Flood Risk Assessment

Gas Turbine Power Generation Station Phase 2 at Kilshane, Co. Dublin

May 2026

Waterman Moylan Consulting Engineers Limited

Block S, East Point Business Park, Alfie Byrne Road, Dublin D03 H3F4
www.waterman-moylan.ie

Client Name: Kilshane Energy Ltd.
Document Reference: 25-046r.003 Flood Risk Assessment
Project Number: 25-046

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015 and BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
1	07 May 2026	Kevin Muhia	Mark Duignan	Mark Duignan

Comments

Disclaimer

This report has been prepared by Waterman Moylan, with all reasonable skill, care, and diligence within the terms of the Contract with the Client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the Client.

We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report is confidential to the Client, and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Contents

1. Introduction ... 3
1.1 Flood Risk Assessment: Statement of Design Consistency ... 3
1.2 Site Description ... 3
1.3 Proposed Development ... 4
1.4 Background to the Report ... 5
1.4.1 Assessing Likelihood ... 5
1.4.2 Assessing Consequence ... 5
1.4.3 Assessing Risk ... 6
2. Tidal ... 7
2.1 Source ... 7
2.2 Pathway ... 7
3. Fluvial ... 9
3.1 Source ... 9
3.2 Pathway ... 9
3.3 Likelihood ... 10
3.4 Consequence ... 10
3.5 Risk ... 10
3.6 Flood Risk Management ... 10
3.7 Residual Risk ... 13
4. Pluvial ... 14
4.1 Source ... 14
4.2 Pathway & Receptors ... 14
4.3 Likelihood ... 14
4.3.1 Surcharging of the proposed on-site drainage systems: ... 14
4.3.2 Surcharging from the existing surrounding drainage system: ... 14
4.3.3 Surface water discharge from the subject site: ... 15
4.3.4 Overland flooding from surrounding areas: ... 15
4.3.5 Overland flooding from the subject site: ... 15
4.4 Consequence ... 15
4.5 Risk ... 16
4.5.1 Surcharging of the proposed on-site drainage systems: ... 16
4.5.2 Surcharging from the existing surrounding drainage system: ... 16
4.5.3 Surface water discharge from the subject site: ... 16
4.5.4 Overland flooding from surrounding areas: ... 16
4.5.5 Overland flooding from the subject site: ... 16
4.6 Flood Risk Management ... 16
4.6.1 Surcharging of the proposed on-site drainage systems: ... 16
4.6.2 Surcharging from the existing surrounding drainage system: ... 16

4.6.3 Surface water discharge from the subject site: 18
4.6.4 Overland flooding from surrounding areas: 18
4.6.5 Overland flooding from the subject site: 18
4.7 Residual Risk 18
5. Groundwater 20
5.1 Source 20
5.2 Pathway 20
5.3 Receptor 20
5.4 Likelihood 20
5.5 Consequence 20
5.6 Risk 21
5.7 Flood Risk Management 21
5.8 Residual Risk 21
6. Human/Mechanical Errors 22
6.1 Source 22
6.2 Pathway 22
6.3 Receptor 22
6.4 Likelihood 22
6.5 Consequence 22
6.6 Risk 22
6.7 Flood Risk Management 22
6.8 Residual Risk 22
7. Conclusions and Recommendations 24

Figures

Figure 1 | *Site Location (Google Earth)* 3
Figure 2 | *Extract from Map 12, Fingal County Council Development Plan 2023-2029* 4
Figure 3 | *Extract from the FEM FRAMS Tidal Flood Extents Map* 7
Figure 4 | *Extract from the FEM FRAMS Fluvial Flood Extents Map M02127-06_FIG_FL119* 9
Figure 5 | *Extract from historic flood event map (Source: floodmap.ie)* 10
Figure 6 | *Overland Flood Route* 13
Figure 7 | *Local Flood Event History Extracted from OPW's National Flood Hazard Maps* 15
Figure 8 | *Extract of Groundwater Vulnerability Map* 20

Tables

Table 1 | *From Table A1 of "DEHLG/OPW Guidelines on the Planning Process and Flood Management"* 5
Table 2 | *3x3 Risk Matrix* 6
Table 3 | *Pathways and Receptors* 14
Table 4 | *Summary of the Flood Risks from the Various Components* 24

1. Introduction

This Flood Risk Assessment has been prepared by Waterman Moylan as part of the planning documentation for Phase 2 of a proposed gas turbine power generation station on lands at Kilshane, Co. Dublin.

Phase 1 which is located immediately north of this subject site has received a notification to grant permission under Reg. Ref. FW25A/0523E.

1.1 Flood Risk Assessment: Statement of Design Consistency

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 the risk of flooding at the site from various sources and sets out possible mitigation measures against the potential risks of flooding. Sources of possible flooding include coastal, fluvial, pluvial (direct heavy rain), groundwater, and human/mechanical errors. This report provides an assessment of the subject site for flood risk purposes only.

1.2 Site Description

The site is located at Kilshane, Dublin 11, just west of the N2 Primary Road as shown in *Figure 1*, approximately 300m west of the R135 and is located approx. 2 km north-west of the M50. The site is under ownership of the project client, is mainly defined as a greenfield site and mainly comprises of agricultural fields. It totals c. 5.22 ha in area, as indicated in ***Figure 1*** below.

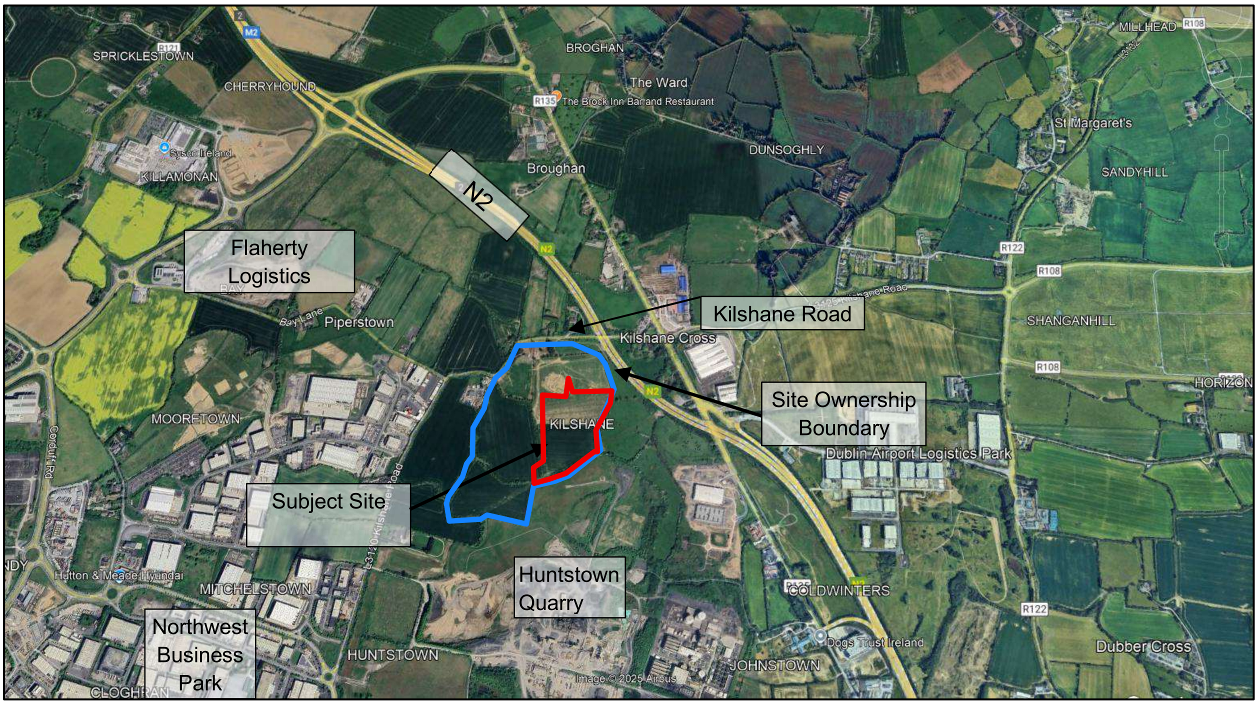


Figure 1 | *Site Location (Google Earth)*

The subject lands are bound to the north and northwest by the Kilshane Road, to the west and southwest by an industrial site (Flaherty Logistics), and agricultural lands, to the south and southeast by Huntstown Quarry, and again to the east by agricultural lands.

A topographic survey of the area indicated that the site generally slopes from west to east with a high point of 80.50m OD Malin on the western boundary, and a low of 77.54m OD Malin on the eastern boundary.

The topographic survey and OS details also indicate that the boundary hedgerows separating the fields comprising the site contain local ditches which convey surface water flows from rainfall in a north-easterly direction. These ditches serve only the subject site and the adjacent agricultural lands to the west, between the site boundary and the Kilshane Road.

These boundary ditches merge to an unnamed ditch to the east of the site. This ditch generally flows in a north-easterly direction to join the River Ward at St. Margaret's Golf and Country Club. The River Ward is a tributary of the Broadmeadow River, which in turn outfalls to the Irish Sea at the Malahide Estuary. The Malahide Estuary is a Special Protection Area (SPA), a candidate Special Area of Conservation (cSAC), a proposed National Heritage Area (pNHA) and a RAMSAR site.

The Fingal Development Plan 2023-2029 shows in its Map No. 12 (Blanchardstown North), that the site is located entirely within the blue area which denotes lands zoned: HI, for Heavy Industry, refer to *Figure 2*, below.

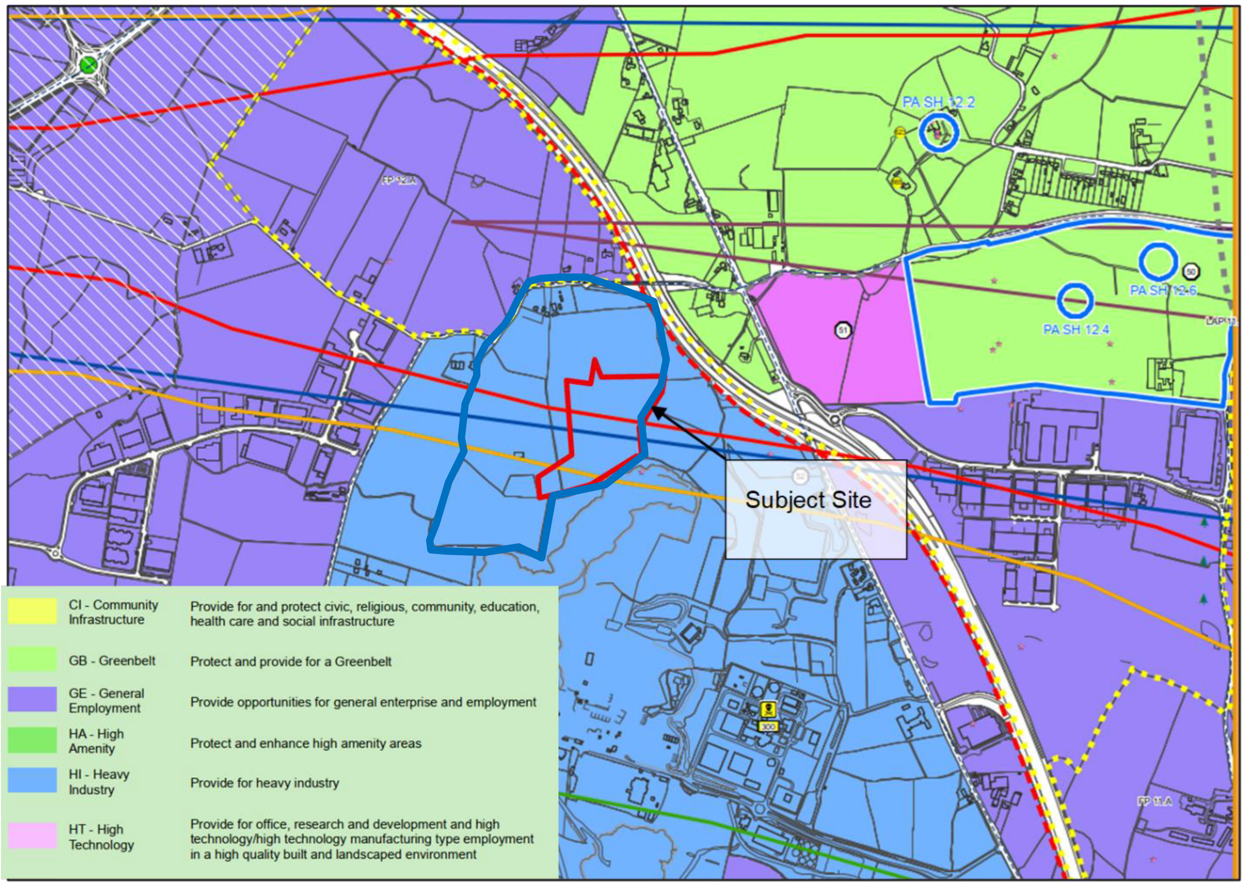


Figure 2 | *Extract from Map 12, Fingal County Council Development Plan 2023-2029*

1.3 Proposed Development

Planning permission is being sought by Kilshane Energy Ltd. for the construction of a Gas Turbine Power Generation Station with an output of up to 680 Megawatts at this site address: Kilshane Road, Kilshane, Finglas, Dublin 11. The proposed development will consist of the following;

- 2 additional gas turbines (340MW each)

- ➢ 400kV GIS building and associated compound
- ➢ Increasing diesel storage from 5000t to 15000t
- ➢ Extension to administration building
- ➢ Access roads
- ➢ Electrical substation

1.4 Background to the Report

This Preliminary 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
- Groundwater – flooding from springs / raised groundwater
- Human/mechanical error – flooding due to human or mechanical error

Each component will be investigated from a Source, Pathway and Receptor perspective, followed by an assessment of the likelihood of a flood occurring and the possible consequences.

1.4.1 Assessing Likelihood

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

Flood Risk Components	**Likelihood: % chance of occurring in a year**		
	Low	***Moderate***	***High***
Tidal	*Probability < 0.1%*	*0.5% > Probability > 0.1%*	*Probability > 0.5%*
Fluvial	*Probability < 0.1%*	*1% > Probability > 0.1%*	*Probability > 1%*
Pluvial	*Probability < 0.1%*	*1% > Probability > 0.1%*	*Probability > 1%*

Table 1 **|** *From Table A1 of "DEHLG/OPW Guidelines on the Planning Process and Flood Management"*

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

From consideration of the likelihoods and the possible consequences a risk is evaluated. Should such a risk exist, mitigation measures will be explored, and the residual risks assessed.

1.4.2 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 also be categorized as low, moderate, and high.

1.4.3 Assessing Risk

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

		Consequences		
		Low	***Moderate***	***High***
Likelihood	**Low**	*Extremely Low Risk*	*Low Risk*	*Moderate Risk*
	Moderate	*Low Risk*	*Moderate Risk*	*High Risk*
	High	*Moderate Risk*	*High Risk*	*Extremely High Risk*

Table 2 | *3x3 Risk Matrix*

1.4.4 Flood Risk Management

After a risk has been assessed, flood risk management is the next stage. Flood risk management aims to minimize the risks to people, properties, and the environment arising from flooding.

1.4.5 Residual Risk

The residual risk is the risk which remains after all risk avoidance, substitution, and mitigation measures have been implemented.

2. Tidal

2.1 Source

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.

2.2 Pathway

The site is approximately 9.8km south-west of the nearest coastline at the Malahide Estuary near Swords, as shown in ***Figure 3*** below. This figure is extracted from the OPW's flood information portal and shows that the site is not at risk of coastal flooding for even the 1-in-1,000 year flood event. The Dublin Coastal Protection Project indicates that the 2002 high tide event reached 2.95m OD Malin. The ground level on site is approx. 76.8m, well above the historic high tide event.

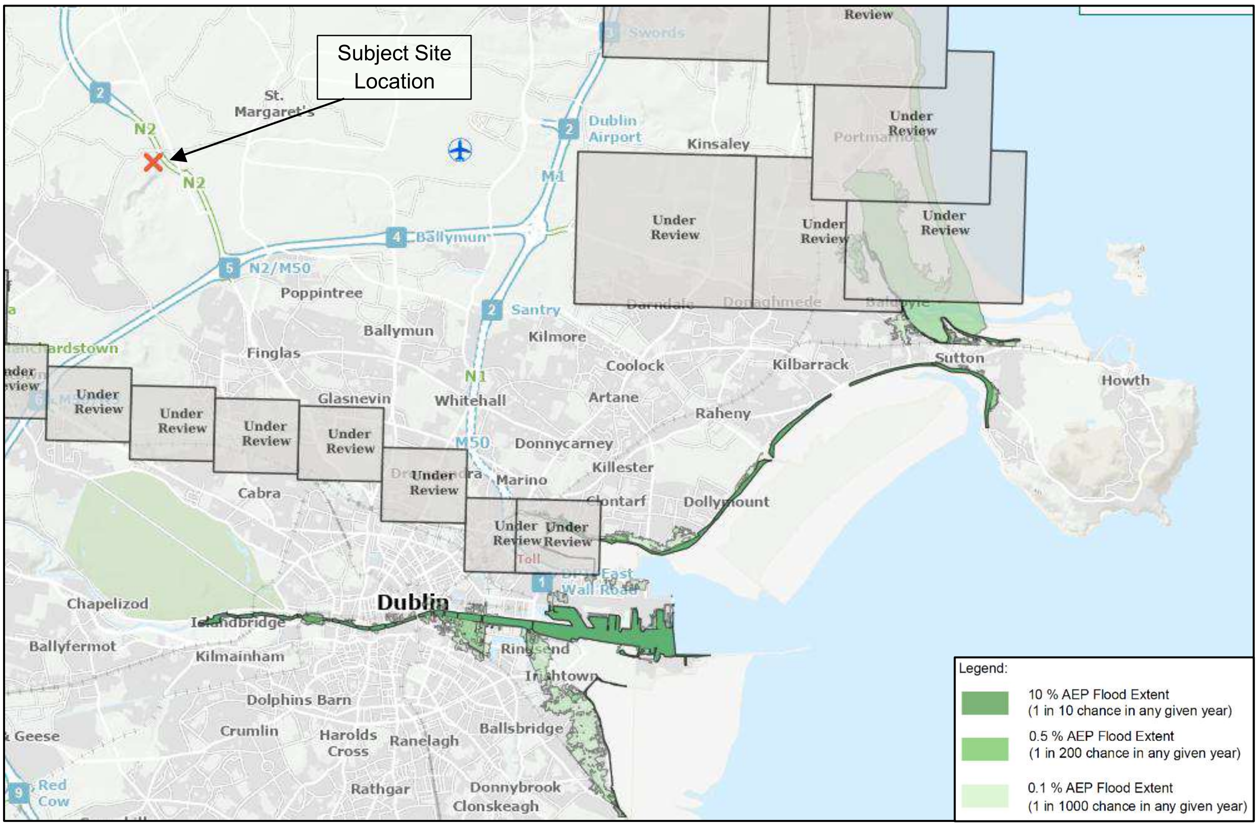


Figure 3 | *Extract from the FEM FRAMS Tidal Flood Extents Map*

High probability flood events, as shown in the above map, are defined as having approximately a 1-in-10 chance of occurring or being exceeded in any given year (10% Annual Exceedance Probability), medium probability flood events are defined as having an AEP of 0.5% (1-in-200-year storm), while low probability events are defined having an AEP of 0.1% (1-in-1,000-year storm). The map indicates that the subject development is not at risk of flooding for even the 1-in-1,000-year event.

Given that the site is located 9.8 kilometres inland from the Malahide Estuary, that there is a 73.85m level difference between the lowest proposed level on-site and the high tide and given that the site is outside of the 1-in-1,000 year flood plain, it is evident that a pathway does not exist between the source and the receptor. The risk from tidal flooding is therefore extremely low and no flood mitigation measures need to be implemented.

3. Fluvial

3.1 Source

Fluvial flooding occurs when a river / water course's flow exceeds its capacity, typically following excessive rainfall, though it can also result from other causes such as heavy snow melt and ice jams.

3.2 Pathway

The subject site is located within the Broadmeadow River catchment. The site generally slopes from west to east and is served by ditches located within the boundary hedgerows. There is an unnamed drainage ditch to the east of the site which generally flows in a north-easterly direction to join the River Ward at St. Margaret's Golf & Country Club. The ditch is a dry / static ditch and only drains the immediate field fronting it and does not convey surface water from upstream of it. The River Ward is a tributary of the Broadmeadow River which outfalls to the Malahide Estuary, east of Swords, and approx. 9.8km north-east of the subject site.

The Fingal Development plan 2023-2029 contains Fluvial Flood Zone maps. Map number 19 of 26 is extracted below to ***Figure 4***. This extract shows that none of the subject site, or indeed any of the surrounding lands, fall within the 0.1% AEP (1-in-1,000 year) flood plain.

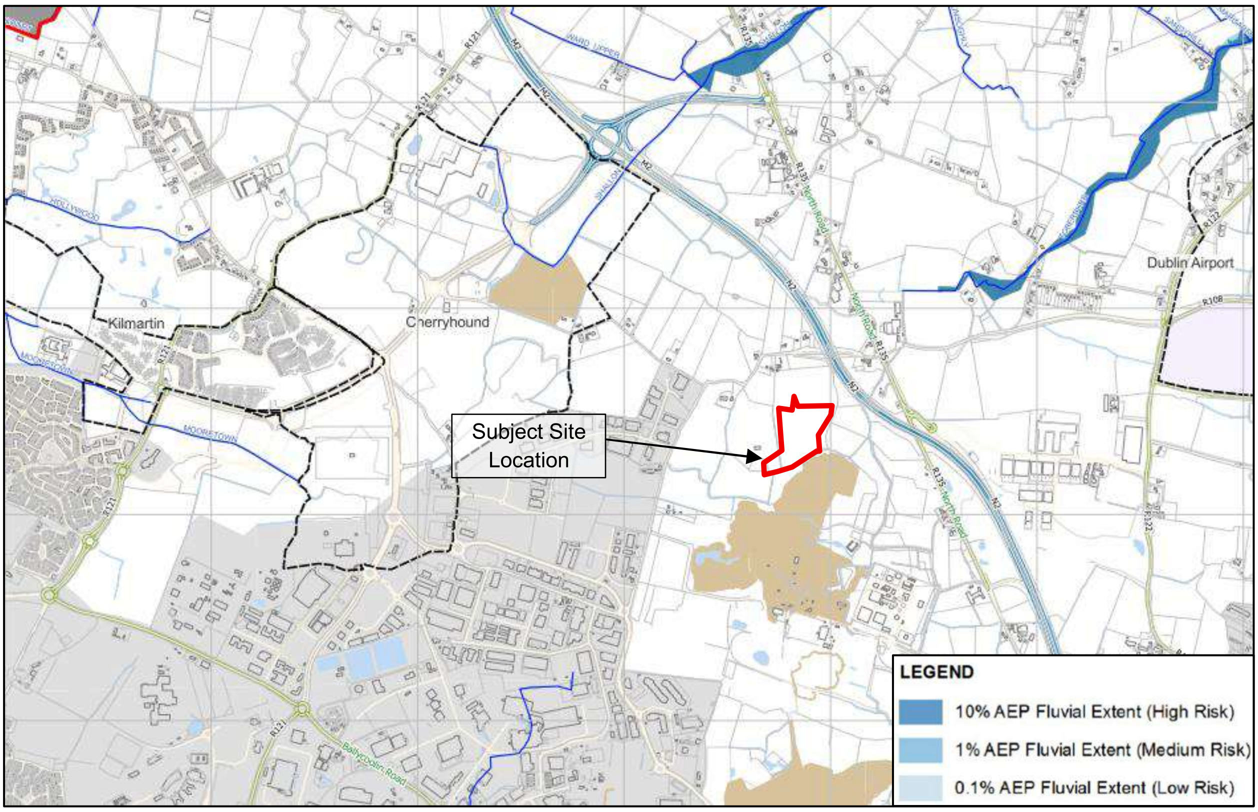


Figure 4 | *Extract from the FEM FRAMS Fluvial Flood Extents Map M02127-06_FIG_FL119*

A review of the available historic records does not indicate that there have not been any instances of flooding at some of the site area.

The nearest flood event took place c400m away from the site, at Kilshane Cross. A review of the "Fingal County Council Report on Flooding 18th April 2005" report associated with this flood event advises that preliminary investigations indicate that flooding on the N2 arose from surface water runoff from adjacent grasslands. Following this, drainage works were undertaken as part of the road development, and there has not been any flooding at this location since.

Figure 5 **|** *Extract from historic flood event map (Source: floodmap.ie)*

3.3 Likelihood

Given that the site and surrounding area is outside of the 1-in-1,000 year flood plain, the adjacent ditch is a dry ditch and only drains the immediate field fronting it and the subject development is min 15m from the ditch, the likelihood of fluvial flooding is low.

3.4 Consequence

The consequence of fluvial flooding would be some out of bank flow of the local ditch minor inundation to open spaces. Therefore, the consequences of fluvial flooding occurring at the proposed development is considered low.

3.5 Risk

There is an extremely low risk of fluvial flooding as the likelihood is low and the consequence is low.

3.6 Flood Risk Management

The proposed finished floor levels of all structures will be 200mm above the adjacent road channel line heights.

Should fluvial flooding occur, surface water can flow overland towards open spaces and the existing ditch system on the eastern boundary via open spaces.

An exception to this is the chimney stack and exhaust slab/compound as indicated as the yellow hatched area on ***Figure 6***. The top of stack height is limited due to the proximity to the flight path of the runways at Dublin Airport. Whilst the height of the stack itself has been reduced as far as possible, the installation of the supporting slab will be below ground level in this area. Thus, there is no possibility of providing an overland flood route from this area directly to the ditch. Further mitigation measures have been incorporated to this area to prevent flooding.

The attenuation strategy of this area is discussed in full in the Engineering Assessment Report, however, a brief overview is as follows: Rainfall in this area will be directed by gravity to an underground attenuation tank, from where it will be pumped to the gravity outfall network. The pumping rate will be limited to that of the greenfield runoff rate. Mitigation/redundancy measures to ensure the continued operation of the stormwater pumping system in the case of mechanical or electrical failure have been incorporated to the design and include the following measures:

- Catchment area has been kept to a minimum area of the lower compound.
- Surface water from the surrounding area and from the adjacent ditch will not have an overland flow route to the lower compound area by means of retaining walls, landscape mounds and swales.
- The compound will drain by gravity to an attenuation tank before being pumped to the adjacent ditch network.
- The top of the attenuation tank has been designed to be lower than the exhaust slab/compound area, so no surcharging of surface water will occur on the exhaust slab/compound surface should the tank ever fill.
- The attenuation tank has been oversized as follows:
    - Stormwater volumes for the 1 in 100-year storm event, plus a 20% allowance for climate change.
    - The size of the attenuation tank has been modelled so that it will accommodate the 1 in 100-year storm event without any outflow during the entire duration of the rainfall event (i.e., if the pumps were not working).
    - While the Site Investigation report indicates the impermeable soil may be classified as Type 4 or Type 5 for attenuation calculations, a soil Type 3 has been utilised throughout the site. This ensures that that the attenuation volume provided is well in excess of what would actually be required.
    - Most of the exhaust stack/compound area is covered with filter stone surfacing with an area of 11,207.4m² sitting on top of virgin ground allowing for maximum infiltration. This will reduce the overall hardstanding area of this catchment and allow rainfall to permeate to the soil strata and natural groundwater network. Attenuation calculation assumes 100% hard standing across the entire exhaust stack/compound area.
    - Filter drains have been incorporated into the filter stone to ensure drainage of the lower compound area will drain to the attenuation tank quickly during extreme rainfall events.
- A duty, standby and back-up pumps assembly will be in place should there be any issue with the primary pump due to failure or downtime for maintenance etc., which will allow it to operate normally.

- Monitoring data/warning systems for the attenuation tanks and pump sets will be incorporated to the plants operational systems as a primary warning source of technical difficulties.

- A set down area and plug in facility will be provided for a temporary generator during times of prolonged electrical supply failure. It is noted that the nature of the Power Station will ensure that maintenance procedures and emergency alarm systems will be constantly observed and implemented.

- Ultrasonic level detectors will be incorporated as standard and will be connected to the telemetry kiosk. This telemetry kiosk will be GSM enabled, meaning that should there be any technical issue whereby the pumping station experiences an electrical or mechanical failure, designated persons are notified via text message and are afforded time to investigate and respond to the issue before an overflow occurs. This automated contact system is also designed to make the designated persons aware of mechanical failures/unexpected levels in the tank etc., even for which redundancy measures are in place. An example of this would be the failure of the primary pump and that the back-up pump has become active. This notification message will allow the designated person to immediately action a repair of the primary pump while the back-up pump ensures the pump station can operate normally.

- The GSM unit itself will run on mains electricity but will be fitted with a battery pack (which will be kept fully charged from the mains), so that the notification warning system will still operate during times of electrical supply failure.

- Mechanical items for the pumping station will also be incorporated to the maintenance manual for the development to ensure they maintain a satisfactory level of operational upkeep.

- An access route has been provided so that should the pumps and stand-by assembly fail, a vacuum/suction tanker can be arranged to empty the attenuation tank. Advanced notice for arranging the tanker will be provided via the GSM telemetry kiosk as noted earlier.

- The proposed development is a power plant facility, the facility will have a continued level of presence on-site, and swift access to emergency maintenance teams should a warning notification appear on the operational control board.

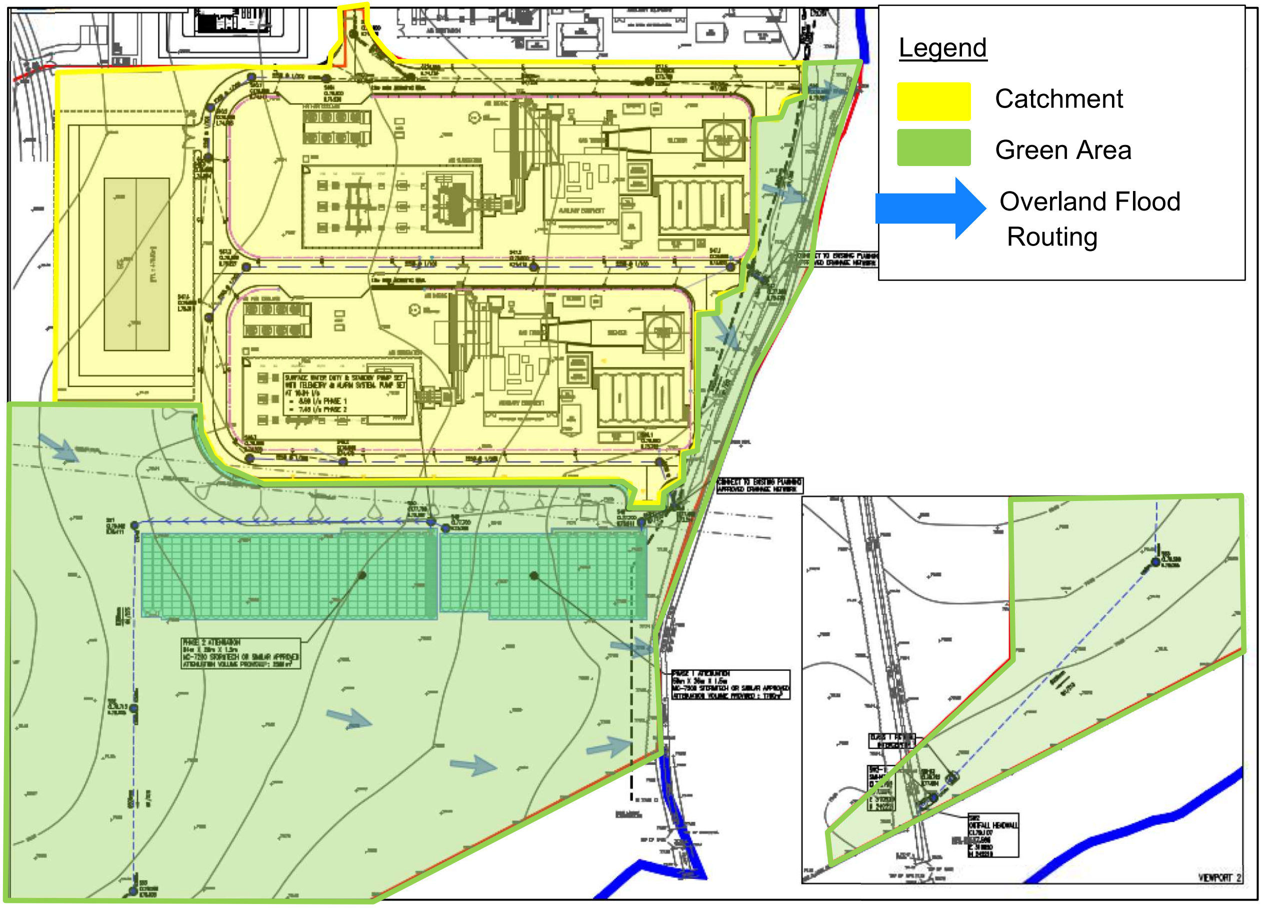


Figure 6 | *Overland Flood Route*

3.7 Residual Risk

The residual risk of fluvial flooding is considered extremely low.

4. Pluvial

4.1 Source

Pluvial flooding occurs when heavy rainfall creates a flood event independent of an overflowing water body. Pluvial flooding can happen in any urban area, including higher elevation areas that lie above coastal and river floodplains.

4.2 Pathway & Receptors

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

	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

Table 3 | *Pathways and Receptors*

4.3 Likelihood

The likelihood of each of the 5 pathway types are addressed individually as follows:

4.3.1 Surcharging of the proposed on-site drainage systems:

The proposed on-site surface water drainage sewers have been designed to accommodate flows from a 5-year return event, which indicates that on average the internal system may surcharge during rainfall events with a return period in excess of five years. The lower compound area also drains by gravity to an attenuation tank which is then pumped to the adjacent ditch network. Therefore, the likelihood surcharging of the on-site drainage system is considered moderate to high.

4.3.2 Surcharging from the existing surrounding drainage system:

The OPW's National Flood Hazard Maps, extracted overleaf, have been consulted to identify recorded instances of flooding in the vicinity of the site. The nearest recorded flood event (ID-1633) occurred approximately 400m west of the site in November 2002 at Kilshane Cross, with no recorded flooding in the immediate vicinity of the site.

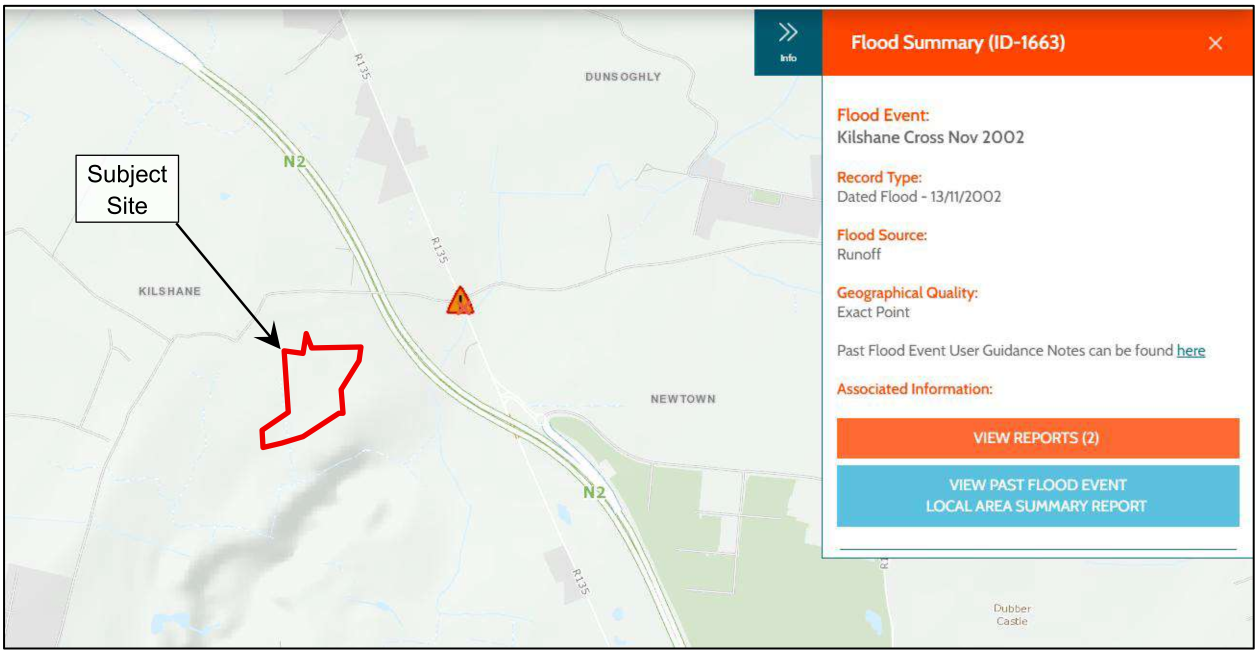


Figure 7 | *Local Flood Event History Extracted from OPW's National Flood Hazard Maps*

The cause of this flooding is recorded as being surface water runoff from adjacent agricultural fields. FCC meeting minutes (ref: P4D403A-F140-014-004), advises that the issue of flooding here has been addressed by drainage works as part of road works at this location, and consultations with the owners of the fields that contributed to the flood event. There have been no recorded instances of flooding since remedial works were completed.

With a history of flooding in the area due to surcharging, but no such record of flooding following remedial works, the likelihood of such flooding occurring is considered moderate.

4.3.3 Surface water discharge from the subject site:

Due to the increase in hard standing area as a result of the proposed development, there is an increased likelihood of surface water discharge from the site leading to downstream flooding. As such, the likelihood can be considered moderate.

4.3.4 Overland flooding from surrounding areas:

With no recorded flood events in the immediate area that could have an impact on the subject site, as per the OPW records referred to above (note that flood ID-1633 is downstream of the site), it is considered that there is a low likelihood of flooding from surrounding areas.

4.3.5 Overland flooding from the subject site:

Due to the increase in hard standing area as a result of the proposed development, there is an increased likelihood of overland flooding from the site leading to downstream flooding. As such, the likelihood can be considered moderate.

4.4 Consequence

Surface water flooding would result in damage to roads and landscaped areas and could impact the ground floor levels of buildings. The consequences of pluvial flooding are considered moderate to high.

4.5 Risk

The risk of each of the 5 pathway types is addressed individually as follows:

4.5.1 Surcharging of the proposed on-site drainage systems:

With a moderate to high likelihood and moderate consequence of flooding the site from surcharging the on-site drainage system, the resultant risk is high.

4.5.2 Surcharging from the existing surrounding drainage system:

With a moderate likelihood and moderate consequence of flooding the site from the existing surface water network, the resultant risk is moderate.

4.5.3 Surface water discharge from the subject site:

With a moderate likelihood and moderate consequence of surface water discharge from the subject site, the resultant risk is moderate.

4.5.4 Overland flooding from surrounding areas:

With a low likelihood and moderate consequence of overland flooding from the surrounding areas, the resultant risk is low.

4.5.5 Overland flooding from the subject site:

With a moderate likelihood and moderate consequence of overland flooding from the subject site, the resultant risk is moderate to high.

4.6 Flood Risk Management

The following are flood risk management strategies proposed to minimise the risk of pluvial flooding for each risk:

4.6.1 Surcharging of the proposed on-site drainage systems:

The risk of flooding is minimised with adequate sizing of the on-site surface water network and SuDS devices. Open grassed areas with low level planting and swales will ensure that these areas act as soft scape and will significantly slow down and reduce the amount of surface water runoff from the site. Permeable paving in parking courts will provide some treatment volume.

These proposed source and site control devices will intercept and slow down the rate of runoff from the site to the on-site drainage system, reducing the risk of surcharging.

Furthermore, a hydro-brake for the catchment will limit runoff to the equivalent greenfield rate. Excess storm water from the catchments is to be attenuated in the underground tanks with sufficient volume for the 1-in-100-year storm (accounting for a 20% increase due to climate change), to limit the runoff from the site and minimise the discharge rate into receiving waters.

Overland flood routing will direct any surface water away from the compounds, buildings and roads and to the near by ditch system, with the exception of the lower compound area.

As noted in section 3.6 of this report, the following mitigation measures have been/will be implemented to ensure minimum risk of flooding the lower compound:

- Catchment area has been kept to a minimum area of the lower compound.

- Surface water from the surrounding area and from the adjacent ditch will not have an overland flow route to the lower compound area by means of retaining walls, landscape mounds and swales.

- The compound will drain by gravity to an attenuation tank before being pumped to the adjacent ditch network.

- The top of the attenuation tank has been designed to be lower than the exhaust stack compound area, so no surcharging of surface water will occur on the exhaust stack compound surface should the tank ever fill.

- The attenuation tank has been oversized as follows:

    - Stormwater volumes for the 1 in 100-year storm event, plus a 20% allowance for climate change.
    - The size of the attenuation tank has been modelled so that it will accommodate the 1 in 100-year storm event without any outflow during the entire duration of the rainfall event (i.e., if the pumps were not working).
    - While the Site Investigation report indicates the impermeable soil may be classified as Type 4 or Type 5 for attenuation calculations, a soil Type 3 has been utilised throughout the site. This ensures that that the attenuation volume provided is well in excess of what would actually be required.
    - Most of the exhaust stack compound area is covered with filter stone surfacing with an area of 11,207.4m² sitting on top of virgin ground allowing for maximum infiltration. This will reduce the overall hardstanding area of this catchment and allow rainfall to permeate to the soil strata and natural groundwater network. Attenuation calculation assumes 100% hard standing across the entire exhaust stack compound area.
    - Filter drains have been incorporated into the filter stone to ensure drainage of the lower compound area will drain to the attenuation tank quickly during extreme rainfall events.

- A duty, standby and back-up pumps assembly will be in place should there be any issue with the primary pump due to failure or downtime for maintenance etc., which will allow it to operate normally.

- Monitoring data/warning systems for the attenuation tanks and pump sets will be incorporated to the plants operational systems as a primary warning source of technical difficulties.

- A set down area and plug in facility will be provided for a temporary generator during times of prolonged electrical supply failure. It is noted that the nature of the Power Station will ensure that maintenance procedures and emergency alarm systems will be constantly observed and implemented.

- Ultrasonic level detectors will be incorporated as standard and will be connected to the telemetry kiosk. This telemetry kiosk will be GSM enabled, meaning that should there be any technical issue whereby the pumping station experiences an electrical or mechanical failure, designated persons are notified via text message and are afforded time to investigate and respond to the issue before an overflow occurs. This automated contact system is also designed to make the designated persons aware of mechanical failures/unexpected levels in the tank etc., even for which redundancy measures are in place. An example of this would be the failure of the primary pump and that the back-up pump has become active. This notification message will allow the designated person to immediately action a repair of the primary pump while the back-up pump ensures the pump station can operate normally.

- The GSM unit itself will run on mains electricity but will be fitted with a battery pack (which will be kept fully charged from the mains), so that the notification warning system will still operate during times of electrical supply failure.

- Mechanical items for the pumping station will also be incorporated to the maintenance manual for the development to ensure they maintain a satisfactory level of operational upkeep.

- An access route has been provided so that should the pumps and stand-by assembly fail, a vacuum/suction tanker can be arranged to empty the attenuation tank. Advanced notice for arranging the tanker will be provided via the GSM telemetry kiosk as noted earlier.

- The proposed development is a power plant facility, the facility will have a continued level of presence on-site, and swift access to emergency maintenance teams should a warning notification appear on the operational control board.

As a result of these proposed measures, the likelihood of surcharging of the proposed on-site drainage systems is low.

4.6.2 Surcharging from the existing surrounding drainage system:

There is no existing surface water network (piped) in the vicinity of the site. The risk of flooding due to surcharging of the existing surface water ditch network is minimised with overland flood routing (refer to the Overland Flood Routing figure in Section 3.6 above) towards the local ditch systems. The risk to the surrounding buildings and plant is mitigated by setting finished floor levels at least 200mm above the adjacent road channel line.

4.6.3 Surface water discharge from the subject site:

Surface water discharge from the subject site is intercepted and slowed down through the use of source control devices, as described in Section 4.6.1 above, minimising the risk of pluvial flooding from the subject site. Sufficient attenuation storage is provided for the 1-in-100 year storm, accounting for a 20% increase due to climate change.

4.6.4 Overland flooding from surrounding areas:

The risk from overland flooding from surrounding areas is low. Overland flood routing and raised finished floor levels will provide protection for the proposed buildings, as described in Section 4.6.2 above.

4.6.5 Overland flooding from the subject site:

The risk of overland flooding from the subject site is minimised by providing SuDS features to intercept and slow down the rate of runoff from the site to the existing surface water sewer system, as described in

Section 4.6.1 above. Sufficient attenuation is provided for the 1-in-100 year storm, accounting for a 20% increase due to climate change. Thus, even under extreme storm conditions, the surface water can be attenuated without causing flooding downstream.

4.7 Residual Risk

As a result of the design measures detailed above in Section 4.6, there is a low residual risk of flooding from each of the surface water risks.

5. Groundwater

5.1 Source

Groundwater flooding occurs when the water table rises above the ground surface. This typically happens during periods with prolonged rainfall which exceeds the natural underground drainage system's capacity.

5.2 Pathway

The pathway for groundwater flooding is from the ground. Note that although groundwater flooding is typically considered to be when the water table rises above the ground surface, underground services and building foundations could also be affected by high water tables that do not reach the ground surface.

5.3 Receptor

The receptors for ground water flooding would be underground services, roads, and the ground floor of buildings.

5.4 Likelihood

Geological Survey Ireland (GSI) produces a wide range of datasets, including groundwater vulnerability mapping. From the GSI groundwater vulnerability map, extracted below, the site lies within an area with moderate to extreme groundwater vulnerability.

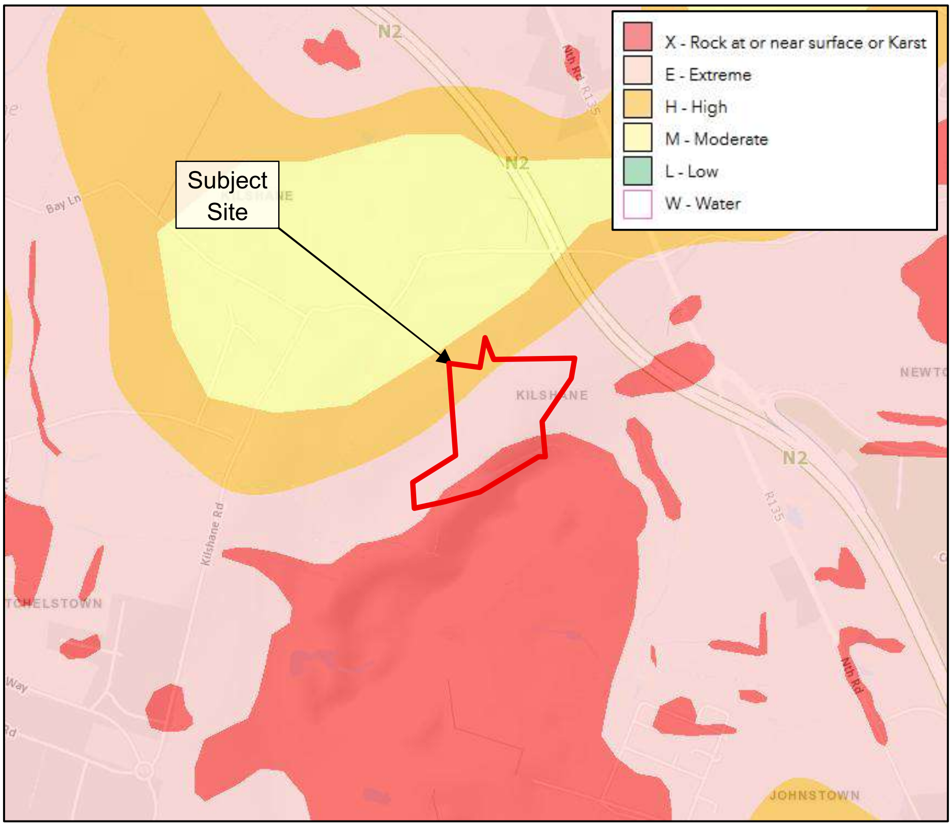


Figure 8 | *Extract of Groundwater Vulnerability Map*

With the Site investigation report conducted as part of the permitted Phase 1 development and includes samples across the subject Phase 2 site, showing no ground water encountered in any trial pit within 1.8m of finished ground levels, the likelihood of groundwater rising through the ground and causing potential flooding on site during prolonged wet periods is low to medium.

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. Underground services could be inundated from high water tables. Therefore, the consequence of ground water flooding occurring at the proposed development is considered moderate.

5.6 Risk

With a high likelihood and moderate consequences of flooding due to groundwater, the risk is considered medium.

5.7 Flood Risk Management

Finished floor levels have been set above the road levels, as described in Section 3.6, to ensure that any seepage of ground water onto the development does not flood into the compounds / buildings. In the event of ground water flooding on site, this water can escape from the site via the overland flood routing, also described in Section 3.6.

The building and plant design will incorporate suitable damp-proof membranes to protect against damp and water ingress from below ground level.

The lower-level compound area has been designed with filter stone and filter drains to assist with draining the lower compound to the 1 in 100-year attenuation tank.

5.8 Residual Risk

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

6. Human/Mechanical Errors

6.1 Source

The subject site will be drained by an internal private storm water drainage system, this discharges to the existing natural surface water network, which outfalls to the River Ward.

The internal surface water network is a source of possible flooding were it to become blocked or malfunction.

6.2 Pathway

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

6.3 Receptor

The receptors for flooding due to human/mechanical error would be the ground floor levels of the compound, buildings, and the roads, and the open areas around the site.

6.4 Likelihood

There is a moderate to high likelihood of flooding on the subject site if the surface water network were to become blocked.

6.5 Consequence

The surface water network would surcharge and overflow through gullies and manhole lids into the compound area and roads. It is, therefore, considered that the consequences of such flooding are moderate to high.

6.6 Risk

With a moderate to high likelihood and moderate to high consequence, there is a high risk of surface water flooding should the surface water network block or malfunction.

6.7 Flood Risk Management

As described in Section 3.6, finished floor levels have been designed to be above the adjacent road network, which will reduce the risk of flooding if the surface water network were to block. In the event of the surface water system surcharging, the surface water can still escape from the site by overland flood routing, as also described in Section 3.6, without causing damage to the proposed buildings. For the area below ground level where an overland flood route cannot be facilitated, the mitigation measures for this are also discussed in Section 3.6.

The surface water network (drains, gullies, manholes, AJs, attenuation system, and pump station) will need to be regularly maintained and where required cleaned out. A suitable maintenance regime of inspection and cleaning should be incorporated into the safety file/maintenance manual for the development.

Mitigation measures for the pumping of surface water run off for the lower compound is set out clearly in section 3.6.

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. Conclusions and Recommendations

The subject lands have been analysed for risks from tidal flooding from the Irish Sea, fluvial flooding from the Grifeen River, pluvial flooding, ground water and failures of mechanical systems. *Table 5*, below, presents the various residual flood risks involved.

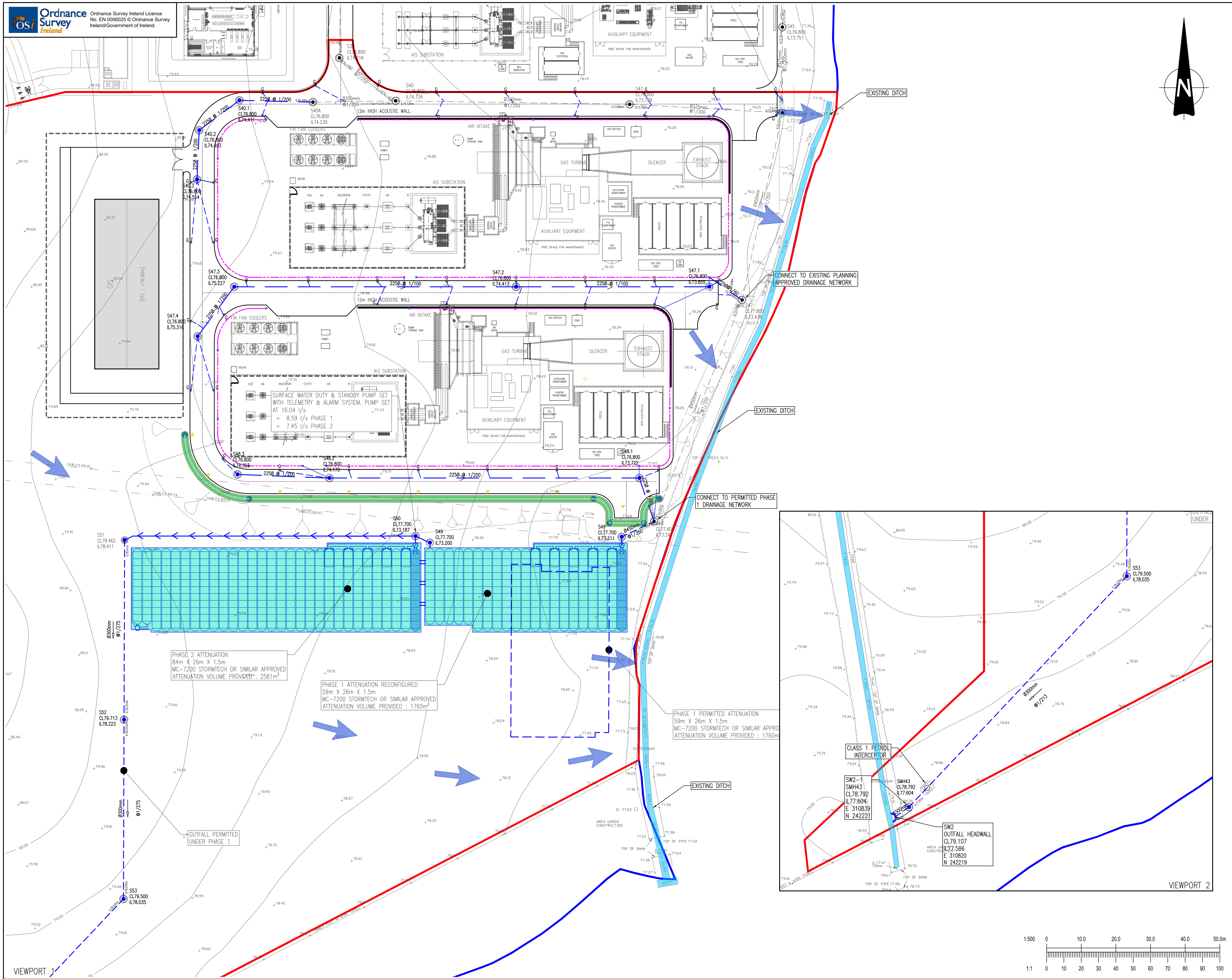
Source	**Pathway**	**Receptor**	**Likelihood**	**Consequence**	**Risk**	**Mitigation Measure**	**Residual Risk**
Tidal	*Irish Sea (Malahide Estuary)*	*Proposed development*	*Extremely low*	*None*	*Extremely low*	*None*	Extremely low
Fluvial	*Local ditches (tributary of the River Ward)*	*Proposed development*	*Low*	*Low*	*Extremely Low*	*Setting of floor levels & freeboard, overland flood routing, no localised low points, no structures located in flood zone*	Extremely Low
Pluvial	*Private & Public Drainage Network*	*Proposed development, downstream properties, and roads*	*Ranges from high to low*	*Moderate to High*	*Ranges from high to low*	*Appropriate drainage, SuDS, and attenuation design, setting of floor levels, overland flood routing, no structures located in flood zone*	Low
Ground Water	*Ground*	*Underground services, ground level of buildings, roads*	*Low to Moderate*	*Moderate*	*Moderate*	*Appropriate setting of floor levels, flood routing, damp proof membranes*	Low
Human/ Mechanical Error	*Drainage network*	*Proposed development*	*Moderate to High*	*Moderate to High*	*Moderate to High*	*Setting of floor levels, overland flood routing, regular inspection of surface water network*	Low

Table 4 | *Summary of the Flood Risks from the Various Components*

As indicated in the above table, the various sources of flooding have been reviewed, and the risk of flooding from each source has been assessed. Where necessary, mitigation measures have been proposed. As a result of the proposed mitigation measures, the residual risk of flooding from any source is low.

APPENDICES

A. Overland Flood Routing



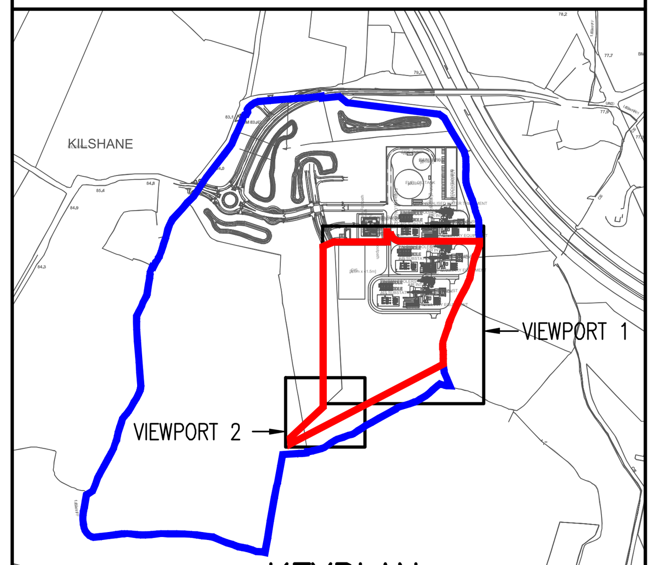
This drawing should not be scaled. Dimensions to be verified on site.
Any discrepancies should be referred to the Engineer prior to work being put in hand.
This drawing is the property of Waterman Moylan Consulting Engineers Limited and is issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorized person, either wholly or in part without the consent in writing of
Waterman Moylan Consulting Engineers Limited
Block S East Point Business Park Dublin D03 H3F4 Ireland
t +353 1 664 8900

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND:

- PERMITTED PHASE 1 PLANNING SURFACE WATER PIPE & MANHOLE
- PERMITTED PHASE 1 PLANNING SURFACE WATER RISING MAIN
- PERMITTED PHASE 1 PLANNING ATTENUATION STORAGE
- PROPOSED SURFACE WATER PIPE & MANHOLE
- PROPOSED FILTER DRAIN
- PROPOSED SWALE WITH PERFORATED PIPE
- PROPOSED KERB INLET
- PROPOSED GULLY AND CONNECTION
- PROPOSED ATTENUATION STORAGE
- OVERLAND FLOOD ROUTE DIRECTION



KEYPLAN
SCALE 1:10000

Rev	Date	Description	By	Chk

Amendments

Project
KILSHANE POWER STATION

Title
DRAINAGE LAYOUT & OVERLAND FLOOD ROUTING

Client
KILSHANE ENERGY LTD.

waterman moylan

BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

Status
FOR PLANNING

Designed By	Approved	Waterman Ref
KM	MD	25-046
Drawn By: PJD	Date: MAY 2026	Scales @ A1: 1:500

Project - Originator - Volume - Level - Type - Role - Number | Revision
KPS - WMC - PH1 - 00 - DR - C - P200 | -

Drawing Location: N:\Projects\25\25-046 Kilshane Power Station\Drawings\Waterman Moylan\Civil\Planning\Autocad Drawings\25-046-P200 Drainage Layout.dwg
Date: May 07, 2026 - 3:32pm

UK and Ireland Office Locations