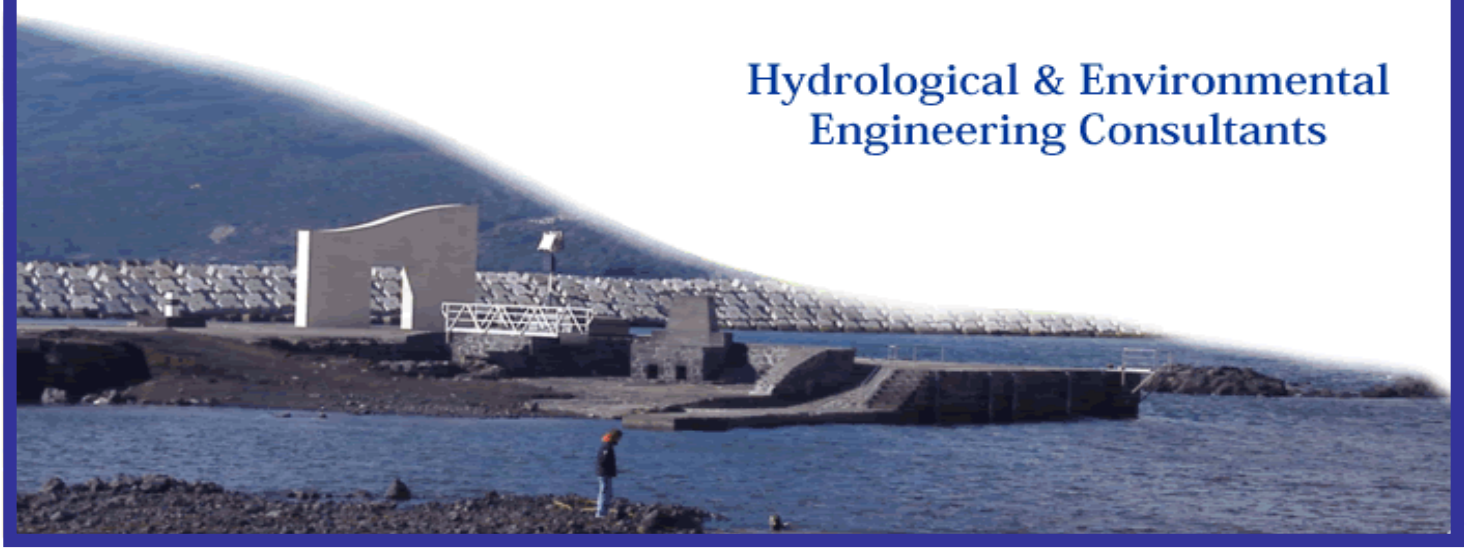
Hydro Environmental Ltd

Flood Risk Assessment of Residential Development, Renville West, Oranmore.

On behalf of

G and M McNulty

8th March 2025



Hydrological & Environmental Engineering Consultants

Flood Risk Assessment of Residential Development, Renville West, Oranmore.

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DISCLAIMER

This report has been prepared solely as a report for G and M McNulty in respect to their conversion of an existing garage to Residential dwelling at Renville West, Oranmore. Hydro Environmental Ltd accept no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned.

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1 Introduction

Hydro Environmental Ltd were requested by G and M McNulty to prepare a flood risk assessment report for permission under section37L of alterations and the conversion of a previously approved domestic garage to residential chalet on a revised site at Renville West, Oranmore. The site is located adjacent to existing farm buildings and dwelling house on the McNulty lands at Renville West. Local flood defence protection is proposed as part of the development seeking permission under section37L.

Figure 1-1 The outline of the site boundary at Renville West Oranmore

2 Description of proposed development

An existing garage was converted for use as a 1-bed chalet for McNulty family members with a finish floor level of 4.55mOD Malin on a 0.1ha site. The chalet connects to the public sewer and storm water from roof is disposed of on site via small stone soakaway. The plan layout is presented in Figure 2-1.

Under the Flood Risk Management Planning Guidelines (2009) this would be regarded as a minor infill development in the context of flood Risk management and application of sequential and justification test. The change of use from garage to residential dwelling changes its flood rise vulnerability classification from less vulnerable development to highly vulnerable development. Such Development under the flood risk Management Planning guidelines would be appropriate in Flood Zone C (low flood risk).

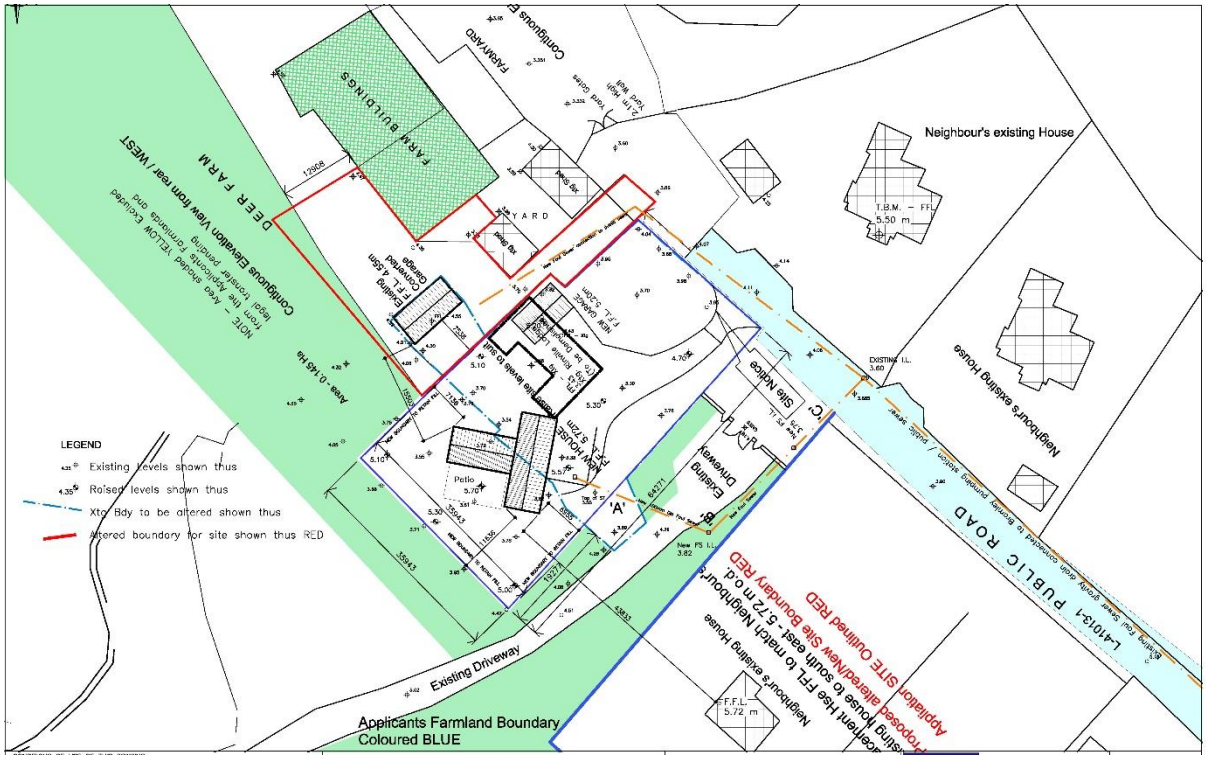

Figure 2-1 Site Layout and survey levels of site

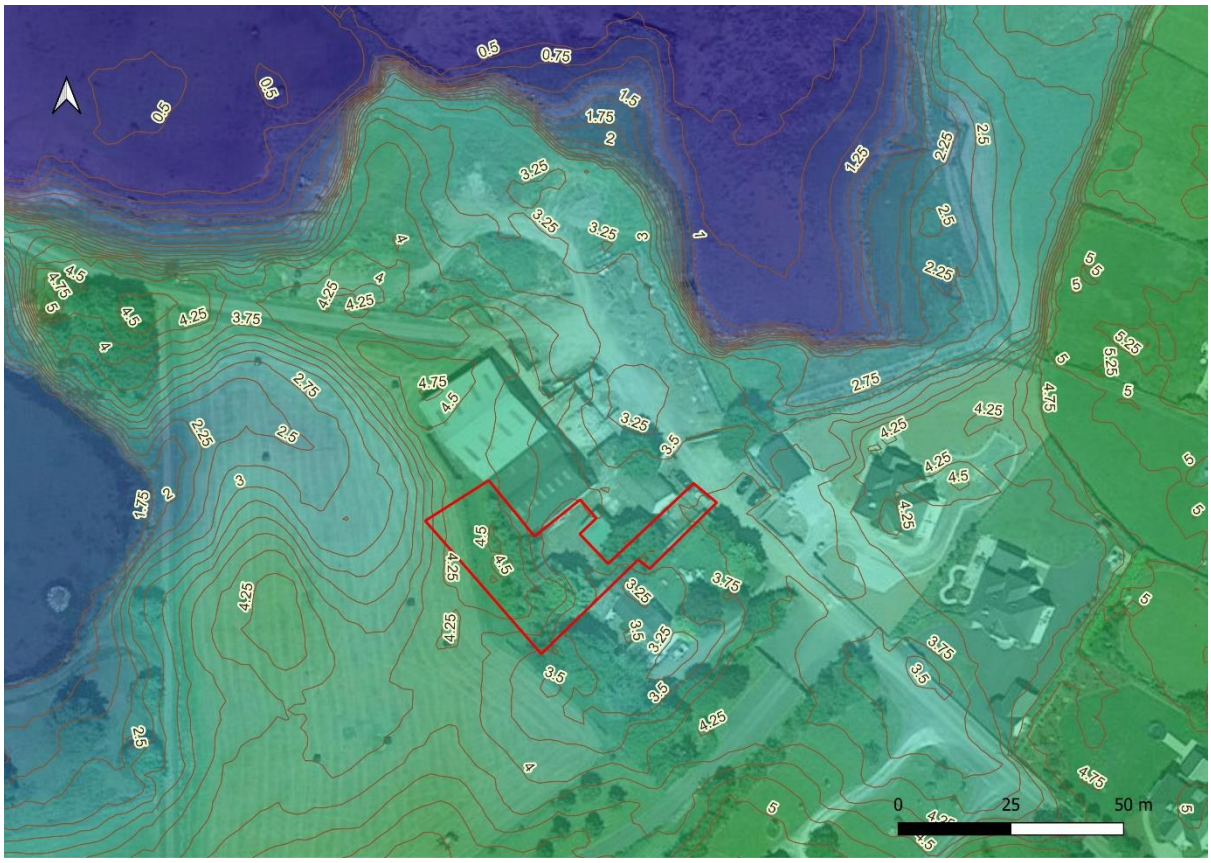

Figure 2-2 Lidar Contour survey using OPW Lidar mapping obtained from GSI open topographical Viewer.

Plate 2-1 Location of the chalet with finish floor level of 4.55m OD Malin and surround ground at 4.4 to 4.5m OD Malin

Plate 2-2 View of coastal flood risk zone from garden looking West

3 Flood risk Assessment

3.1 Introduction

This assessment follows the requirements set out in the Flood Risk Management Planning Guidelines (2009) for assessing Flood Risk of proposed minor developments. This represents a commensurate assessment as it is a redevelopment of an existing single detached dwelling house. The sources of flood risk to a development site can be defined as from coastal only.

3.2 Historical Flooding

There is no anecdotal evidence that the retained garage structure on the site has ever flooded and this includes the very recent extreme coastal flood event of the 13th November 2023. However extensive flooding of the surrounding lands, and roads surrounding the property was observed on the 13th November 2023. The evidence gathered shows that the 13th November 2023 produced the historical highest flood in living memory and exceeding the previous historical maximum observed on the 2nd January 2018 and prior to that the 1st February 2014. Based on Rack marks adjacent to the property the highwater mark came to over 4m OD Malin. In more exposed shoreline areas wave action added to this height.

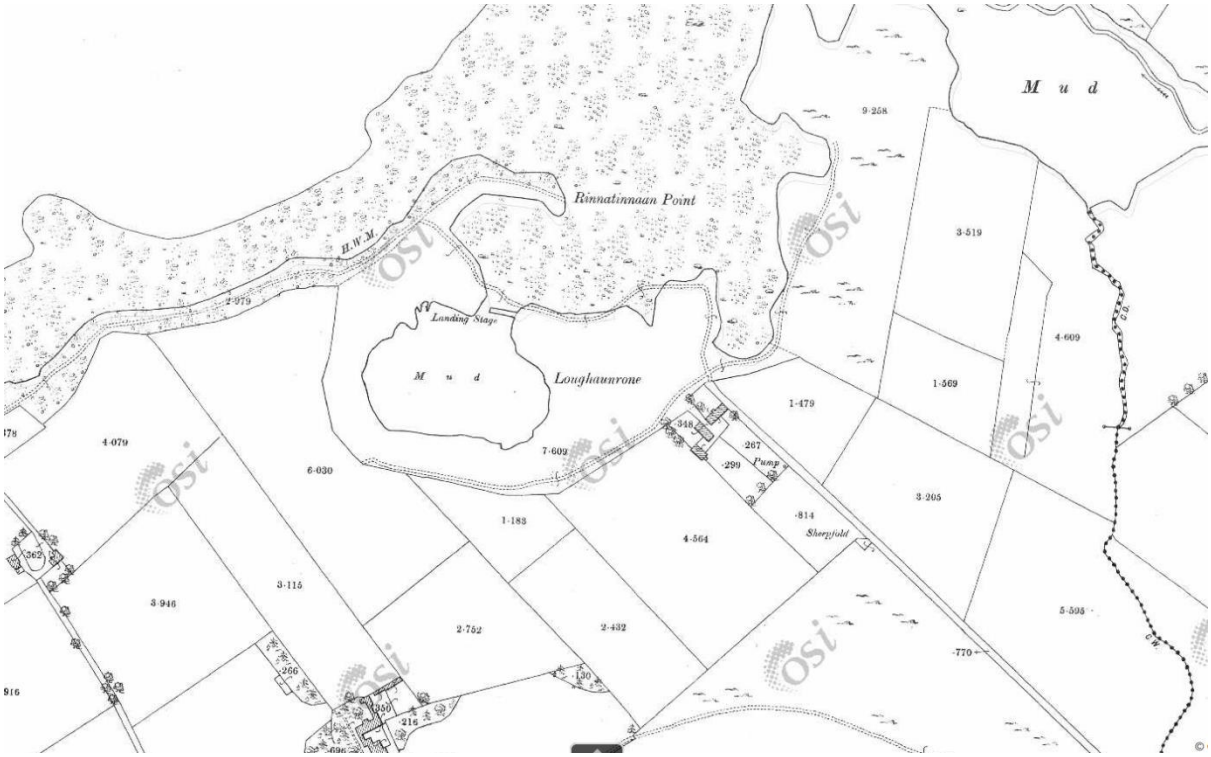

Figure 3-1 Historical 25inch Map showing historical dwelling on this section of land

3.3 Coastal Flood Risk

3.3.1 Screening for Coastal Flood Risk

The mapping associated with the Irish Coastal Protection Strategic Study (ICPSS for Oranmore) is presented in Figure 3-2.

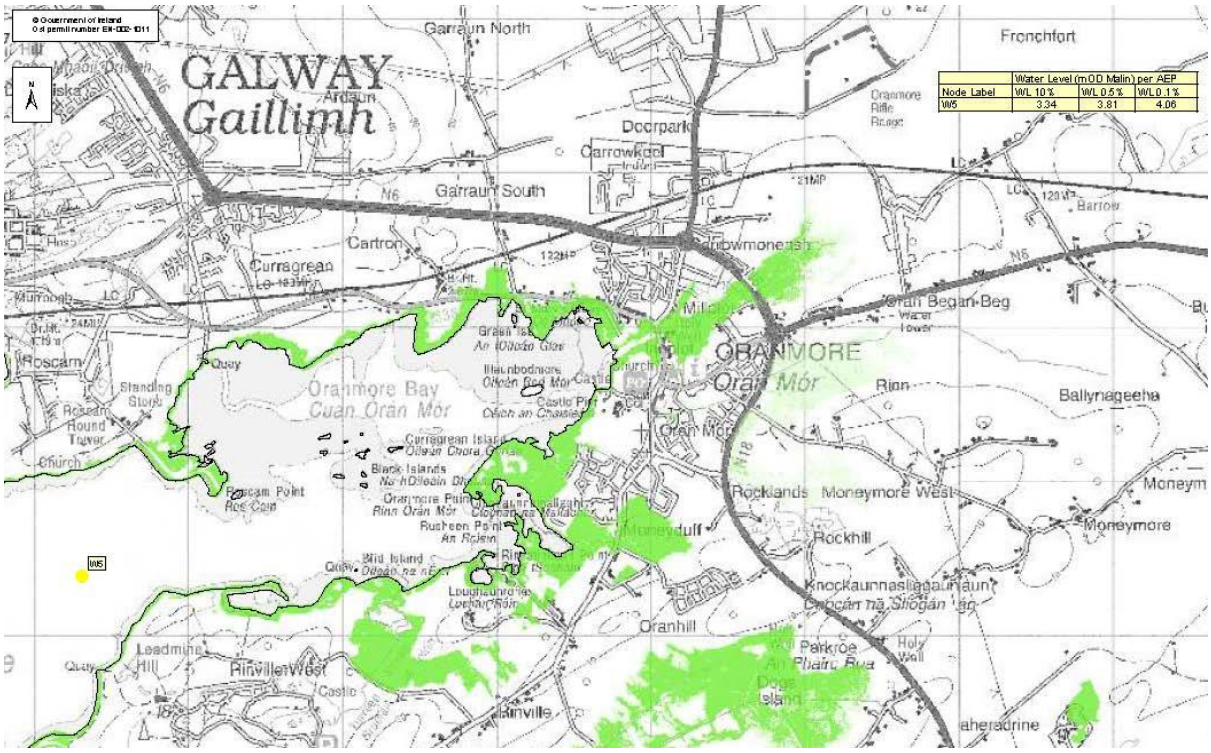

Figure 3-2 Extract from the ICPSS Tidal Flood Extents Mapping (ICPSS June 2011)

The CFRAM Study produced the following Coastal Flood Risk Map for Oranmore and Renville areas showing substantial area of lands at Renville West within coastal flood risk zone of medium and high.

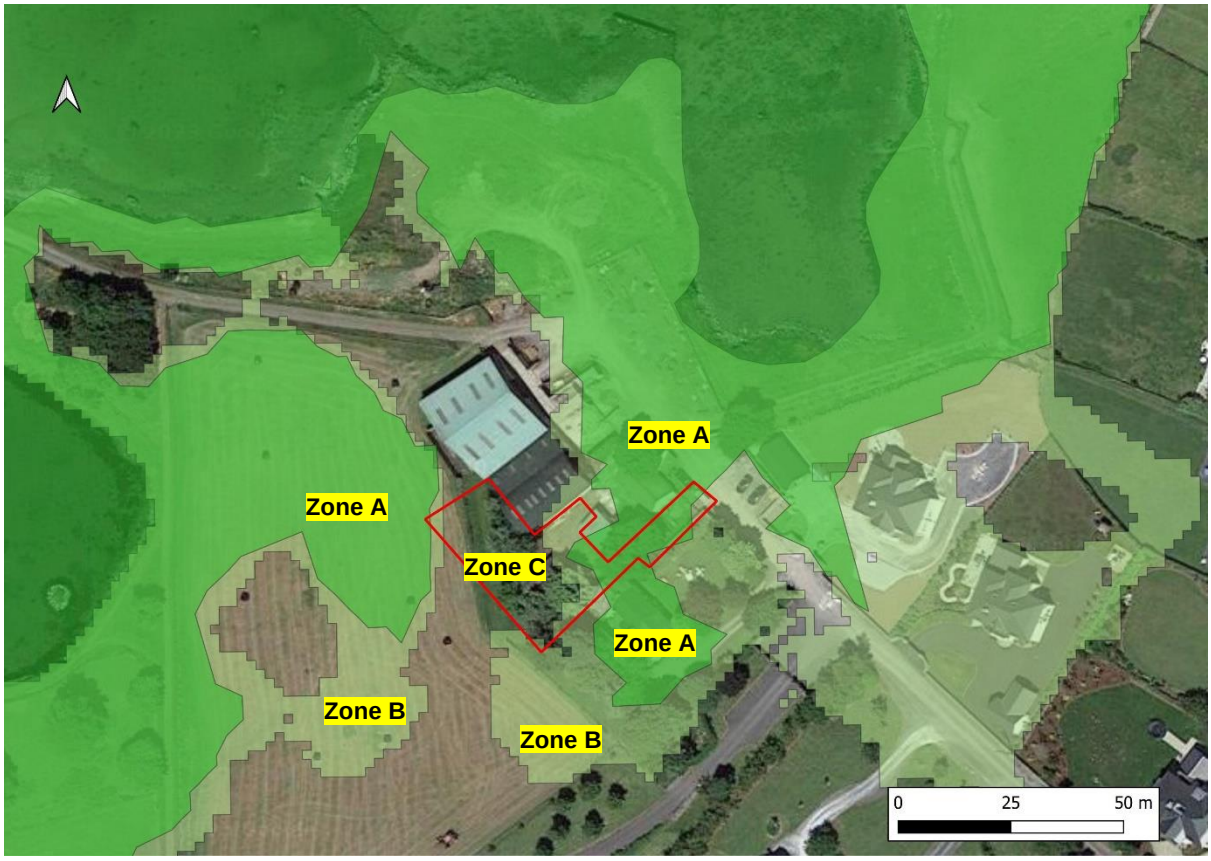

Figure 3-3 Coastal Flood Risk Mapping in the vicinity of the development at renville West Oranmore (200 and 1000year tidal flood extents from the ICPSS and OPW Floodinfo mapping)

3.4 Tide Highwater Levels

Tidal Information is available for the Galway Port Gauge (30062) located off the Harbour Quay wall in the entrance to the Docks on the seaside of the Dock gates. The tides at Galway are generally referred to chart datum, which is akin to the lowest astronomical tide level (LAT). Historically the Galway Port the chart datum is taken as 0.2m below Poolbeg OS datum (LAT at Poolbeg Lighthouse). Based on a review of Poolbeg datum relative to Malin Datum (OSGM02 and OSGM15) for the Galway City area at several historical OSI bench marks the conversion from Poolbeg datum to Malin OGSM02 is -2.728m (benchmark on St. Nicholas church and Salmon Weir Bridge most reliable for this purpose). The Chart datum at Galway Port is therefore estimated to be -2.945m OGSM15. It should be noted that the LAT estimate used by the Marine Institute which represents the Galway Port gauge datum is given as -2.967m OGSM15 which is only 0.022m below the chart datum estimate described above. The tide level characteristics for Galway Harbour are presented below in Table 3-1.

Table 3-1 Tidal elevation at Galway Port (OGSM15)

	m Chart Datum	**m OD Malin OGSM15**
Highest Astronomical Tide (HAT)	5.84	2.895
Mean Highwater Springs (MHWS)	5.087	2.142
Mean Highwater Neaps (MHWN)	3.987	1.042
Mean Sea level (MSL)	2.987	0.042
Mean Low Water Neaps (MHLN)	1.987	-0.958
Mean Low Water Springs (MLWS)	0.91	-2.035
Lowest Astronomical Tide (LAT)	-0.022	-2.967

A recent study as part of the Irish Coastal Wave and Water Level Study 2018 by OPW/RPS (Oct. 2020) into mean sea level relative to the Irish ordnance Malin Head datum for the various tidal gauges around Ireland produced a table of adjustment factors and concluded that for The Galway Port area and Inner Galway Bay that the mean sea level (Zo) was typically 0.042m above the Malin head OS datum (mean sea level at Malin Head).

The highest astronomical tide this century occurred on the 21/02/2015 and the 29/09/2015 having a predicted astronomical tide height of 2.867m and 2.895m OGSM15 based on the Marine Institute astronomical tide forecast model for Galway Port. The lowest astronomical tide based on the Marine Institute model for the record period 2007 to 2022 is -2.967m OD which is assumed to represent LAT.

3.5 Past Tidal Flood Events

Significant tidal flood events are produced by a combination of high astronomical tides and storm surge events and can vary somewhat along the coastline depending on location, geometry, wind direction and shelter/exposure . Unfortunately for the Galway Bay and specifically the Galway Port area the record length of recorded tide levels is limited. The Galway Harbour Authority would have recorded the highwater levels each day with ledgers dating back many years. Unfortunately, this information was lost due to a severe fire in the old Harbour Offices at Dockgates. Consequently, information on tidal flooding in the Galway Docks area extends back to the mid 1990's only, in hardcopy records, and electronic records from the Marine Institute for the Galway Port Gauge (30062) are available from 2007 onwards. The available tidal flood record at the Wolfe Tone gauge on the Corrib Estuary from the OPW is only

available from 1992 onwards. The most extensive gauged record available is at Oranmore gauge on the Old Dublin Road Bridge (29015) which is available from 1982 onwards. The recorded annual maximum tidal flood levels recorded at the Oranmore gauge are presented in Figure 3-4.

Prior to the more recent tidal flooding associated with the January and February 2014, January 2018 (Storm Eleanor) and November 2023 (Storm Debie) tidal flood events, the Hurricane Debie tidal storm surge event in 1961 (22 Oct 1961) has often been reported as the historical maximum tidal flood event along the south and west coast of Ireland. Unfortunately, there is no quantifiable record as to the significance of the Hurricane Debie tidal event for the Galway area. The available record for the Abbey Estuary on the Shannon at Ball's Bridge gauge Limerick City (25061) provides a record length that extends back to 1957 and shows that the 1961 Hurricane Debbie event was ranked 3rd largest at 4.291m OGSM15 behind the 2nd of January 2018 at 4.371m OGSM15 (42year return period) and 1st February 2014 at 4.484m OGEM15 (68year return period). At Galway City it is likely that the 1961 Hurricane Charlie event is also probably the 3rd largest event behind the 2nd of January 2018 of 3.772m OGSM15 and 1st February 2014 of 3.590m OGSM15.

The Storm Surge events independent of the tide were extracted from the Galway Port Gauge (30062) by subtracting the astronomical tide component (estimated from the Marine Institute tidal prediction model) from the recorded tidal flood level for the gauged period. This provided information on the surge component, the surge profile and the combined profile for the recorded tide and storm surge flood events. These events and analysis are presented in detail in **Error! Reference source not found.**.

Figure 3-4 Oranmore Gauge AM tidal heights (hydrological Years 1982 to 2023)

3.6 Historical Maximum Tides levels

The OPW operate an automatic water level recorder at Wolfe Tone Bridge (gauge influenced by Corrib Fluvial Flows and tides in Galway Harbour) and the Marine Institute operate a tidal gauge at Galway Port. The highest tide from this series was recorded recently on the 13th of November 2023 from Storm Debbie of 3.783mOD at Galway Port and 3.854m OD at Oranmore gauge. This was followed in second place by Storm Eleanor on the 2nd of January 2018 giving a highwater of 3.77m OD at the Galway Port and 3.89m OD at the OPW Wolfe Tone gauge (30061) and 3.78mOD at the Oranmore Gauge (29015).

The recent storm Debbie event is considered the highest tidal flood event in living memory (in at least 50years) based on the Oranmore Gauge which provides 42years of record. This event, anecdotally, exceeded the previous Hurricane Debbie event of 1961. The third and fourth highest recorded tidal events for the Galway City / Oranmore area occurred on consecutive months in 2014 (1st Feb and 3rd Jan 2014) producing maximum tide levels of 3.68m and 3.60m OD at the Wolfe Tone Bridge Gauge (30061), located immediately upstream of the Claddagh Basin and 3.59m OD and 3.55mOD at the Galway Dock's Gauge (30062).

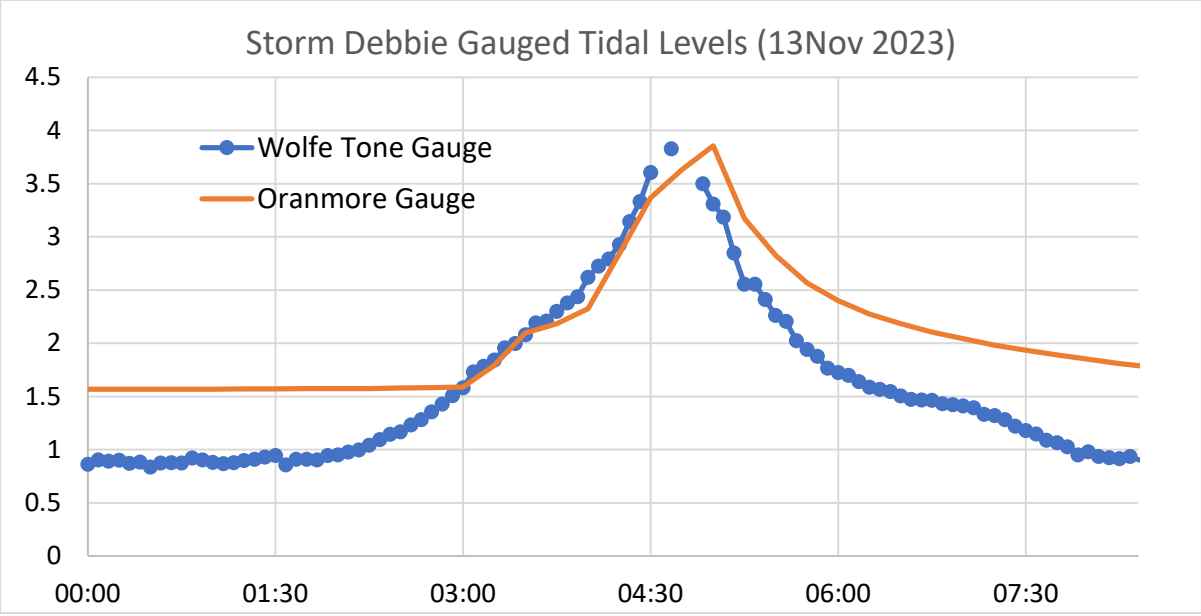

Figure 3-5 Tidal Flood Event recorded at Wolfe Tone Bridge Galway City and Oranmore Bridge on the 13th of November 2023 (Storm Debbie).

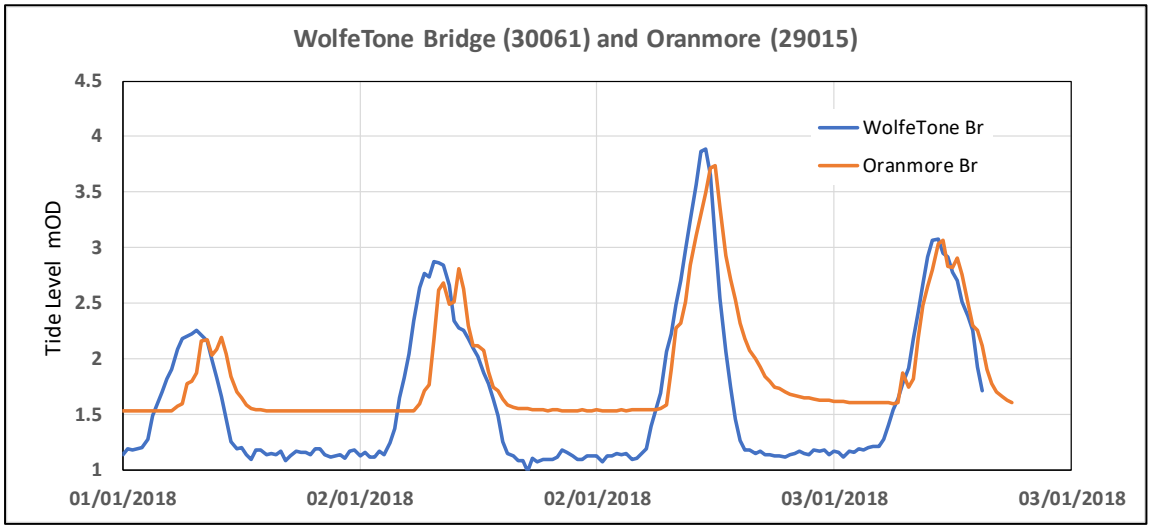

Figure 3-6 Tidal Flood Event recorded at Wolfe Tone Bridge Galway City and Oranmore Bridge on the 2nd of January 2018 (Storm Eleanor)

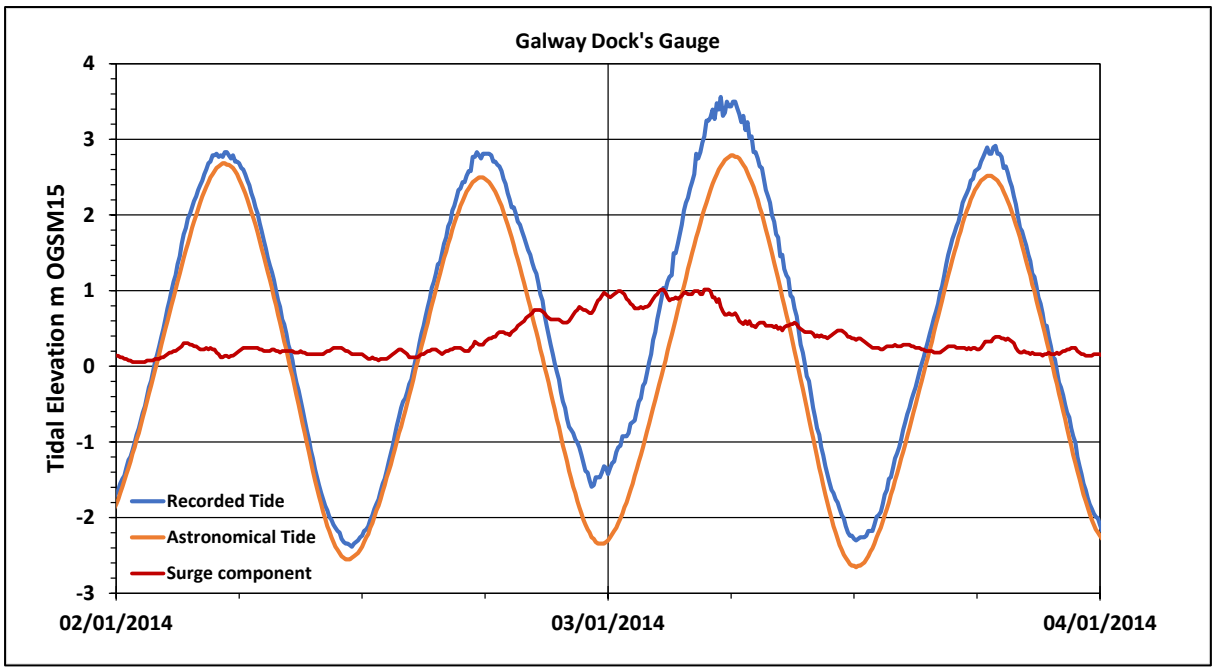

Figure 3-7 Observed versus Predicted Tides for Galway Port – 3rd Jan 2014 (note surge component is residual level between observed tide less the predicted astronomical tide)

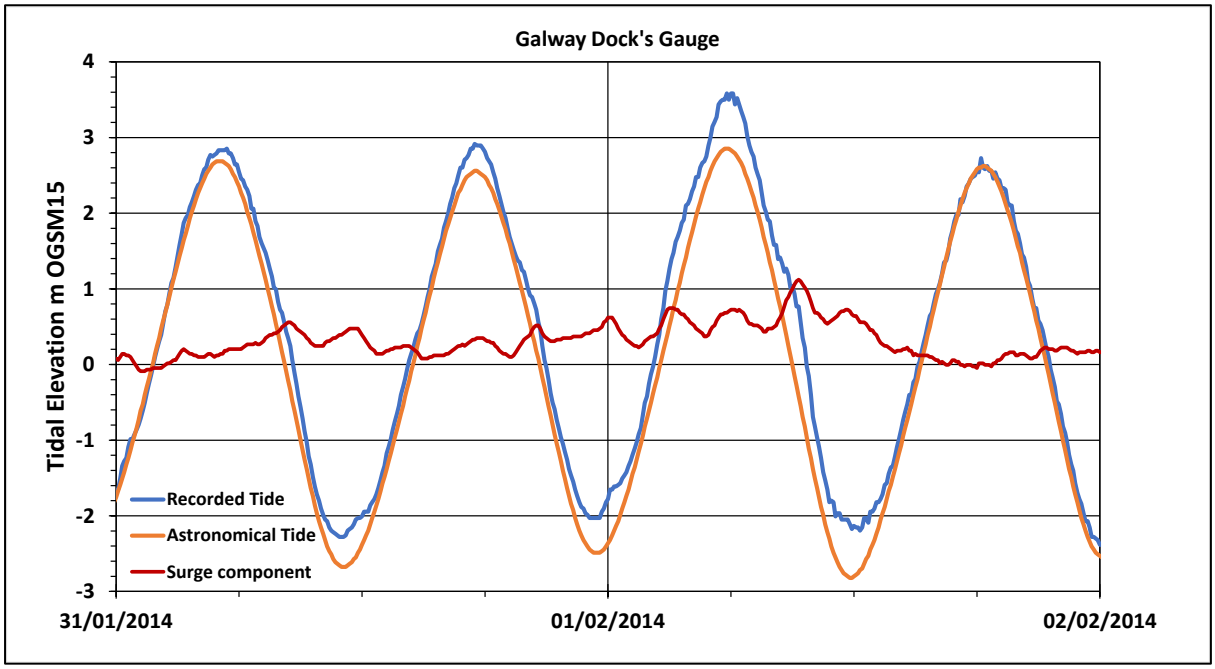

Figure 3-8 Observed versus Predicted Tides for Galway Port – 1st February 2014 (note surge component is residual level between observed tide less the predicted astronomical tide)

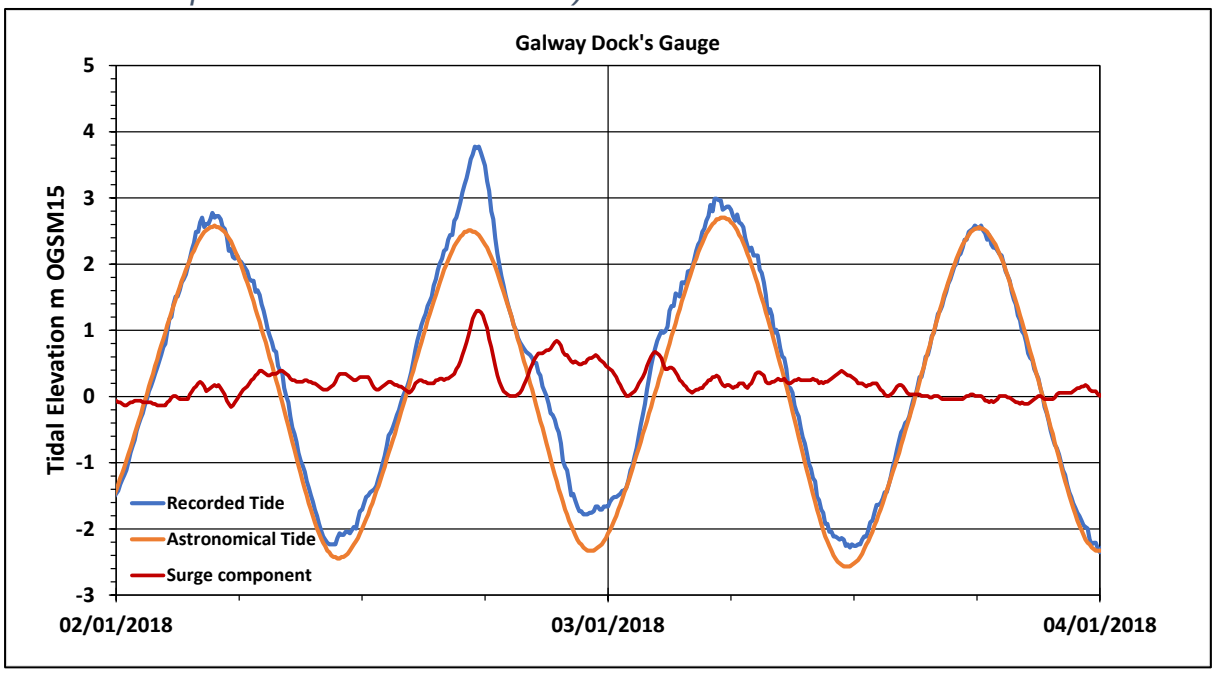

Figure 3-9 Observed versus Predicted Tides for Galway Port - 2nd Jan 2018 (note surge component is residual level between observed tide less the predicted astronomical tide)

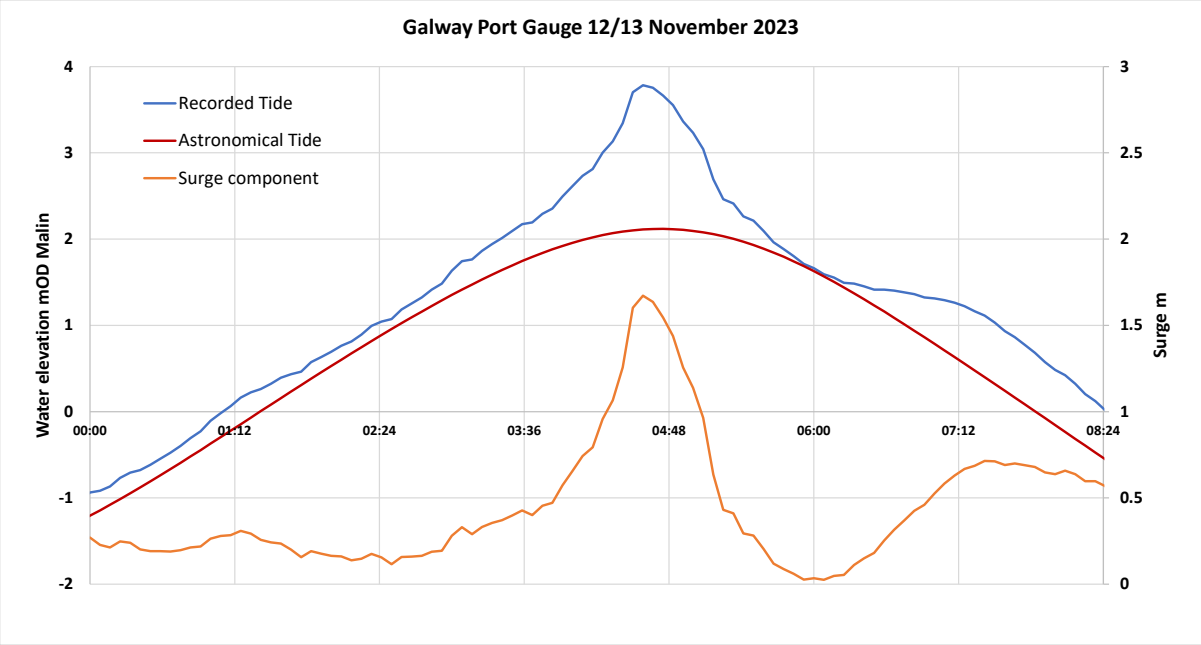

Figure 3-10 Observed versus Predicted Tides for Galway Port – 13th November 2023 (note surge component is residual level between observed tide less the predicted astronomical tide)

Both the Storm Debie and Storm Eleanor events which produced historical maximum high tides in inner Galway Bay, at Galway and Oranmore, Clarinbridge, and at Kilcolgan gauges approached under strong westerly winds, steepening rapidly as they propagated up the narrow westerly orientated estuarine channels.

These relatively recent tidal events caused significant flooding along the Galway and Clare coastal areas and in the Shannon Estuary areas and are reported as being the highest tides historically and exceeded the previous Hurricane Debbie event of Sept 1961 at Limerick City.

3.7 Flood Frequency Analysis

3.7.1 Statistical Analysis of Tides

From the recorded gauged tidal data for Oranmore Bridge, Wolfe Tone Bridge Claddagh, Galway Port and Ros an Mhíl gauges the annual maximum (AM) tidal flood level series were extracted and analysed statistically, by fitting extreme value type 1 (Gumbel) statistical distribution by the method of L-moments to the respective AM flood level series, to predict the return period tide flood level at the three available gauges.

Table 3-2 Annual maximum series of tides at Oranmore (29015)

Year	m OD Malin	Stage (m)	Date	comment
1982	2.870	1.79	08/09/1983	Tidal Peaks
1983	2.940	1.86	19/02/1984	Tidal Peaks
1984	3.100	2.02	23/11/1984	Tidal Peaks
1985	2.880	1.80	28/03/1986	Tidal Peaks
1986	2.980	1.90	03/12/1986	Tidal Peaks
1987	3.080	2.00	27/09/1988	Tidal Peaks
1988	3.150	2.07	09/03/1989	Tidal Peaks
1989	3.110	2.03	26/02/1990	Tidal Peaks
1990	3.460	2.38	05/01/1991	Tidal Peaks
1991	2.990	1.91	29/08/1992	Tidal Peaks
1992	3.130	2.05	12/01/1993	Tidal Peaks
1993	3.220	2.14	12/01/1994	Tidal Peaks
1994	3.550	2.47	17/01/1995	Tidal Peaks
1995	3.000	1.92	28/09/1996	Tidal Peaks
1996	3.540	2.46	10/02/1997	Tidal Peaks
1997	3.050	1.97	30/03/1998	Tidal Peaks
1998	3.160	2.08	02/01/1999	Tidal Peaks
1999	2.950	1.87	26/12/1999	Tidal Peaks
2000	3.050	1.97	09/03/2001	Tidal Peaks
2001	3.320	2.24	02/02/2002	Tidal Peaks
2002	2.840	1.76	08/10/2002	Tidal Peaks
2003	2.940	1.86	19/03/2004	Tidal Peaks
2004	3.340	2.26	08/01/2005	Tidal Peaks
2005	3.090	2.01	29/03/2006	Tidal Peaks
2006	3.060	1.98	20/02/2007	Tidal Peaks
2007	2.890	1.81	27/10/2007	Tidal Peaks
2008	2.885	1.805	22/08/2009	Tidal Peaks
2009	3.000	1.920	02/03/2010	Tidal Peaks
2010	3.000	1.920	08/10/2010	Tidal Peaks
2011	2.900	1.820	26/10/2011	Tidal Peaks
2012	3.084	2.004	14/12/2012	Tidal Peaks
2013	3.663	2.583	01/02/2014	Tidal Peaks
2014	3.095	2.015	03/08/2015	Tidal Peaks
2015	3.107	2.027	08/02/2016	Tidal Peaks
2016	2.948	1.868	16/10/2016	Tidal Peaks
2017	3.795	2.715	02/01/2018	Tidal Peaks
2018	3.257	2.177	12/10/2018	Tidal Peaks
2019	3.300	2.220	09/02/2020	Tidal Peaks
2020	3.199	2.119	14/11/2020	Tidal Peaks
2021	3.300	2.220	07/12/2021	Tidal Peaks
2022	3.193	2.113	23/03/2023	Tidal Peaks
2023	3.854	2.774	13/11/2023	Tidal Peaks (MAX)

Median annual tide level for Oranmore (29015) is 3.093m OD.

Table 3-3 Annual maximum series of tides at Galway (WolfeTone Bridge)

Year	Tide level m OD Malin	Stage (m)	Date	comment
1992	3.214	3.04	**01/11/1993**	Tidal Peaks
1993	3.174	3.00	**01/12/1994**	Tidal Peaks
1994	3.434	3.26	**17/01/1995**	Tidal Peaks
1995	2.974	3.8	**25/10/1995**	Tidal Peaks
1996	3.574	4.4	**02/10/1997**	Tidal Peaks
1997	3.024	3.85	**16/10/1997**	Tidal Peaks
1998	3.084	3.91	**01/03/1999**	Tidal Peaks
1999	3.254	4.08	**25/12/1999**	Tidal Peaks
2000	3.014	3.84	**12/12/2000**	Tidal Peaks
2001	3.514	4.34	**01/02/2002**	Tidal Peaks
2002	2.934	3.76	**08/10/2002**	Tidal Peaks
2003	2.817	3.643	**02/08/2004**	Tidal Peaks
2004	3.124	3.95	**08/01/2005**	Tidal Peaks
2005	3.134	3.96	**30/03/2006**	Tidal Peaks
2006	3.174	4.00	**20/02/2007**	Tidal Peaks
2007	2.874	3.70	**27/10/2007**	Tidal Peaks
2008	2.889	3.712	**22/08/2009**	Tidal Peaks
2009	3.06	3.883	**02/03/2010**	Tidal Peaks
2010	3.021	3.844	**08/10/2010**	Tidal Peaks
2011	2.893	3.716	**29/10/2011**	Tidal Peaks
2012	3.127	3.95	**14/12/2012**	Tidal Peaks
2013	3.629	4.452	**01/02/2014**	Tidal Peaks
2014	3.093	3.916	**03/08/2015**	Tidal Peaks
2015	3.087	3.91	**28/10/2015**	Tidal Peaks
2016	2.974	3.797	**16/10/2016**	Tidal Peaks
2017	3.854	4.677	**02/01/2018**	Tidal Peaks
2018	3.3	4.123	**12/10/2018**	Tidal Peaks
2019	3.257	4.080	**18/12/2019**	Tidal Peaks
2020	3.131	3.954	**16/12/2020**	Tidal Peaks
2021	3.223	4.046	**07/12/2021**	Tidal Peaks
2022	3.176	3.999	**23/03/2022**	Tidal Peaks
2023	3.828	4.046	**13/11/2023**	Tidal Peaks (MAX)

Median annual tide level for the Galway Gauge at Wolfe Tone Bridge is 3.129m OD (the Highwater tide level is slightly influenced by the river Corrib fluvial flows adding typically a number of centimetres to the high tide level).

Table 3-4 Annual maximum series of tides at Galway Port Gauge (30062)

Year	m OD Malin	Stage (m)	Date	comment
2007	2.99		10/03/2008	Tidal Peaks
2008	2.94		22/08/2009	Tidal Peaks
2009	3.10		02/03/2010	Tidal Peaks
2010	3.01		08/10/2010	Tidal Peaks
2011	2.97		29/10/2012	Tidal Peaks
2012	3.17		14/12/2012	Tidal Peaks
2013	3.59		01/02/2014	Tidal Peaks
2014	3.02		03/08/2015	Tidal Peaks
2015	3.02		28/10/2015	Tidal Peaks
2016	2.99		16/10/2016	Tidal Peaks
2017	3.772		02/01/2018	Tidal Peaks
2018	*3.204*		*12/10/2018*	Tidal Peaks
2019	*3.178*		*18/12/2019*	Tidal Peaks
2020	*3.091*		*15/11/2020*	Tidal Peaks
2021	*3.176*		*7/12/2021*	*Tidal Peaks*
2022	*3.119*		*23/03/2023*	Tidal Peaks
2023	*3.780*		*13/11/2023*	*Tidal Peaks (MAX)*

Median annual tide flood level for the Galway Port is 3.100m OD.

3.7.2 Statistical Analysis Results

The Oranmore gauge site provides 42years of annual maximum tide flood level data (1982 to 2023), the Wolfe Tone gauge (30061) in Galway City provides (32years) and the Galway Docks gauge (30062) provides 17years of data. The record lengths available at these gauges are relatively short when predicting extreme tides of 200year and 1000year return period magnitudes and therefore caution needs to be exercised in their interpretation and use, particularly with the non-stationarity of the flood series due to climate change.

Given the relatively short record lengths available at these gauges it is recommended that the at-site frequency analysis uses a more robust 2-parameter EV1 distribution rather than a larger 3 parameter distribution in estimating the design return period flood levels, refer to Figure 3-11 to Figure 3-13. The three-parameter distributions includes a shape parameter based on skewness which potentially fits better the sample but may not perform well at the larger return periods and has a much higher statistical error associated with it.

The Wolfe Tone Bridge gauge (30061) AM record is influenced by River Corrib flows and as such, is considered to represent a combined fluvial and tidal flood level series and therefore to overestimate the return period tidal flood level. The river Corrib influence on tidal flood levels at Wolfe Tone gauge site is relatively small due to the large flow depth available at highwater but sufficient to result in potentially a 15cm increase in the true tidal flood level at 200year return period.

The Oranmore gauge is more dependable of the three gauges based on its longer unbroken record period of 42years. There is a reasonable agreement between Oranmore and Galway Port flood level estimates with Galway port having a higher statistical error due to the shorter sample period of 17 AM years available. The Galway Port gauge record period is considered too short for accurate estimation of large return period events providing only a 17 year AM size.

The EV1 analysis suggests that the tide event of the 1st of Feb 2014 at Oranmore gauge of 3.603m OD Malin was equivalent to a 27year return period event and that the more recent and historical maximum recorded Storm Eleanor tidal flooding event that occurred on the 2nd of Jan 2018 of 3.735mOD was equivalent to a 57year return period event. The predicted 200year return period tide level is 3.956 with a statistical error of 0.149m and the 1000year is 4.238m OD with a statistical error of 0.190.

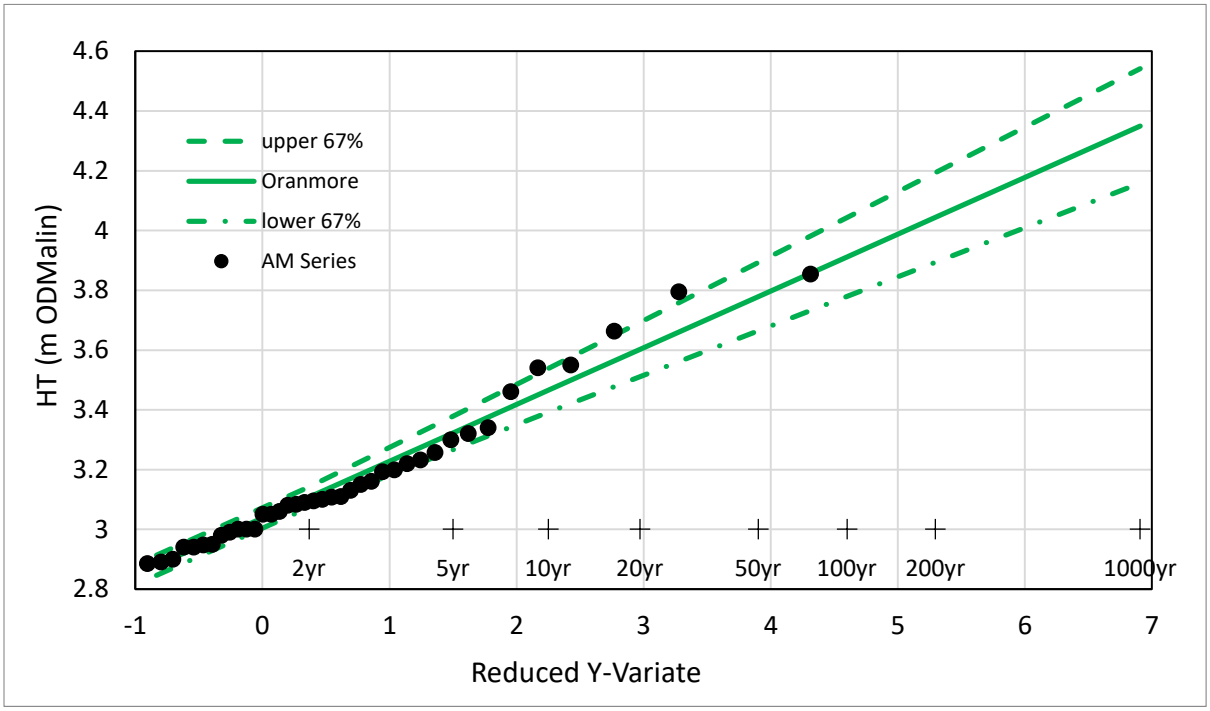

Figure 3-11 Tidal Flooding H – T with 67-percentile upper and lower confidence Intervals based on EV1 analysis of the Oranmore Gauge

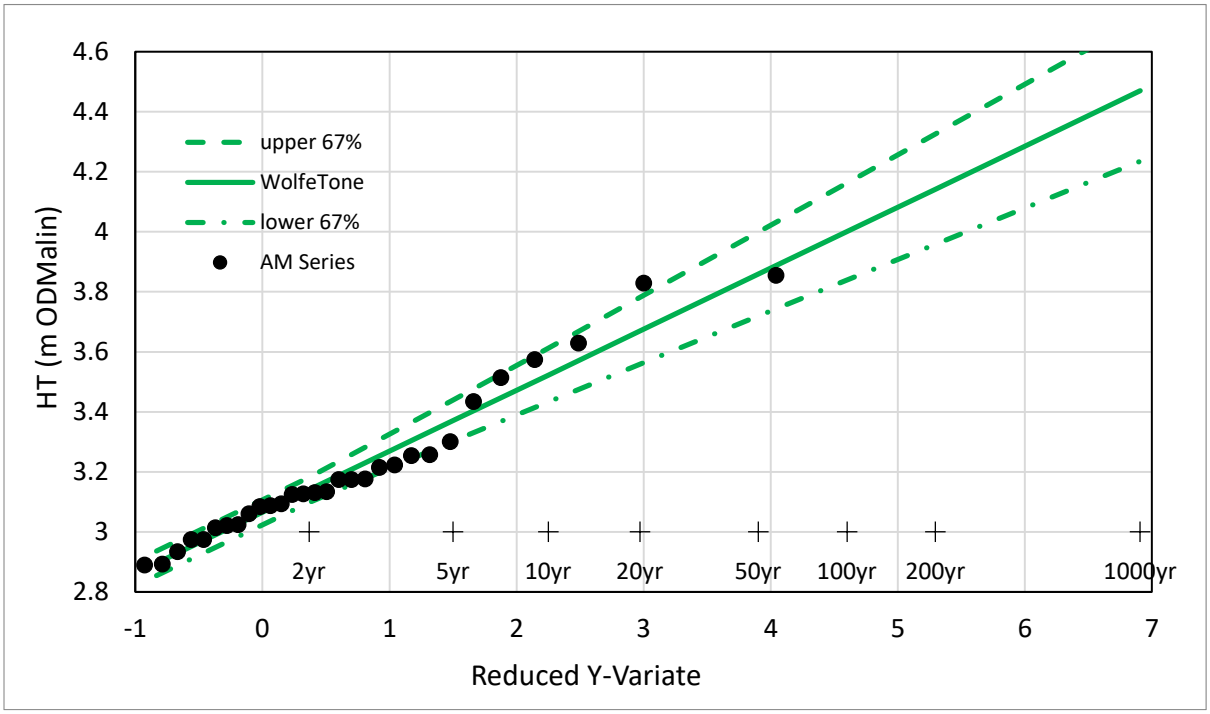

Figure 3-12 Tidal Flooding H – T with 67-percentile upper and lower confidence Intervals based on EV1 analysis of the Wolfe Tone Gauge

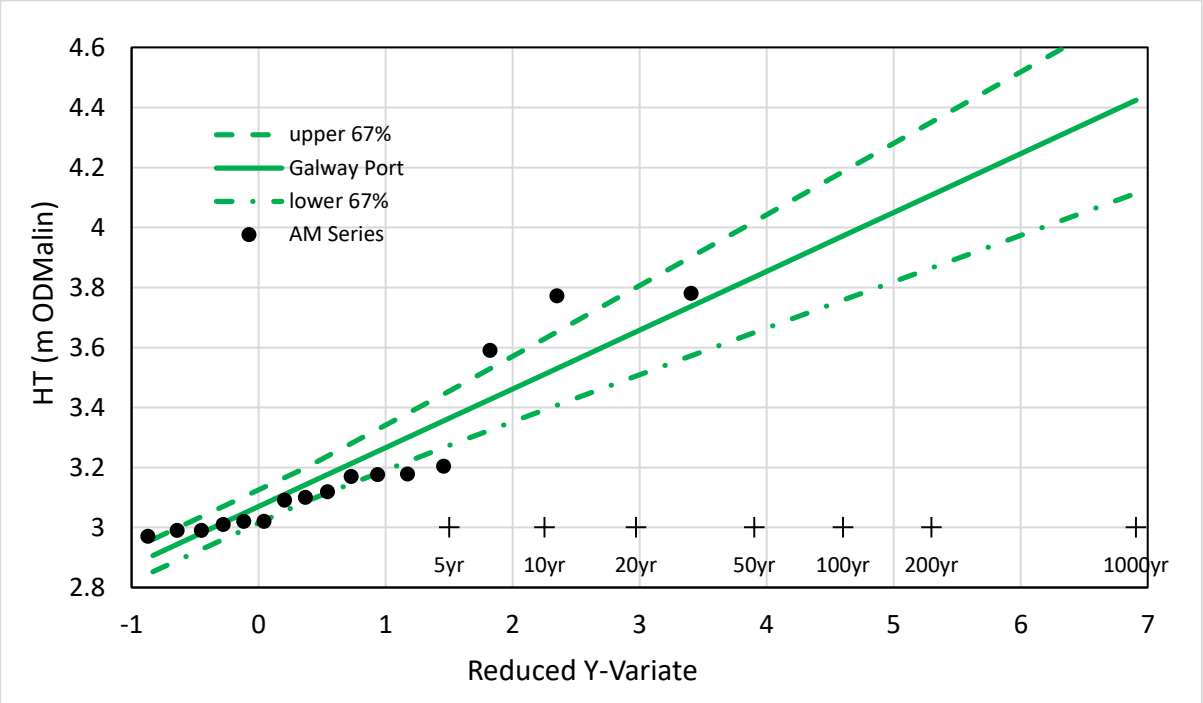

Figure 3-13 Tidal Flooding H – T with 67-percentile upper and lower confidence Intervals based on EV1 analysis of the Galway Docks Gauge

Table 3-5 Return Period Tide level estimates from At Site Frequency Analysis using EV1 distribution.

Return Period	Wolfe Tone Gauge 30061		Galway Port Gauge 30062		Oranmore Gauge 29015	
T years	H_T mOD	S.E.(HT) mOD	H_T mOD	S.E.(HT) mOD	H_T mOD	S.E.(HT) mOD
1	2.896	0.041	2.907	0.054	2.880	0.033
2	3.140	0.042	3.142	0.056	3.108	0.035
5	3.371	0.068	3.364	0.090	3.323	0.056
10	3.523	0.090	3.511	0.118	3.466	0.073
20	3.670	0.111	3.652	0.147	3.602	0.091
50	3.859	0.140	3.835	0.185	3.779	0.114
100	4.001	0.162	3.972	0.214	3.912	0.132
200	4.142	0.184	4.108	0.243	4.044	0.150
1000	4.470	0.235	4.424	0.310	4.350	0.191

Note : H_T is T return period tidal flood Level and S.E. (H_T) is statistical standard error of H_T.

The Irish Coastal Wind and Wave Study ICWWS (2018) was published in November 2020 (RPS, 2020) and represents an update to the previous Irish Coastal Protection Strategic Study ICPSS (2012) for which published flood maps are available nationally.

The predicted return period tidal flood levels from the ICWWS 2018 are presented below in Table 3-6 relative to OSGM15 Malin datum for the relevant nodes W5, W6 and W16. Node W5 represents the Oranmore Bay Area, W6 represents Galway Harbour area and W16 represents the mouth to Cashla Bay Area (refer to Figure 3-14). These predicted flood levels include a constant allowance over the return periods for local wind wave and seiching effects of 0.15m for the inner Galway Bay area and 0.05m at Cashla and Greatmans Bay Area, similar to the original ICPSS (2012) study allowances.

The ICWWS is an update to the 2012 ICPSS study that includes additional storm events for the years 2013 to 2018. This updated period include the large tidal flood events that were recorded in 2014 and 2018. The most significant factor influencing differences between the ICWWS and the ICPSS was not from the additional tidal events included but from the conversion used to relate mean sea level predicted by the Irish coastal Waters hydrodynamic model to Malin Head OGSM15 datum. The difference in the conversions between the ICPSS(2012) and the ICWWS2018 is 0.25m and 0.18m for MSL to Malin Head OGSM15 for Galway Harbour and Cashla Bay areas

respectively with the previous ICPSS predictions lower than the current ICWWS predictions at the relevant nodes W5, W6 and W16.

Table 3-6 Computed return period tidal flood levels at relevant nodal points to Oranmore and Galway Port, ICWWS 2018 study (RPS, 2020).

Return Period	W5 HT m OD Malin OSGM15	W5 S.E. m	W6 HT m OD Malin OSGM15	W6 S.E. m
2	3.31	0.021	3.29	0.021
5	3.46	0.031	3.44	0.031
10	3.57	0.039	3.55	0.038
20	3.68	0.047	3.66	0.046
50	3.82	0.057	3.80	0.057
100	3.92	0.065	3.90	0.065
200	4.03	0.073	4.01	0.073
1000	4.28	0.092	4.26	0.091

H_T is the Return Period flood level and S.E. is the statistical standard error .

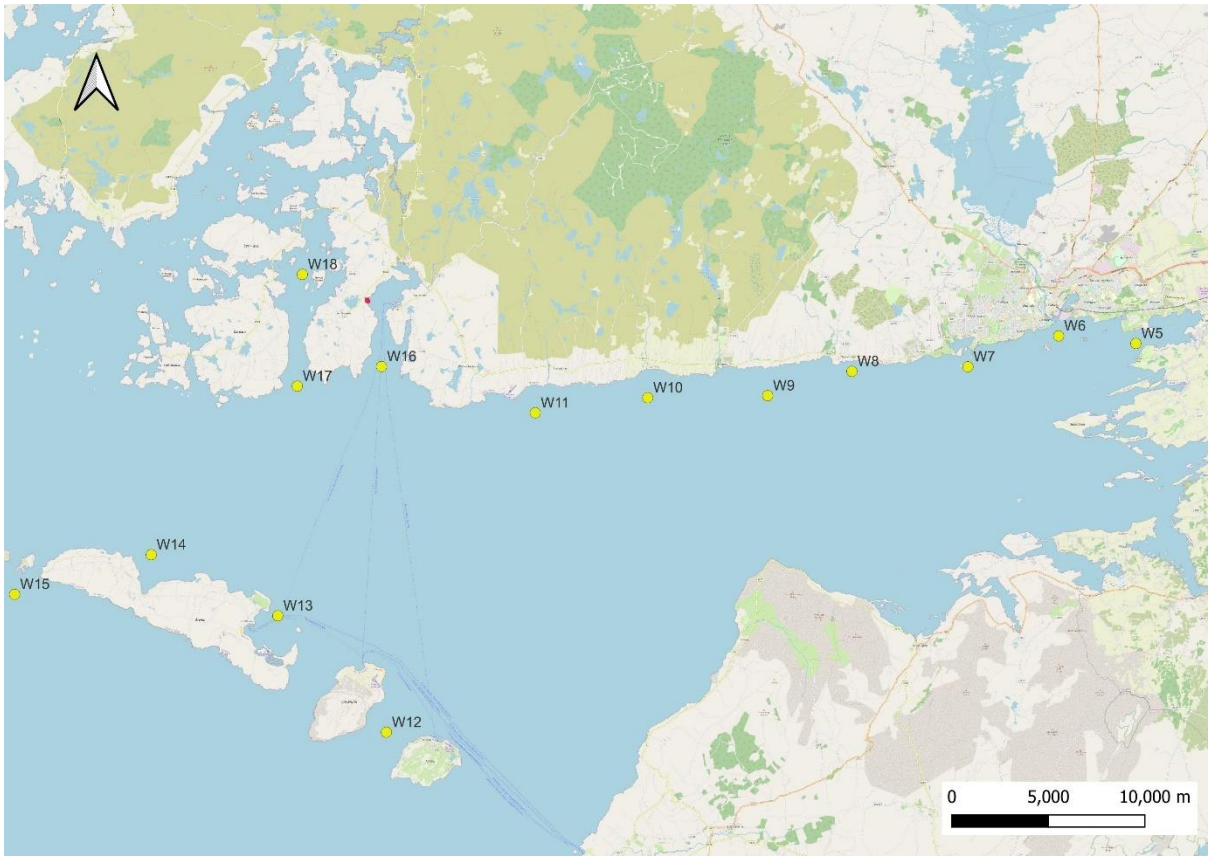

Figure 3-14 Location of the ICWWS Estimation Poits for return period tidal Flood Levels

ICWWS study estimate for Oranmore Bay area, Node W5, gives a 200year return period high tide estimate of 4.03m OD Malin and a 1000year high tide estimate of 4.28mOD Malin with an estimated statistical standard error of 0.073m and 0.092m respectively.

3.8 Recommended Design Flood Tide Level

There is reasonable agreement between the ICWWS predictions and the at-site gauged AM series for the Oranmore gauge (29015). The ICWWS predictions will be used for the purposes of defining the present day 200year and 1000year flood Levels at the Subject Site. The 200year and 1000year estimated coastal flood levels at the subject site from the ICWWS predictions are 4.03 and 4.28m OD Malin (OSGM15). The At Site statistical analysis provides slightly higher estimates of the 200 and 1000year return period tidal flood level at 4.04 and 4.35m OD.

In the context of flood risk all lands with ground levels below 4.04m OD Malin are in the high flood risk Zone A, lands between 4.04 and 4.35m OD are considered to be in the medium flood risk Zone B and lands above 4.35m OD are considered to be in the low flood risk Zone C based on the definition from Flood Risk Management Planning guidelines (2009).

Table 3-7 Comparison between ICWWS2018 and at-Site Coastal Flood Level Estimates

Return Period years	**Oranmore Node 5 CWWS2018 m OD Malin OSGM15**	**At-site EV1 Statistical Analysis m OD Malin OSGM15**
2	3.31	3.11
5	3.46	3.32
10	3.57	3.47
20	3.68	3.60
50	3.82	3.78
100	3.92	3.91
200	4.03	4.04
1000	4.28	4.35

These are still water levels and do not include surface wind wave effects at exposed coastal locations exposed to local fetches. In more exposed locations a wave climate factor needs to be applied which should be of the order of + 300 to 500mm. This does not under present day conditions apply to the subject Site.

4 Findings and Conclusions

4.1 Flood Risk

The current best practice guidance (OPW) in respect to setting minimum finish floor levels for new residential developments is to use the estimated present day 200year return period flood level for coastal flooding and allow for hydrological uncertainty and future climate change through suitable allowances. Generally new development would require a minimum finish floor level of 5.1m OD in non-exposed coastal areas.

The hydrological uncertainty associated with the ICWWS predictions is a model error of 0.15m and a statistical error of 0.073m. A higher statistical error was obtained using the at-site statistical analysis of the Oranmore Gauge at 0.150m. The 95-percentile upper confidence limit is generally estimated at twice the statistical error which is recommended for establishing the hydrological uncertainty. Therefore, the 200year design flood level based on the upper 95-percentile limit from the ICPSS2018 study is 4.33m and from at-site Oranmore gauged analysis is 4.34m OD.

The Finish Floor Level of the subject Dwelling is at 4.55m OD which is 0.21m above the estimated present day 200year coastal flood level at the site. This development being constrained by the existing building is vulnerable to the future sea level rise estimated at the medium emission scenario of 0.5m. Therefore some flood defences may be required to protect future flood events in the event of sea level rise of 0.5m.

4.2 Recommended Flood Mitigation

The nature of the Flood risk is short duration flood event from combined wave and tidal surge coastal events. The minimum design defence Level is 5.34m OD which is 1m above the predicted 200year tidal Flood Leve of 4.34m OD. This allows for climate change and uncertainty. The duration of flood event will be less than 3hours during the high water period of the tide and typically associated with spring tides.

The proposal by Oliver Higgin's Consulting Engineers (OHCE) is to protect the exposed westerly and north westerly boundary with a flood embankment set with a top level of 5.7m OD and tying into the existing shed wall which has been assessed by OHCE as sufficiently robust to withstand the future 200year tidal surge event the defence is to use demountable barriers on the access to the property and construct a flood wall along the eastern boundary wall of the site to a height of 5.7m OD. This wall will tie into the Earthen embankment. Given the short duration of high tides pumping of surface drainage behind the defences within the site will not be required. The Layout plan for the flood defences is shown in Oliver Higgin's Site Layout Drawing April 2024.

The proposed flood defences described above and detailed in Oliver Higgin's Site Layout Drawing April 2024 are a local property defence measure and will not impact tidal flooding elsewhere either through displacement of tidal waters or interference through diversion of the flowing tidal waters.