Windmill, Porterstown, Clonsilla, Dublin 15

Flood Risk Assessment

3 October 2019

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DOCUMENT CONTROL

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Extent of Inspections

Where this Report is in connection with an inspection, note that we did not examine parts of the property/site/building which were covered, unexposed or inaccessible and we are therefore unable to report that any such part is free from defect. It should be assumed that no opening-up works, sampling, testing of materials, testing of drains or other underground services was carried out, except as explicitly stated within this Report. Any inspection was therefore of a superficial nature only.

Third Parties

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Exclusions

This Report specifically excludes the following areas (unless explicitly noted otherwise herein):- Mechanical and Electrical Services, Architectural Matters (such as weathering, insulation, waterproofing, dpc, dpm etc.), Planning Issues, Fire Safety Issues, Asbestos, Health & Safety Issues, Property Valuations.

REPORT CONTENTS PAGE

1.0. INTRODUCTION

1.1. This Flood Risk Assessment has been prepared as an accompaniment to the residential development planning application for 211no. apartment units, a communal amenity space, access routes and all associated site development works at Windmill, Porterstown, Clonsilla, Dublin 15.

1.2. This Flood Risk Assessment has been carried out in accordance with the DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management published in November 2009. This assessment identifies and sets out possible mitigation measures against potential risks of flooding from various sources. Sources of possible flooding include coastal, fluvial (river), pluvial (direct heavy rain), groundwater and the Royal Canal. This report provides an assessment of the subject site for flood risk purposes only.

1.3. Site Location

The site is located within the unfinished residential development known as Windmill at Porterstown, Clonsilla, Dublin 15. The site is bound to the south by the Royal Canal, to the north by St. Mochta's Estate, to the east by Stationcourt Park residential development and to the west by Diswellstown Road.

Figure 1.1 below illustrates the location of the site.

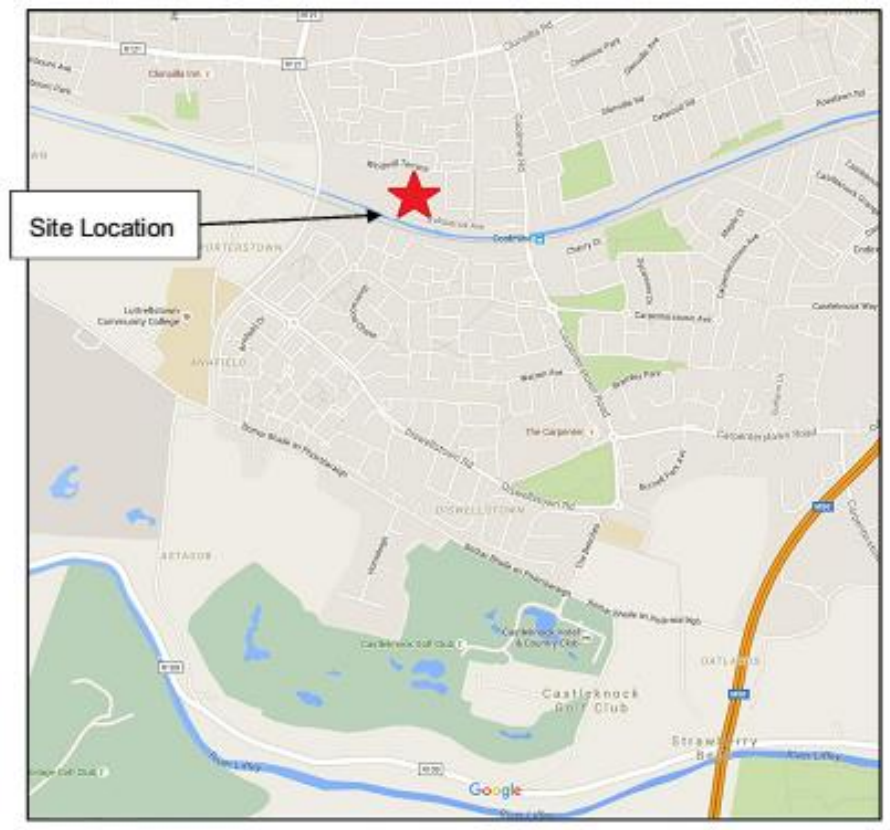

Figure 1.1 – Site Location Plan

The lands sit within an unfinished residential development. The site which is subject to development lies adjacent to 5no. completed and occupied apartment blocks and 6no. completed and occupied duplex blocks. The site has a ground level of between 65.6m and 64.0m OD Malon. A partly completed basement is located beneath some of the existing apartments and will also be located under part of the proposed development. The basement access is constructed, yet the podium area over the basement has not been finished entirely. The topography of the site slopes slightly from the north to south.

The topography of the site results in the groundwater of the site being collected by the Royal Canal which traverses lands immediately south of the site.

The existing road levels around the site range from 65.6m to 64.9m OD Malin with the finished floor level of the existing apartment block, which forms the eastern boundary of the site, set at 65.9m.

1.4. Background to the Report

This Flood Risk Assessment report follows the guidelines set out in the DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management published in November 2009.

The components to be considered in the identification and assessment of flood risk are as per Table A1 of the above guidelines:

- 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.
- Canal – flooding from water course.

Each component will be investigated from a Source, Pathway and Receptor perspective.

1.5. Assessing the Overall Flood Risk

The overall risk of flooding to a development shall be determined by way of a 3x3 Risk Matrix, considering the likelihood of a flooding event occurring within a development versus the consequences of such flooding.

1.5.1. Assessing Likelihood

The likelihood of flooding falls into the categories of low, moderate and high, which are described in the OPW Guidelines as follows:

Likelihood	Low	Moderate	High
Tidal	Probability <0.1%	0.5%> Probability <0.1%	Probability > 0.5%
Fluvial	Probability <0.1%	1.0%> Probability <0.1%	Probability > 1.0%
Pluvial	Probability <0.1%	1.0%> Probability <0.1%	Probability > 1.0%

Note: Probability denotes likelihood of occurrence in a given year

Table 1.1 – OPW Guidelines for assessing likelihood

For ground water and human/mechanical error, the limits of probability are not defined and therefore professional judgement is used. However, the likelihood of flooding is still categorised as low, moderate and high for these components.

1.5.2. Assessing Consequence

There is not a defined method used to quantify a value for the consequences of a flooding event. Therefore, in order to determine a value for the consequences of a flooding event, the elements likely to be adversely affected by such flooding will be assessed, with the likely damage being stated, and professional judgement will be used in order to determine a value for consequences. Consequences will be categorised as low, moderate and high.

1.5.3. Assessing Risk

Based on the determined "likelihood" and "consequences" values of a flood event, the following 3x3 Risk Matric will then be referenced to determine the overall of a flood risk event.

		CONSEQUENCES		
LIKELIHOOD		**LOW**	**MODERATE**	**HIGH**
	LOW	Extremely Low Risk	Low Risk	Moderate Risk
	MODERATE	Low Risk	Moderate Risk	High Risk
	HIGH	Moderate Risk	High Risk	Extremely High Risk

Table 1.2 – 3x3 Risk Matrix

2.0. TIDAL

2.1. Sources

The Irish Sea is approximately 12 kilometres east of the subject site. The proposed development is to be constructed at a level of between 65.6m, and 64.0m OD Malin.

The Dublin Coastal Protection Project indicated the highest recorded tide event occurred in 2002 with the high tide reaching 2.95m OD Malin. This results in 61.05m of freeboard between the lowest ground level of the site and the highest recorded tide event of the Irish Sea.

2.2. Pathway

Given that the site is 12km west of the Irish Sea and 61.05m above the highest recorded tide event, it is not assessed that a tidal flooding pathway exists for the site.

2.3. Receptor

The receptors within the proposed development for any tidal flooding event would be the properties, basement and roads of the development.

2.4. Likelihood

Given that a pathway for tidal flooding does not exist, the likelihood of tidal flooding is LOW.

2.5. Consequences

The consequences of a flooding event on the site would be minor damage to roads and landscaped areas. The consequences of a tidal flooding event are therefore assessed to be LOW.

2.6. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event of a low likelihood with low consequences, it is deemed that the risk from tidal flooding on the proposed development is EXTREMELY LOW, and no tidal flood mitigation measures are required to be implemented.

3.0. FLUVIAL

3.1. Source

The source of fluvial flooding is river flooding. The subject site is located 1.7km south-west of the Tolka River and 1.6km north of the River Liffey. The Royal Canal traverses lands immediately south of the southern boundary of the site. Figure 3.1 below is an extract from the Preliminary Flood Risk Assessment Map (PFRAM). Although the site location is obscured on the PFRAM map by a text box, the map still clearly shows that the subject site is outside of the extreme flood event catchment of both rivers.

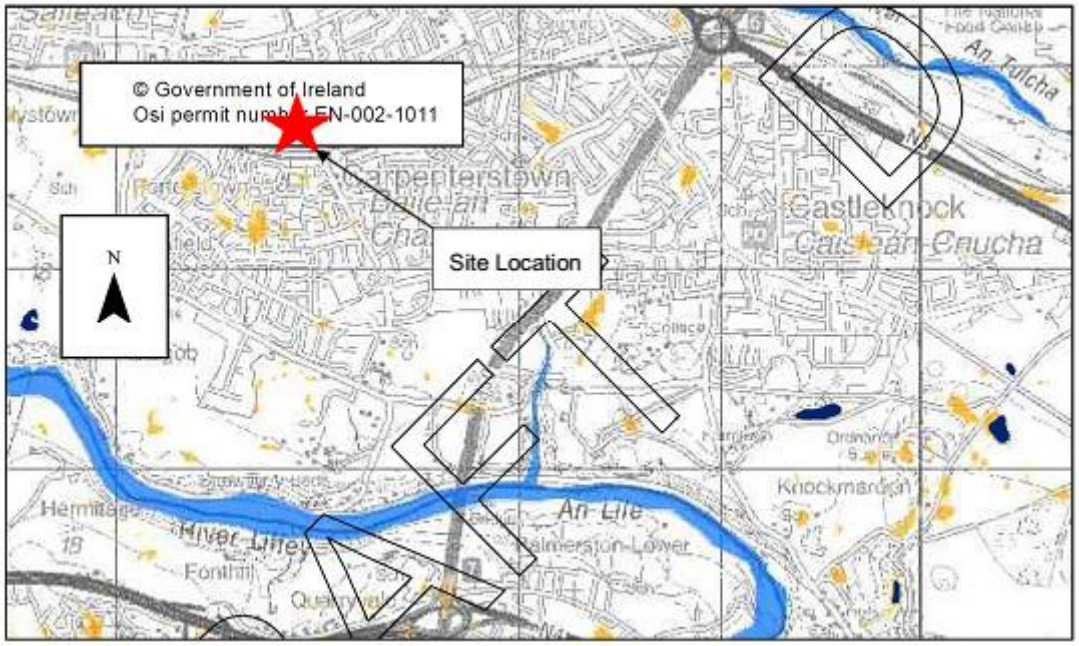

Figure 3.1 - PFRAM Flood Extent Map for River Liffey

3.2. Pathway

The lowest existing road level within the proposed development is approximately 64.9m OD Malin, with the entrance to the basement car park being 65.5m OD Malin.

The PRAM extreme event flood level for the River Liffey is located 1.55km south of the subject site and by referencing the Ordnance Survey Ireland maps for the area, has a level of approximately between 20m and 30m OD Malin. Given the scale of the Ordnance Survey Ireland maps, it is accepted that there is a degree of inaccuracy in reading elevations from the map. However, it is clear that there is more than 30m of freeboard between the lowest existing level of the site and the extreme flood event water level for the River Liffey as determined from the PFRAM map.

Similarly, for the Tolka River, the proposed site is not impacted by the extreme flood event of the river as shown on Figure 3 below. Note the site is approximately 1.5km south of the Tolkas flood zone for an extreme event, and using the Ordnance Survey Ireland maps, approximately 10m above the extreme flood water level.

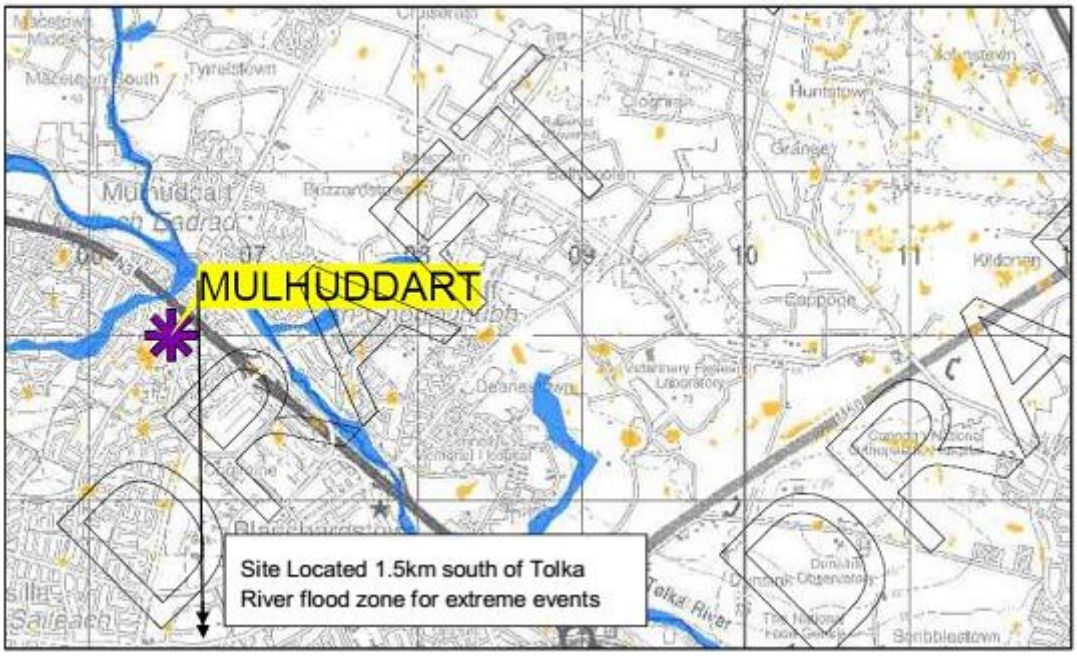

Figure 3.2 - PFRAM Flood Extent Map for Tolka River

3.3. Receptor

The receptor for a fluvial flood event is the proposed residential units with the lowest FFL within the development and the basement of the apartment block. The FFLs within the development will be kept approximately 250mm above the high point of the adjacent roads.

3.4. Likelihood

Given that the PFRAM flood map indicates that no fluvial flooding will occur at the proposed site for an extreme storm event, and as per the OPW guidelines, the likelihood of fluvial flooding is LOW.

3.5. Consequences

The consequences of a flooding event on the site would be minor damage to roads and landscaped areas. The consequences of a fluvial flooding event are therefore assessed to be LOW.

3.6. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event of a LOW likelihood with LOW consequences, it is deemed that the risk from fluvial flooding on the proposed development is extremely low, and no fluvial flood mitigation measures are required to be implemented.

4.0. PLUVIAL

4.1. Source

The source of pluvial flooding is from heavy rainfall.

4.2. Pathway & Receptors

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

	Pathway	**Receptor**
1	Surcharging of the proposed internal drainage systems during heavy rain events leading to internal 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 subject site to the existing drainage network leading to downstream flooding	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

Note, the risk of pluvial flooding for each of the pathways discussed below has been assessed by referencing the Risk Matrix in section 1.5.3 of this report.

4.3. Surcharging of the Proposed On-Site Drainage System

4.3.1. Likelihood

On site drainage has been sized to accommodate a 1 in 5-year storm event. Therefore, it is considered that there is a HIGH likelihood of flooding as a result of surcharging the proposed on-site drainage.

4.3.2. Consequences

The consequence of surface water flooding from surcharging of the proposed on-site drainage system would result in damage to the housing units and landscaped area within the development. Therefore, the consequences of such flooding is assessed to be MODERATE.

4.3.3. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event with a high likelihood and moderate consequences of flooding as a result of surcharging the proposed on-site drainage system, there is a HIGH risk associated with such flooding

4.3.4. Flood Risk Management

The likelihood of flooding is minimised with adequate sizing of the on-site surface water network and SuDS devices. The risk to properties from any surcharged surface water is reduced by designing the finished floor levels to be approximately 250mm above the adjacent road levels. Finish floor levels have been set higher than internal road crest (high point) levels so that even if the road floods, the flood levels will not rise above adjacent floor levels. The road layout and levels of the development has been designed such that flood routing has been taken into consideration in order to direct overland flooding away from the properties of the development. Refer to Overland Flood Route drawing in Appendix A for an illustration of the flood routing.

4.3.5. Residual Risk

As a result of the flood risk management details outlined above, the residual risk is considered LOW.

4.4. Surcharging from the Existing Surrounding Drainage System

4.4.1. Likelihood

The existing drainage system has been designed to accommodate development on the subject site and therefore the likelihood of flooding is LOW. A meeting was held with Fingal County Council Drainage Inspectors on 30 October 2015 on site to inspect the receiving 1050mm diameter sewer. It was noted that the site has no known history of flooding.

4.4.2. Consequences

The consequence of flooding from surcharging of the existing surrounding drainage system, would result in damage to the housing units and landscaped area within the development. Therefore, the consequences of such flooding is assessed to be MODERATE.

4.4.3. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event with a low likelihood and moderate consequence of flooding the site from the existing surface water network, the resultant risk is assessed to be LOW.

4.4.4. Flood Risk Management

The risk of flooding to properties from the surcharging of the existing surface water network has been reduced by designing the finished flood levels to be approximately 250mm above the adjacent road levels. Furthermore, overland flood routing has been incorporated into the road network design.

4.4.5. Residual Risk

As a result of the flood risk management details outlined above, the residual risk is considered LOW.

4.5. Surface Water Discharge from the Subject Site

4.5.1. Likelihood

Due to the increase in hard standing area as a result of the proposed development, there is an increase in the likelihood of surface water discharging from the site, leading to downstream flooding. Therefore the likelihood of if flooding from surface water discharge from the subject site is considered MODERATE.

4.5.2. Consequences

The consequence of surface water discharging from the subject site would result in damage to the surrounding roads and landscaped areas. Therefore, the consequences of such flooding is assessed to be MODERATE.

4.5.3. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event with a moderate likelihood and the moderate consequences of flooding downstream of the site due to discharging of surface water from the site, the resultant risk is MODERATE and flood risk management will be required to be implemented.

4.5.4. Flood Risk Management

Surface water discharging from the proposed development will be limited by a flow controlled manhole to ensure the maximum discharge rate from the site is limited to mimic the greenfield runoff rate. Excess discharge flows from the development will be attenuated in a designated area which has been sized to attenuate up to the PFRA 1.0% AEP ~ (1 in 100 year) storm event.

4.5.5. Residual Risk

As a result of the flood risk management details outlined above, the residual risk is considered LOW.

4.6. Overland Flooding from Surrounding Areas

4.6.1. Likelihood

The Office of Public Works (OPW) records for predictive and historic flood maps and benefiting land maps have been consulted with regard to recorded flood events in the vicinity of the subject site. A map showing all flood events within 2.5 kilometres of the subject site was downloaded from the OPW website and is provided below in Figure 4

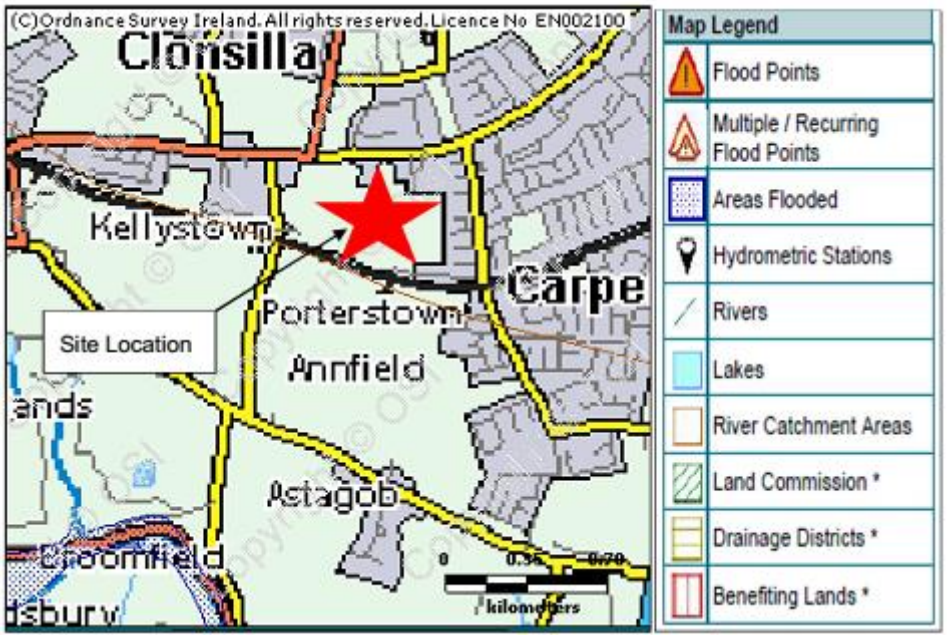

Figure 4.1 - OPW Land Benefiting Maps and Historic Flood Maps

The map indicates no historic flooding events within a 2.5km radius if the site. With no recorded flood events in the immediate area that could have an impact on the subject site, it is considered that there is a LOW likelihood of flooding from surrounding areas.

4.6.2. Consequences

The consequence of overland flooding from the surrounding area, would result in damage to the housing units and landscaped area within the development. Therefore, the consequences of such flooding is assessed to be MODERATE.

4.6.3. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event with a low likelihood and the moderate consequences of overland flooding from surrounding areas, the resultant risk is LOW.

4.6.4. Flood Risk Management

Overland flood routing and raised finished floor levels, will provide protection from overland flooding

from surrounding areas for the proposed housing units within the development.

4.6.5. Residual Risk

As a result of the flood risk management details outlined above, the residual risk is considered LOW.

4.7. Overland Flooding from the Subject Site

4.7.1. Likelihood

Due to the increase in hard standing area as a result of the proposed development, there is an increase in the likelihood of surface water discharging from the site, leading to downstream flooding. Therefore the likelihood of overland flooding from the subject site is considered MODERATE.

4.7.2. Consequences

The consequence of overland flooding from the subject site would result in damage to the surrounding roads and landscaped area adjacent to the site. Therefore, the consequences of overland flooding from the subject site is assessed to be MODERATE.

4.7.3. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event with a moderate likelihood and the moderate consequences of overland flooding from the subject site, the resultant risk is MODERATE.

4.7.4. Flood Risk Management

The risk of overland flooding from the subject site is minimised by restricting surface water discharge runoff to greenfield rates and provided on-site attenuation for rainfall events up to 1 in 100 year storm event.

4.7.5. Residual Risk

As a result of the measures detailed above, there is a LOW residual risk of overland flooding from the subject site.

5.0. GROUND WATER

5.1. Source

During periods of prolonged rainfall, the groundwater can seep to above ground level.

5.2. Pathway

During periods of prolonged rainfall there is a possibility that the groundwater level could rise. This may result in ground water seeping above the ground surface.

5.3. Receptor

The receptors would be the underground services, houses, and road areas within the proposed development.

5.4. Likelihood

There is no known history of ground water/springs seeping through the ground in this area. However, it is possible for ground water to rise and cause potential flooding on site during prolonged wet periods. Therefore the likelihood of ground water flooding occurring at the proposed development is assessed to be LOW.

5.5. 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 may also be inundated from high water tables. Therefore the consequences of ground water flooding occurring at the proposed development is assessed to be MODERATE.

5.6. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event of a low likelihood with moderate consequences, it is deemed that the risk from ground water flooding on the proposed development is low.

5.7. Flood Risk Management

The basement structure will be constructed to prevent ground water from entering the car park. The underground structure of the basement car park will be made water tight in order to eliminate the ingress of groundwater.

Finished floor levels have been set above the road levels and surrounding garden levels to insure any seepage of ground water onto the development does not flood into the houses. Any groundwater that may potentially flood the site can escape from the site via the overland flood routing shown in Appendix A.

5.8. Residual Risk

There is a low residual risk of flooding from ground water.

6.0. HUMAN/MECHANICAL ERROR

6.1. Source

The subject lands will be drained by an internal private storm water drainage system which discharges to the existing surface water network via a flow control manhole. This internal surface water network is the source of possible flooding if the system was to block.

6.2. Pathway

If the proposed private drainage system blocks this could lead to possible flooding within the private and public areas.

6.3. Receptor

The receptors are the properties and roads.

6.4. Likelihood

There is a HIGH likelihood of flooding on the subject site if the surface water network was to block.

6.5. Consequence

The surface water network would surcharge and overflow through gullies and manhole lids. It is therefore assessed that the consequences of such flooding are MODERATE.

6.6. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event of a high likelihood with moderate consequences, it is deemed that the risk of overland flooding from human/mechanical error flooding on the proposed development is HIGH.

6.7. Flood Risk Management

As described in Section 4.6, levels on-site have been designed such that in the event of the surface water system surcharging, surface water can still escape from the site by overland flood routing without damaging properties.

The surface water network would need to be unblocked and maintained should a blockage occur. Inspection monitoring should be carried out of the sub-surface attenuation system at times of extreme rainfall events.

6.8. Residual Risk

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

7.0. ROYAL CANAL

7.1. Source

The Royal Canal traverses lands directly south of the proposed development. The proposed site is located between the 12th and 13th lock of the canal, with the 12th lock being a double lock and located approximately 2km east of the site. There is a large body of water between the 12 and 13th lock with approximately 12km between the two locks.

7.2. Pathway

The pathway for flooding from the canal would come from overland flooding if the water level of the canal was to spill over its banks.

7.3. Receptor

The receptors are the properties and roads.

7.4. Likelihood

There is a raised bank between the canal and the subject site. The top of bank elevation is approximately 66.0m with the Canal being at an elevation of approximately 64.0m. This bank will provide natural protection from any potential flood risk from the canal. Furthermore, as shown in section 4.6 above, there is no history of overland flooding from surrounding areas.

Given the above points, the likelihood of the subject site flooding from the canal is low.

7.5. Consequence

The consequence of overland flooding from the canal would result in damage to the surrounding roads and landscaped area adjacent to the site. Therefore, the consequences of overland flooding from the subject site is assessed to be MODERATE.

7.6. Risk

Referencing the Risk Matrix in section 1.3 of this report for a flood event of a low likelihood with moderate consequences, it is deemed that the risk of overland flooding from human/mechanical error flooding on the proposed development is LOW.

7.7. Flood Risk Management

The topography of the landscaped lands between the proposed development and the canal will be maintained to be above the level of the canal and thus continue to provide protection to the proposed site from any overland flooding from the canal.

7.8. Residual Risk

As a result of the flood risk management outlined above, there is a LOW residual risk of overland flooding from the Royal Canal.

8.0. CONCLUSIONS AND RECOMMENDATIONS

8.1. The subject lands have been analysed for risks from flooding from the Irish Sea, fluvial flooding, pluvial flooding, ground water and failures of mechanical systems. The table below presents the various residual flood risks involved.

Source	Pathway	Receptor	Likelihood	Consequence	Risk	Mitigation Measures	Residual Risk
Tidal	None	Proposed Development	Low	Low	Extremely Low	None	**Extremely Low**
Fluvial	None	Proposed Development	Low	Low	Extremely Low	None	**Extremely Low**
Pluvial	Private and Public Drainage Network	Proposed Development	High	Moderate. Flooding of the proposed properties and roads.	High risk of damage to houses.	Appropriate drainage design, over land flood routing, additional upstream attenuation and setting of floor levels.	**Low**
Ground Water	Ground	Proposed Development	Low	Moderate. Saturation of the surrounding grounds during long rainfall periods.	Low risk of minor saturation of area around the development.	Appropriate drainage design, over land flood routing and setting of floor levels.	**Low**
Human/ Mechanical Error	Drainage Network	Proposed Development	High	Moderate. Surcharging of surface network resulting in flooding of the property.	High risk of minor damage to houses.	Over land flood routing, setting of floor levels and inspection of SW network.	**Low**
Royal Canal	Overland	Proposed Development	Low	Moderate	Low	Maintain topography between site and the canal	**Low**

Table 8.1 – Summary of the Flood Risk from the Various Components

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