3 of spare storage volume. As such the design included in Appendix A ensures there is no risk of pluvial flooding to the site.

Fluvial Flood Risk

A fluvial, or river flood, occurs when the water level in a river, lake or stream rises and overflows onto the surrounding banks, shores and neighbouring land. The water level rise could be due to excessive rain or snowmelt.

The sources consulted such as the OPW Flood Maps and OPW Flood Plans mapping show no indication that the proposed site is subject to fluvial derived flooding.

The proposed design allows for a finished floor level of 78.700 to the main warehouse buildings and 81.809 to the weighbridge. It is noted that the nearest recorded water level on Floodinfo.ie is located in Sillogue with a recorded water level of 69.85m and a flow rate of 1.29m3/s for a 1/100 flood event. Based on this water level the proposed design allows for a free board of approx 8.85m against a 1/100yr flood event.

Coastal Flood Risk

Coastal flooding is the inundation of land areas along the coast by seawater. Common causes of coastal flooding are intense windstorm events occurring at the same time as high tide (storm surge), and tsunamis.

Storm surge is created when high winds from a windstorm force water onshore — this is the leading cause of coastal flooding and often the greatest threat associated with a windstorm. The effects increase depending on the tide - windstorms that occur during high tide result in devastating storm surge floods. In this type of flood, water overwhelms low-lying land and often causes devastating loss of life and property.

The sources consulted such as the OPW Flood Maps and OPW Flood Plans mapping show no indication that the site is subject to coastal derived.

Based on above site would be allocated as **Flood Zone C.**

5.3 Conclusion of Stage 2 FRA and Mitigation Measures

The information provided in this section identifies that there are no potentially elevated levels of pluvial, fluvial, coastal and groundwater flood risk.

6. STAGE 3 – DETAILED FLOOD RISK ASSESSMENT

6.1 Conclusion of Stage 3 FRA

Stages 1 and 2 of the flood risk assessment of proposed site have indicated that the site is not subject to flooding in low, medium or high probability exceedance events up to 0.1% AEP (1 in 1000 chance in any given year) with 20% climate change factor applied from pluvial, fluvial, coastal or groundwater sources.

Proposed site is located within **Flood Zone C** as per Table 2.2. Proposed site is defined as **Less vulnerable Development** as per OPW The Planning System and Floor Risk Management, Figure 2.2. As such the site is deemed **Appropriate** for the proposed development as per Table 2.2.

7. CONCLUSIONS

Based on current available data for the study location there is no indication of flooding from coastal, pluvial, fluvial and groundwater sources.

The proposed site is located within **Flood Zone C** as per Table 2.2 and is defined as a **Less Vulnerable Development** as per OPW The Planning System and Floor Risk Management, Figure 2.2. Site is **Appropriate** for proposed development as per Table 2.2.

The proposed development is not at risk of flooding, will not obstruct or impede important flow paths, exacerbate flooding in the immediate vicinity or wider area and will not result in residual risk to the area.

APPENDIX A
PROPOSED DEVELOPMENT LAYOUT

- On-line Air Valve as per STD-W-22
- Sluice Valve as per STD-W-15
- Washout Hydrant as per STD-W-30A with Scour Chamber as per STD-W-30B
- Off-line Hydrant as per STD-W-19
- WM Electromagnetic Meter chamber as per STD-W-26

GREYWATER INLET PIPE TO BUILDING

10,000 LITRE KINGSPAN KLARGESTER BELOW GROUND RAINWATER HARVESTING SYSTEM (ENV0350TKSW)

PROPOSED SUDS BASED PERMEABLE PAVING TO CARPARK AREA

STORM TO FOUL CONNECTION TO ALLOW FOR STORAGE AREA OUTFALL TO FOUL LINE

10,000 LITRE KINGSPAN KLARGESTER BELOW GROUND RAINWATER HARVESTING SYSTEM (ENV0350TKSW)

GREYWATER INLET PIPE TO BUILDING

Drainage storage with infiltration - Geocellular storage 20m x 96m. Stormblock Optimum 0.8m x 0.8m x 0.66m, two layers of 3000 pcs, 2407m^3 volume. 2335m^3 required storage, 72m^3 spare capacity.

STORM TO FOUL CONNECTION TO ALLOW FOR STORAGE AREA OUTFALL TO FOUL LINE

By-pass Petrol Interceptor Klargester NSBE040 or similar approved

Approx location of overhead lines

Drainage Layout.

Scale:- 1: 500.

NOTES:-

This is a planning drawing only and is therefore limited in its capacity to convey the total information, details & specification necessary to complete the works. Any work carried out that is not covered here will be the responsibility of the persons carrying them out. If any situation arises which would cause a contravention of the building regulations, then the Engineer should be consulted, otherwise the Engineer cannot be held responsible. As these drawings are prepared as planning drawings only, it is strongly recommended that the Engineer be consulted for the preparation of full working drawings. It is solely the clients responsibility to appoint a Qualified Engineer to supervise the project during the construction stage and to prepare structural working drawings for the builder.

ALL WORK AND MATERIALS ARE TO BE IN ACCORDANCE WITH THE CURRENT BUILDING REGULATIONS WHETHER DETAILED ON THIS DRAWING OR NOT.

All dimensions to be taken on site. Do not scale any dimensions from this drawing. This drawing is to be read in conjunction with all other relevant drawings and specifications etc that are issued.

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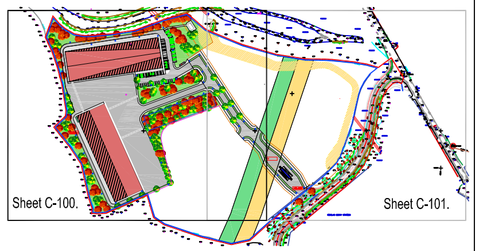
Key Plan.



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Client: Rathdrinagh Land Unlimited Company, t/a Irish Recycling Limited.

Sheet Title: Drainage & Watermain Layout - Sheet 1 of 2.

Project No.: 22-039		Date: 17-04-23	
Drawing No.: C-100.	Scale: As shown.	Rev: B	Checked: PC

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