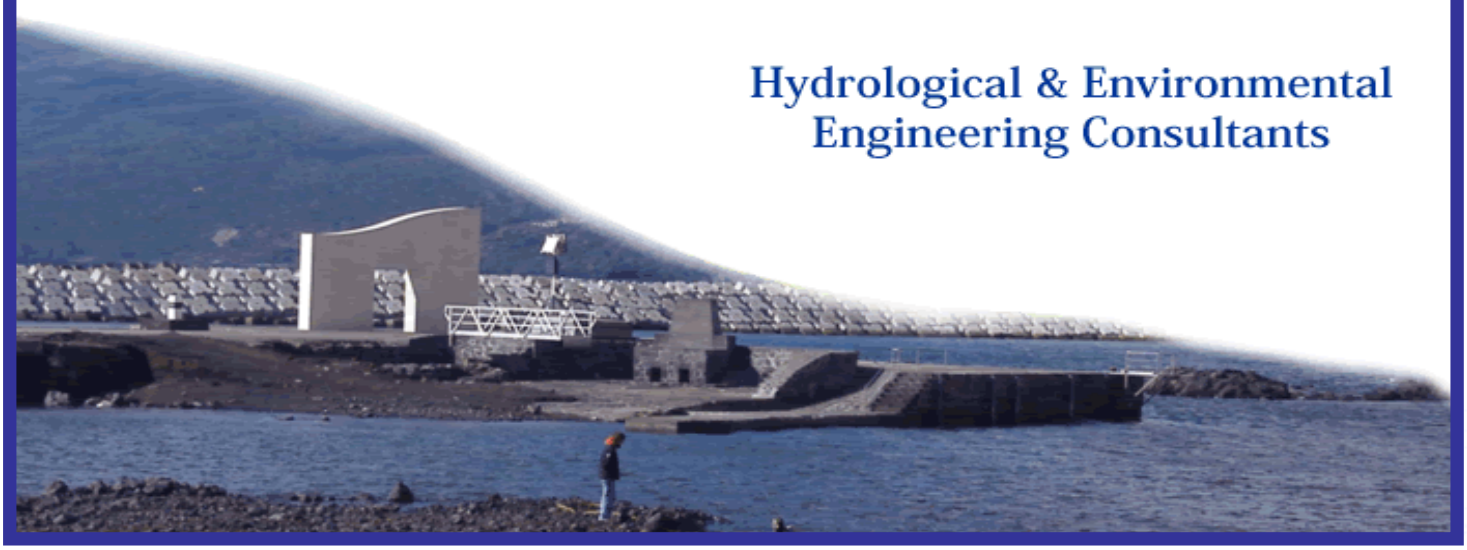
Hydro Environmental Ltd

# Flood Risk Assessment
# Lake Amenity Enhancement Project
# at Long Point, Loughrea

**On behalf of**

**Helena McElmeel Architects**

**September 2024**



Hydrological & Environmental
Engineering Consultants

# Flood Risk Assessment
# Lake Amenity Enhancement Project
# at Long Point, Loughrea

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# 1 Introduction

Hydro Environmental Ltd was requested by Helena McElmeel Architects to carryout a Flood Risk Assessment of proposed Swimming Amenity Development at Long Point adjacent to Lough Rea, Co. Galway. Long Point has an existing quay side facilities including changing room facilities and a buoyed Swimming area on the eastern side of Lough Rea. Existing facilities including Carparking is shown in Figure 1-1.


***Figure 1-1 Existing Layout of facilities at Long Point including carparking and changing Facilities***

The topographical Survey of the proposed site area is presented in Figure 1-2 and shows shoreline levels at 79.5 to 80m OD and rising south-eastward away from the lake edge to 84.5m OD. The existing Changing area is at 80.8 to 80.9 m OD and the existing carparking area is 80.5 to 81.5m OD.

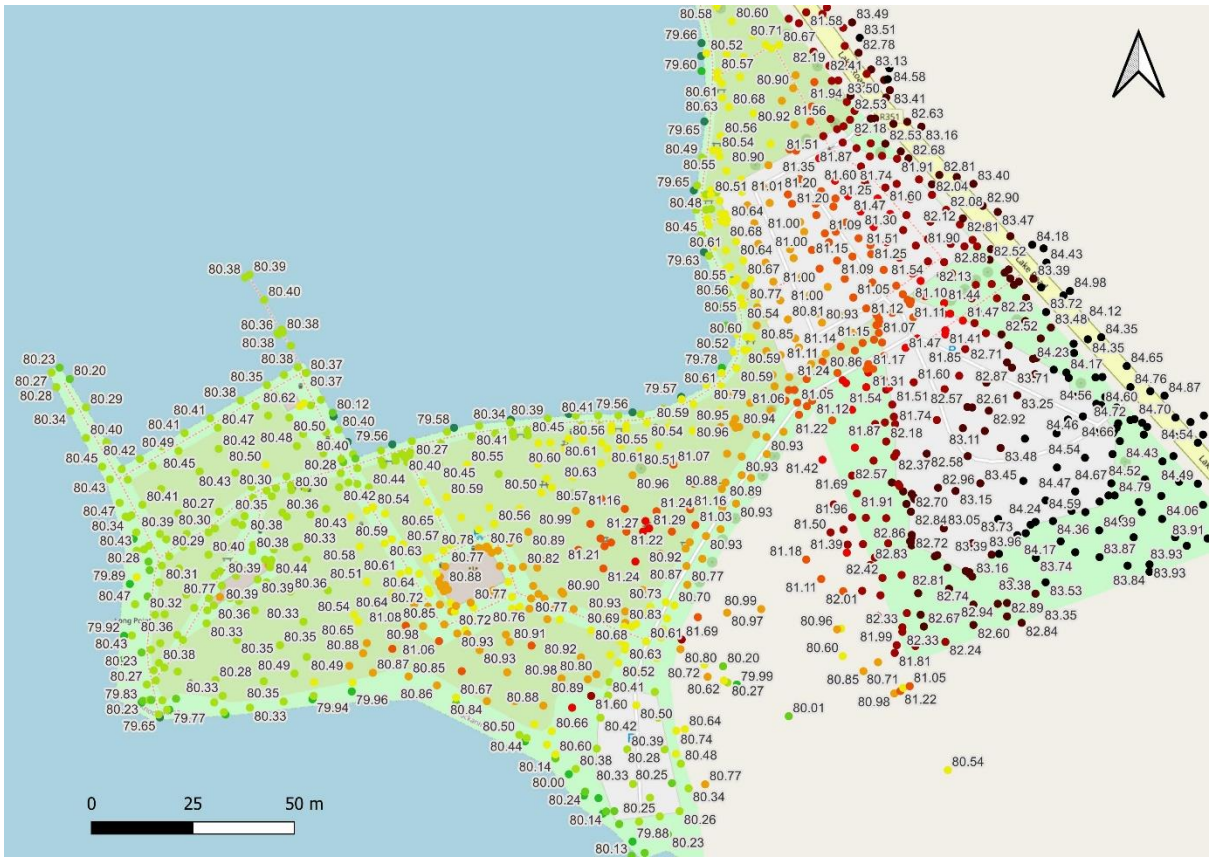



*Figure 1-2 Surveyed Ground levels at Long Point*

# 2 Proposed Development

## 2.1 Development Description

This development involves the construction of a new changing rooms and storage / plant room at Long Point and extension and reconfiguration of the Car parking area on the site, refer to Figure 2-1.

The development will consist of the following:

1. Repair works comprising:
    a. Repair of the existing pier surfaces.
    b. Repair of the existing slipway to provide safe launching point for kayaks and stand-up paddle boards.
2. Demolition of an existing changing shelter to facilitate passive surveillance and views of Lough Rea.
3. Alteration to existing toilet and shower building to provide storage, plant, and a changing places toilet (accessible toilet, shower and changing facility) (93 sqm).

4. Provision of new changing, toilet and shower facilities in a single storey building (86 sqm) including sheltered outdoor shower changing area.
5. Provision of a lifeguard station building (16 sqm).
6. Provision of a circular viewing deck to the south of the existing pier.
7. Provision of a totem sign extending to c. 4 metres in height.
8. Alteration to existing beach area and provision of a deck, steps and ramp to water's edge and beach area for access for all to the water.
9. Provision of a shared active travel route along the sites eastern boundary adjacent to the Lake Road (R351) and the provision of designated bicycle parking spaces.
10. Removal of 2 no. existing vehicular access points and alterations and junction upgrade works to the existing central access point, and provision of internal pedestrian crossings.
11. Reconfiguration of and upgrades to the existing car parking areas to provide increased parking provision and to accommodate age friendly and set down spaces and trading bays, and the provision of 1 no. new car parking area which includes EV charging and accessible parking spaces.
12. Provision of hard and soft site landscaping works, SuDS measures, pumping and water stations all connections, public lighting, PV panels at roof level and site services.
13. All ancillary services and associated site development works.

The proposed Finish Floor level of the existing building will be raised to 81.15m OD and the proposed Shower building will also have a finish Floor Level of 81.15m OD to reduce potential Flood Risk to the facility.


***Figure 2-1 Proposed Layout Plan showing changing room facilities, carparking areas and storm water attenuation soakaway areas***

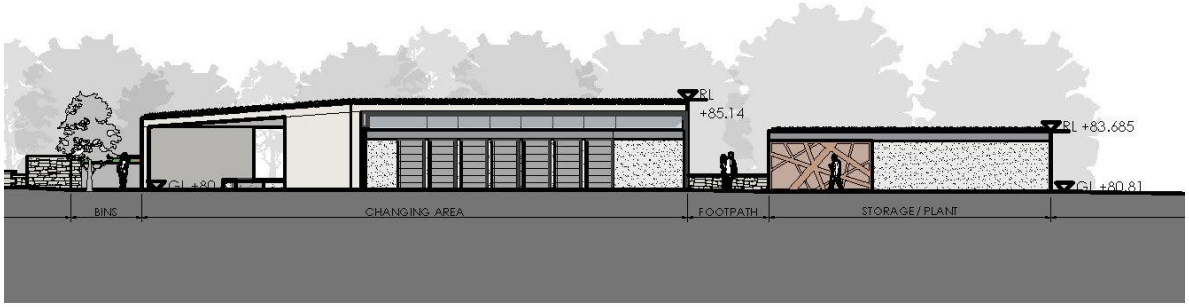



***Figure 2-2 Section view of Changing Area and Storage and Plant Area***

***Plate 2-1 Existing Changing Facilities***

***Plate 2-2 Existing Quay area and ESB substation located within grassed area***

***Plate 2-3 View of bathing area and Lifeguard hut looking Southwest***

***Plate 2-4 View of Quay, floating pontoon pier and Lifeguard hut looking Northeast***

*Plate 2-5 View of existing Carparking area*

## 2.2 Storm Water Management

The proposed Storm Drainage system is collection off the hard paved areas (Car parks A B and C, internal roadway and Roofs of the two buildings, passing through a petrol interceptors and infiltration to ground via engineered Percolation areas. There are three proposed infiltration areas with storm breaker water attenuation, infiltration and soakaway systems of 149m3, 98.4m3 and 136.9m3. The storm water upstream of the three infiltration areas will be passed through Kingspan Klargester bypass interceptor. There will be no direct discharge of surface water pavement drainage directly to the Lake. However the groundwater drains to the lake and therefore provides a pathway for flow and potential pollutants to enter the lake. The requirement for attenuation from a flood risk perspective is not critical as the downstream flood risk receptor is Lough Rea which is a 300ha Lake that significantly attenuates. The focus of the storm water management SUDs approach is protection of water quality in the receiving groundwater and ultimately the Lough Rea SAC. Retention storage is provided to cater for the infiltration rates available in the percolation areas.

The Percolation areas will be located beneath green space, grassed and landscaped areas on the site. The proposed amenity use of Long Point will have limited HGV's and sources of significant hydrocarbon spillage potential. It is primarily for vehicular carparking of users which has limited pollutant loadings and spillage risk. The greatest potential is during first flush events of 15 to 20mm rainfall depth and primarily during non winter flood periods / prevailing wet antecedent conditions.

## 2.3 Foul Water management

The proposed toilets and WC facilities will be connected to the existing Loughrea Public foul water sewer and which will be treated at the municipal WWTP. There will be no onsite treatment or disposal of Foul Effluent. Currently the sewage at Long Point is collected and pumped via an on-site pump station to the public foul sewer. The proposal is to retain this connection and onsite pumping station.

# 3 Hydrological Analysis

Loughrea was included as an AFA (area for further assessment) in the CFRAM study of the western basin. The hydrology and hydraulics (OPW CFRAM 2012 and 2015 ) reports provide relevant information for the Flood Risk Assessment of Lough Rea and the subject site and subject site at Long Point.

The total catchment area to the outlet sluices from Lough Rea at in Loughrea is 12.5km$^2$ and this includes a lake surface of 3km$^2$ providing significant attenuation through lake storage and protecting the downstream river reaches through Loughrea Town, refer to Figure 3-1.

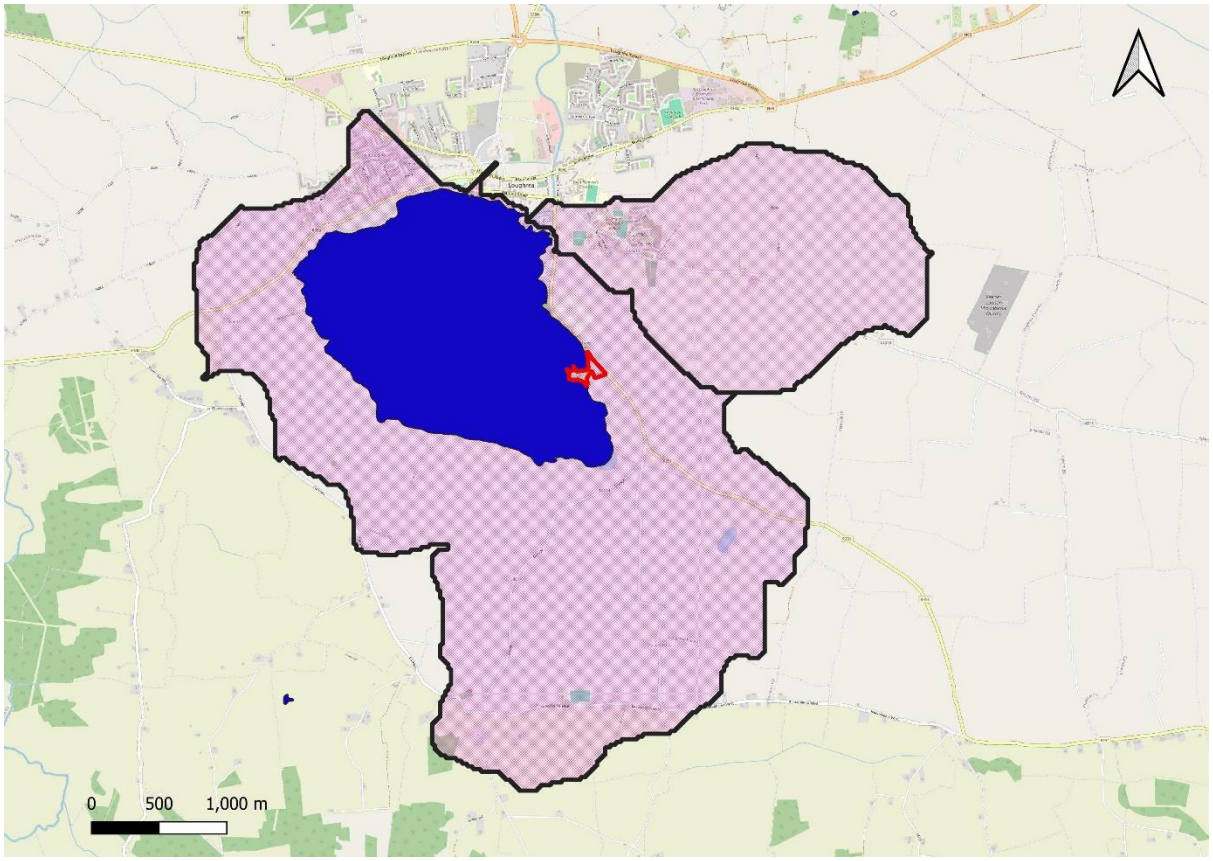



***Figure 3-1 Lough Rea and its contributing Catchment Area.***

There are two river outlet channels from the lake which are controlled by sluice gates, refer to Figure 3-2 and Plates 3-1 to 3-2. It is understood that at times of flood indicated by high levels in Lough Rea the sluice gates operated by Galway Co. Co. are fully open. The CFRAM study established a stage discharge relationship for flood events for the sluiced outlet channels assuming sluices gates are fully opened. This is presented below in Figure 3-3.

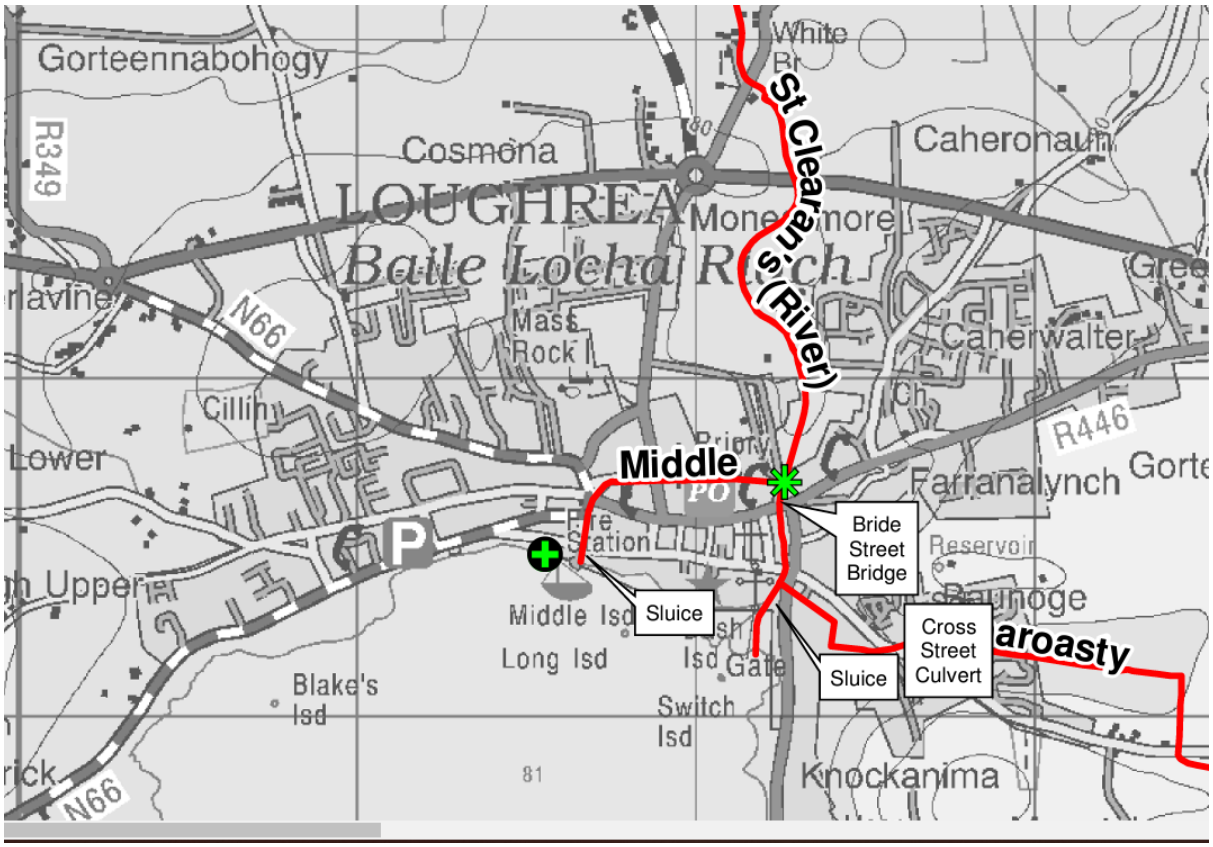



*Figure 3-2 Location of Outlet Sluices from Lough Rea*

Commentary extracted from the CFRAM hydraulics modelling report concerning the Lough Rea channel outlet sluices at Middle Island and Bush Island.

| | |
|---|---|
| It is believed that these gates are not actively managed therefore these have been modelled as surveyed in an open position. |  <br>Looking downstream at upstream face of structure. |

*Plate 3-1 Middle Island Sluice (CFRAM Hydraulic Modelling Report 2015)*

| | |
|---|---|
| It is believed that the gates are not actively managed and therefore have been modelled as surveyed, in an open position. |  |

***Plate 3-2 Bush Island Sluice (CFRAM Hydraulic Modelling Report 2015)***

The CFRAM Hydraulic Modelling Report produced lake outflow stage data refer to Table 3-1 which provides the following Stage-Discharge relationship for the lake based on modelling the sluices as surveyed. The CFRAM study identified that the sluice gate operation was not actively managed and that the modelling assumed all gates in open position as was surveyed.

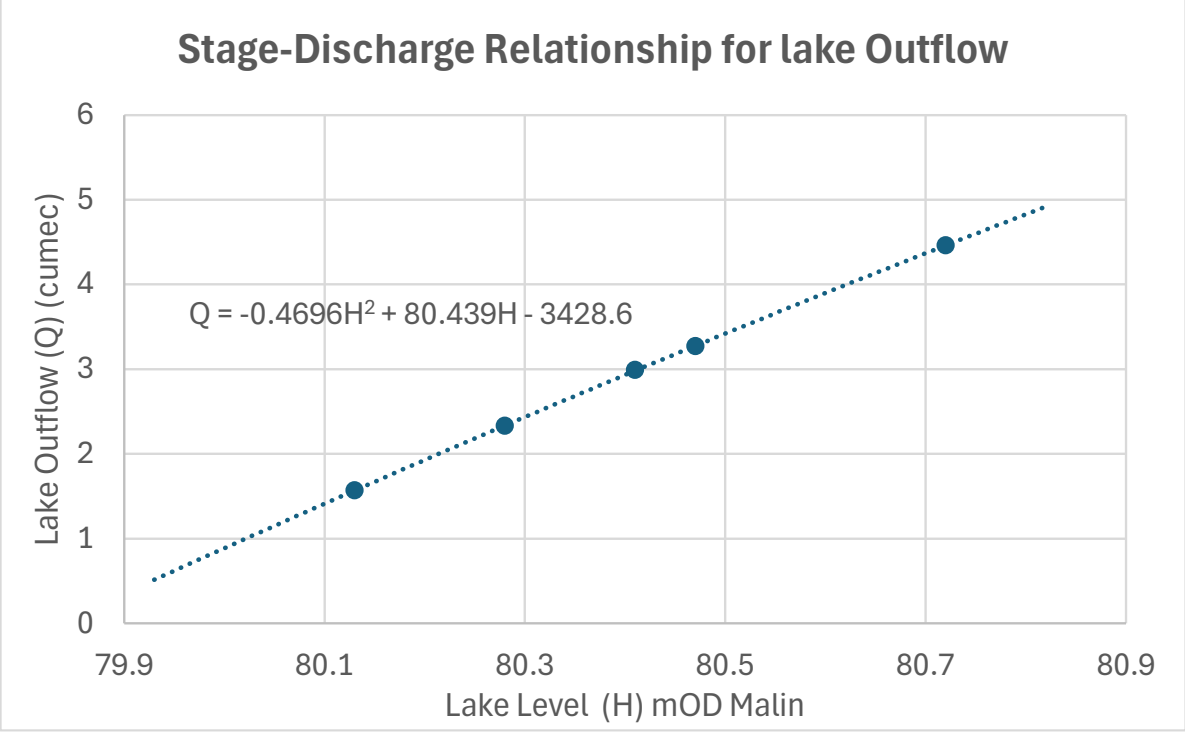



***Figure 3-3 Lough Rea Flood Stage Discharge Relationship for outflow***

***Table 3-1 CFRAM Hydraulics Modelling Study Results for lake flood levels and Lake Ouflow***

| Return Period T (years) | 2 | 10 | 50 | 100 | 1000 |
|---|---|---|---|---|---|
| lake level H (mOD Malin) | 80.13 | 80.28 | 80.41 | 80.47 | 80.72 |
| Lake Outflow Qout (cumec) | 1.57 | 2.33 | 2.99 | 3.27 | 4.46 |

The CFRAM study gives the present day 100year lake flood level as 80.47m OD Malin and the 1000year lake flood level as 80.727m OD.

A lake level gauge (ref 29070 inactive) was in operation by the EPA on behalf of Galway Co. Co. for Lough Rea from 1976 to 1992, refer to Figure 3-4 (obtained from the CFRAM study, OPW 2012, 2015) presenting the recorded time series of daily lake levels. This gives and long-term annual average lake level of 79.9m OD suggesting an outflow rate from the rating of 0.46cumec. A water balance assessment using a SAAR of 1250mm and an evaporation loss of 450mm gives an annual discharge rate of 0.39cumec.

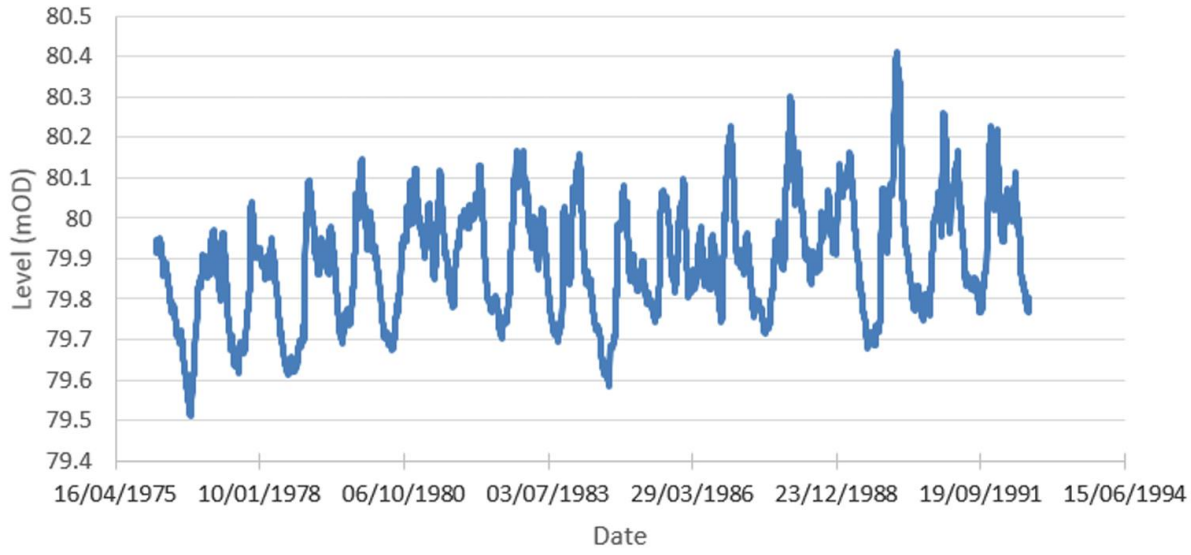



***Figure 3-4 Daily Lake level Series from historical gauge (EPA 29070) for 1976 to 1992***

It is clear given the size of the lake at 3km$^2$ relative to the overall catchment of 12.5km$^2$ that attenuation storage plays an important role on the lake level and the associated outflow rates. In order to assess this correctly medium to long duration rainfall events were routed through the contributing catchment and lake levels simulated using Reservoir routing. A series of Rainfall durations were investigated with the critical duration for maximum flood levels

occurring at 450hours (12.5days) identified. The Median Flood, 100year flood and 1000year flood events were simulated. Given the long duration the percentage runoff from the contributing catchment was set at 100% and the initial conditions was set at the mean lake level of 79.9. The computed hydrographs are presented in Figure 3-5 to Figure 3-7 for the median Flood, 100year and 1000year respectively.

The design flood represented by the future 100year (inclusion of 30% allowance in rainfall) is presented in Figure 3-8.

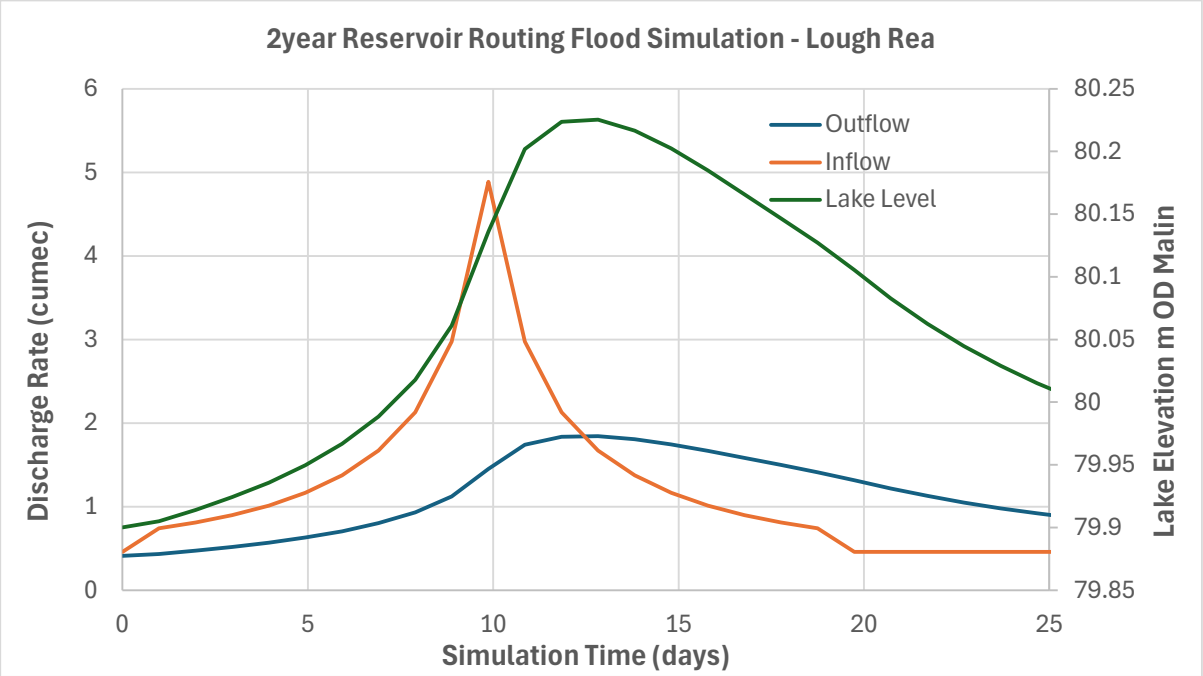



***Figure 3-5 Computed Flood Hydrograph for 2year event***

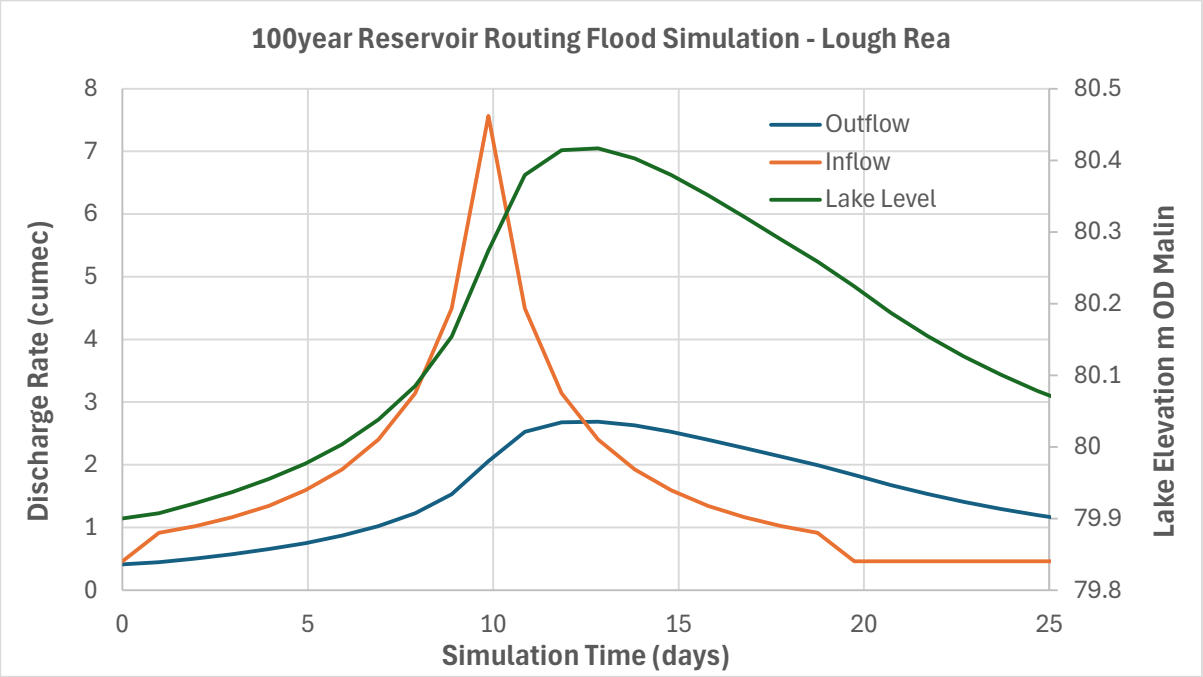



*Figure 3-6 Computed Flood Hydrograph for 100year event*

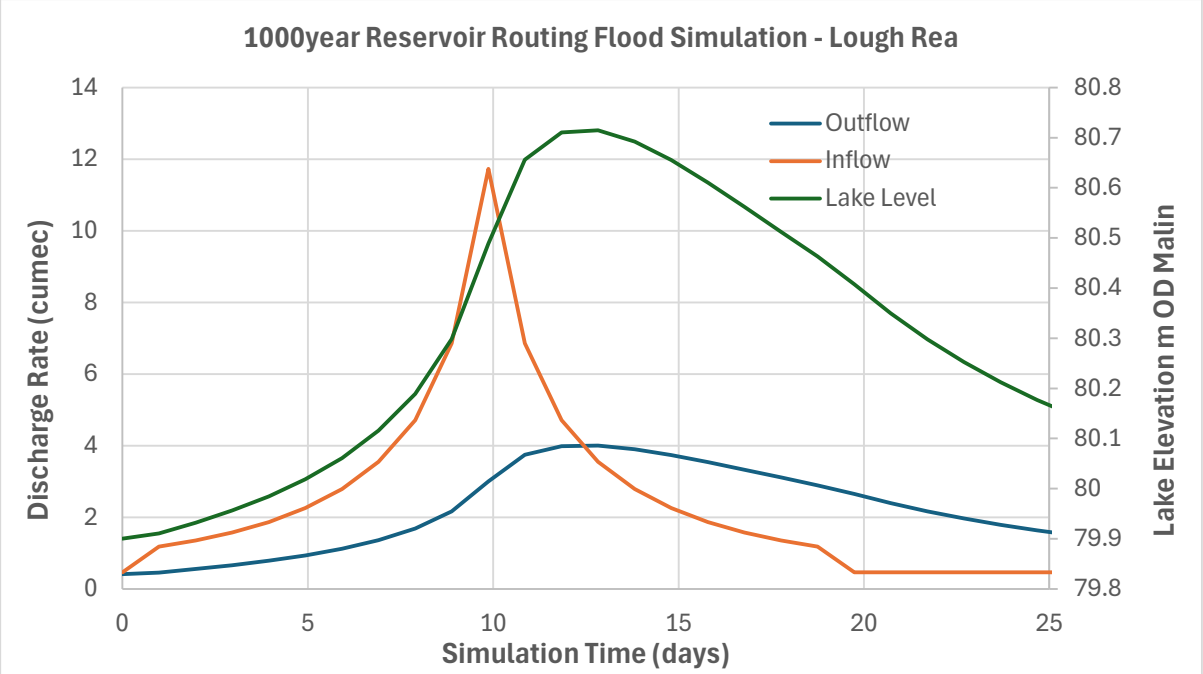



*Figure 3-7 Computed Flood Hydrograph for 1000year event*

*Table 3-2 Computed Return Period Flood Levels and outflows for Lough Rea*

| Return Period T (years) | 2 | 100 | 1000 | 100 + 30% CC |
|---|---|---|---|---|
| Computed lake level HT (mOD Malin) | 80.22 | 80.42 | 80.71 | 80.57 |
| Computed Lake Outflow QT Qout (cumec) | 1.84 | 2.69 | 4.00 | 3.36 |

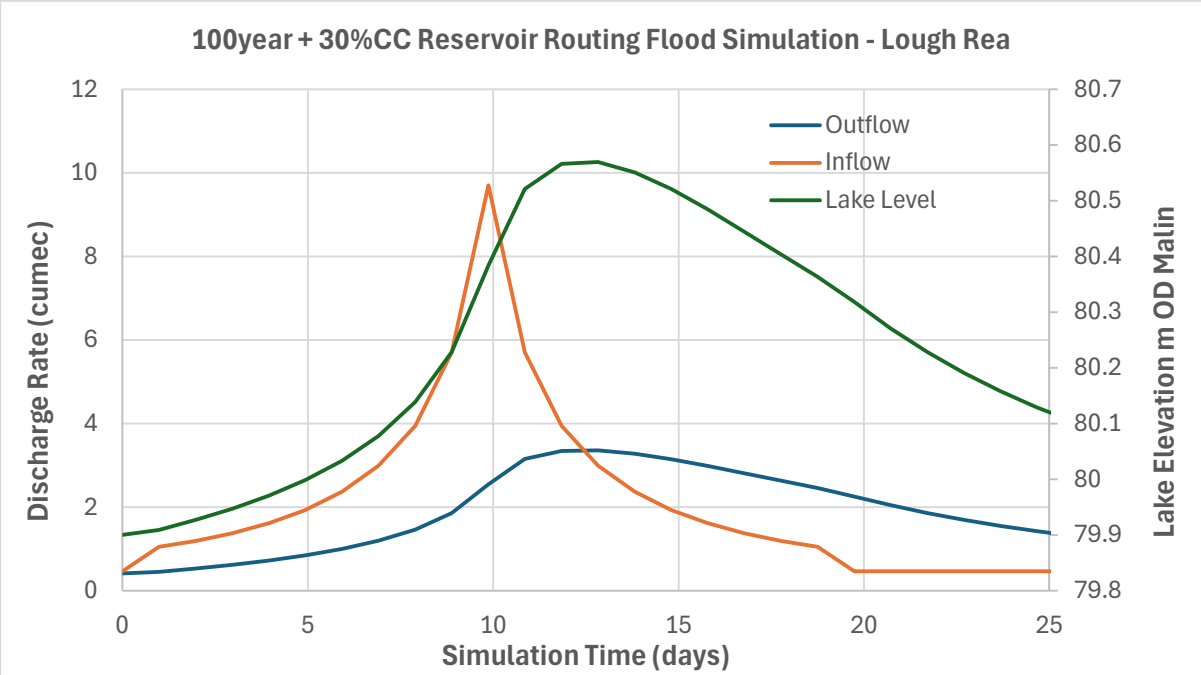



*Figure 3-8 Computed Flood Hydrograph for 100year plus 30% Climate change allowance Design Flood*

# 4 Flood Risk Assessment

This development which is associated with swimming and the lake amenity would be considered to generally fall within the water compatible type development. However the plant room and possibly the changing rooms might be considered to be less vulnerable type development.

The current existing floor level of the Changing Facility is 80.94m OD. The proposed finish floor level is increased to 81.15m OD for both the existing building and the new building, placing it above the design lake flood level of 80.6m OD Malin. This design lake flood level of 80.6m OD Malin, which is the 100year plus 30% climate change allowance, represents the still water flood level and does not include for surface wind waves across the lake, principally generated from the westerly to south westerly sector. The westerly fetch which is the longest is approximately 1km in length and under extreme winds could produce significant wave height in excess of 0.5m.

An additional allowance of 0.5m is recommended for westerly wind waves giving a design flood level of 81.1m OD Malin for the development. The changing room and store/plant room facilities are located in flood Zone C, as is the majority of the Carparking based on the still water flood levels.

The proposed stormwater percolation areas for the hard paved areas are located in the proposed grassed areas and designed for on site infiltration with the provision of attenuation storage to ensure the system can under design rainfall conditions infiltrate freely to the groundwater table for the majority of the year. In the more extreme flood conditions some surface ponding may occur due to elevated groundwater conditions associated with extreme winter flood levels on Lough Rea as levels in Lough Rea will dictate the Groundwater table level at Long Point site given its close proximity. Flood attenuation is not critical as the lake is over 300ha in area and represents a significant flood storage reservoir.

The Flood Risk Map showing the current 100year and 1000year fluvial flood levels for the subject site is presented in Figure 4-1.

The development type is suited for Flood Zones A and B and all areas on the site below the 80.92 m level are at risk of flooding from the lake still water flood level plus surface wind waves. The changing rooms and plant room should be protected against the design flood level of 81.1m OD Malin plus a freeboard allowance of 0.3m (81.4m OD) in respect to potential flood damage making the development sustainable well into the future.


*Figure 4-1 Flood Risk mapping showing present day 100year and 1000year flood contours at Long Point*

# 5 Conclusion

A site-specific flood risk assessment has been carried out for the proposed amenity development. The development type falls into the category of water compatible and less vulnerable development allowing for development within flood zones A and B.

The proposed changing room and store/plant room facilities are located in flood Zone C, as is the majority of the Carparking based on the still water flood levels and without climate change.

The current existing floor level of the Changing Facility is 80.94m OD. The proposed finish floor level is to be increased to 81.15m OD for both the existing building and the new shower/plant building, placing it above the design lake flood level of 80.6m OD Malin. This design lake flood level of 80.6m OD Malin, which is the 100year plus 30% climate change allowance, represents the still water flood level and does not include for surface wind waves across the lake, principally generated from the westerly to south westerly sector. The westerly fetch which is the longest is approximately 1km in length and under extreme winds could produce significant wave height in excess of 0.5m. An additional allowance of 0.5m is recommended for westerly wind waves giving a design flood level of 81.1m OD Malin for the development.

The changing rooms and plant room should be protected against the design flood level of 81.1m OD Malin plus a freeboard allowance of 0.3m (81.4m OD) in respect to potential flood damage making the development sustainable well into the future and including for climate change at 30% allowance.

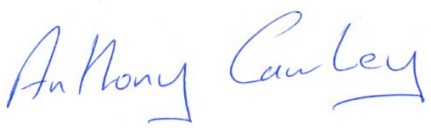
The site characteristics and retention of the existing building do not allow for a finish level of 81.4m OD to be achieved. The proposal is to raise the finish level of the existing building to 81.15m OD and also set the new shower room building to that level also this sets it above the design flood level but with limited freeboard allowance. Given that the proposed development is for provision of a changing and a shower room facility and would be classified as less vulnerable development type in relation to flood risk the level of flood protection afforded to the development at a finish level of 81.15m OD is considered to be sufficient as it allows for future climate change flood level increases.

Storm water management on the site is via on-site infiltration to groundwater with no surface storm water outfalls. The three proposed infiltration fields are located in the greenspace areas with attenuation storage designed for the recorded on-site infiltration rates. All storm water will pass through petrol interceptors before entering the percolation areas. The engineered percolation areas with storage are designed to infiltrate freely to the groundwater table for the majority of the year. In the more extreme flood conditions some surface ponding may occur due to elevated groundwater conditions associated with extreme winter flood levels on Lough Rea as levels in the lake dictate the Groundwater table at the site. Such surface ponding is

not considered a flood risk to the development and would be associated with prolonged winter flooding periods which would see the lake levels elevated and inundating the quay area and green space areas, which are considered water compatible components of the development. The petrol interceptors will be protected against such flood levels with non-return valves and chamber levels set above 81.4m OD Malin and thereby not a potential source of pollution during such extreme events.

There is no proposed on-site disposal of the foul effluent from the development as it does and will connect to the Loughrea public Foul Sewer and ultimately treated at the Loughrea WWTP. The foul sewage is contained in a storage tank and pumped via the existing pumping system up to the Public sewer on Lake Road. Consideration of protecting the existing pumping facility against flooding should be given by some bunding around the pumping station which is located in the grassed area to the northeast of the existing building.

A Flood risk justification test is not required for this development as the proposed changing room building and plant room are not located in the high-risk Flood Zone A and the development is a mix of water compatible or less vulnerable development suitable for Flood Risk Zones B and A respectively. The proposed development satisfies the requirements of the Flood Risk Management planning guidelines (2009) and includes for potential future climate change impacts in respect to the Lough rea lake levels.



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