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APPENDIX 9-1

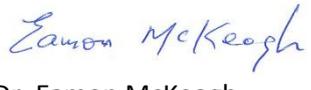
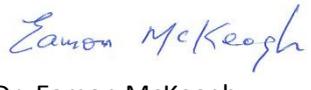
**FLOOD RISK ASSESSMENT (R&D
FLUVIO LIMITED, 2025)**

Gannow Wind Farm Flood Risk Assessment



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1 Introduction

1.1 BACKGROUND AND SITE LOCATION

Fluvio R&D Ltd. was commissioned by Ghrian Energy Limited, to undertake a Flood Risk Assessment (FRA) for a wind farm development at Gannow, Co. Galway, Ireland.

This report will assess the flooding risk to the development and adjoining lands in accordance with the guidelines published by the OPW and DHELG in November 2009 "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" [1].

The site is located between M6 motorway on the south and the Dublin-Galway railway at Attymon station on the north west and is circa 10km east of Athenry, Co. Galway as shown in Figure 1.1.

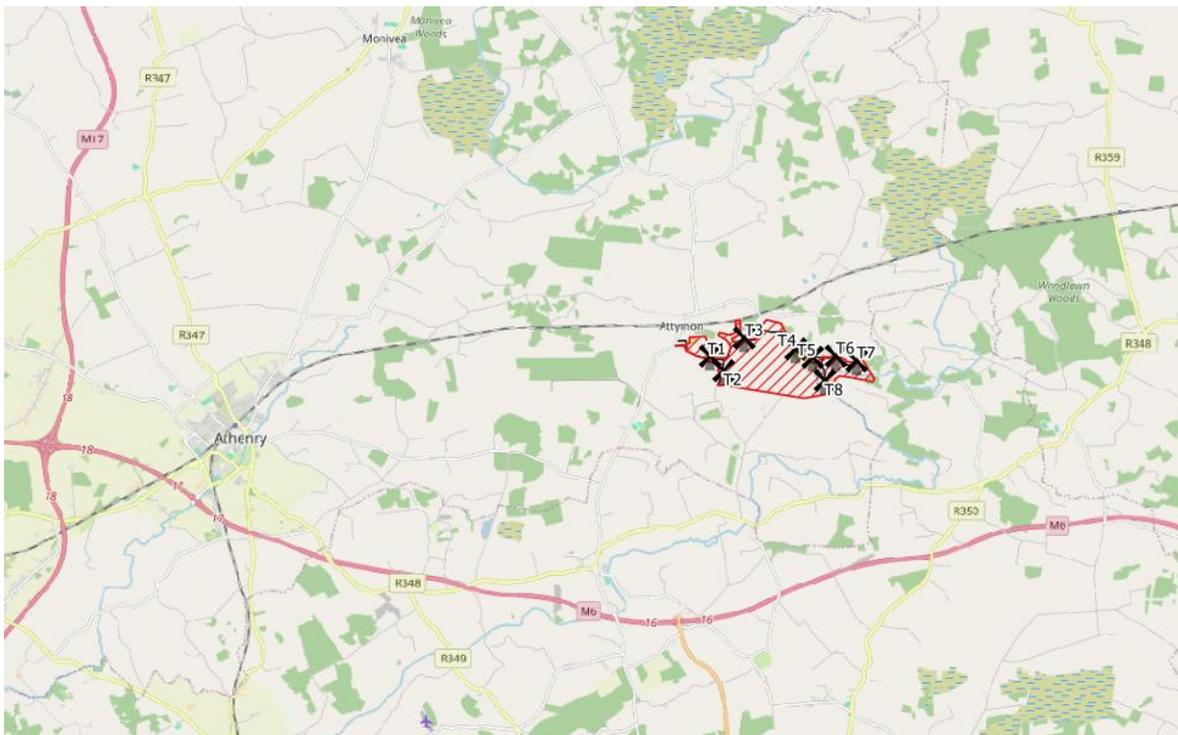


Figure 1.1. Site location.

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1.1.1 Development proposal

The proposed Wind Farm (WF) (Figure 1.2) consists of eight wind turbines with hardstands, a substation and a road network. The site is bounded on the east and west sides by two main rivers – the River Raford with drainage channels on the east and the River Killimor with drainage channels on the west. Access to the WF road network is from the L3115 local road which is not subject to flooding. Hardstands for turbines are designed with finished ground levels above the flood levels for both flood Zones A and B and the WF road network is retained at existing ground levels in order to avoid flood plain flow blockage of pre-construction flood flow paths.



Figure 1.2. Proposed wind farm development.

1.1.2 Scope and objectives

The scope of this report is to provide the information necessary for a planning application by the WF developer, to discharge their responsibilities under the OPW Planning and Development Flood Policy with regard to flood risk constraints and to ensure that the development complies with the flood risk policies within Galway County Council's Development Plan [11]. This report has been prepared in accordance with "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" published by OPW and the Department of the Environment, Heritage and Local Government in November 2009 [1]. The aim of the FRA is to:

- Identify the flooding issues at and adjacent to the site,
- Identify and carry out the studies required to assess these.
- Design mitigation and flood alleviation measures for the development.

The risk assessment covers all sources of flooding, including the effects of run-off from the development on flood risk to the vicinity, environs and downstream of the development site. The study involves a hydrological assessment to estimate extreme river flows (including Climate Change influences) and examines the effect of the proposed development on these and assesses if this will have any significant impact on flooding elsewhere.

1.1.3 Planning and policy framework

In this Report the following Planning Framework documents were considered:

- Relevant legislation and regulations
- Irish National policy on flooding
- Local policy

1.1.3.1 Relevant legislation and regulations

Relevant legislation and regulations include *Arterial Drainage Acts*, *Environmental Legislation and Regulations* and *Planning and Development Management* which are presented in Annex D.

1.1.3.2 Irish National policy on flooding

The current Irish National policy on flood risk is outlined in the OPW document *OPW Planning and Development Flood Policy* published on www.flooding.ie. The details of the policy are presented in the Annex E.

Gannow WF is not within any local area plans, as shown in Annex G. However, Galway County Development plan 2022-2028 [10] and Renewable Energy Strategy [12] apply to the site.

1.1.4 Structure of the Report

The Flood Risk Assessment (FRA) is central to the implementation of the OPW Guidelines [1]. A FRA may be undertaken over a large area, or for a particular site to:

- identify whether and the degree to which flood risk is an issue,
- identify flood zones (if not already identified),
- inform decisions in relation to spatial zoning and planning applications,
- develop appropriate flood risk mitigation and management measures for developments sited in flood risk areas.

This Report is undertaken in a sequential manner in three stages, which represent increasing levels of detail, which are: Stage 1 – Flood Risk Identification, Stage 2 – Initial Flood Risk Assessment and Stage 3 – Detailed Flood Risk Assessment. Only assessments that are needed for the purposes of decision making were carried out.

FRA's can be undertaken at a range of scales relevant to the planning process. This Report is a full FRA with a Site-Specific Flood Risk Assessment, i.e. for an individual site planning application. In accordance with the OPW Guidelines for the assessment of flood risk, the source-pathway-receptor model has been adopted. In the report, the probability of flooding occurring was calculated, the hazards that will arise were assessed, and the vulnerability of the receptors of those hazards was examined. These assessments were carried out using computer simulations of the rivers and floodplains system for existing and post-development scenarios.

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2 Methodology

This report has been prepared in accordance with "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" published by OPW and the Department of the Environment, Heritage and Local Government in November 2009 [1].

The *Guidelines for Planning Authorities* [1] and its Technical Appendices outline the requirements for a SSFRA. The *Guidelines for Planning Authorities* requires that works:

- Avoid development in areas at risk of flooding.
- Substitute less vulnerable uses, where avoidance is not possible.
- Mitigate and manage the risk, where avoidance and substitution are not possible.

The key principles of the *Guidelines for Planning Authorities* are to apply the **Sequential Approach** to the planning process. Figure 2.1 of this report describes the mechanism of the sequential approach for use in the planning process.

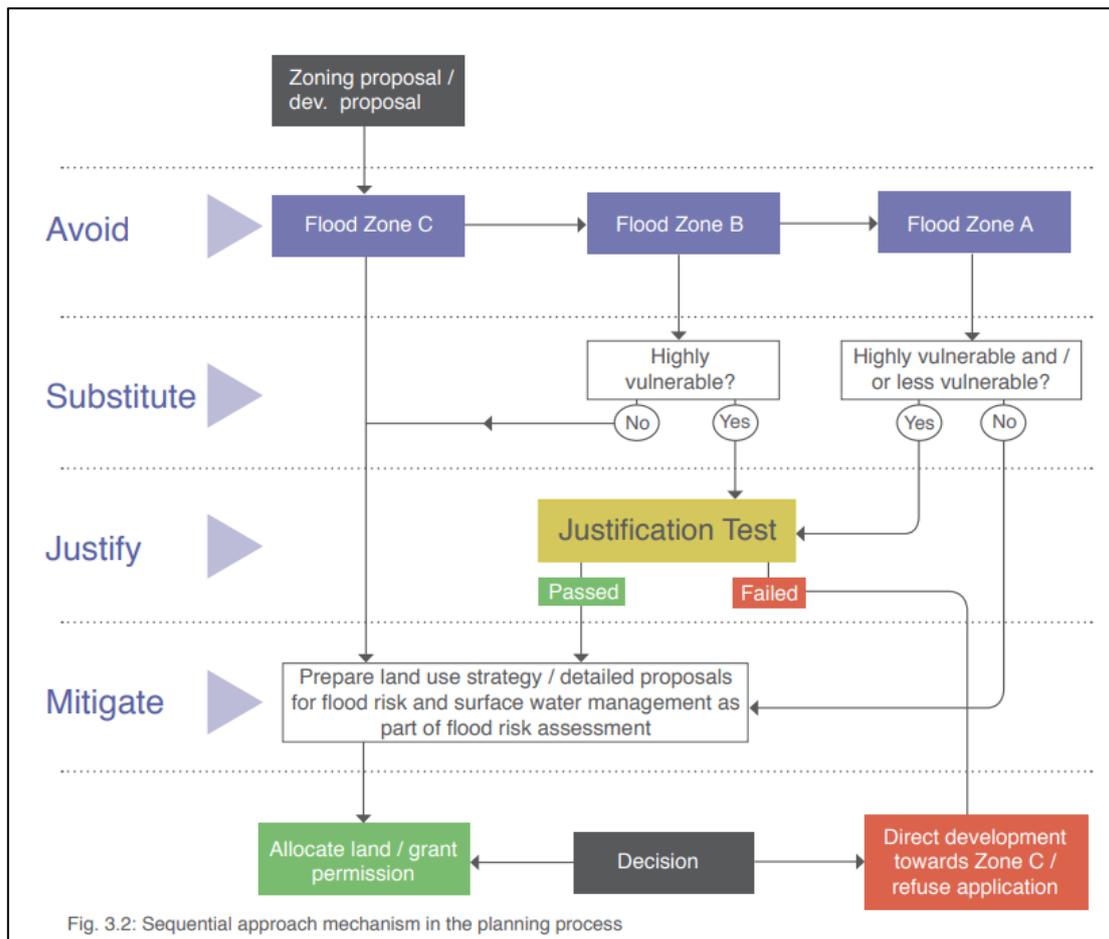


Figure 2.1. Sequential Approach Mechanism [1].

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2.1 SOURCE-PATHWAY-RECEPTOR MODEL

The assessment of flood risk requires a thorough understanding of:

- The sources of flood water (e.g. intense or prolonged rainfall leading to runoff and increased flow in rivers).
- The pathways by which the flood water reaches those receptors (e.g. river channels, river and coastal floodplains, drains, sewers and overland flow).
- The people and assets affected by flooding (known as the receptors).

The Source-Pathway-Receptor (S-P-R) Model illustrated in Figure 2.2 has become widely used to assess and inform the management of environmental risks.

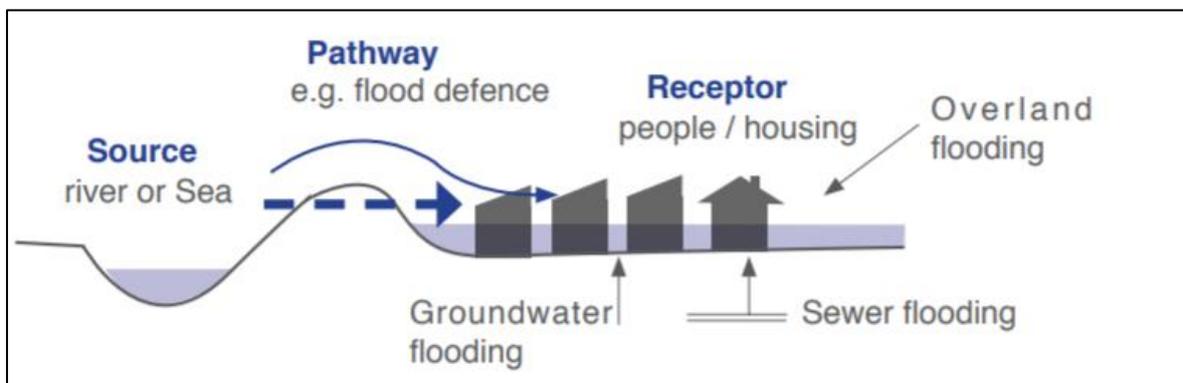


Figure 2.2. Source-Pathway- Receptor Model [1].

2.2 LIKELIHOOD OF FLOODING AND DEFINITION OF FLOOD ZONES

The *Guidelines for Planning Authorities* [1] define the likelihood of flooding as the percentage probability of a flood of a given magnitude occurring or being exceeded in any given year. Likelihood of flooding is expressed as a return period or annual exceedance probability (AEP).

Flood Zones are geographical areas within which the likelihood of flooding is in a particular range. They are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. These flood zones are split into three categories in the *Guidelines for Planning Authorities*.

There are three types or levels of flood zones (Figure 2.3) in accordance with the guidelines published by the OPW and DHELG in November 2009 "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" [1].



Figure 2.3. Indicative flood zone map

2.2.1.1 Flood Zone A

Is the zone where the probability of flooding from rivers and the sea is highest (greater than 1% AEP or 1 in 100 for river flooding or 0.5% AEP or 1 in 200 for coastal flooding).

2.2.1.2 Flood Zone B

Is the zone where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1000 and 1% AEP or 1 in 100 for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 for coastal flooding);

2.2.1.3 Flood Zone C

Flood zone C is where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

2.3 CLASSIFICATION OF THE PROPOSED DEVELOPMENT AND JUSTIFICATION TEST

The *Guidelines for Planning Authorities* categorises all types of development as either:

- Highly Vulnerable (Garda stations, ambulance stations, schools, hospitals, dwelling houses, student halls...).
- Less Vulnerable (buildings used for: retail leisure, warehousing, commercial, industrial, and non-residential institutions,...).
- Water Compatible (flood control infrastructure, docks, marinas, amenity open spaces,...).

Full list of types of development and related vulnerability classes are provided in Table 3.1 of the *Guidelines for Planning Authorities*. Uses which are not listed in the table are considered on their own merits.

The Sequential Approach restricts development types to occur within the flood zone appropriate to their respective vulnerability classes. Table 2.1 identifies the types of development appropriate for each flood zone and those that will require a Justification Test.

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Table 2.1. Matrix of Vulnerability Versus Flood Zone [1].

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

The Justification Test has been designed to rigorously assess the appropriateness of developments that are being considered in areas of moderate or high flood risk. There are two types of the Justification Test:

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

2.4 FLOOD RISK ASSESSMENT STAGES

The *Guidelines for Planning Authorities* outline that a staged approach should be adopted when carrying out a SSFRA. These stages, see also Figure 2-3 below are:

- Stage 1 Flood Risk Identification.
- Stage 2 Initial Flood Risk Assessment.
- Stage 3 Detailed Flood Risk Assessment.

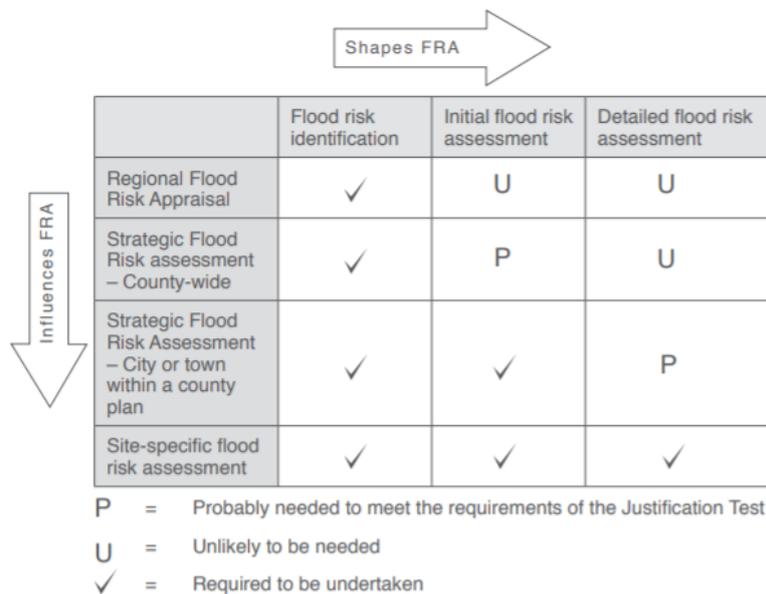


Figure 2.4. Flood risk assessment stages required per scale of study undertaken [1].

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues relating to the proposed development site that may warrant further investigations. Flood risk identification stage uses existing information to identify whether there may be any flooding or surface water management issues related to the site. Flood risks identified in this stage are then addressed in Stage 2.

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect the development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of data addressed in Stage 1. Data where the flood risk at the site is recognized as being low is screened out and it is not further addressed in the report, data which recognized the flood risk on the site to be medium or high is further analysed in the report.

Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or newly developed hydraulic model which represents a wide enough area to appreciate the overall catchment-wide impacts and hydrological process involved.

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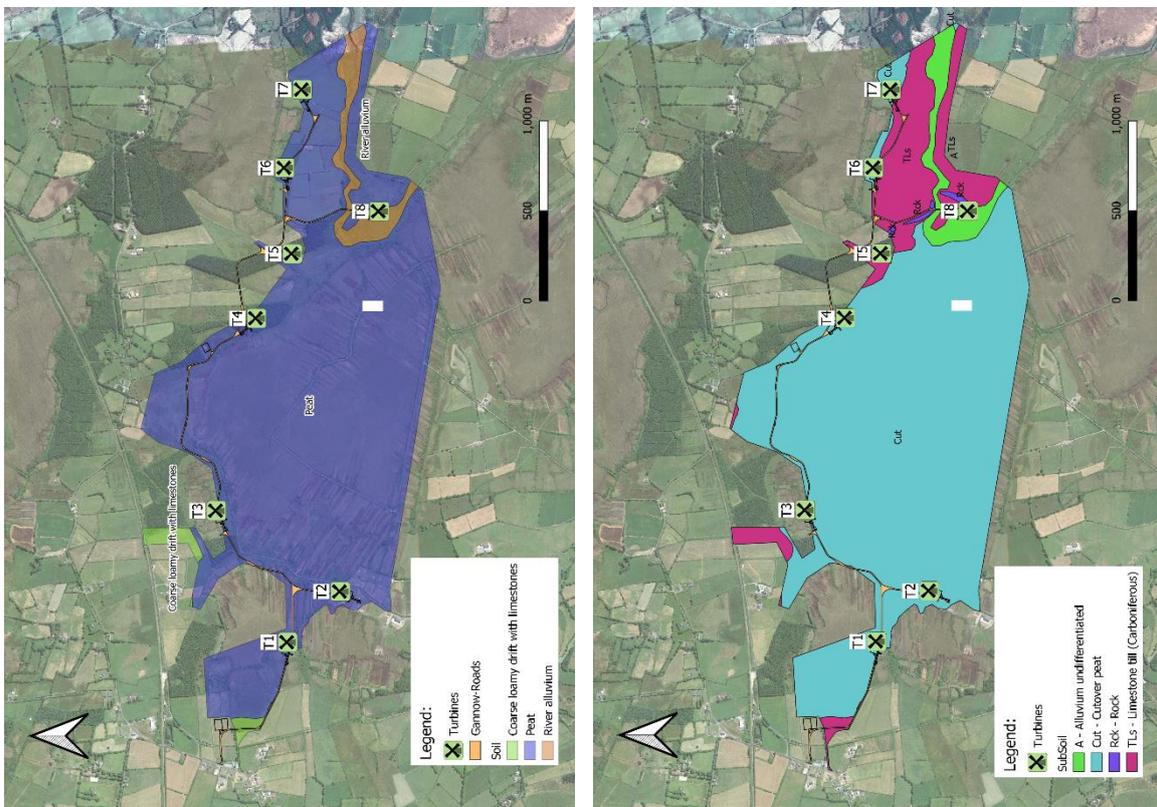
3 Existing site conditions

The subject site is located around Gannow, Co. Galway, Ireland. The site is located east of the L3115 road, south of Dublin-Galway railway line and North of the M6 motorway as shown in Figure 1.1.

The site is bounded by two main rivers – the Raford on the east and the Killimor on the west and it is in a zone which is subject to flooding. The access to the windfarm road network is from the local road L3115 which is not subject to flooding.

3.1 SUBSOIL AND HYDROGEOLOGY

The soil in the general vicinity of the site is predominately Peat with some river alluvium and coarse loamy drift with limestones. The general vicinity of the site is underlain predominately by Cutover peat (Cut), Limestone till (TLs), Alluvium (A) and some rock (Rock) according to the Geological Survey of Ireland (GSI). This is show on Figure 3.1.



A) Soil map

B) Subsoil map

Figure 3.1 Soils Characteristics

There are no karst features located within the site, see Figure 3.2 below.

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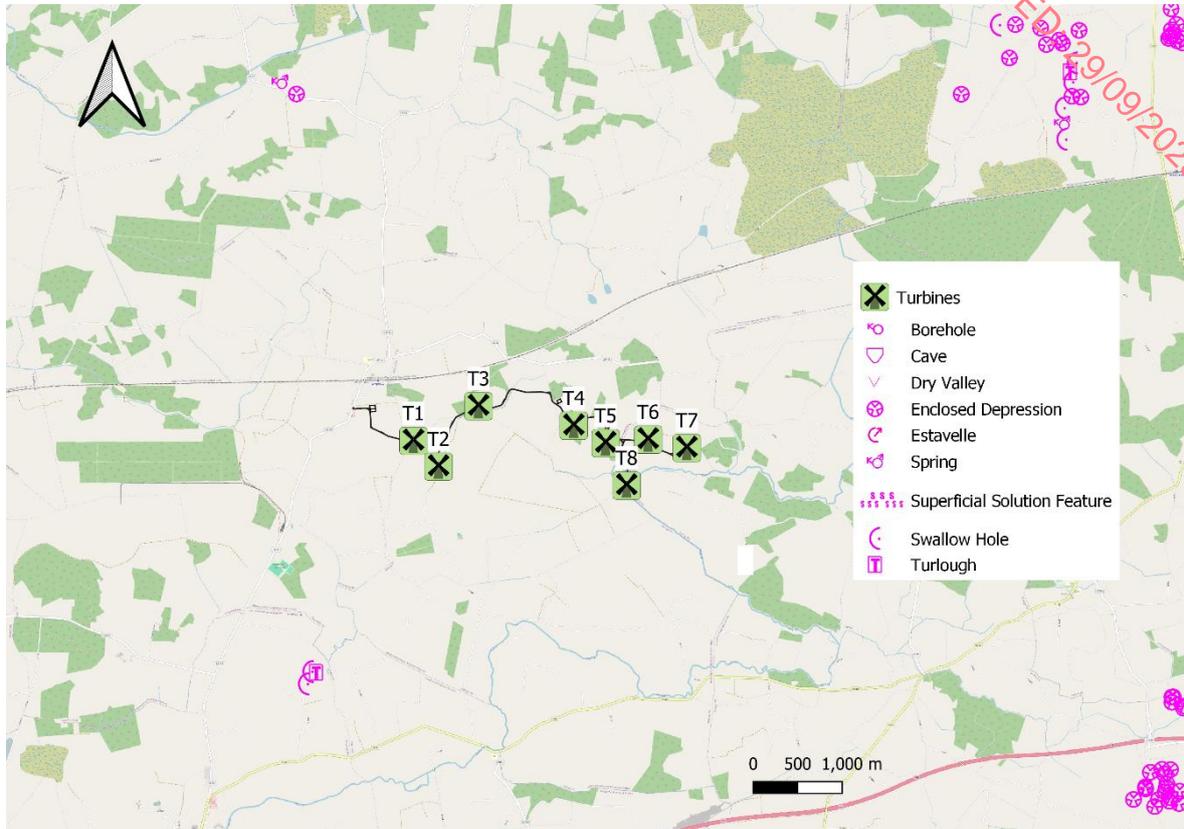


Figure 3.2. Karst features.

3.2 HYDROLOGICAL FEATURES

A site walkover and survey were carried out in August 2023 to establish the pattern of existing drainage and to record existing hydrology features. The site has a gentle slope in a north – south direction. The middle part south of the main road network is characterised by peat bogs. The surface runoff percolates underground while the excess water is collected by the River Killimore, River Raford and field drains along the site. Photos associated with the site walkover are provided in Annex A. Identified hydrological features are shown on Figure 3.3.

In total, 30 stream/river crossings and one levee have been identified within the site and adjacent to the site boundary, these are marked on Figure 3.3 below. Property access culverts/bridges are marked from '1' to '31'. Culvert/Bridge characteristics are provided in Table 3.1. The highest ground level is at the northern part of the site, 78mOD, and the lowest point is in the south-western corner of the site, 60mOD. No local low points were identified during the site walkover. Some marsh areas with surface water ponding are located at the south east side of the site at the downstream end of river Raford.

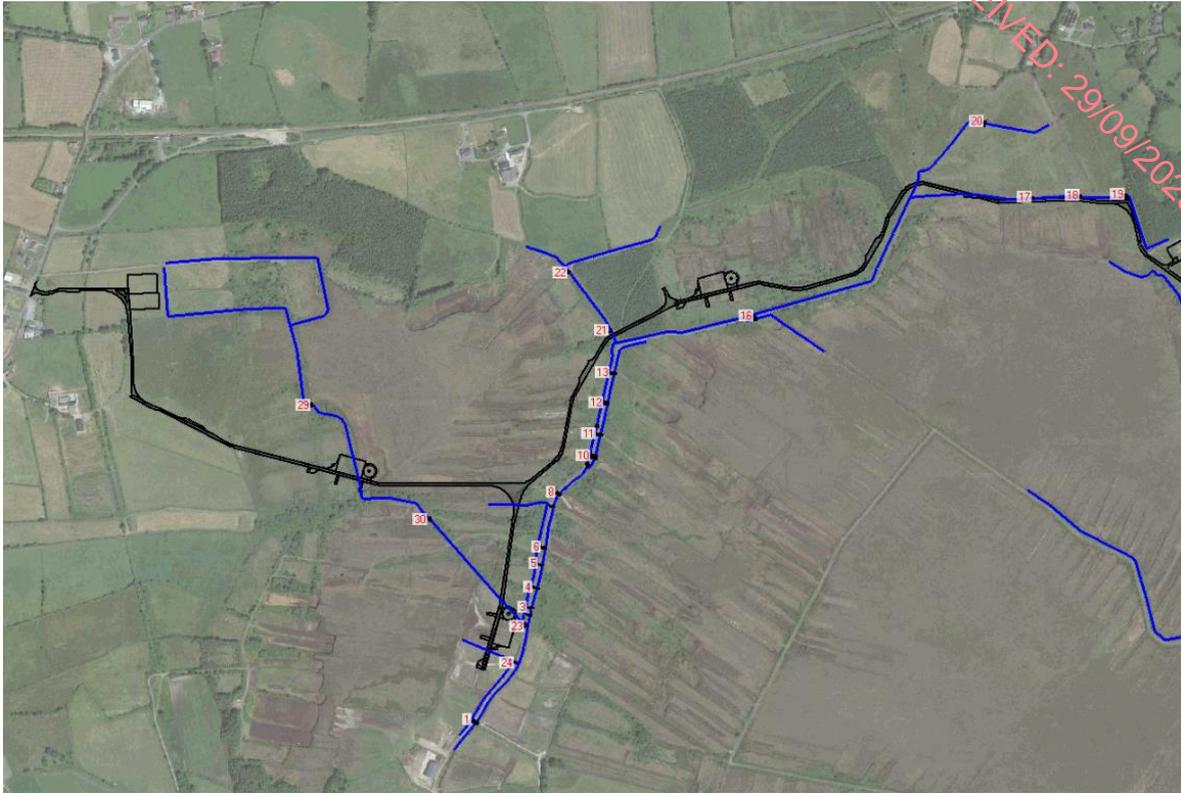
Table 3.1. Culvert details

No	Type	Detail
1	Bridge	Single span concrete bridge with irregular openings U/s opening 2.2m, D/s opening is concrete pipe 1.6m in diameter
2	Beams	Deteriorated Farm Access (two wooden beams left)
3	Farm bridge	Single span 3.5m wooden farmer access bridge
4	Beams	Deteriorated Farm Access (two wooden beams left)
5	Culvert	Single span 3.5m wooden farmer access bridge
6	Culvert	Pipe Culvert 800mm
7	Beams	Metal pipes no bridge
8	Bridge	Pipe Culvert 1100mm
9	Bridge	Concrete bridge single span 2m with wing walls
10	Culvert	Pipe Culvert 600mm partially blocked at u/s end
11	Culvert	Two pipe culvert pipe 1 = 600mm pipe 2 = 300mm. Pipes blocked 50% downstream end
12	Culvert	Two pipe 500mm pipes. Both pipes blocked with sediment 50% of height
13	Culvert	Three pipe culvert pipes 300mm. Pipe 2 partially blocked
14	Bridge	Farm wooden Bridge single span 2.5m wide
15	Bridge	Culvert 600mm pipe crossing main farm road
16	Bridge	Culvert 300mm pipe
17	Bridge	Culvert 600mm pipe
18	Bridge	Culvert 600mm pipe
19	Bridge	Culvert 900mm pipe
20	Bridge	Culvert 750mm pipe
21	Bridge	Metal beams over the banks
22	Bridge	Single span bridge – wooden deck with concrete abutments
23	Culvert	1200mm pipe
24	Culvert	1200mm pipe
25	Culvert	600mm pipe
26	Culvert	500mm pipe

No	Type	Detail
27	Culvert	500mm pipe
28	Bridge	Singe span concrete bridge 3.1m
29	Culvert	750 pipe
30	Culvert	750 pipe
31	Levee	245m Levee at Raforf Tributary 5

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Killimor



Raford

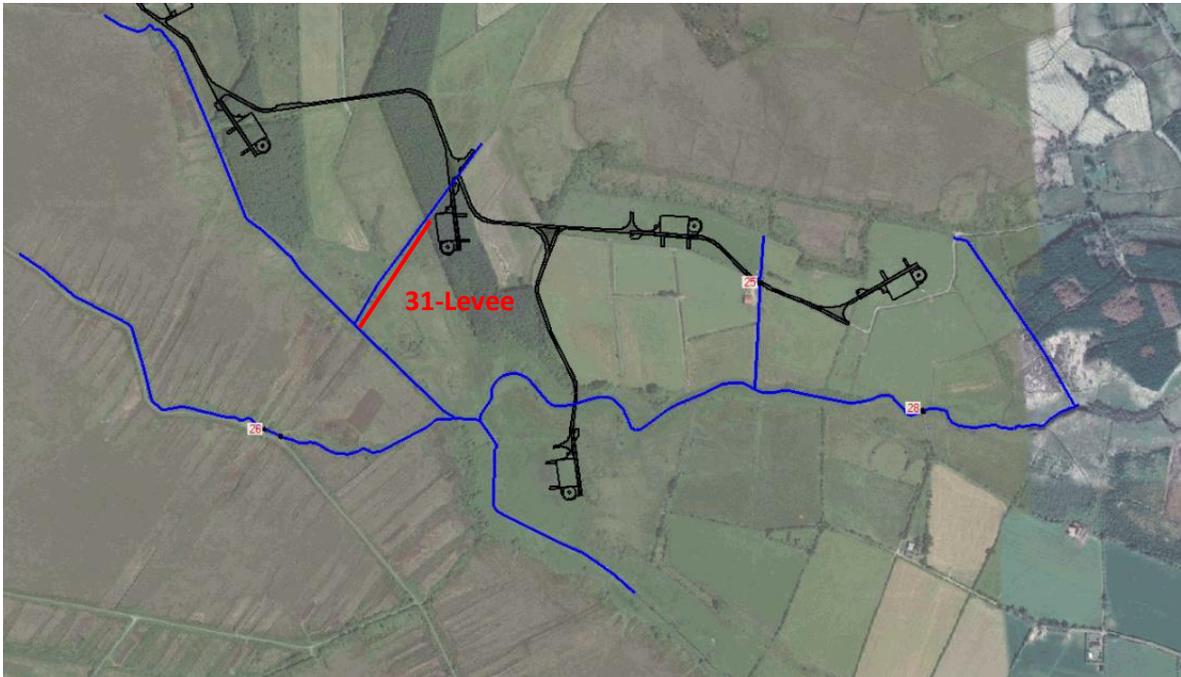


Figure 3.3. Location of Hydrological Features

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4 Stage 1 - Flood Risk Identification

Flood Risk Identification is the process for deciding whether a plan or project requires a Flood Risk Assessment (FRA). It is conducted in order to identify whether there are any flooding or surface water management issues related to a proposed development site that may warrant further investigation.

4.1 OPW HISTORIC FLOOD MAPS

No flooding around the site area was reported. On a site visit in August 2024 and the Winter of 2015/2016 Surface Water Flooding was reported; see blue hatch in Figure 4.1 below indicating flooding near turbine T8, however turbine T8 is to be constructed on a hardstand platform that will be constructed to above flood levels so there is no risk of flooding (i.e Turbine is outside of Flood zone A and B). Benefiting Lands also suggest no risk of flooding along the site area.

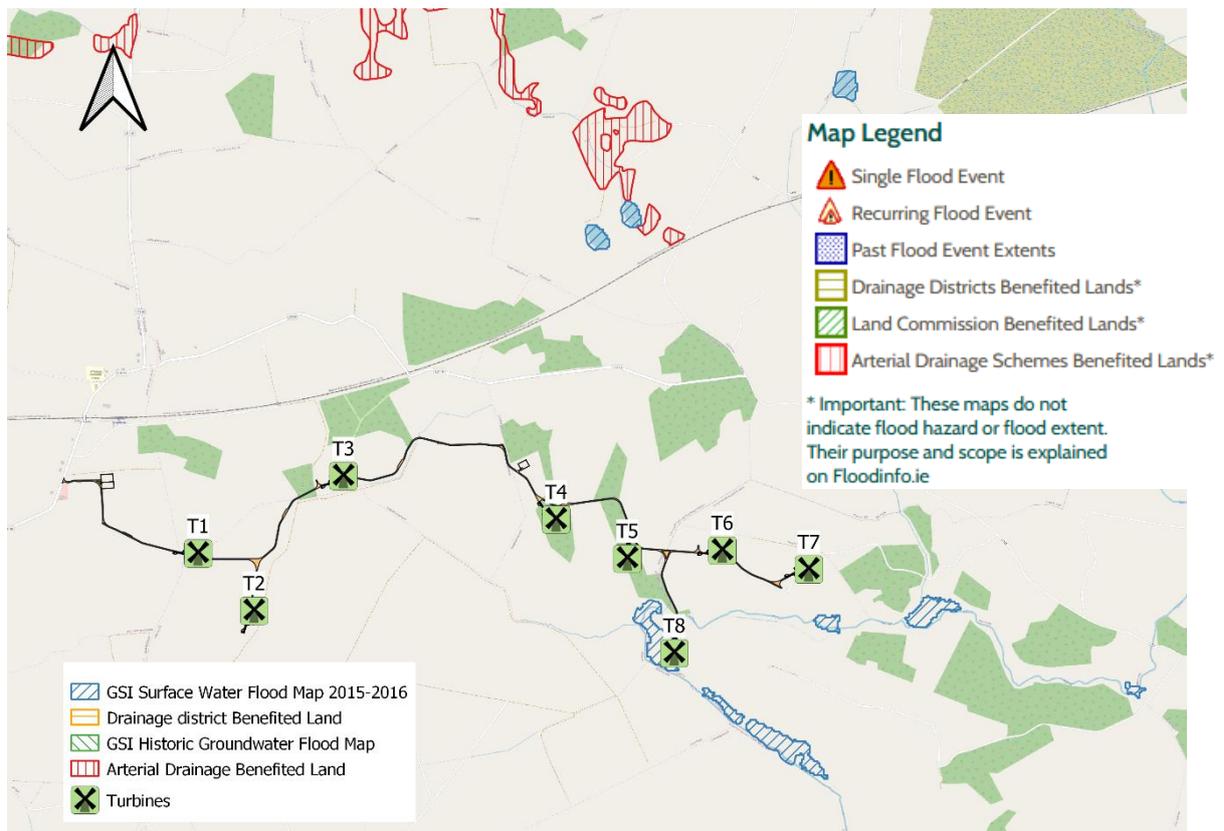


Figure 4.1. OPW flood hazard mapping [5].

4.2 LIKELIHOOD OF FLOODING FROM PREVIOUS STUDIES

4.2.1 Existing FRA

N/A

4.2.2 SFRA

The most recent Strategic Flood Risk Assessment (SFRA) draft plan [11] for Galway Co. Co. does not cover the proposed site area.

4.2.3 Previous FRAs at national/regional, strategic and site-specific scales

No previous FRA available.

4.2.4 Areas for Further Assessment and Benefiting Lands

The National Catchment Flood Risk Management (CFRAM) Programme has examined the flood risk, and possible mitigation measures to address the risk in 300 communities throughout the country at potentially significant flood risk. These communities were identified through the Preliminary Flood Risk assessment (PFRA), which was a national screening assessment of flood risk. The communities recognized as being at a significant flood risk are called Areas for Further Assessment (AFA). For the AFAs a detailed hydraulic modelling has been carried out to produce indicative flood maps (CFRAM Maps).

The subject site is not directly within any AFA (Figure 4.2).

The proposed site is not under the OPW Maintenance of Arterial Drainage Scheme.

The proposed wind farm is adjacent to the River Raford and Killimor. Indicative flood maps (Figure 4.2) produced by the OPW are available for the site only for Raford River and these show no flood risk throughout the site as shown below. Turbine T8 is located in flood zone A and along with turbines T1 and T2 these are the only turbines within flood zone A or B from indicative flood maps. Flooding of Turbines T1, T2 and T8 will be mitigated by constructing earth/stone filled hardstands with finished surface levels above calculated flood levels.

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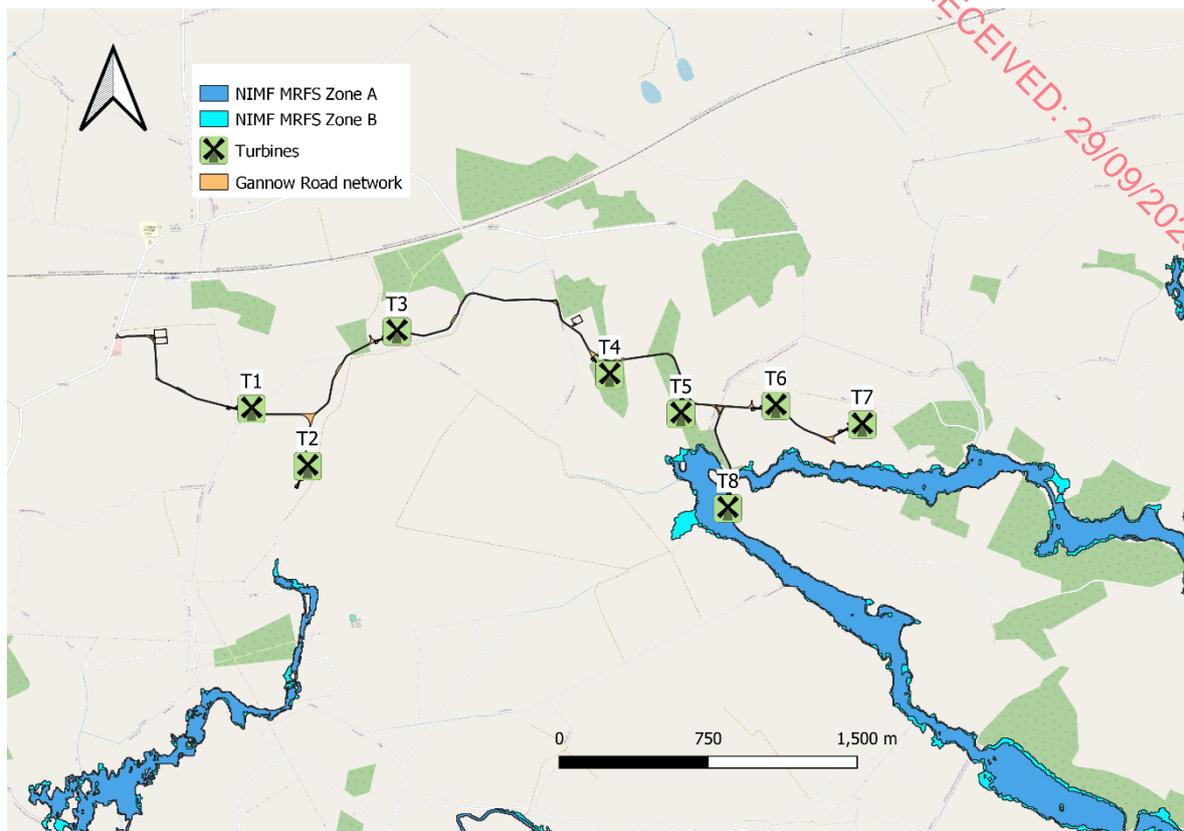


Figure 4.2. Indicative Flood Maps (floodinfo.ie)

4.3 SOURCES OF FLOODING

4.3.1 Fluvial flooding

Fluvial flooding occurs when the capacity of a watercourse is exceeded or the channel is blocked or restricted and excess water spills out from the channel onto the floodplain.

According to the OPW historical flood maps (Figure 4.1) and indicative flood maps (Figure 4.2) there are clear indications that the site is predominately located outside flood zones A and B.

Since indicative flood maps (Figure 4.2) do not entirely cover the west side of the site, it is concluded that any flooding risk from the River Killimor and the River Raford have to be assessed with more detailed site specific flood maps.

4.3.1.1 CFRAM and NIF Maps

CFRAM Fluvial Mapping for the subject area is not available because the site area was not included in CFRAM detailed maps [9] at the time of writing of this report.

The National Indicative Fluvial (NIF) mapping (Figure 4.3) suggest that the site is outside 1% and 0.1% AEP flood zones.



Figure 4.3. NIF Fluvial flood extent for 1% and 0.1% AEP (source: www.floodinfo.ie).

4.3.1.2 County Development Plan

Apart from zoning within the Renewable Energy Strategy of Galway County Development Plan [10]-[12], the site is not within zoning of County Development Plan, see Annex F and Annex G.

4.3.2 Coastal flooding

Coastal flooding which is caused by higher sea levels than normal, largely as a result of storm surges combined with high tides resulting in the sea inundating the land. Coastal flooding is influenced by the following three factors, which often work in combination: High tide levels i.e. Highest Astronomical Tide (HAT) combined with storm surges caused by low barometric pressure exacerbated by high winds and wave action which is dependent on wind speed and direction, local topography and exposure.

The ground levels within the site varies between 60.0mOD and 78.0mOD. **The site at no risk of coastal flooding.**

4.3.3 Pluvial flooding

Pluvial flood risk has been assessed using CFRAM PFRA maps (floodinfo.ie) and findings from the site visit. According to PFRA maps the subject site is not vulnerable to pluvial flooding.

It should be noted that all proposed developments must limit the surface runoff to the greenfield rate (pre-development rate) so as not to increase the flood risk downstream of the site. The site visit in August 2023 confirmed some pluvial flooding (water ponding) at the south east end of the site at Raford River. The water table is high and a large portion of land is marshy with no depressions.

The Winter 2015/2016 Surface Water Flooding map from GSI Groundwater Flooding Data Viewer data show fluvial (rivers) and pluvial (rain) floods in Ireland during the 2015/2016 flood event and indicate possible Pluvial / overland flooding at the site (Figure 4.4). This flooding is predominately evident at the south east end of the site around Raford River. This ponding and very wet soil conditions were evident during the site visit. The depth of water was noted to be low (<0.2m) and this would not cause flooding of the extended wind farm road network or turbine hard stands. This ponding influences soil conditions and makes foundation conditions for the construction of turbine T8 hardstand and bridge B1 piers and abutments more challenging for design rather than posing a flood concern.

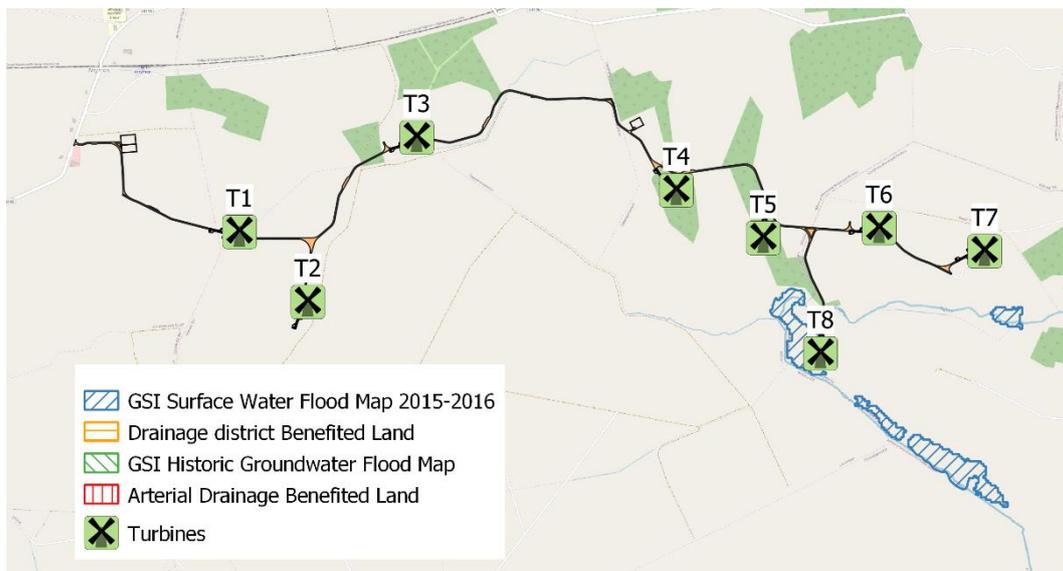


Figure 4.4. The GSI Winter 2015/2016 Surface Water Flooding map.

4.3.4 Overland flooding

Overland flooding occurs when the amount of rainfall exceeds the infiltration capacity of the ground to absorb it. This excess water flows overland, ponding in natural hollows and low-lying areas or behind obstructions.

Drainage channels of the surrounding fields are in operation to intercept overland flooding. Overland flooding, e.g. surface water is associated with pluvial flooding, see section above.

4.3.5 Groundwater flooding

Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall to meet the ground surface and flows out over it, i.e. when the capacity of this underground reservoir is exceeded.

The terrain configuration at the site is flat and with a low to medium slope in north to south direction (see Figure 5.5 and Figure 6.1). The subsoil at the site has lower permeability as it is underlain with Limestone till (Carboniferous) (TLs) and Cutover peat (Cut) with some more permeable Alluvium undifferentiated (A), see Figure 3.1. There are no notable ponds, depressions or karst features at the site (Figure 3.2).

GSI Groundwater flooding probability maps show no risk to groundwater flooding at the site.

4.3.6 Flooding from artificial drainage systems

Flooding from artificial drainage systems results when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, the system becomes blocked, and/or cannot discharge due to a high-water level in the receiving watercourse.

There several surface drainage channels within the proposed development site. The drainage channels have crossings that could be blocked or backwater could occur due to fluvial flooding of the river Killimor. Therefore, the risk from drainage channel systems is linked to the fluvial flooding risk.

4.3.7 Flooding arising from the failure of infrastructure

Flooding arising from the failure of infrastructure designed to store or carry water is a less frequent form of flooding. This type of flooding could occur due to e.g. a dam breach, a leaking canal, or a breach of flood protection measures (e.g. breach of a flood defence, failure of a non-return valve, pumping station or the blockage of a pipe or culvert).

There are no flood protection measures, e.g. dams or canals located at or near the proposed development site.

4.4 OTHER SOURCES

4.4.1 Flow gauge information

There are no gauging stations within the subject site.

4.4.2 Local embankments

See section 4.3.7.

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4.5 SOURCE-PATHWAY-RECEPTOR MODEL AND DEVELOPMENT CLASSIFICATION

A Source-Pathway-Receptor (SPR) model, see Table 4.1 summarizes the possible sources of floodwater, the receptors that maybe affected by potential flooding and the pathways by which flood water may reach the receptors. These sources, pathways and receptors will be assessed further in the Stage 2- Initial flood risk assessment

Table 4.1. Source-Pathway-Receptor Analysis

Source	Pathway	Receptor	Flood Risk?
Tidal/Coastal	Flood defence (Banks)	Proposed site	No
Fluvial	River Raford and River Killimor and drainage canals	Proposed site	Yes
Pluvial	Increased runoff from developed site increasing flood levels	Proposed site	No
Groundwater (GW) flooding	Rising GW level on the site	Proposed site	No

As the Indicative flood maps for Killimor river are not available, the fluvial flood risk should be further assessed. The only remaining flood risk at the site is from Fluvial flooding.

4.5.1 Mitigation measures

Proposed turbine hard stands should be constructed with finished ground level at such a height greater than:

$$H_{1000} \text{ (0.1\% AEP water levels) } + 0.50\text{m (freeboard)}$$

Planned road networks within the wind farm should include only widening of existing farm tracks and new access road routes should be constructed to finish surface levels of the existing adjacent floodplain in order to exclude the possibility of water backup due to blockage of existing flood flow paths within the floodplains. Crossings of the River Killimor and River Raford should be subject to OPW Section 50 approval.

5 Stage 2 - Initial flood risk assessment

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5.1 INTRODUCTION

The purpose of the initial scoping flood risk assessment is to ensure that the relevant flood risk issues are identified so that they can be addressed appropriately in the Flood Risk Assessment (FRA). The scoping phase included:

- Confirmation of sources of flooding that may affect a plan area
- An appraisal of the availability and adequacy of existing information
- Scope of possible mitigation measures

The previously conducted screening process implies that a development proposal is at risk from fluvial (river) flooding. It was concluded that the development site is at low risk of flooding from artificial drainage systems and groundwater flooding, and therefore these flood mechanisms were excluded from further investigation.

5.1.1 Methodology

In order to assess the existing flooding risks associated with the development proposal, an unsteady 1D/2D computer based hydrological/hydraulic model study was carried out. The 2D model component covers an area of 5km². The 1D model covers river reaches of c.11km, defined by 597 cross-sections and 42 bridges/culverts (the Existing River System model contains 30 bridges). The assessment also involves a hydrological analysis to determine a design flood flow.

The detailed assessment involved the following:

1. A hydrological analysis to determine the magnitude of the mean annual flood Q_m , 100-year and the 1000-year at defined HEP points.
2. Site visits to determine the extent of the river reach to be modelled based on detailed river and flood plain survey data.
3. Collection of additional survey data to develop DEM of selected river reach.
4. Computer model simulation to determine existing flood levels at the site for the design flow for the existing river and floodplain.

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5.2 HYDROLOGY

The river flood risk is assessed on the basis of a 100-year (1% AEP) and 1000-year (0.1% AEP) flood flow hydrographs. The calculation of the design flow involved the use of the Office of Public Works Flood Studies Update (FSU) Programme¹ [14-17]. The FSU calculation reports are shown in Annex J. Median annual maximum flood Q_m at ungauged sites is estimated from seven catchment descriptors:

AREA, S1085, BFISOIL, SAAR, FARL, DRAIN, ARTDRAIN2.

In accordance with the OPW guidelines on hydrology, appropriate hydrological methods were used in the determination of the design peak flow which reflected the size of the catchment and the availability of river flow data in the vicinity of the wind farm site. The generation of a design flood hydrograph was necessary since we are investigating hydrological system storage effects caused by the infrastructure of the windfarm.

The following hydrological methods used for calculation of design flow rates are as follows:

- Flood Studies Update – FSU [14]
- Institute of Hydrology loH124 [18].
- The Flood Estimation Handbook (FEH) [20]

5.2.1 Catchment Area

The calculation of the total catchment area at the downstream end of the model is 43.787km² (where Killimor has 5.277km² and Raford has 38.560km²), see Figure 5.1. The effective contributing catchment area is calculated as:

$$\text{Catchment area, } A = 43.787\text{km}^2.$$

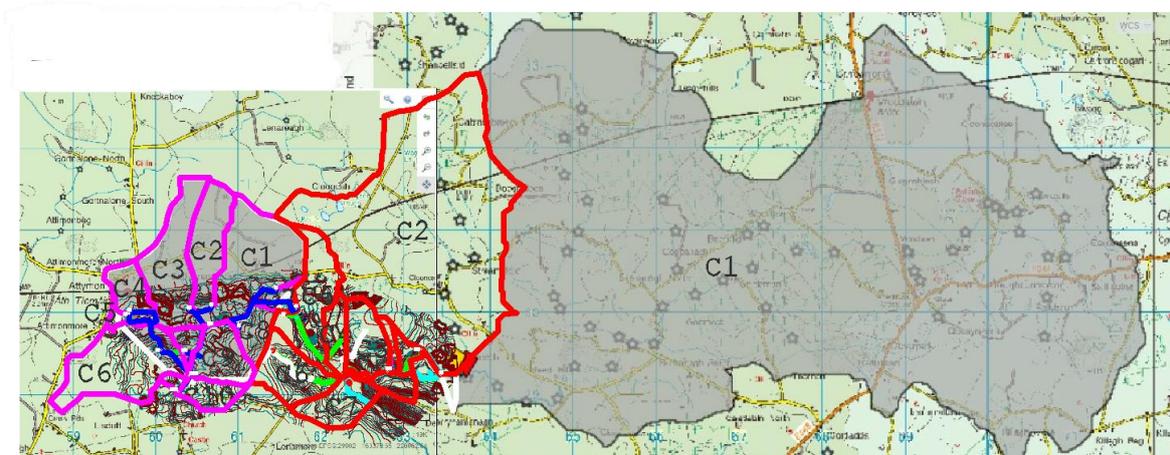


Figure 5.1. Catchment area delineation for all HEPs.

¹ Office of Public Works, Flood Studies Update, Technical Research Report, Volumes I-IV, 2014.

5.2.2 Hydrological Estimation Points - HEPs

As stated in the Section above, the FRA requires a high resolution hydrological analysis due to the fact that the OPW Indicative flood maps show flooding. The hydrological model for the wind farm site therefore is complex involving the combination of a number of tributaries and drainage channels.

Each of the tributaries is hydrologically assessed separately and the runoff is calculated for a set of Hydrological Estimation Points (HEPs). The locations of the HEPs are shown in Figure 5.2 below. The breakdown of the contributing catchment areas for each HEP is given in the Table 5.1 below.

Table 5.1. Contributing catchment area for each HEP

HEP ID at Killimor	Total Area [km ²]	HEP ID at Raford	Total Area [km ²]
kH1	1.101	rH1	30.418
kH2	0.565	rH2	5.554
kH3	1.002	rH3a	0.409
kH4	0.253	rH3b	0.078
kH5	0.096	rH3c	0.097
kH6	1.040	rH3d	0.152
kH7	0.129	rH4	0.224
kH8	0.245	rH5	0.717
kH9a	0.419	rH6	0.515
kH9b	0.116	rH7	0.395
kH10a	0.218		
kH10b	0.021		
kH10c	0.021		

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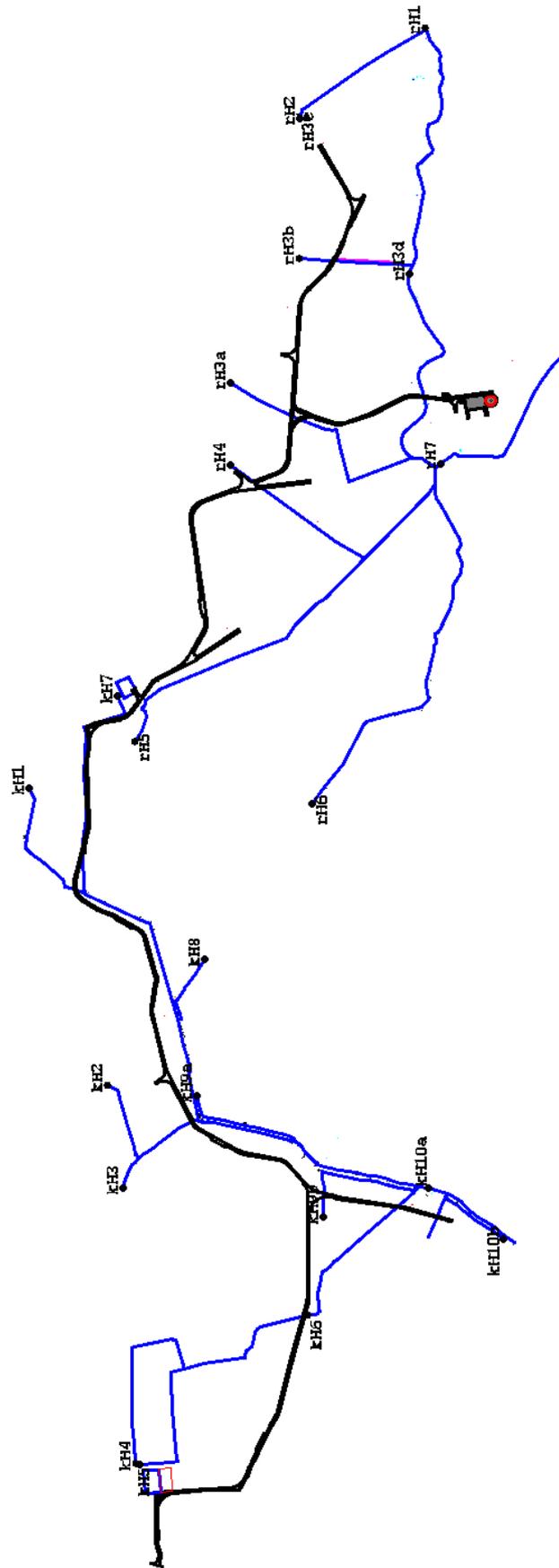


Figure 5.2. Location of HEPs.

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5.2.3 Design Flow Rates

5.2.3.1 Flood Study Update

The catchment of the selected subject site at Killimor river has an area of 5km² which is below the FSU minimum threshold and is recommended to apply 5-parameter FSU method for this catchment. The catchment of the selected subject site at Raford river has an area of 38km² which is above the FSU minimum threshold and is ideally suited FSU 7-parameter method for this catchment.

The FSU Catchment characteristic approach was used to determine Q_{med} values. The OPW online tool was used to determine BFISOIL, SAAR, FARL, DRAIN2, ARTDRAIN2 and URBEXT, see table below and [Annex K](#).

Table 5.2. FSU Input parameters

Contributing Catchment Area	Killimor	Raford	km ²
BFISOIL	0.472	0.514	
SAAR	1089.43	1093.31	mm
FARL	1	0.994	
DRAIN2	0.616	1.462	km/km ²
S ₁₀₈₅	7.3	2.82	m/km
ARTDRAIN2	0.00	0.00	
URBEXT	0.00	0.00	
Q_{MED} values	2.61	9.32	
Q _{med} (without factors)	2.61	9.32	m ³ /s

The Pivotal site adjustment factor was not used as the flows without adjustment are more conservative. The EV1 distribution yielded the Growth factors as shown in Table 5.3 below.

Table 5.3. Growth factors from FSU analysis.

Return Period [years]	Growth factors for Killimor [1]	Growth factors for Raford [1]
2	1	1
5	1.33	1.32
10	1.55	1.51
50	2.03	1.90
100	2.24	2.06
200	2.44	2.22
1000	2.91	2.59

The FSU Method was applied to the HEPs as shown in Table 5.4 and Table 5.5 and below:

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5.2.3.1.1 Flood Study Update 5 parameter (Killimor)

There site area is rural. $Q_{med} = 11.45$ (2-year flood flow) was calculated based using equation below. A Climate Change factor of 1.20 is applied to the Q_{med} .

$$Q_{med} = 0.000020951 \times AREA^{0.9245} BFI_{soil}^{-0.903} SAAR^{1.2695} FARL^{2.3163} S1085^{0.2513} \quad (2.1)$$

Table 5.4. FSU design flows for Killimor.

	Return Period	Q2	Q5	Q10	Q50	Q100	Q200	Q1000
	F.S.E	1.37	1.37	1.37	1.37	1.37	1.37	1.37
	G.F	1.20	1.60	1.86	2.44	2.69	2.93	3.49
HEP	FSU 5-variable Q_{MED} [m ³ /s]	Flow rate increasing downstream [m ³ /s]						
kH1	0.53	0.867	1.153	1.344	1.761	1.943	2.116	2.524
kH2	0.28	0.468	0.623	0.726	0.951	1.049	1.142	1.363
kH3	0.48	0.795	1.057	1.232	1.613	1.780	1.939	2.313
kH4	0.14	0.223	0.296	0.345	0.452	0.499	0.543	0.648
kH5	0.06	0.091	0.121	0.141	0.185	0.204	0.223	0.266
kH6	0.50	0.823	1.094	1.275	1.670	1.842	2.007	2.393
kH7	0.07	0.120	0.159	0.186	0.243	0.268	0.292	0.349
kH8	0.13	0.216	0.288	0.335	0.439	0.484	0.527	0.629
kH9a	0.22	0.355	0.472	0.550	0.720	0.794	0.865	1.032
kH9b	0.07	0.108	0.144	0.167	0.219	0.242	0.263	0.314
kH10a	0.12	0.194	0.258	0.301	0.394	0.435	0.473	0.565
kH10b	0.01	0.022	0.030	0.035	0.046	0.050	0.055	0.065
kH10c	0.01	0.022	0.030	0.035	0.046	0.050	0.055	0.065

*G.F. includes 20% increase for climate change

These flows were further processed for suitable form for hydraulic model input (see Table 5.10).

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5.2.3.1.2 Flood Study Update 7 parameter (Raford)

There site area is rural. $Q_{med} = 11.45$ (2-year flood flow) was calculated using the equation below. A Climate Change factor of 1.20 is applied to the Q_{med} .

$$Q_{med} = 1.237 \times 10^{-5} AREA^{0.937} BF\text{soil}^{-0.922} SAAR^{1.306} FARL^{2.217} DRAIN^{0.341} S1085^{0.185} (1+ARTDRAIN2)^{0.408} \quad (2.2)$$

$$Q_{med,urb} = Q_{med} \times (1+URBEXT)^{1.4825} \quad (2.2)$$

Table 5.5. FSU design flows for Raford.

	Return Period	Q2	Q5	Q10	Q50	Q100	Q200	Q1000
	F.S.E	1.37	1.37	1.37	1.37	1.37	1.37	1.37
	G.F	1.20	1.58	1.81	2.28	2.47	2.66	3.11
HEP	FSU 7-variable Q_{MED} [m ³ /s]	Flow rate increasing downstream [m ³ /s]						
rH1	7.09	11.651	15.379	17.593	22.137	24.001	25.865	30.176
rH2	1.44	2.368	3.126	3.576	4.499	4.878	5.257	6.133
rH3a	0.13	0.206	0.271	0.310	0.391	0.424	0.456	0.533
rH3b	0.03	0.043	0.057	0.065	0.082	0.089	0.096	0.112
rH3c	0.03	0.054	0.071	0.081	0.102	0.110	0.119	0.139
rH3d	0.05	0.081	0.107	0.123	0.154	0.167	0.180	0.210
rH4	0.07	0.117	0.155	0.177	0.222	0.241	0.260	0.303
rH5	0.21	0.348	0.459	0.525	0.661	0.716	0.772	0.901
rH6	0.16	0.255	0.337	0.385	0.485	0.526	0.566	0.661
rH7	0.12	0.199	0.263	0.301	0.378	0.410	0.442	0.516

**G.F. includes 20% increase for climate change*

These flows were further processed for suitable form for hydraulic model input (see Table 5.10).

5.2.3.2 The Flood Estimation Handbook (FEH)

Q_{MED} is used as the index flood in the Flood Estimation Handbook. “ Q_{MED} is formally defined as the middle ranking value in the series of annual maximum floods, where the annual maximum series comprises the largest flow observed in each year.”

The FEH catchment descriptor methods are applicable to catchments no smaller than 0.5km² (50 ha).

There site is rural. For Killimor River, the $Q_{med} = 4.17$ (2-year flood flow) was calculated using the equation below. For Raford $Q_{med} = 16.60$ (2-year flood flow) was calculated using the equation below. A Climate Change factor of 1.20 is applied to the Q_{med} .

$$Q_{med} = 8.306 AREA^{0.851} \times 0.154^{(1000/SAAR)} \times FARL^{3.445} \times 0.046^{(BF_{host})^2} \quad (2.3)$$

Table 5.6. FEH design flows.

FEH design flows for Killimor.

	Return Period	Q2	Q5	Q10	Q50	Q100	Q200	Q1000
	F.S.E	1.55	1.55	1.55	1.55	1.55	1.55	1.55
	G.F	1.20	1.60	1.86	2.44	2.69	2.93	3.49
HEP	FEH Q _{MED} [m ³ /s]	Flow rate increasing downstream [m ³ /s]						
kH1	0.80	1.490	1.982	2.310	3.025	3.338	3.636	4.336
kH2	0.45	0.845	1.124	1.310	1.715	1.892	2.061	2.459
kH3	0.74	1.375	1.829	2.131	2.791	3.080	3.355	4.001
kH4	0.23	0.426	0.567	0.661	0.865	0.955	1.040	1.241
kH5	0.10	0.188	0.249	0.291	0.381	0.420	0.458	0.546
kH6	0.76	1.419	1.887	2.200	2.881	3.179	3.463	4.130
kH7	0.13	0.241	0.320	0.373	0.489	0.540	0.588	0.701
kH8	0.22	0.415	0.552	0.643	0.842	0.929	1.012	1.207
kH9a	0.35	0.654	0.870	1.014	1.328	1.465	1.596	1.904
kH9b	0.12	0.219	0.291	0.339	0.444	0.490	0.534	0.637
kH10a	0.20	0.376	0.499	0.582	0.762	0.841	0.916	1.093
kH10b	0.03	0.052	0.069	0.080	0.105	0.116	0.126	0.150
kH10c	0.03	0.052	0.069	0.080	0.105	0.116	0.126	0.150

*G.F. includes 20% increase for climate change

FEH design flows for Raford.

	Return Period	Q2	Q5	Q10	Q50	Q100	Q200	Q1000
	F.S.E	1.55	1.55	1.55	1.55	1.55	1.55	1.55
	G.F	1.20	1.58	1.81	2.28	2.47	2.66	3.11
HEP	FEH Q _{MED} [m ³ /s]	Flow rate increasing downstream [m ³ /s]						
rH1	14.36	26.706	35.252	40.326	50.742	55.015	59.288	69.169
rH2	11.87	22.082	29.148	33.344	41.956	45.489	49.022	57.193
rH3a	2.79	5.195	6.857	7.844	9.871	10.702	11.533	13.455
rH3b	0.30	0.564	0.745	0.852	1.073	1.163	1.253	1.462
rH3c	0.07	0.137	0.181	0.207	0.261	0.283	0.305	0.355
rH3d	0.09	0.166	0.220	0.251	0.316	0.343	0.370	0.431
rH4	0.13	0.243	0.320	0.366	0.461	0.500	0.539	0.628
rH5	0.18	0.338	0.447	0.511	0.643	0.697	0.751	0.876
rH6	0.49	0.910	1.201	1.374	1.728	1.874	2.019	2.356
rH7	0.37	0.687	0.907	1.037	1.305	1.415	1.525	1.779

*G.F. includes 20% increase for climate change

5.2.3.3 Institute of Hydrology Report No. 124

Institute of Hydrology Report No. 124 [18] method is applicable for the catchments less than 25km^2. $Q_{BARrural}$ was calculated using the flood estimation for small catchments (IH124) equation:

$$Q_{BARrural} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17} [m^3/s], \quad (2.4)$$

Where AREA [km^2] is catchment area derived from contours, SAAR is annual rainfall derived from OPW FSU Portal, and SOIL (0.50) is soil index.

Q_{bar} was calculated to be
 For Killimor: $4.74\text{m}^3/\text{s}$, e.g. $Q_{med} = Q_{bar}/1.07 = 4.43$;
 For Raford: $24.50\text{m}^3/\text{s}$, e.g. $Q_{med} = Q_{bar}/1.07 = 22.85$.

A growth factor consists of climate change factor (1.2), 1% AEP growth factor pooled from FSU pooled analysis and Factorial Standard Error (FSE) of 1.65.

The IH124 Method was applied to the HEPs as shown in Table 5.7 below:

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Table 5.7. IoH 124 design flows.

IoH 124 design flows for Killimor.

	Return Period	Q2	Q5	Q10	Q50	Q100	Q200	Q1000
	F.S.E	1.55	1.55	1.55	1.55	1.55	1.55	1.55
	G.F	1.20	1.60	1.86	2.44	2.69	2.93	3.49
HEP	IoH124 Q _{MED} [m ³ /s]	Flow rate increasing downstream [m ³ /s]						
kH1	0.87	1.731	2.302	2.683	3.514	3.877	4.223	5.037
kH2	0.48	0.956	1.272	1.482	1.941	2.142	2.333	2.783
kH3	0.80	1.591	2.116	2.466	3.230	3.564	3.883	4.630
kH4	0.24	0.468	0.622	0.725	0.949	1.047	1.141	1.361
kH5	0.10	0.198	0.264	0.307	0.402	0.444	0.483	0.577
kH6	0.83	1.645	2.187	2.549	3.339	3.684	4.013	4.786
kH7	0.13	0.257	0.342	0.399	0.522	0.576	0.628	0.749
kH8	0.23	0.454	0.604	0.704	0.922	1.018	1.109	1.322
kH9a	0.37	0.732	0.973	1.134	1.485	1.639	1.786	2.129
kH9b	0.12	0.233	0.310	0.361	0.473	0.521	0.568	0.677
kH10a	0.21	0.410	0.545	0.635	0.831	0.917	0.999	1.192
kH10b	0.03	0.051	0.068	0.080	0.104	0.115	0.126	0.150
kH10c	0.03	0.051	0.068	0.080	0.104	0.115	0.126	0.150

*G.F. includes 20% increase for climate change

IoH 124 design flows for Raford.

	Return Period	Q2	Q5	Q10	Q50	Q100	Q200	Q1000
	F.S.E	1.55	1.55	1.55	1.55	1.55	1.55	1.55
	G.F	1.20	1.58	1.81	2.28	2.47	2.66	3.11
HEP	IoH124 Q _{MED} [m ³ /s]	Flow rate increasing downstream [m ³ /s]						
rH1	16.83	33.326	43.990	50.322	63.320	68.652	73.984	86.315
rH2	3.71	7.337	9.685	11.079	13.941	15.115	16.289	19.003
rH3a	0.36	0.720	0.951	1.087	1.368	1.484	1.599	1.865
rH3b	0.08	0.164	0.217	0.248	0.312	0.338	0.364	0.425
rH3c	0.10	0.201	0.265	0.303	0.382	0.414	0.446	0.520
rH3d	0.15	0.298	0.393	0.450	0.566	0.613	0.661	0.771
rH4	0.21	0.422	0.557	0.637	0.801	0.869	0.936	1.092
rH5	0.60	1.186	1.566	1.791	2.254	2.443	2.633	3.072
rH6	0.45	0.884	1.167	1.335	1.680	1.821	1.963	2.290
rH7	0.35	0.698	0.922	1.054	1.327	1.439	1.550	1.809

*G.F. includes 20% increase for climate change

5.2.3.4 Hydrology – Summary

The catchment area was calculated to be 5.23km² for Killimor and 38.56km² for Raford. This gives total catchment area of 43.787 km².

FSU approach was used to determine Q_{med} , Q_{100} , Q_{100cc} and Q_{1000cc} flood flows.

It should be noted that majority of the sub-catchments have catchment area less than 25km², thus FSU 5-parameter equation, FSE method and loH124 were used. Additionally, input flow hydrographs are set to peak at the same time. This adds additional safety factor and implies that input flood flows flood maps are conservative.

The design flows are calculated using loH124 method. Design flows for Q_{100cc} and Q_{1000cc} are shown in Table 5.8 and Table 5.9 respectively.

Table 5.8. Summary table comparing design Q_{100cc} flows for MRFS.

River	HEP	HEC-RAS node	Area [km ²]	FSU [m ³ /s]	FEH [m ³ /s]	loH124 [m ³ /s]
Killimor	kH1	H1	1.101	1.943	3.338	3.877
Killimor	kH2	H2	0.565	1.049	1.892	2.142
Killimor	kH3	H3	1.002	1.780	3.080	3.564
Killimor	kH4	H4	0.253	0.499	0.955	1.047
Killimor	kH5	H5	0.096	0.204	0.420	0.444
Killimor	kH6	H6	1.040	1.842	3.179	3.684
Killimor	kH7	H7	0.129	0.268	0.540	0.576
Killimor	kH8	H8	0.245	0.484	0.929	1.018
Killimor	kH9a	H9a	0.419	0.794	1.465	1.639
Killimor	kH9b	H9b	0.116	0.242	0.490	0.521
Killimor	kH10a	H10a	0.218	0.435	0.841	0.917
Killimor	kH10b	H10b	0.021	0.050	0.116	0.115
Killimor	kH10c	H10c	0.021	0.050	0.116	0.115
Raford	rH1	C1	30.418	24.001	55.015	68.652
Raford	rH2	C2	5.554	4.878	45.489	15.115
Raford	rH3a	UBC1	0.409	0.424	10.702	1.484
Raford	rH3b	Raford-Trib2	0.078	0.089	1.163	0.338
Raford	rH3c	UBC2	0.097	0.110	0.283	0.414
Raford	rH3d	Radford-Up 1366	0.152	0.167	0.343	0.613
Raford	rH4	C4	0.224	0.241	0.500	0.869
Raford	rH5	C5	0.717	0.716	0.697	2.443
Raford	rH6	C6	0.515	0.526	1.874	1.821
Raford	rH7	C7	0.395	0.410	1.415	1.439

Table 5.9. Summary table comparing design Q_{1000cc} flows for MRFS

River	HEP	HEC-RAS node	Area [km ²]	FSU [m ³ /s]	FEH [m ³ /s]	10H124 [m ³ /s]
Killimor	kH1	H1	1.101	2.524	4.336	5.037
Killimor	kH2	H2	0.565	1.363	2.459	2.783
Killimor	kH3	H3	1.002	2.313	4.001	4.630
Killimor	kH4	H4	0.253	0.648	1.241	1.361
Killimor	kH5	H5	0.096	0.266	0.546	0.577
Killimor	kH6	H6	1.040	2.393	4.130	4.786
Killimor	kH7	H7	0.129	0.349	0.701	0.749
Killimor	kH8	H8	0.245	0.629	1.207	1.322
Killimor	kH9a	H9a	0.419	1.032	1.904	2.129
Killimor	kH9b	H9b	0.116	0.314	0.637	0.677
Killimor	kH10a	H10a	0.218	0.565	1.093	1.192
Killimor	kH10b	H10b	0.021	0.065	0.150	0.150
Killimor	kH10c	H10c	0.021	0.065	0.150	0.150
Raford	rH1	C1	30.418	30.176	69.169	86.315
Raford	rH2	C2	5.554	6.133	57.193	19.003
Raford	rH3a	UBC1	0.409	0.533	13.455	1.865
Raford	rH3b	Raford-Trib2	0.078	0.112	1.462	0.425
Raford	rH3c	UBC2	0.097	0.139	0.355	0.520
Raford	rH3d	Radford-Up 1366	0.152	0.210	0.431	0.771
Raford	rH4	C4	0.224	0.303	0.628	1.092
Raford	rH5	C5	0.717	0.901	0.876	3.072
Raford	rH6	C6	0.515	0.661	2.356	2.290
Raford	rH7	C7	0.395	0.516	1.779	1.809

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5.3 HYDRAULIC MODEL FOR EXISTING RIVER SYSTEM

5.3.1 Methodology

The methodology described in Section above requires the development of a 1d-2d HEC-RAS computer model for varying flood flows to provide:

1. Hydrological/hydraulic simulations for the existing pre-development on the rivers Killimor and Raftord and flood plain site which give a benchmark for post-development impacts.
2. Hydrological/hydraulic simulations to determine if there are any hydrological/hydraulic impacts adjacent to or downstream of the site.
3. Hydrological/Hydraulic simulations of the initial proposed windfarm layout and iterations leading to the final design (chapter 6).
4. Hydrological/hydraulic simulations of the final windfarm layout to obtain all relevant data relating to the wind farm design and planning application.

5.3.2 Model description

The computer model is based on detailed river and tributary cross-sections which form the 1-D component of the model and detailed topographical maps of the surrounding flood plains which provide the 2-D component of the integrated 1d-2d HEC-RAS computer model. In addition to this, estimates of the river channel and flood plain roughness (Manning's-n values) are required as input parameters and these were determined during a site inspection.

Models were developed for two River Systems:

- Existing River System which uses the geometry of the natural river channel and flood plains.
- Design River System that includes the final geometry of the proposed windfarm.

In addition to the assessment of flood risks for the development, adjacent lands and downstream reaches, the simulations provided the following additional information:

- Identification of locations where new or upgraded culverts would be required.
- Identification of existing culverts and the role they play in providing storage in the hydrological system.

The 2-D model covers an area of 5km². The 1-D model covers a reach of c. 11km, defined by 597 cross sections and a 38 bridges/culverts (the Existing River System model contains 30 bridges). The layout of the HEC-RAS cross-section locations and DTM are shown in Figure 5.3.

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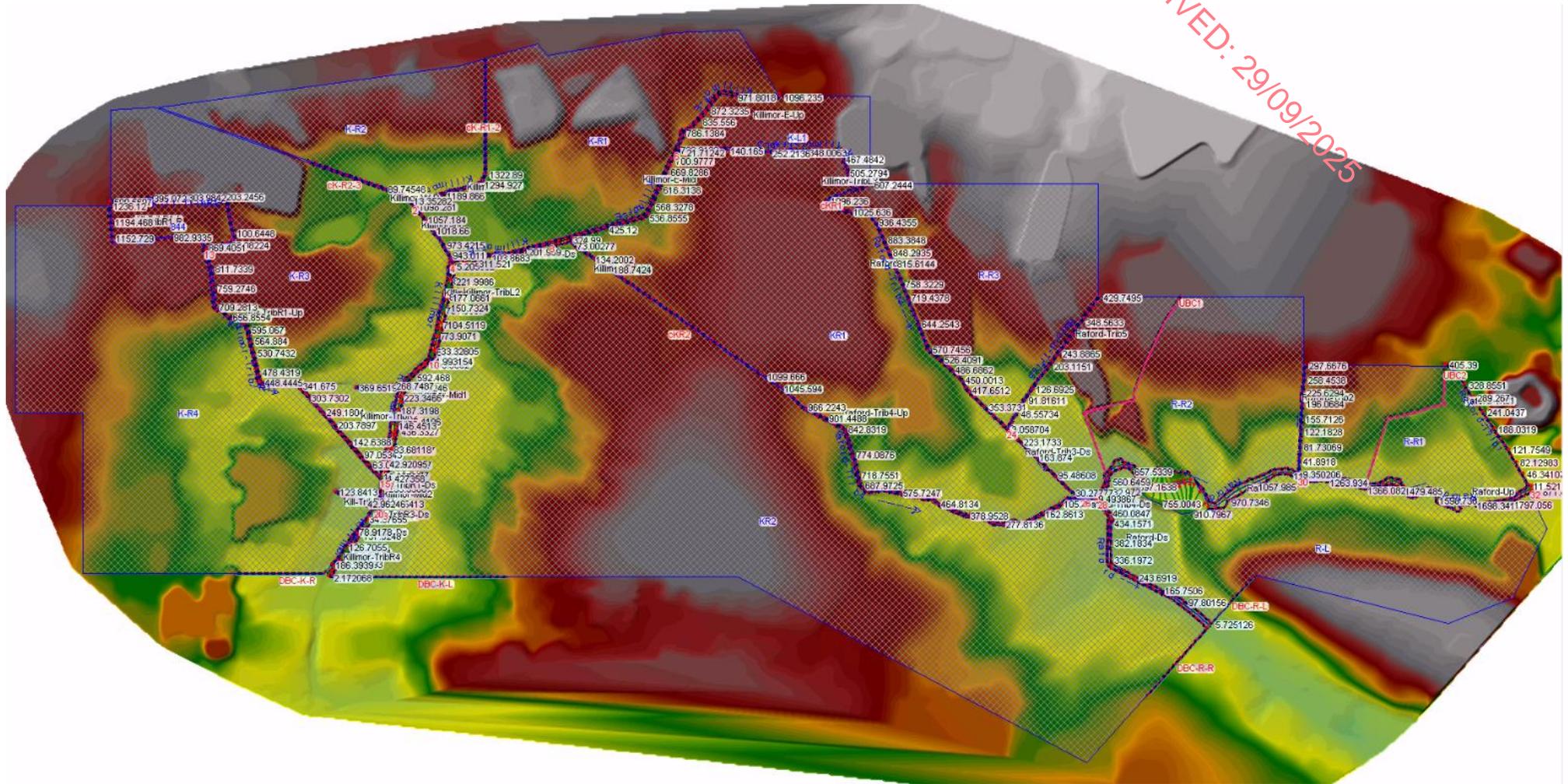


Figure 5.3. Layout of HEC-RAS model.

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5.3.3 Model Input data

5.3.3.1 Geometry - Survey of river bed and flood plains

A survey of the river channel, banks and flood plains was carried out between 7th to 14th August 2023 by KU217 Ltd. The survey included river banks, river channel and flood plains (see Figure 5.4). The extensive area of the flood plains was surveyed using a LIDAR/RGB Drone surveying. The survey covered a river length of more than 11km. The survey data were processed using a GIS toolset and two Digital Terrain Models (DTM) were created. The first DTM describes the Existing River System and flood plains (Figure 5.5) and second one describes the Design River System with added wind turbine hardstands elevated above flood water levels, a road network which follows the existing terrain and includes additional bridges and culverts (Figure 6.1).

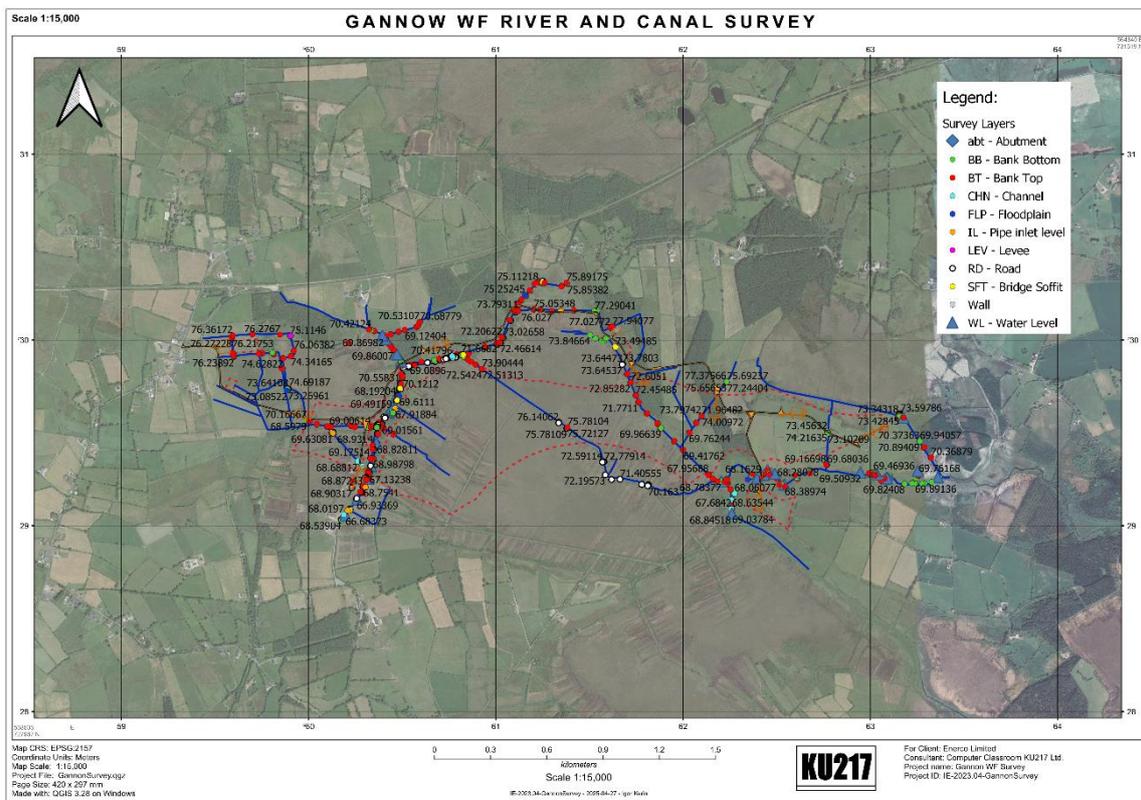


Figure 5.4. Overlay of the Survey points and satellite images.

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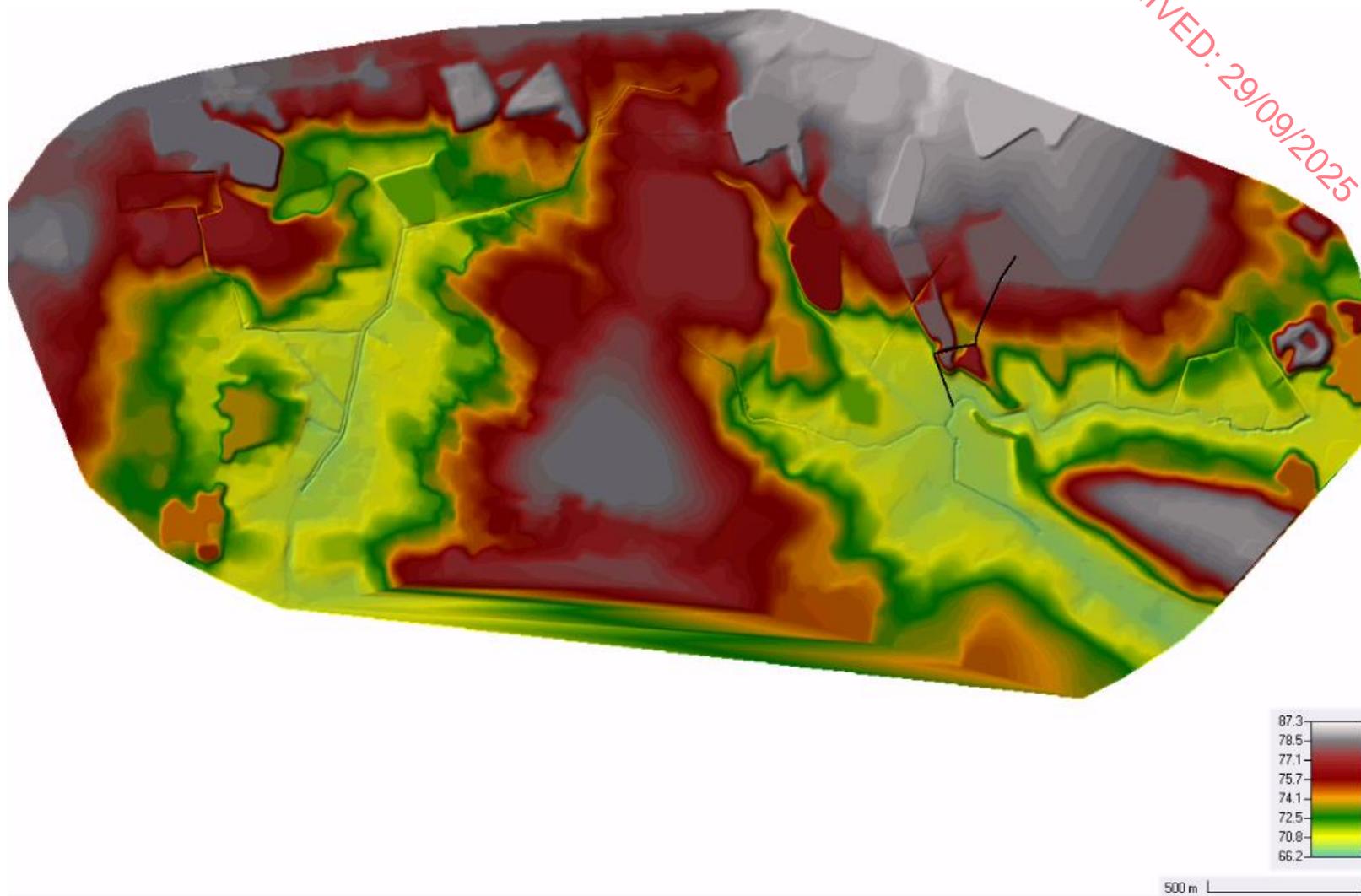


Figure 5.5. Digital Terrain Model of the existing model area.

5.3.3.2 Upstream Boundary condition

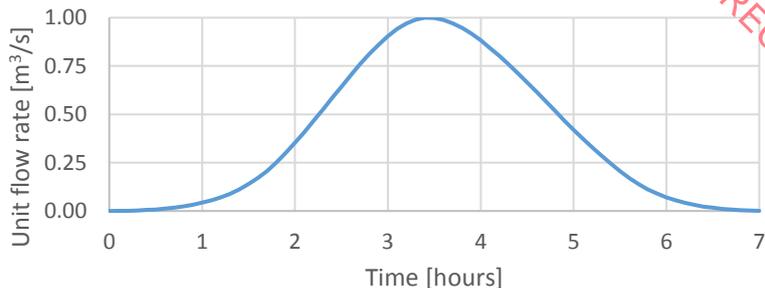
The upstream boundary conditions for the unsteady flow computer simulations is a set of 7-hour hydrographs with 3.4-hour rising stages (see Figure 5.6). A total of 23 upstream boundary conditions were defined and are listed in Table 5.10.

Table 5.10. Input design flows for the hydraulic model.

HEPs	HEC-RAS				Peak Flow [m ³ /s]	
	No	River	Reach	Station [m]	Q _{100cc}	Q _{1000cc}
kH1	1	Kil-TribR1-L	Kil-TribR1-L	500.5697	1.047	1.361
kH2	2	Killimor	Killimor-W-L	1322.89	2.142	2.783
kH3	3	Killimor	Killimor-Mid2	283.3988	0.917	1.192
kH4	5	Killimor-E	Killimor-E-Up	1096.235	3.877	5.037
kH5	6	Killimor-TribL1	Killimor-TribL1	188.7424	1.018	1.322
kH6	7	Killimor-TribL2	Killimor-TribL2	311.521	1.639	2.129
kH7	8	Killimor-TribL3	Killimor-TribL3	607.2444	0.576	0.749
kH8	9	Killimor-TribR1	Kil-TribR1-R	1236.12	0.444	0.577
kH9a	10	Killimor-TribR1	Kil-TribR1-Up	456.5301	3.684	4.786
kH9b	11	Killimor-TribR2	Killimor-TribR2	369.6519	0.521	0.677
kH10a	12	Killimor-TribR3	Kil-TribR3-Up	123.8413	0.115	0.150
kH10b	13	Killimor-TribR4	Killimor-TribR4	186.3939	0.115	0.150
kH10c	14	Killimor-W	Killimor-W-R	89.74548	3.564	4.630
rH1	15	Raford	RafordIN	1871.475	68.652	86.315
rH2	16	Raford	Raford-Up	1366.082	0.613	0.771
rH3b	17	Raford	Raford-DS	494.0685	1.439	1.809
rH3d	19	Raford-Trib1	Raford-Trib1	405.39	15.115	19.003
rH4	20	Raford-Trib2	Raford-Trib2	297.6676	0.338	0.425
rH5	22	Raford-Trib3	Raford-Trib3-Up	1096.236	0.869	1.092
rH6	23	Raford-Trib4	Raford-Trib4-Up	1099.236	2.443	3.072
rH7	24	Raford-Trib5	Raford-Trib5	429.7495	1.821	2.290
rH3a	6'	UBC1	-	-	1.484	1.865
rH3c	5'	UBC2	-	-	0.414	0.520

**Note that for model stability higher peak flow than 0.3m³/s was used*

Unit hydrographs were multiplied with peak flows from Table 5.10 to obtain the final shapes of the input hydrographs. All input hydrographs for Q_{100cc} and Q_{1000cc} are shown in Figure 5.7 and Figure 5.8 respectively.



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Figure 5.6. Unit hydrograph.

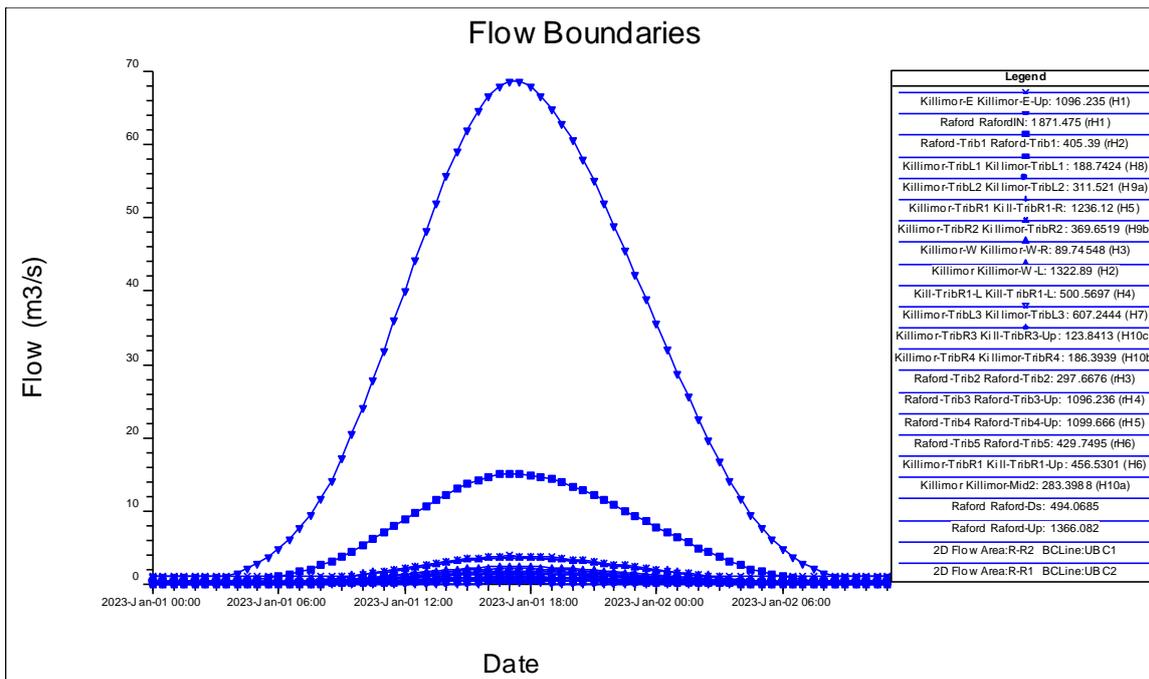


Figure 5.7. Resulting hydrographs for Q_{100cc}.

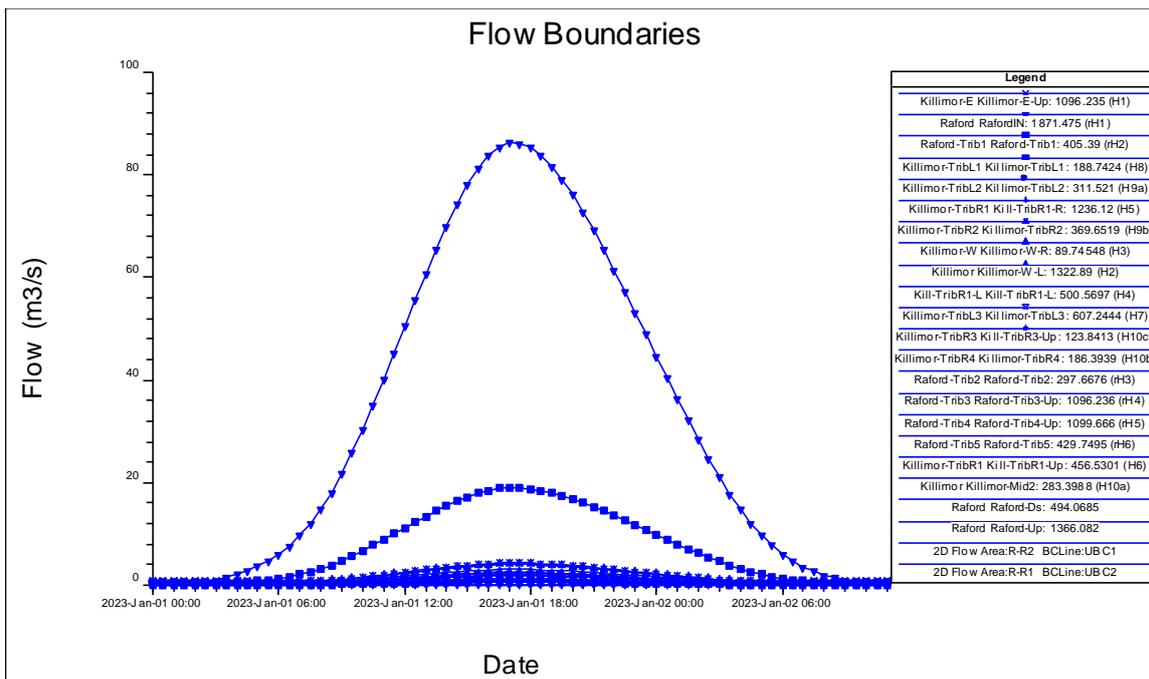


Figure 5.8. Resulting hydrographs for Q_{100cc}.

5.3.3.3 Downstream Boundary condition

The downstream boundary conditions are defined as the normal depth, d_n , with a defined energy slope of 0.0116m/m at Killimor and 0.00174m/m at Raford.

5.3.3.4 Calibration results

According to inspected site conditions, **roughness values for river channels have a Manning coefficient of $n=0.040 - 0.045 \text{ s/m}^{1/3}$. Roughness factors of $n=0.060 \text{ s/m}^{1/3}$ was used for the flood plains.** Recommended values of Manning roughness values for channels and flood plains are shown in *Annex E - Table E4.3*.

5.3.4 Design events in flood risk scoping

Using the HEC-RAS computer model, computer simulations were carried out for unsteady flow conditions using a flood flow value corresponding to the peak of the flood hydrograph. In summary the flood risk at development site was analysed for two hydrologically extreme existing scenarios, Q_{100cc} and Q_{1000cc} , as shown in Table 5.11.

Table 5.11. Design Events used in flood risk scoping

Design event	Flow Rate [m^3/s] / return period	Downstream boundary condition – Normal depth	Description
1	Q_{100cc} (20% climate change)	0.01160m/m 0.00174m/m	Flood zone A - Q_{100cc}-Exist
2	Q_{1000cc} (20% climate change)	0.01160m/m 0.00174m/m	Flood zone B - Q_{1000cc}- Exist

5.3.5 Computer model results for existing river system

The results are shown for Existing River System for Q_{100cc} and Q_{1000cc} year flow rates with included 20% increase of flows due to Climate Change (MRFS) as follows:

- Q_{100cc} and Q_{1000cc} Longitudinal profiles for River Killimor main channel showing water levels for Existing river system (Figure 5.9).
- Q_{100cc} and Q_{1000cc} Longitudinal profiles for River Raford showing water levels for Existing river system (Figure 5.10).
- Q_{100cc} and Q_{1000cc} Flow velocity map for the River Killimor main channel for Existing River System (Figure 5.11).
- Q_{100cc} and Q_{1000cc} Flow velocity map for the River Raford channel for Existing River System (Figure 5.12).
- Q_{100cc} Flow velocity maps for Existing river system (Figure 8.1).
- Q_{1000cc} Flow velocity maps for Existing river system (Figure 8.2).
- Q_{100cc} Flood Maps for Existing river system (Figure 8.3).
- Q_{1000cc} Flood Maps for Existing river system (Figure 8.4).

Table output model results for Q_{100cc} (MRFS) and Q_{1000cc} (HEFS) is shown in Annex H.

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5.3.5.1 Longitudinal profiles

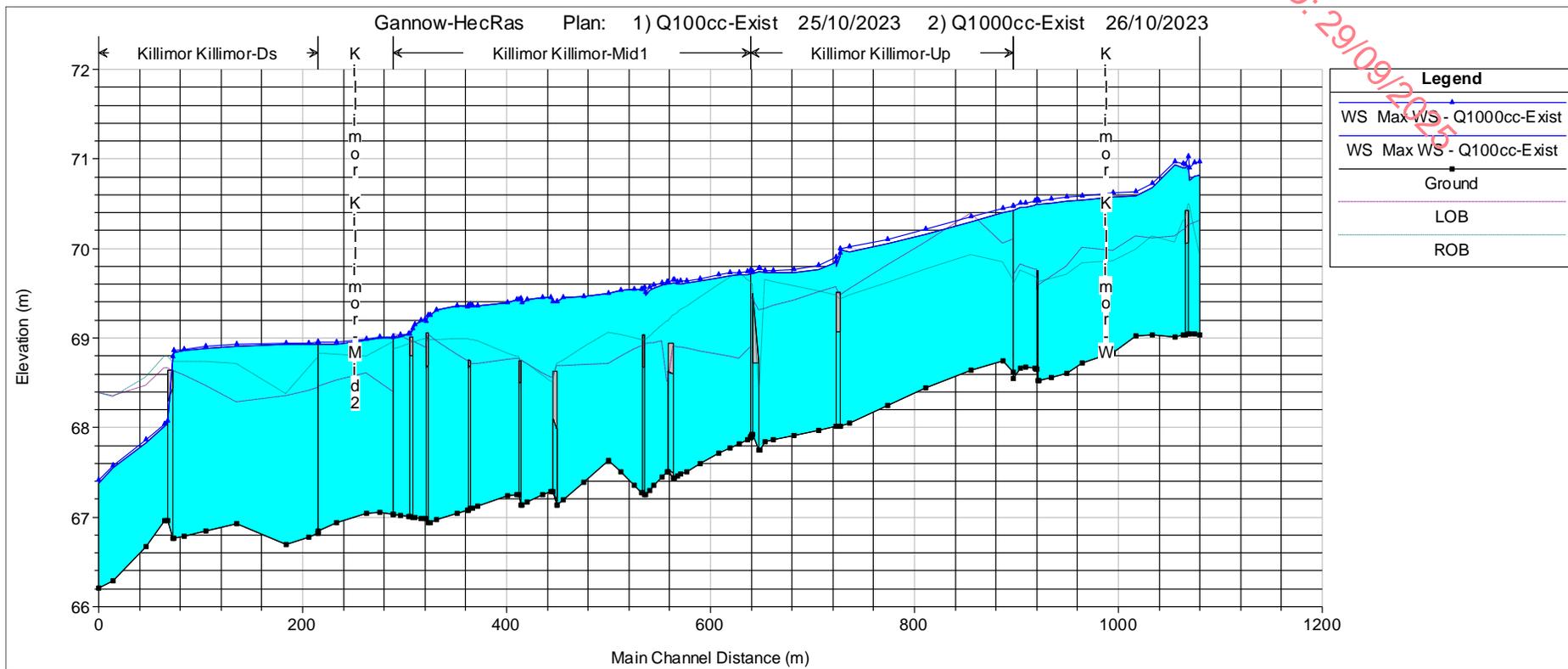


Figure 5.9. Killimor Longitudinal profile showing water levels in the river channel for Existing River System for Q_{100cc} and Q_{1000cc}.

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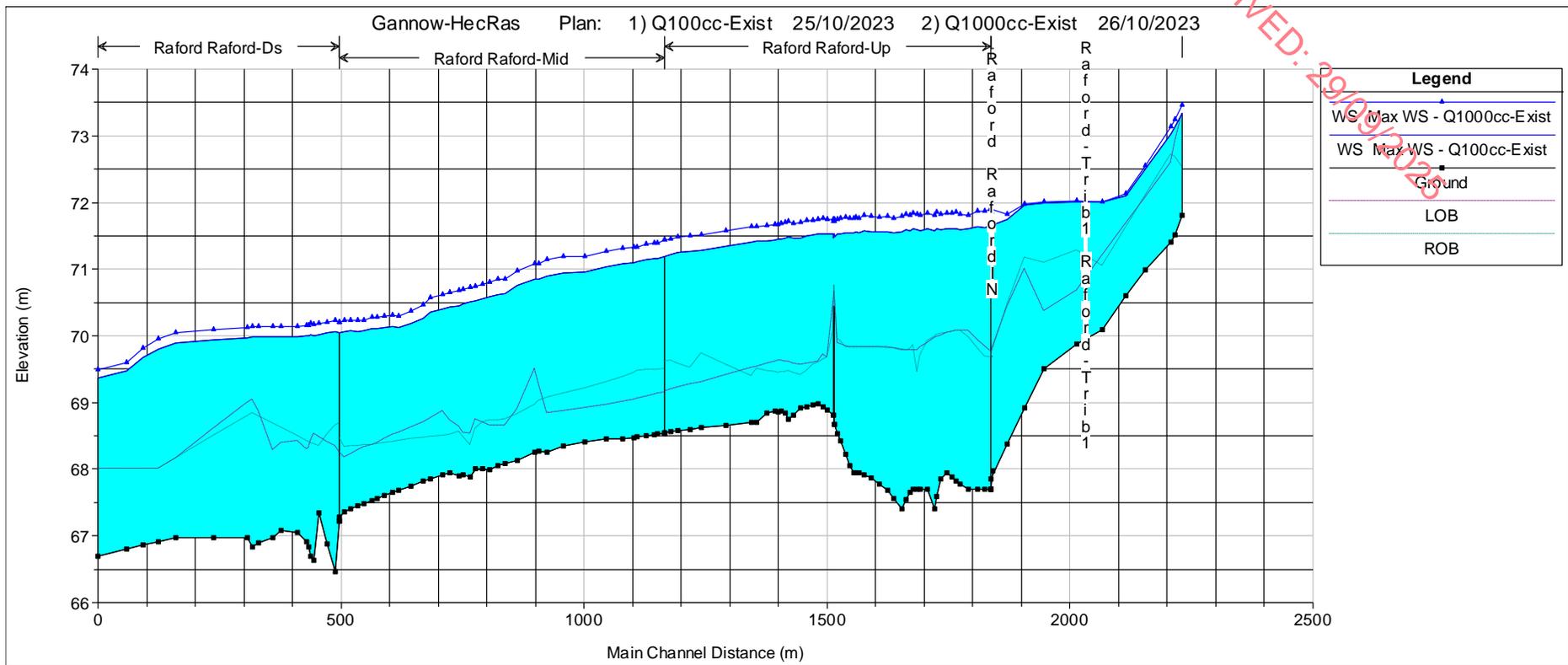


Figure 5.10. Raford Longitudinal profile showing water levels in the river channel for Existing River System for Q_{100cc} and Q_{1000cc}.

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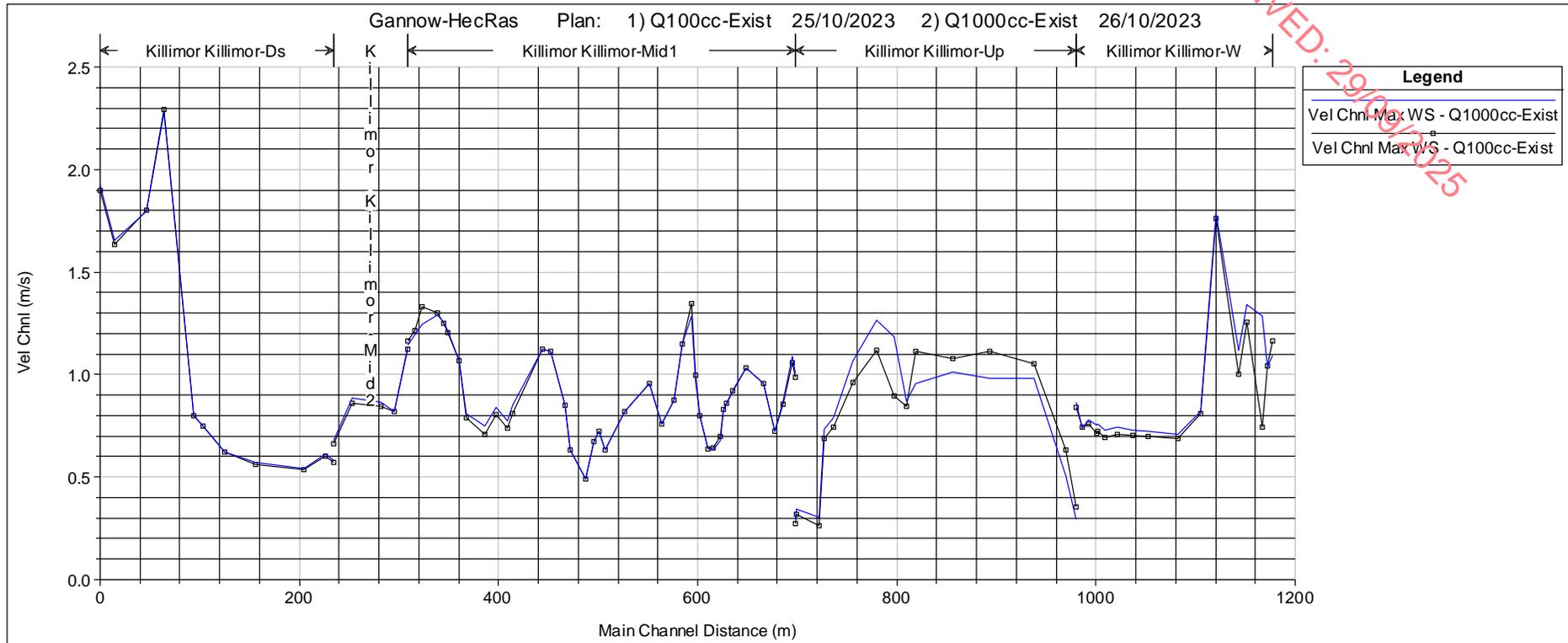


Figure 5.11. Killimor Longitudinal profile showing flow velocity in the river channel for Existing River System for Q_{100cc} and Q_{1000cc}.

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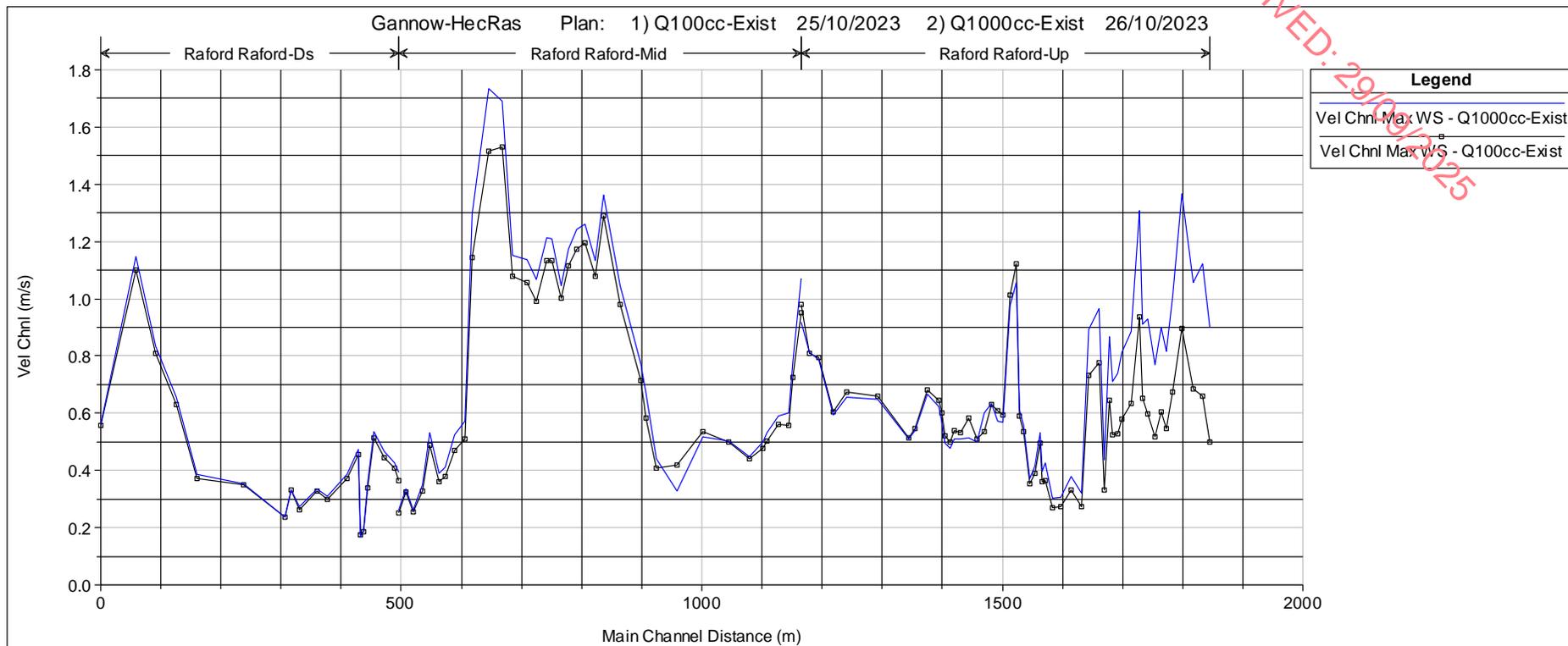


Figure 5.12. Raforf Longitudinal profile showing flow velocity in the river channel for Existing River System for Q_{100cc} and Q_{1000cc}.

5.4 FLOOD RISK MANAGEMENT MEASURES

5.4.1 Fluvial and coastal flood risk

Finished Floor/Hardstand Levels

In order to mitigate tidal and fluvial flood risk, the proposed properties, e.g. wind turbine hard stands and substation should be constructed with their finished floor/ground levels at a height greater than:

Adjacent water level for Q_{1000cc} (1000-year flood flow including climate change) + 0.5m

Site roads

The finished level of site roads should be the same as the existing ground levels of the of the site in order to avoid disturbance of natural(existing) flood flow paths.

Bridges and Culverts

Proposed bridges and culverts or culvert upgrades should be constructed in compliance with OPW Section 50.

5.4.2 Coastal flooding

Excluded from further investigation. See section 4.3.2.

5.4.3 Pluvial flooding

Some ponding evident, but affects soil conditions rather than causing flooding. Excluded from further investigation. See section 4.3.3.

5.4.4 Overland flooding

Excluded from further investigation. See section 4.3.4.

5.4.5 Groundwater flooding

Excluded from further investigation. See section 4.3.5.

5.4.6 Drainage systems

Excluded from further investigation and attributed to fluvial flooding. See section 4.3.6.

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6 Stage 3 – Detailed flood risk assessment

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6.1 INTRODUCTION

This detailed risk assessment assesses the combined effects of the two rivers, the Killimor and the Raford and a network of field drainage channels at the development site. Residual risks that remain after all risk avoidance, substitution and mitigation measures have been applied, have also been considered. An iterative process of the assessment of flood risk and impacts has been performed, to give detailed design parameters which are recommended for the wind farm development.

The hydrology of the system is calculated and elaborated on in Chapter 5 and section 5.2.3. Two flow rate scenarios combining climate change (20% flow increase) were analysed in order to obtain flood Zones A and B, in accordance with Table 5.11 and Table 6.1.

In order to examine the extreme hydrological occurrence of ‘worst case scenario’ the approach of combining all flow hydrographs peaks simultaneously is used and is considered conservative.

6.1.1 Risk of fluvial flooding

The Stage 1 assessment concluded that the development proposal is at risk from river, e.g. fluvial flooding, and that parts of the proposed development site fall within flood Zone A and Zone B.

In the scoping process, additional detail surveys have been conducted and subsequently computer model simulations were performed for the existing river system. An assessment of proposed mitigation measures for river flood risk involved computer simulations to determine flood levels at the site for the river channel and modified floodplain.

6.1.2 Risk of coastal flooding

The Stage 1 assessment concluded that the development proposal is not at risk of coastal flooding (see 4.3.2).

6.1.3 Risk of pluvial flooding

The Stage 1 assessment concluded that the development proposal is not at risk of pluvial flooding (see 4.3.3).

6.1.4 Risk of artificial drainage system and groundwater flooding

It was concluded that the development site is at low risk of flooding from artificial drainage systems and groundwater flooding, and therefore these flood mechanisms were excluded from risk assessment. See section 4.3.4. and section 4.3.5.

6.1.5 Surface water drainage risk

The study also examines the effect of the proposed development on the storm runoff from the site area and assesses if this will have any significant impact on flood levels in the rivers. Since extreme flood levels are dominated by extreme river levels the contribution from surface runoff from a relatively small site will be insignificant. Therefore, it is excluded from further investigation.

6.1.6 Risk of flooding due to culvert blockage

Culverts 10, 11, 12 and 13 are partially blocked (Table 3.1).

6.2 HYDRAULIC MODEL FOR DESIGN RIVER SYSTEM

6.2.1 Model Input data

The Design Model input data is a combination of Existing River System model data, (see section 5.3.3 for input Digital Terrain Model data), and the additional geometry of eight turbine hardstands and eight bridges/culverts which are required for windfarm access road (Figure 6.1).

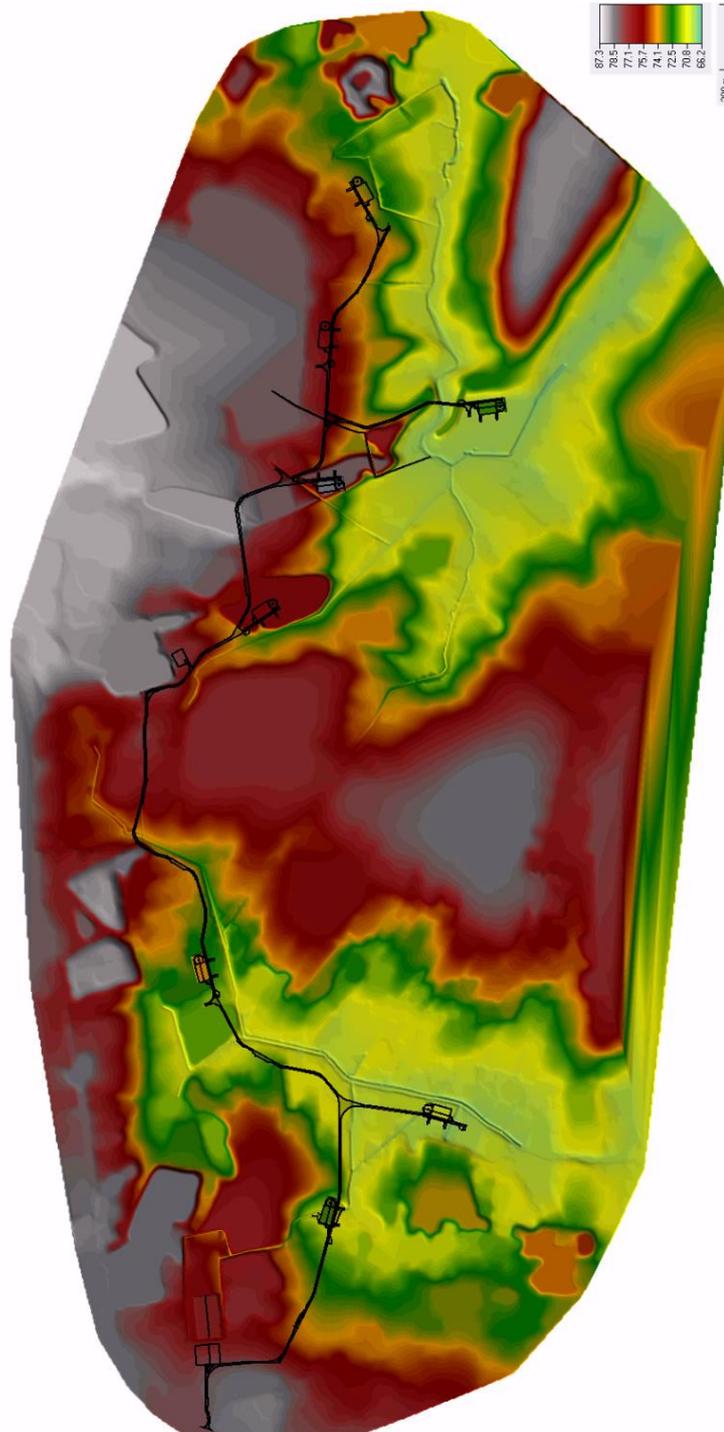


Figure 6.1. Digital Terrain Model of the design model area.

6.2.2 Design events in flood risk scoping

Using the 1d-2d HEC-RAS computer model, computer simulations were carried out for unsteady flow conditions using a flood flow value corresponding to the peak of the flood hydrograph. In summary the flood risk at development site was analysed for two hydrologically extreme design scenarios, as shown in Table 6.1.

Table 6.1. Design Events used in flood risk scoping

Design event	Flow Rate [m^3/s] / return period	Downstream boundary condition – Normal depth	Description
1	$Q_{100\text{cc}}$ (20% climate change)	0.01160m/m 0.00174m/m	Flood zone A - $Q_{100\text{cc}}$-Design
2	$Q_{1000\text{cc}}$ (20% climate change)	0.01160m/m 0.00174m/m	Flood zone B - $Q_{1000\text{cc}}$-Design

6.2.3 Computer model results for design river system

The results are shown for Existing River System for $Q_{100\text{cc}}$ and $Q_{1000\text{cc}}$ year flow as follows:

- $Q_{100\text{cc}}$ and $Q_{1000\text{cc}}$ Longitudinal profiles for River Killimor main channel showing water levels for Design river system (Figure 6.2).
- $Q_{100\text{cc}}$ Longitudinal profiles for River Killimor main channel showing water levels for Existing and Design river system (Figure 6.3).
- $Q_{1000\text{cc}}$ Longitudinal profiles for River Killimor main channel showing water levels for Existing and Design river system (Figure 6.4).
- $Q_{100\text{cc}}$ and $Q_{1000\text{cc}}$ Longitudinal profiles for River Raford showing water levels for Design river system (Figure 6.5).
- $Q_{100\text{cc}}$ Longitudinal profiles for River Raford showing water levels for Existing and Design river system (Figure 6.6).
- $Q_{1000\text{cc}}$ Longitudinal profiles for River Raford showing water levels for Existing and Design river system (Figure 6.7).
- $Q_{100\text{cc}}$ and $Q_{1000\text{cc}}$ Flow velocity profile for the River Killimor main channel for Design River System (Figure 6.8).
- $Q_{100\text{cc}}$ and $Q_{1000\text{cc}}$ Flow velocity profile for the River Raford channel for Design River System (Figure 6.9).
- $Q_{100\text{cc}}$ Flow velocity distribution maps for Design river system (Figure 8.5).
- $Q_{1000\text{cc}}$ Flow velocity distribution maps for Design river system (Figure 8.6).
- $Q_{100\text{cc}}$ Flow depth maps for Design river system (Figure 8.7).
- $Q_{1000\text{cc}}$ Flow depth maps for Design river system (Figure 8.8).
- Flood zone A Existing and Design river system comparison (Figure 8.9).
- Flood zone B Existing and Design river system comparison (Figure 8.10).
- Flood zone A Comparison of Water Levels for Existing and Design river system (Figure 8.9).
- Flood zone B Comparison of Water Levels for Existing and Design river system (Figure 8.10).
- Hydrographs for Existing and design river systems to ascertain if there has been any change in the downstream flow as a result of the wind farm development (Figure 6.18).

Table output model results for $Q_{100\text{cc}}$ (MRFS) and $Q_{1000\text{cc}}$ (HEFS) is shown in Annex H.

6.2.4 Longitudinal profiles

There are two main river channels within the zone of influence of the wind farm; viz. The River Killimor channel and the River Rafor channel. Figure 6.2 below, for the main River Killimor channel, gives the longitudinal profiles for the Q_{100cc} and Q_{1000cc} flows for Final Design River System, one superimposed on the other.

Comparison of water levels between Existing and Design river systems - one superimposed on the other is shown in Figure 6.3 and Figure 6.4 for the main River Killimor channel for Q_{100cc} and Q_{1000cc} respectively. It is clear that the two water surface profiles are co-incident which confirms that the construction of the wind farm involving access roads and turbine hardstands has no impact on the water levels for the extreme Q_{100cc} and Q_{1000cc} flood events.

Figure 6.6 and Figure 6.7 show water level longitudinal profiles for Q_{100cc} and Q_{1000cc} respectively for the River Rafor channel and again the surface profiles are co-incident for the existing and Design River Systems confirming no water level change due to the windfarm construction.

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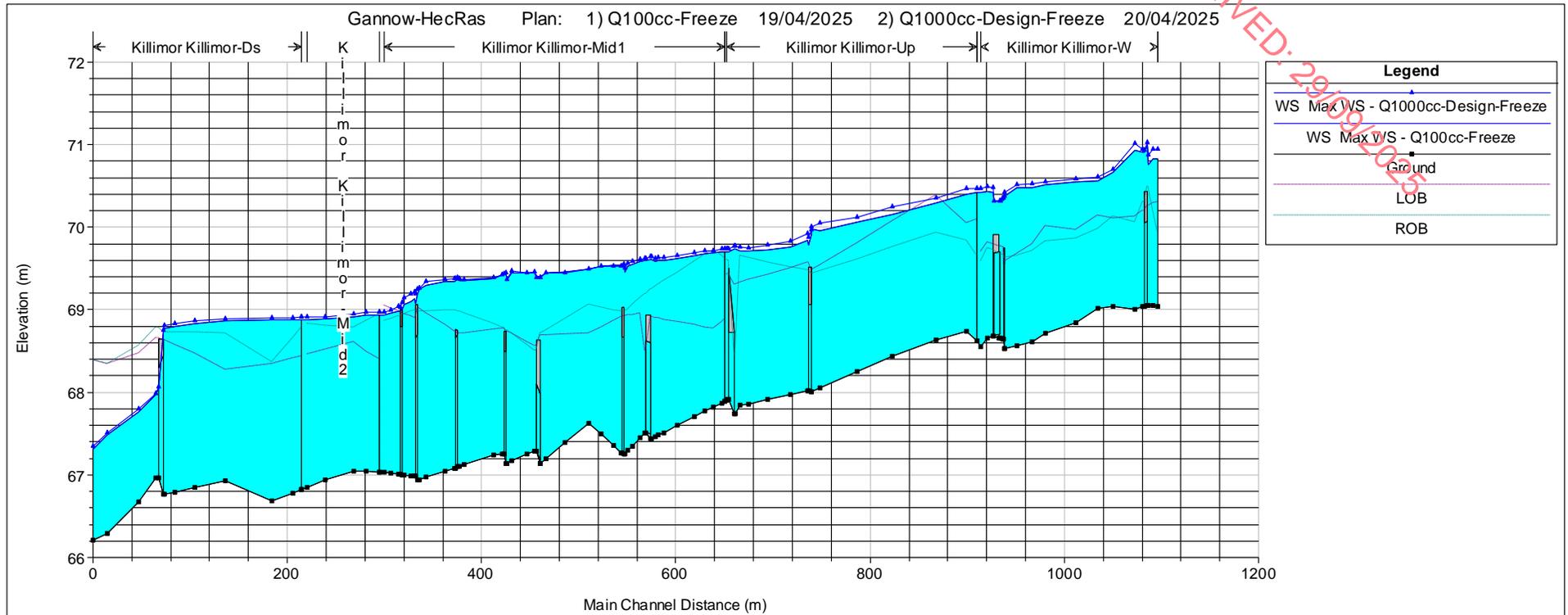
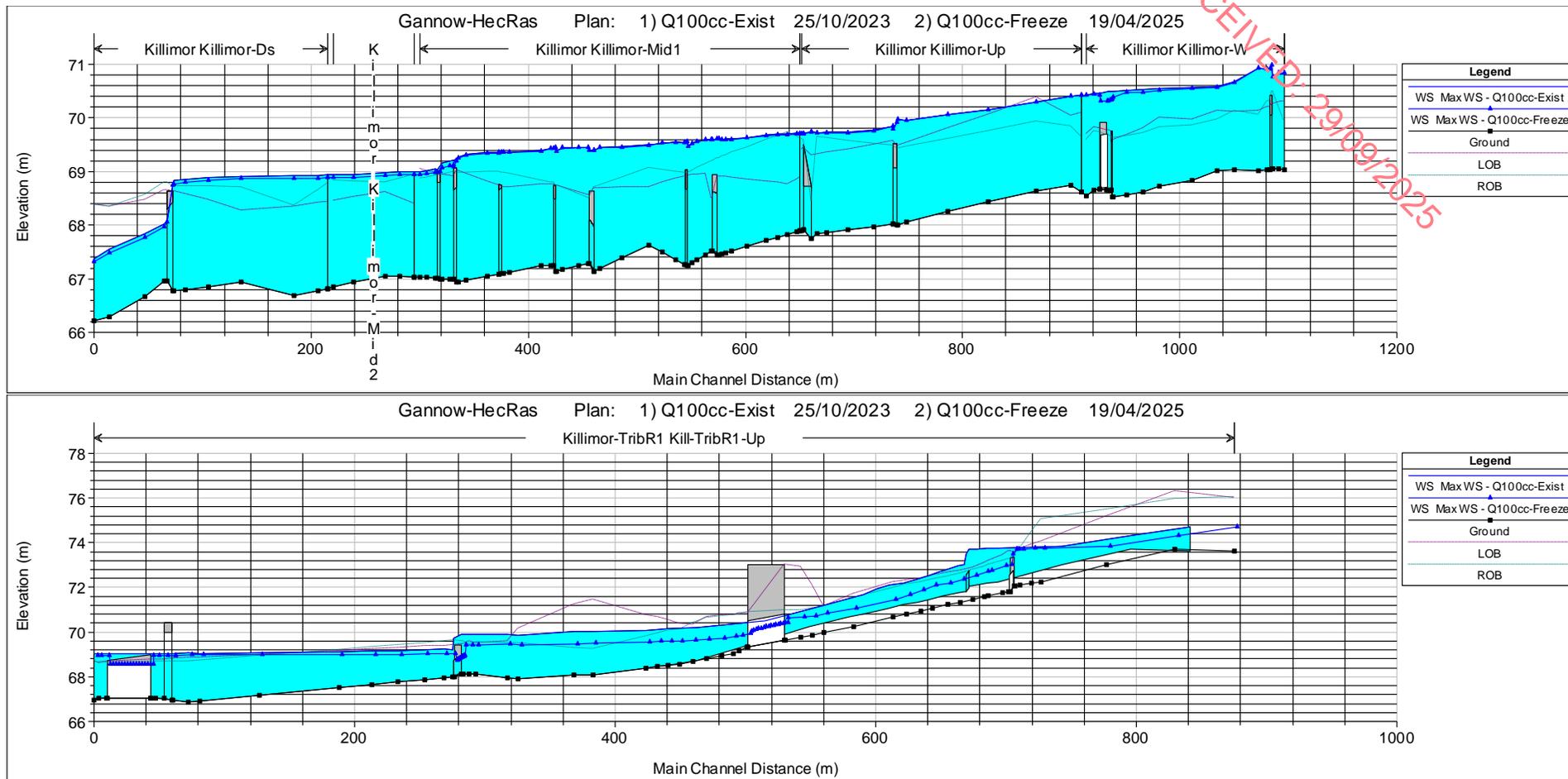


Figure 6.2. Killimor Longitudinal profile showing water levels in the river channel for Design River System for Q_{100cc} and Q_{1000cc}.



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Figure 6.3. Killimor Longitudinal profile comparing water levels in the river channel for Existing and Design River System for Q_{100cc}.

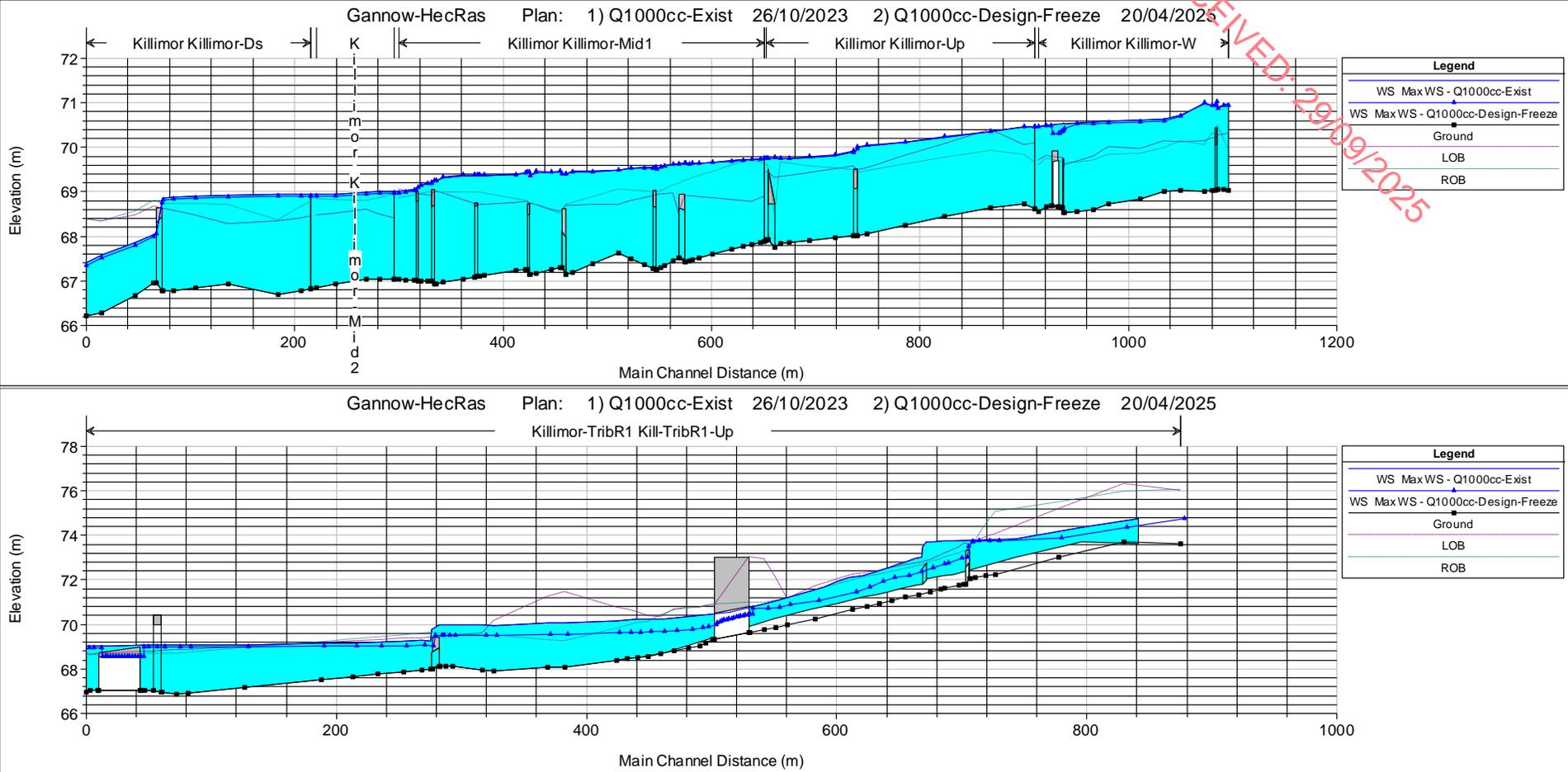


Figure 6.4. Killimor Longitudinal profile comparing water levels in the river channel for Design River System for Q_{1000cc}.

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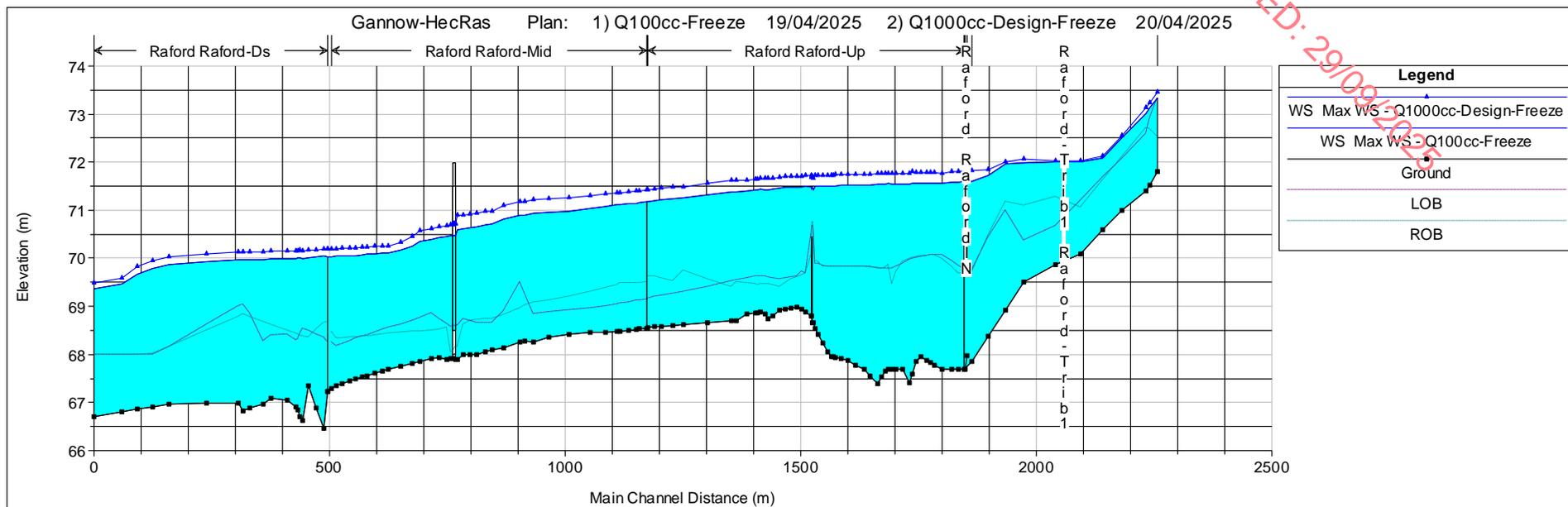


Figure 6.5. Rford Longitudinal profile showing water levels in the river channel for Design River System for Q_{100cc} and Q_{1000cc}.

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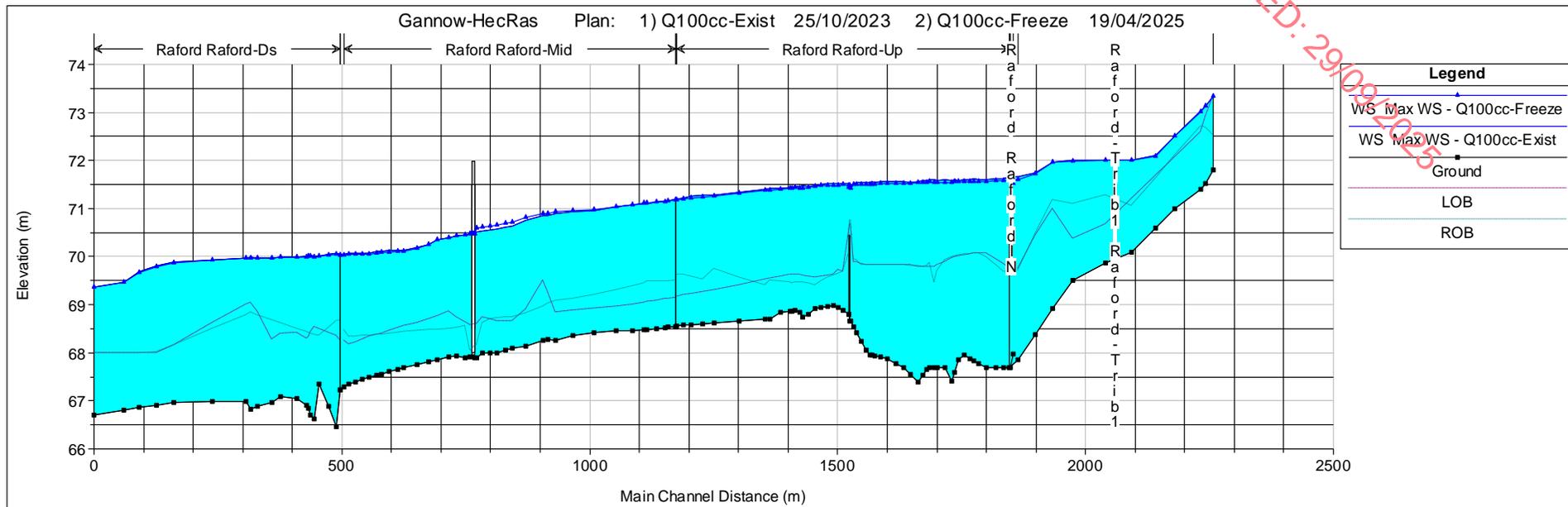


Figure 6.6. Rafor Longitudinal profile comparing water levels in the river channel for Existing and Design River System for Q_{100cc}.

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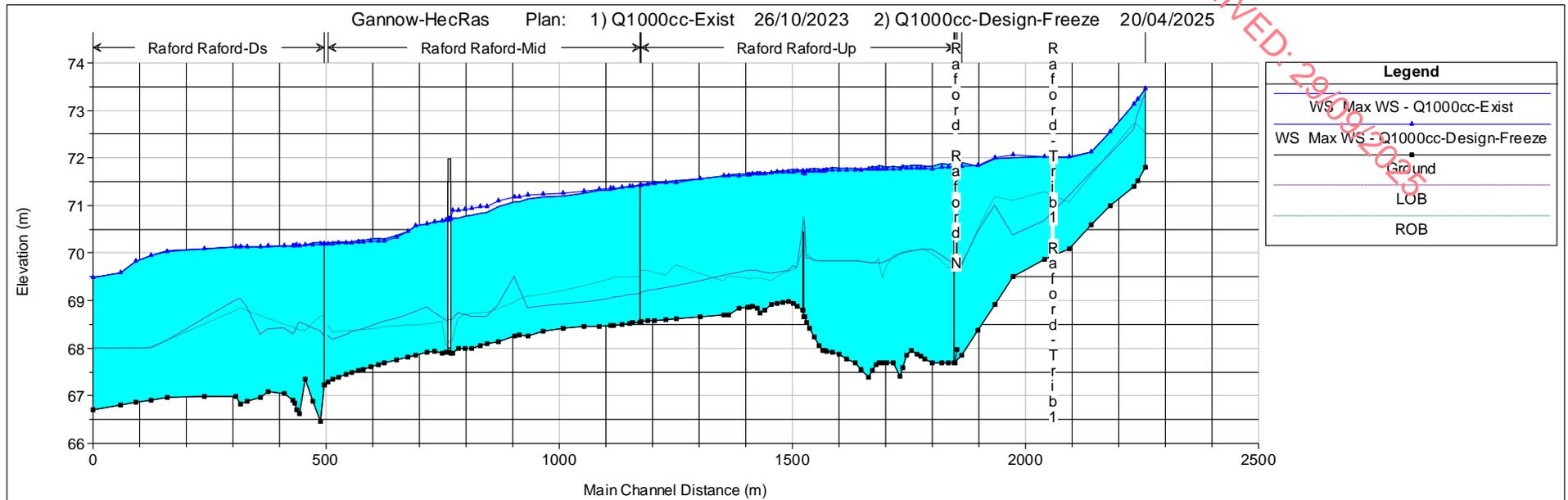


Figure 6.7. Rafor Longitudinal profile comparing water levels in the river channel for Existing and Design River System for Q_{1000cc} .

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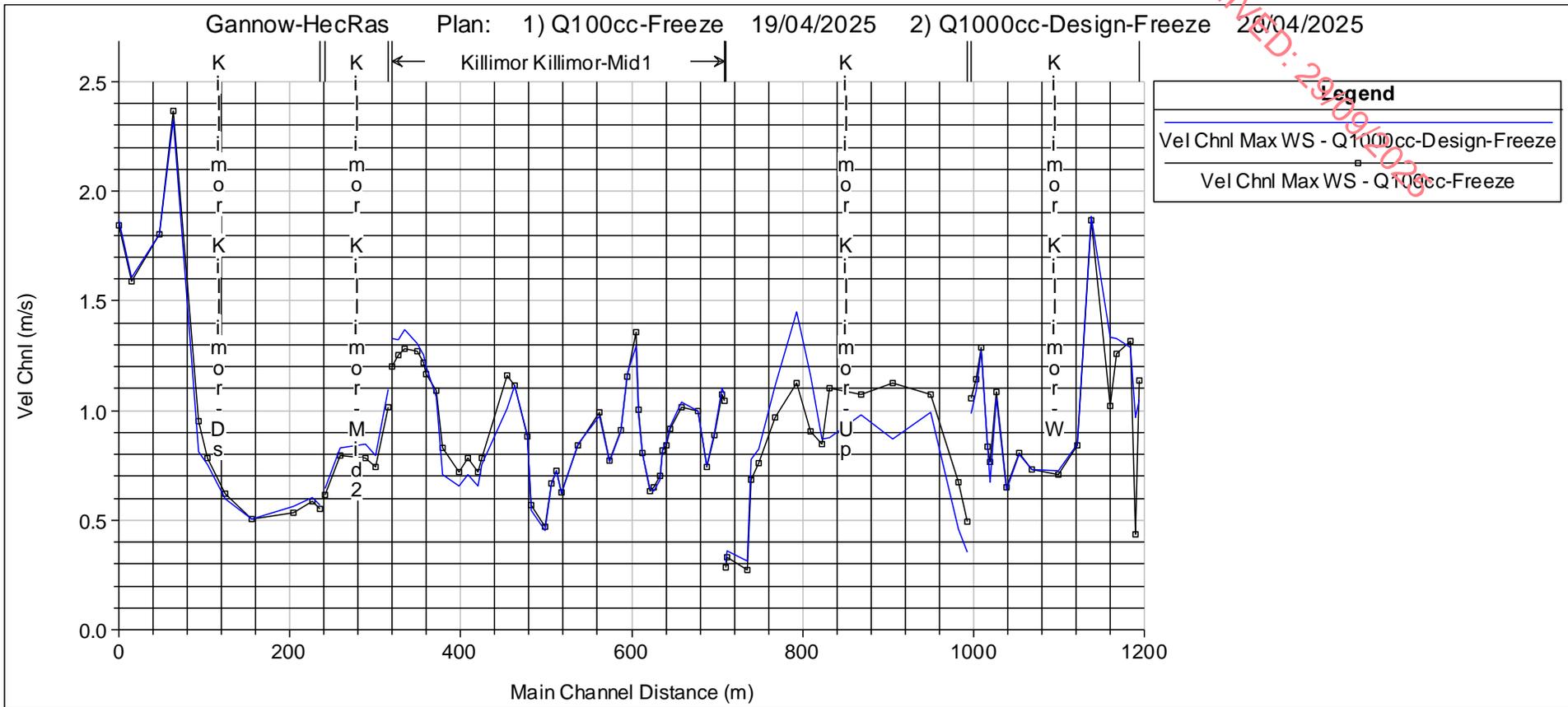


Figure 6.8. Killimor Longitudinal profile showing flow velocity in the river channel for Design River System for Q_{100cc} and Q_{1000cc}.

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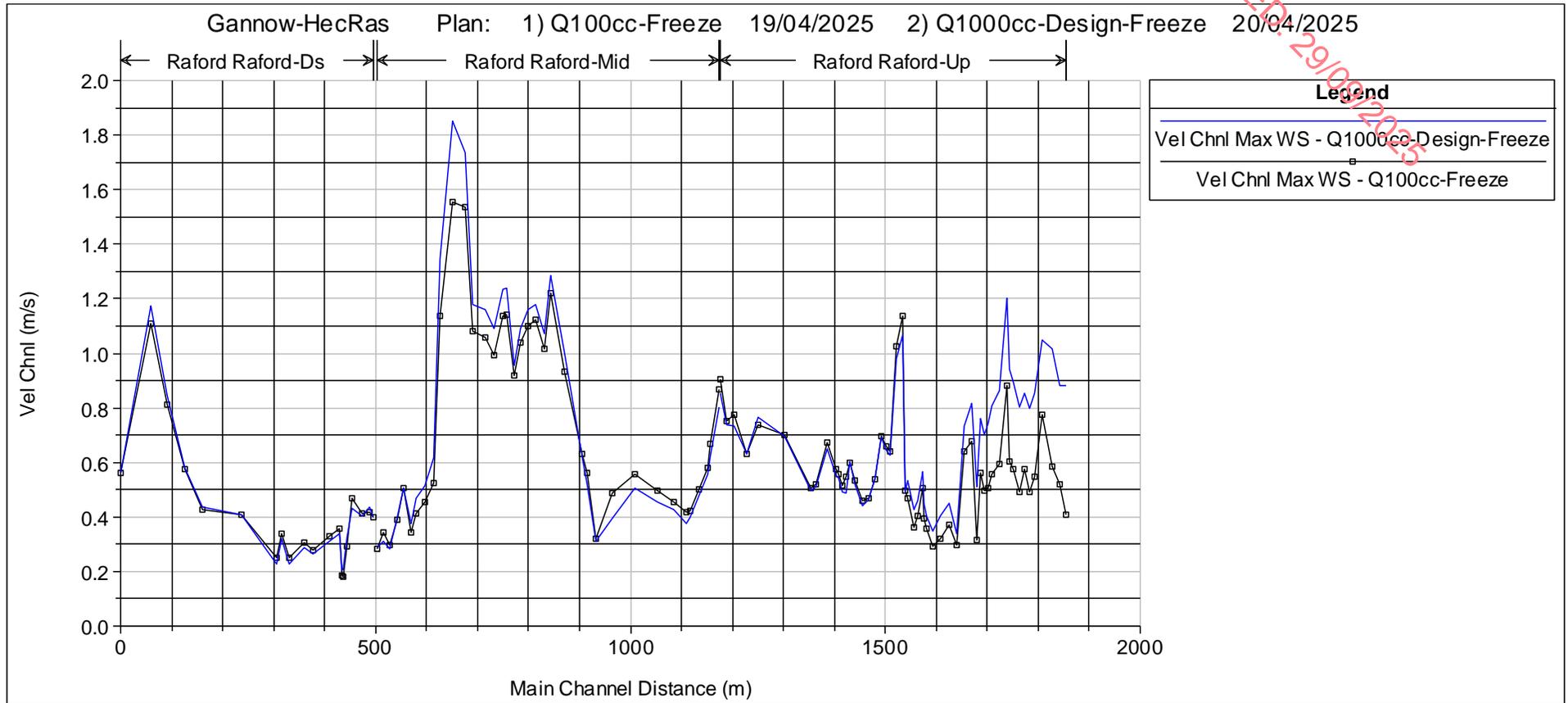


Figure 6.9. Raford Longitudinal profile showing flow velocity in the river channel for Design River System for Q_{100cc} and Q_{1000cc}.

6.2.5 Velocity distribution

A comparison of Figure 5.11 with Figure 6.8 data gives the impact on mean velocity along the River Killimor a channel for the existing and design river systems. It is apparent that there is no perceptible change in the velocities. The velocities are relatively low and range between 1m/s and 1.5m/s along the river reach. These velocity values for such an extreme flood event should give no cause for concern for the development.

A comparison of Figure 5.12 with Figure 6.9 gives the velocity distribution impact for the Raford channel and again the velocity pattern is similar; with velocities ranging from 0.5m/s to 1m/s.

Note:

Figures which give velocity distributions and flood maps are in Appendices B & C and have the identifier label in the main text of Figure 8.1-Figure 8.2 and Figure 8.5-Figure 8.6.

Figure 8.5 and Figure 8.6 (in Appendix B) give maps of the velocity distribution throughout the site for Q_{100cc} and Q_{1000cc} . It is clear that, in general, velocities are at an acceptable level and slightly higher velocities occur localized at a location downstream of the new bridges and culverts.

6.2.6 Flood Maps for Design System

Figure 8.7 and Figure 8.8 (Appendix C) gives the flood map for the extreme 100-year flood with Climate Change factored in (Q_{100cc}). The main access roads affected are only in the vicinity of turbine T2. It is important that the turbine hardstand at these locations should be elevated with ground levels higher than the extreme flood level. The access roads to this elevated hardstand should be ramped at a suitable gradient for heavy vehicle access. The Design model used in the hydrological/hydraulic simulations has accounted for elevated hardstands and ramped approach roads

A comparison of the flood extent for Zone A and Zone B for Existing and Design river system is shown in Appendix C in Figure 8.9 and Figure 8.10 respectively. The impact of the wind turbine hardstands and roads on the flood extent for both flood zones A and B is minimal and is further discussed in section 6.4.3.

Figure 8.11 and Figure 8.12 in Appendix C show the difference between Design and Existing water levels for Q_{100cc} and Q_{1000cc} flood flows respectively. Only a minor water level rise upstream of bridge B1 of +0.06m is evident for Q_{100cc} flow. For the Q_{1000cc} flows at the same location, the increase of water levels is +0.15m between the Design with Existing river systems. These changes are associated with the design of new 12m span bridge and the rise in water level extends approximately 100m upstream of the bridge.

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6.2.7 On site impact assessment

The proposed flood protection works for the development involve the construction of a flood terraces to form the hardstands to levels that are shown in Table 6.3 for turbine T2.

A comparison of water levels and flow velocities in the channel, between existing and design river system imply that there would be no significant change in water levels and in flow velocities. **This means that all normal river flows remain unaffected by the proposed flood protection works.**

Some minor increase of flood extents (see section 6.4.3) due to design of new bridges and culverts is noted, however this increase is localised and not significant.

An assessment of flow velocities for extreme flood flows shows that there will be no increase in the potential for erosion within main river channels. Furthermore, there will be no increase of flooding risk, since water levels are not increased by the development.

6.2.8 Flood Mitigation for design river system

6.2.8.1 Existing Culverts

The existing river system of main channels, tributaries and drainage channels has a number of existing culverts which influence the hydrological characteristics of the catchment. These culverts have been modelled accurately within the HEC-RAS model. The overall effect of these existing culverts is to increase the storage within the catchment thus attenuating flood flows. The development should not interfere with the existing storage and therefore the hydraulic characteristics of existing culverts should not be changed if possible.

6.2.8.2 New Culverts / Bridges

One new bridge (B1) and 13 new culverts (C1 – C12) will be required at points where the proposed access roads cross waterways. Figure 6.11 identifies the locations where new culverts are required. Proposed bridges and culverts with their location and description are listed in Table 6.2 below.

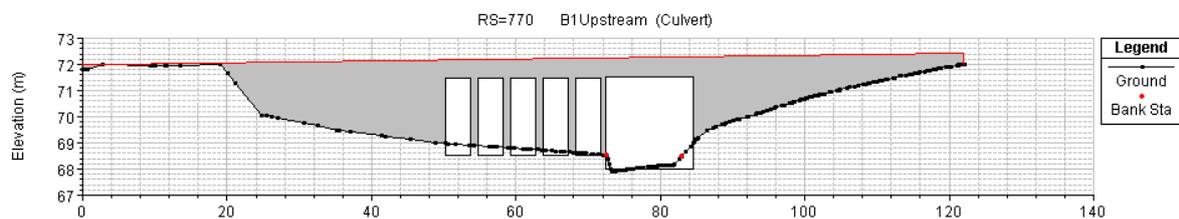


Figure 6.10. New bridge (B1) cross section.

Table 6.2. Proposed new bridges and culverts with description and location.

No	Crossing ID	Type	X [m]	Y [m]	Shape: Dimensions (W, D, H, L)	Notes
1	B1	Bridge	562423.65	729270.09	Six span bridge Span 1-5 = 6m Span 6 = 12m	River Rafor See Figure 6.10 below
2	C1	Culvert	560496.58	729878.46	Box culvert: W = 2.0m H = 1.0m L = 6.0m	River Killimor West
3	C2	Culvert	561082.48	730122.82	Box culvert: W = 2.5m H = 1.5m L = 6.0m	River Killimor East
4	C3	Culvert	561218.78	730163.76	Pipe: D = 0.90m L = 24.0m	Killimor Tributary L3
5	C4	Culvert	561545.45	730144.96	Pipe: D = 0.90m L = 9.0m	Killimor Tributary L3
6	C5a	Culvert	560274.62	729334.02	Box culvert: W = 6.0m, H = 3.0m, L = 6.0m or Pipe: D = 1.50m L = 6.0m	Killimor Tributary R1
7	C5b	Culvert	560293.68	729312.52	Pipe: D = 1.50m L = 33.0m	Killimor Tributary R1
8	C6	Culvert	560245.19	729234.02	Pipe: D = 0.90m L = 6.0m	Killimor Tributary R3
9	C7	Culvert	560301.19	729530.26	Pipe: D = 1.20m L = 13.0m	Killimor - Tributary R2
10	C8	Culvert	562362.95	729614.33	Pipe: D = 1.20m L = 7.1m	Tributary of Rafor, downstream end not pronounced
11	C9	Culvert	562353.49	729592.87	Pipe: D = 1.20m L = 8.7m	Tributary of Rafor, downstream end not pronounced
12	C10	Culvert	559936.92	729605.48	Pipe: D = 1.20m L = 28.0m	New bypass channel around Turbine T1 Channel characteristics bottom width: 1.5m bank slope: 1V:1H
13	C11	Culvert	562187.15	729713.13	Pipe: D = 1.20m L = 10.0m	Located around Turbine T5 (u/s)
14	C12	Culvert	562172.49	729693.23	Pipe: D = 1.20m L = 11.0m	Located around Turbine T5 (d/s)

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Figure 6.11. New culvert locations.

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6.2.8.3 Wind turbine hardstands

We recommend a freeboard of 0.5m above Q_{1000cc} design flood levels ($FFL = H_{1000cc} + 0.5m$) for hardstands for turbines T1, T2 and T8 and the substation in accordance with the table below. Hardstands for the remaining five turbines should be elevated to a minimum of +0.25m relative to existing ground levels.

Table 6.3. Wind turbine hardstands Finished Ground levels.

No	Turbine ID	Q1000cc Water levels [mOD]	Finished ground Levels FFL [mOD]
1	T1	71.00	71.50
2	T2	69.00	69.50
3	T8	70.14	70.64
4	Substation	76.20	76.70

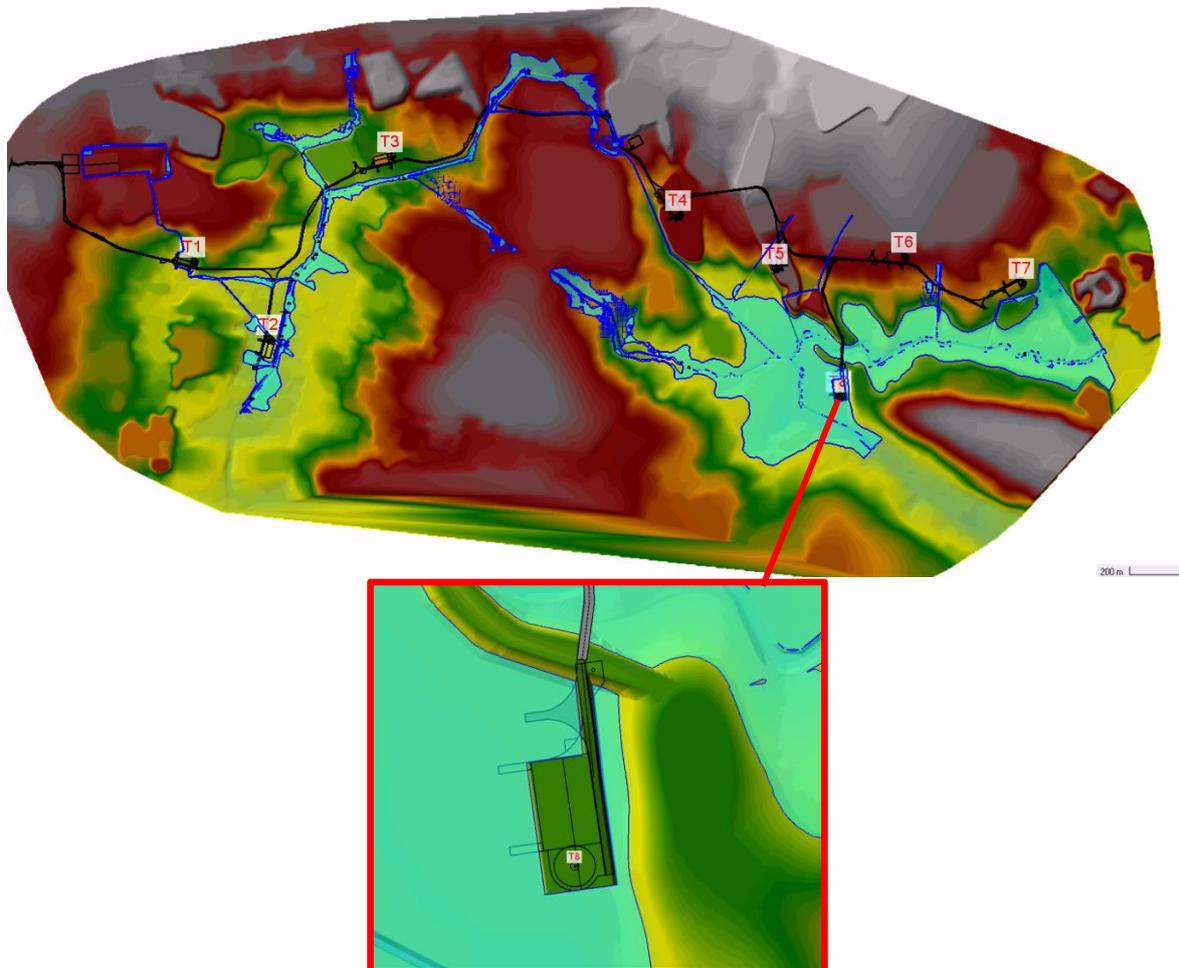


Figure 6.12. Wind turbine Hardstands location and typical close-up layout.

6.2.8.4 Channel re-alignment

At turbine T1, due to the location of the hardstand relative to the existing drainage channel, the channel needs to be re-aligned. The alignment/re-routing plan around hardstand with new channel cross-section characteristics is shown in Figure 6.13 for wind turbine T1.

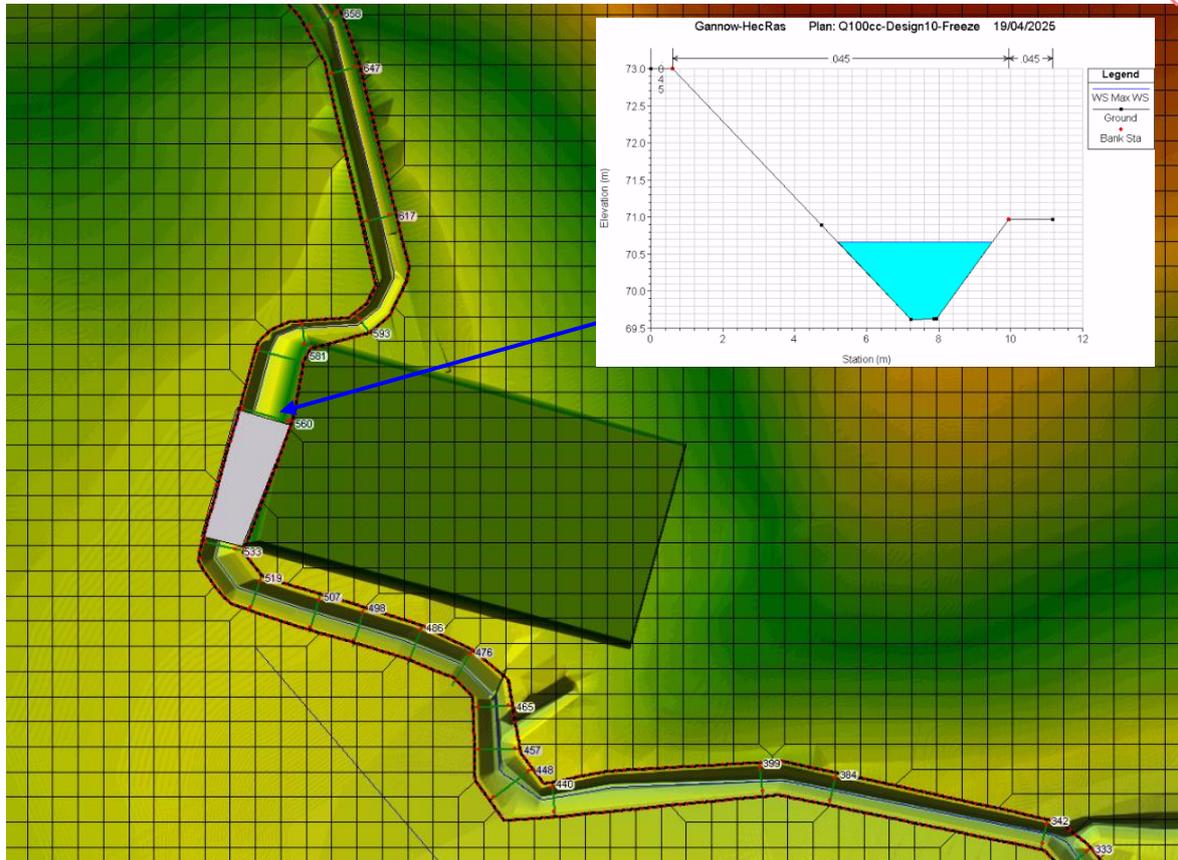


Figure 6.13. Channel re-alignment around wind turbine T1
(Length of channel = 150m, channel bottom width = 1.5m, bank slope = 1V:1H).

6.2.8.5 Wind farm sub-station

The Windfarm sub-station is located outside of Flood Zones A and B, however a FFL of +0.50m above existing ground level is recommended.

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6.3 ASSESSMENT OF SURFACE WATER DRAINAGE RISK

6.3.1 Calculations showing the pre- and post-development peak run-off flow rate for the critical rainfall event

The OPW River Basin Management measures at the location of the site suggest to 'ensure that all new developments incorporate sustainable drainage systems (SuDS)' and 'provide adequate storm water infrastructure in order to accommodate the planned levels of growth expected in the County'. The drainage from the site, e.g. from turbine hardstands and widened road network will be taken to the Killimor and Raford rivers. Notwithstanding the above, runoff calculations associated with the development are presented in this report for completeness.

The increased runoff from the site was calculated using the Modified Rationale Formula. Based on an increase in impermeable surface area for ten turbine hardstands² (runoff coefficient = 0.9) from 0m² (existing - runoff coefficient = 0.5) to 61981m² (hardstands 4,020x8= 32,160m² and new proposed roads 47,810m²) the increase in runoff was determined for the 100-year rainstorm event. The rainfall intensity taken for this calculation was 96mm/hr obtained Met Eireann DDF tables (Annex I) for a duration of 10mins and a return period of 100 years.

The calculation gave a total increase in flow to the river which peaks at a value of $Q_{\text{increased}} = 0.85\text{m}^3/\text{s}$ ($Q_{\text{design}} = 1.919\text{m}^3/\text{s} - Q_{\text{exist}} = 1.066\text{m}^3/\text{s}$). This is relatively low flow increase (0.8% of $Q_{100\text{cc}}$ flow = 105.95m³/s, e.g. 18.47m³/s at Killimor + 87.48m³/s at Raford) and it is not expected to have effect on water levels in the river. Sustainable Drainage Systems is designed for the rain duration of 1hour for each turbine hardstand (Area of single hard stand is 4,020m²) and new design roads (47,810m²). The calculated volume of excess water in 1 hour per single hardstand is 386m³ and for roads is 4600 m³. One option for SuDS:

- Design of open collection/attenuation ponds. The attenuation pond should be 1.0m deep with an area of 400m² per hardstand and 4600 m² for all roads. The attenuation ponds should be distributed at appropriate locations throughout the wind farm site taking advantage of natural depressions and existing drainage channels. (The attenuation ponds could tie in with silt management systems using silt traps which would normally be employed during construction).

² Total area single turbine hardstand is 4020m²

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6.4 POTENTIAL IMPACT OF DEVELOPMENT ON FLOODING ELSEWHERE

Proposals at the site must not worsen flood risk at other developments, be they upstream, downstream or adjacent to the site. The off-site impacts associated with the development are identified in sections below.

6.4.1 Water level comparisons

There are two main river channels within the zone of influence of the wind farm. The main River Killimor channel and the Raford river channel with contributing drainage channels. Figure 6.3 and Figure 6.6, for the main rivers Killimor and Raford, give the longitudinal profiles for the Existing River System and the Final Design River System - one superimposed on the other. It is clear that the two water surface profiles are co-incident which confirms that the construction of the wind farm involving access roads and turbine hardstands has no impact on the water levels for the extreme Q_{100cc} flood event.

Figure 6.14 below gives comparison water level comparison of the Q_{100cc} longitudinal profiles for Existing and Design River System, showing differences in water levels and length of channels due to channel realignment around turbine T1. The design water levels are lower than existing.

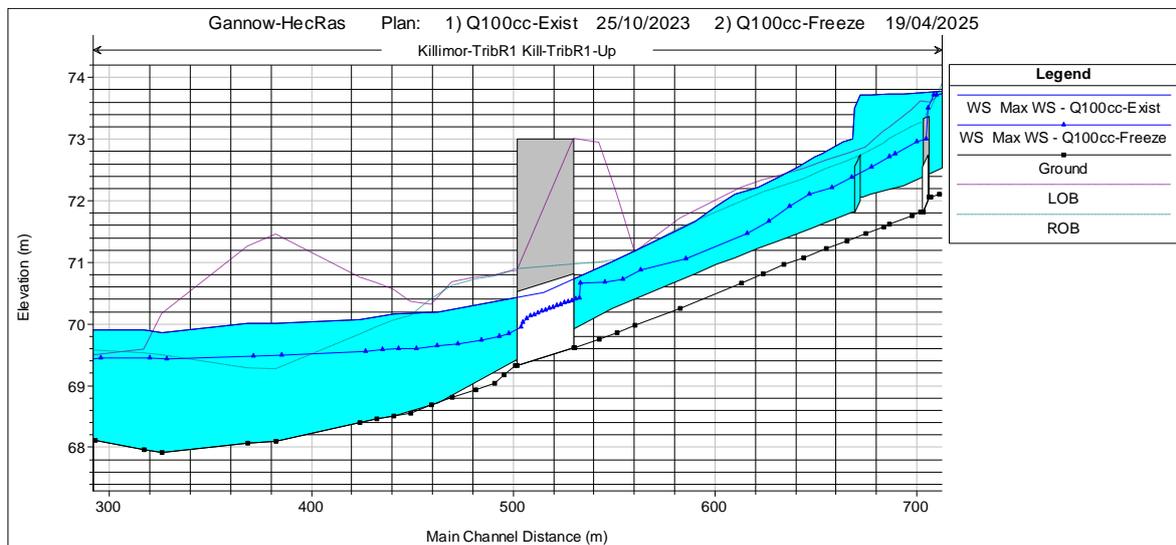


Figure 6.14. Killimor right tributary R1 around turbine T1 Longitudinal profile showing water levels in the river channel for Existing and Design River System for Q_{100cc} .

6.4.2 Q_{100cc} MRFS Velocity distributions

Figure 6.15 below gives the mean velocity along the River Killimor channel for the existing and design river systems. It is apparent that there is no perceptible change in the velocities. The velocities range between 1m/s and 1.5m/s along the river reach with maximum increase of flow velocities between +0.05m/s and +0.3m/s. These velocity values for such an extreme flood event should give no cause for concern for the development but as a precaution, rock armoured of banks around new culverts and bridges, designed to withstand velocities of 2m/s should be provided at the appropriate locations.

Figure 6.16 gives the velocity distributions for the Raford channel and again the velocity pattern is similar; with velocities ranging from 0.3m/s to 1.5m/s.

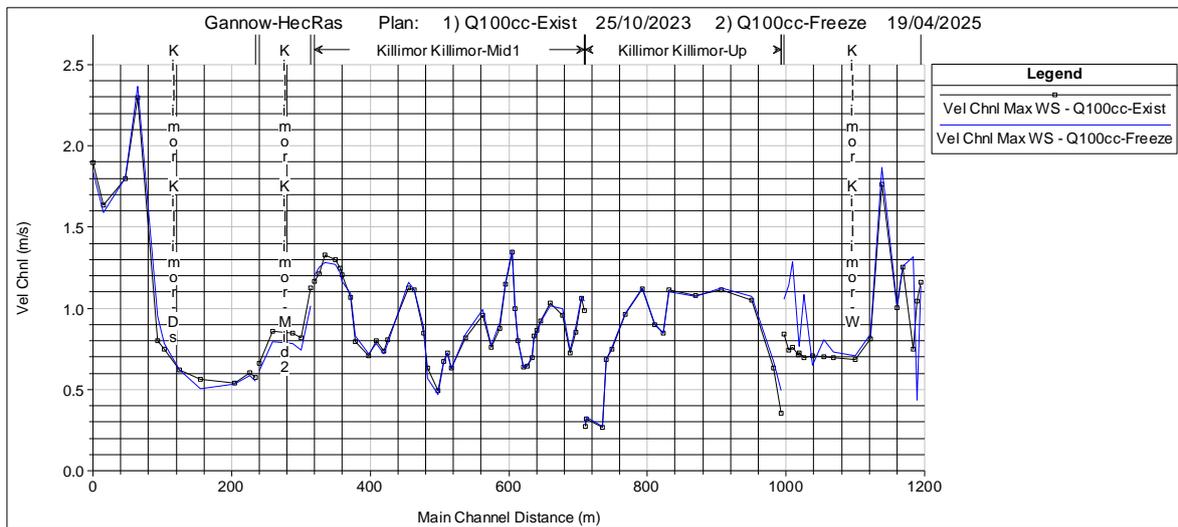


Figure 6.15. Killimor Longitudinal profile showing flow velocity in the river channel for Existing and Design River System for Q_{100cc}.

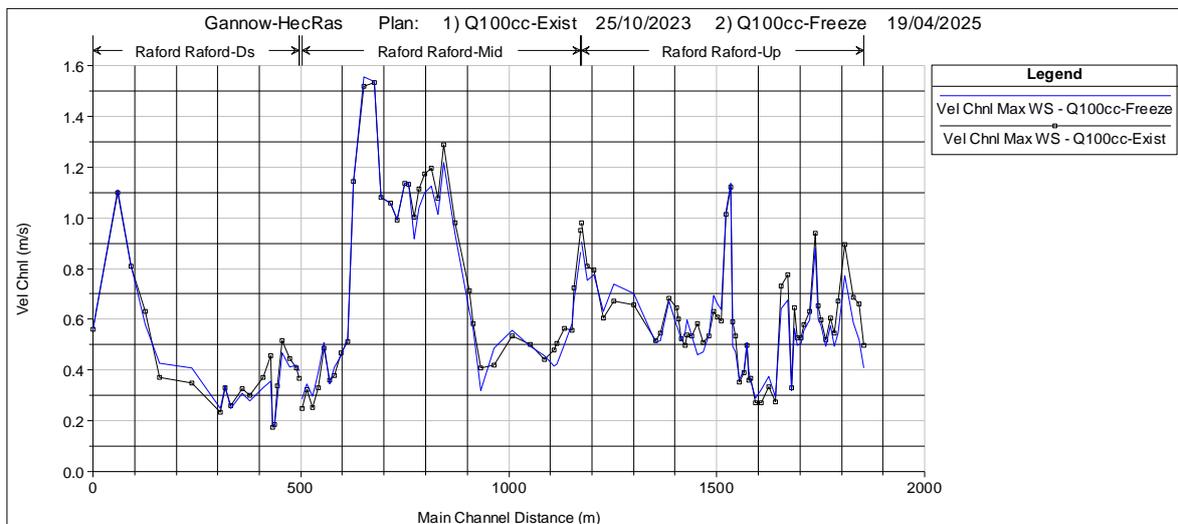


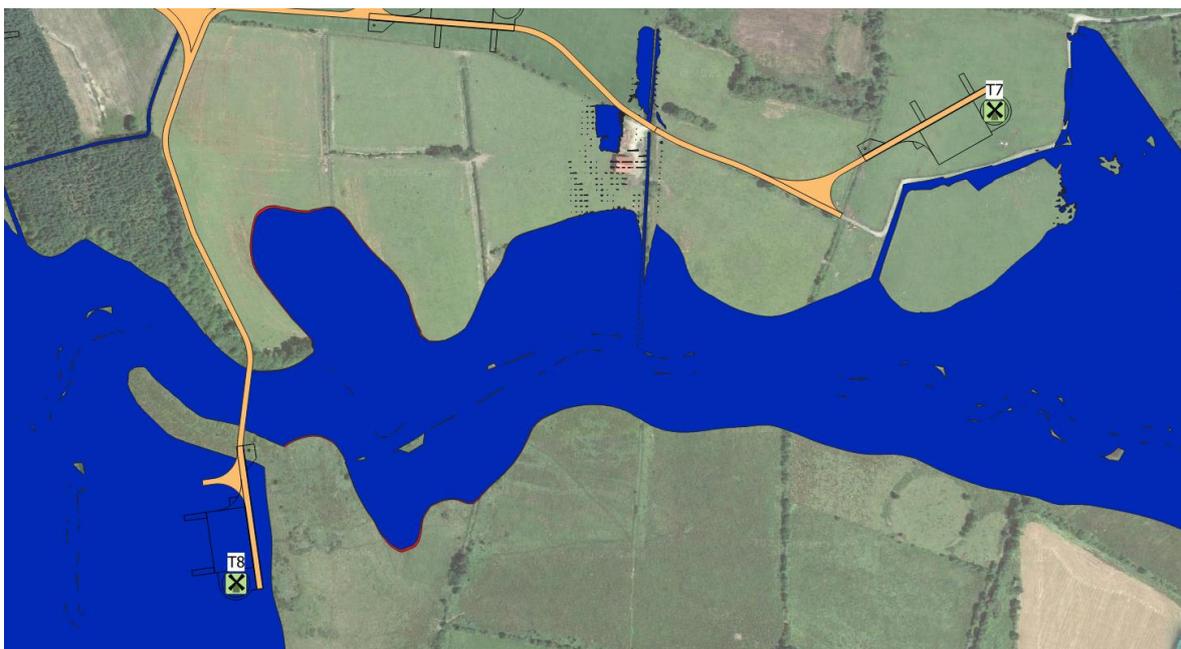
Figure 6.16. Raford Longitudinal profile showing flow velocity in the river channel for Existing and Design River System for Q_{100cc}.

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6.4.3 Flood Extent comparisons

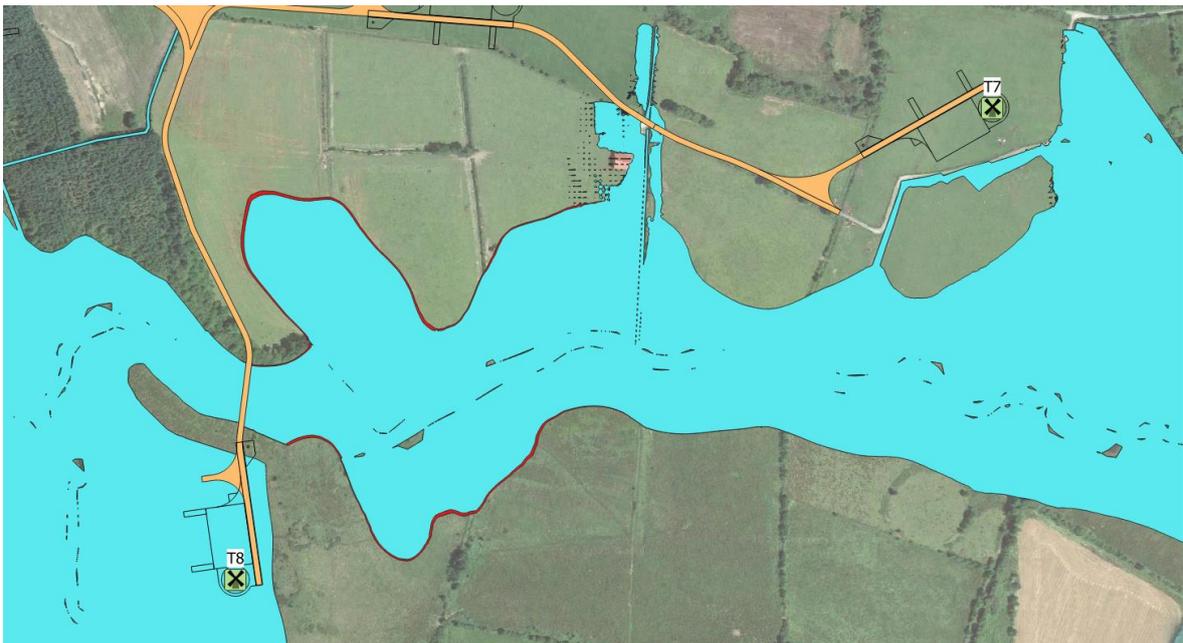
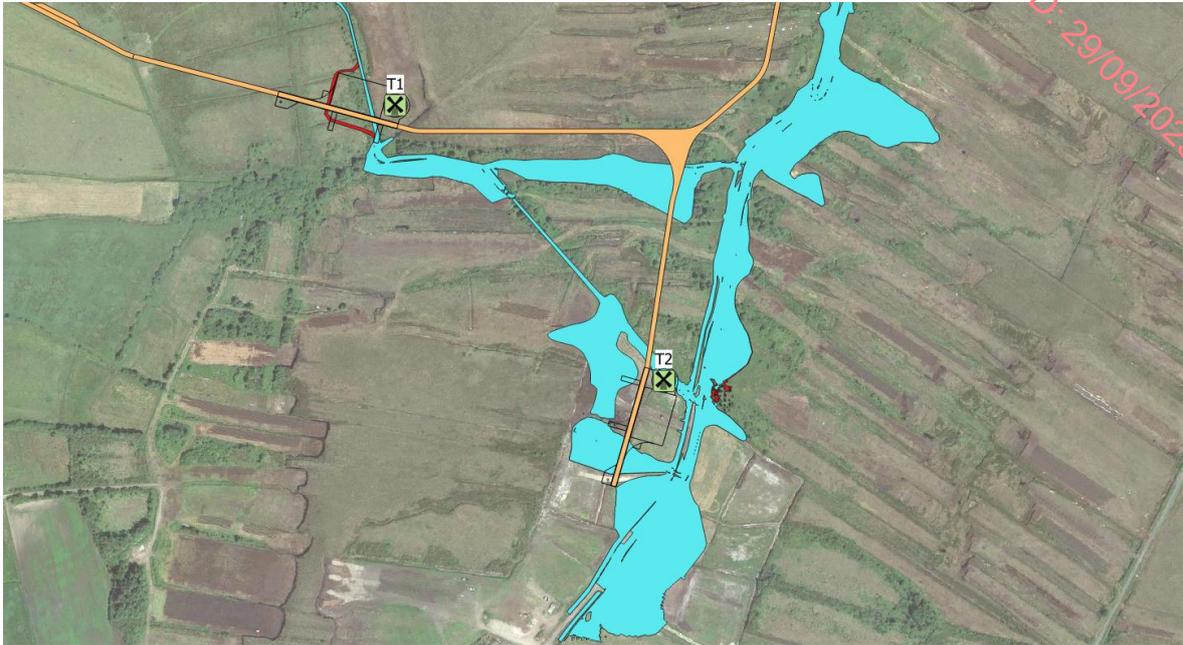
Flood extents maps for both Zones A and B indicate a small increase (almost imperceptible red hatch shown in figures below) of flood extent around the proposed site area (middle of the model) for the design river system. This increase in flood extent is associated with construction of turbine hardstands. Differences are notable around turbine T1 where channel re-routing is designed with addition of new culverts. Some increase of flood extent is evident around turbine T2 and T8 (around which a new 12m span bridge is to be designed). Differences are more notable for flood Zone B – Q_{100cc} than in flood Zone A – Q_{100cc} .

6.4.3.1 Flood Zone A



6.4.3.2 Flood Zone B

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6.4.4 Hydrograph comparisons for Q_{100cc}

The hydrographs for the existing river system was compared to the hydrograph for the design River system at a number of locations as shown in Figure 6.17 below.

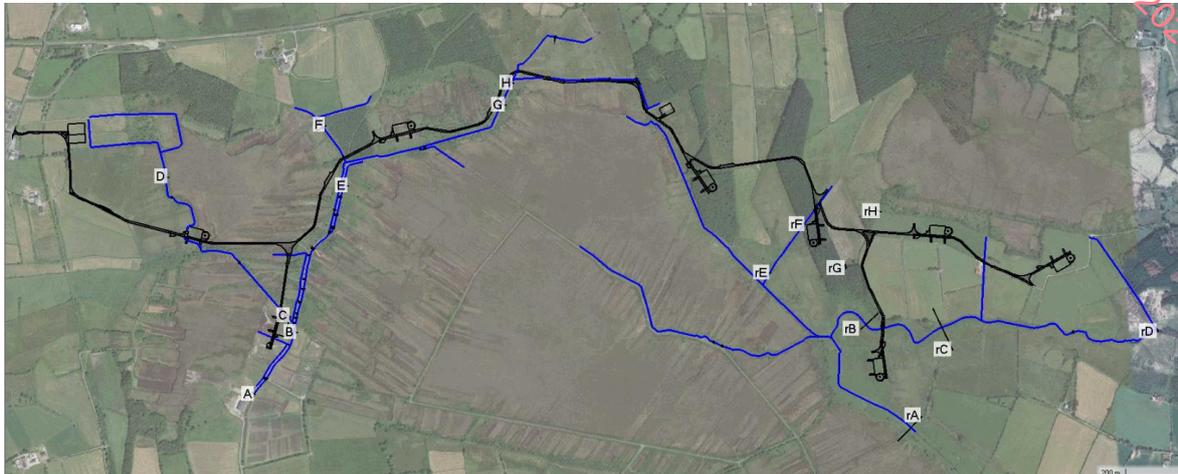


Figure 6.17. Hydrograph comparison locations for Q_{100cc} design flow.

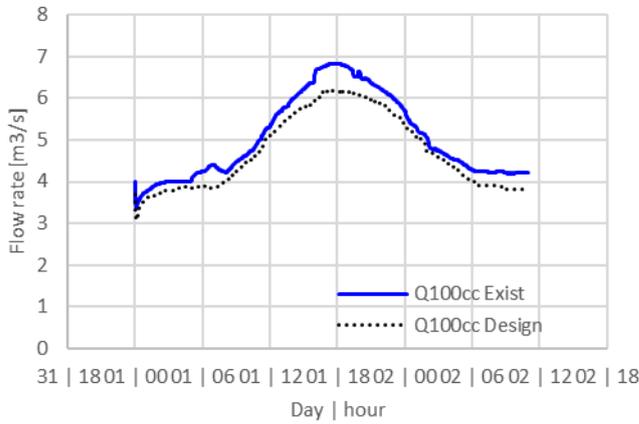
Figure 6.18(a),(b),(c),(d),(e),(f),(g) & (h) gives the comparisons at Killimor River.

Figure 6.19(a),(b),(c),(d),(e),(f),(g) & (h) gives the comparisons at Raford River.

It is clear that there is only minor changes in the sub-catchment flood flow values at the downstream points (in some cases there is a flow reduction).

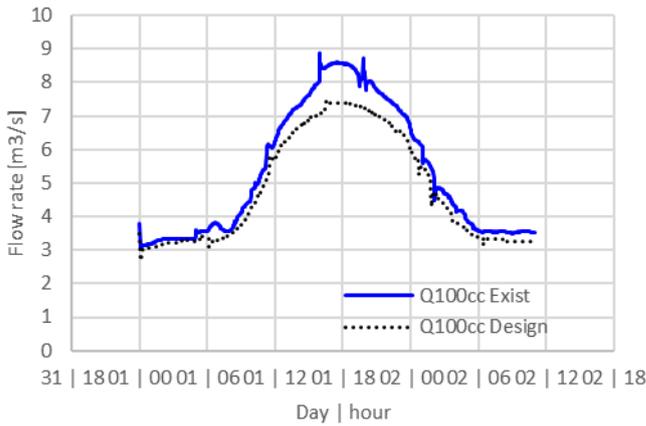
Figure 6.18. Hydrograph comparisons at the Killimor locations for Q_{100cc} design flow.

(a) Location A - Output flow hydrographs for Q_{100cc}



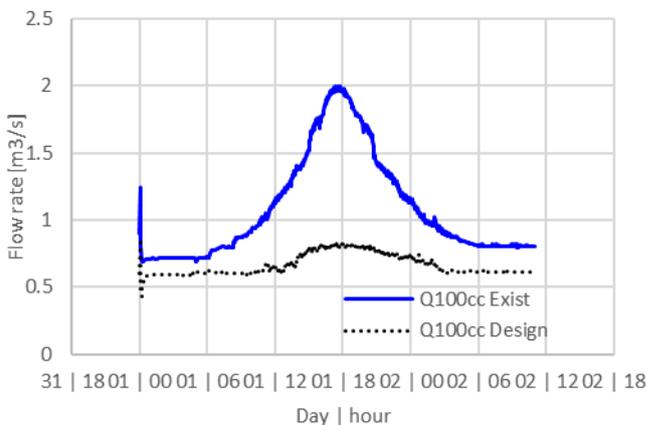
Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
6.82	6.17	-0.65	-9.57%

(b) Location B - Output flow hydrographs for Q_{100cc}



Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
8.88	7.48	-1.41	-15.8%

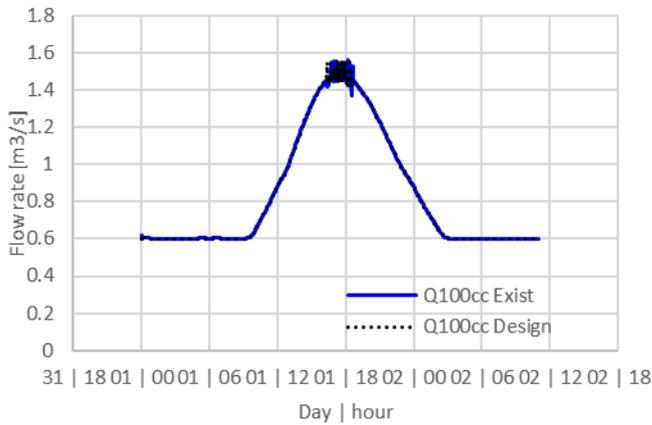
(c) Location C - Output flow hydrographs for Q_{100cc}



Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
2.00	0.84	-1.16	-58.1%

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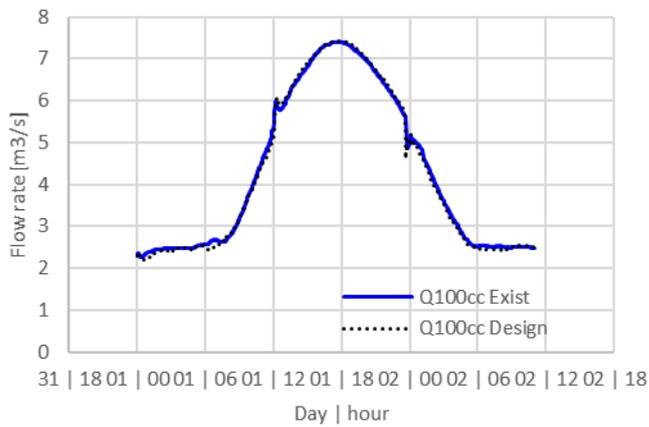
(d) Location D - Output flow hydrographs for Q_{100cc}



Q_{100cc} Exist [m ³ /s]	Q_{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
1.56	1.57	0.01	0.51%

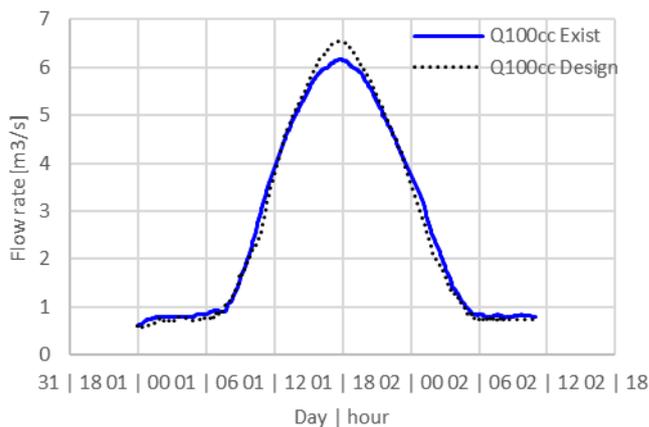
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(e) Location E - Output flow hydrographs for Q_{100cc}



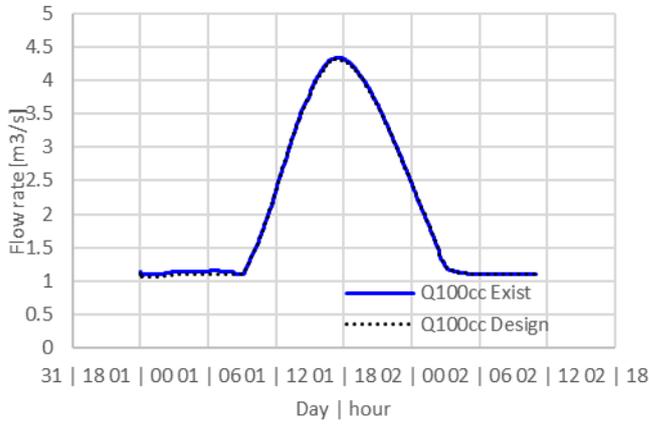
Q_{100cc} Exist [m ³ /s]	Q_{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
7.39	7.44	0.04	0.58%

(f) Location F - Output flow hydrographs for Q_{100cc}



Q_{100cc} Exist [m ³ /s]	Q_{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
6.16	6.55	0.38	6.20%

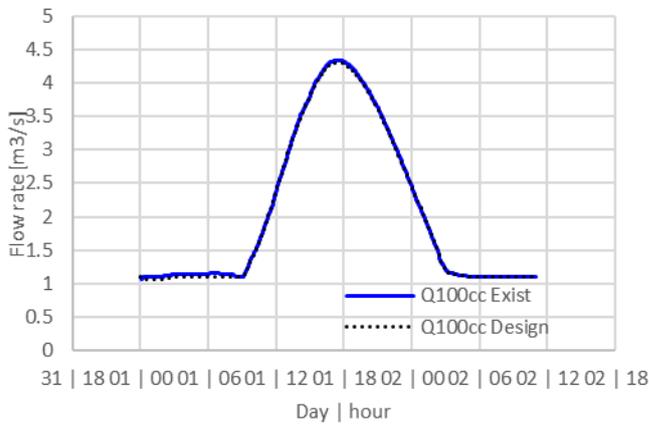
(g) Location G - Output flow hydrographs for Q_{100cc}



Q_{100cc} Exist [m ³ /s]	Q_{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
4.33	4.31	-0.02	-0.55%

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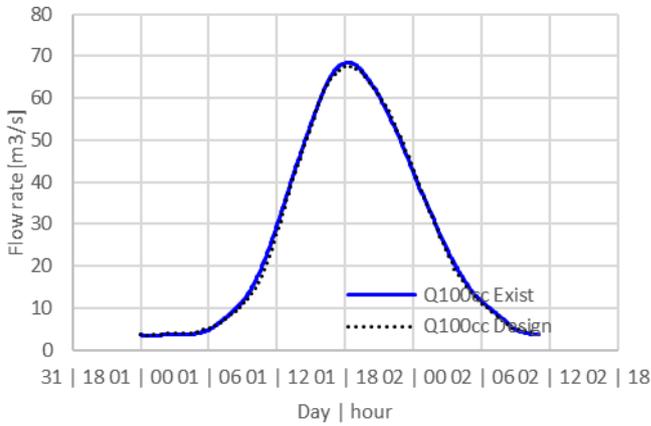
(h) Location H - Output flow hydrographs for Q_{100cc}



Q_{100cc} Exist [m ³ /s]	Q_{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
4.34	4.30	-0.04	-0.81%

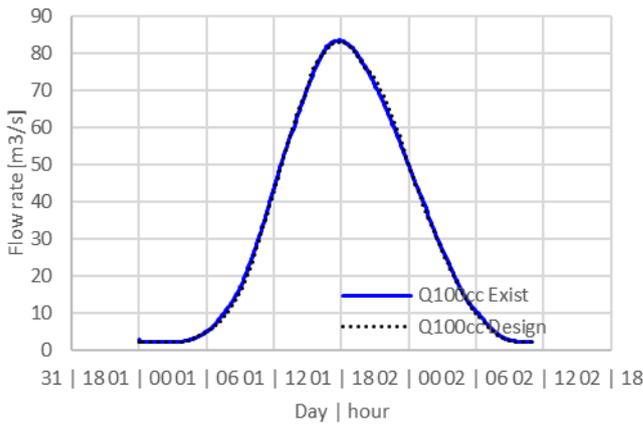
Figure 6.19. Hydrograph comparisons at the Raford locations for Q_{100cc} design flow.

(a) Location rA - Output flow hydrographs for Q_{100cc}



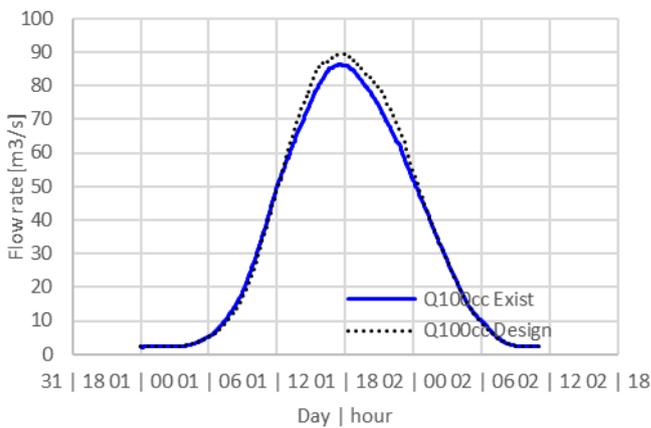
Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
68.52	67.75	-0.77	-1.13%

(b) Location rB - Output flow hydrographs for Q_{100cc}



Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
83.45	83.11	-0.34	-0.41%

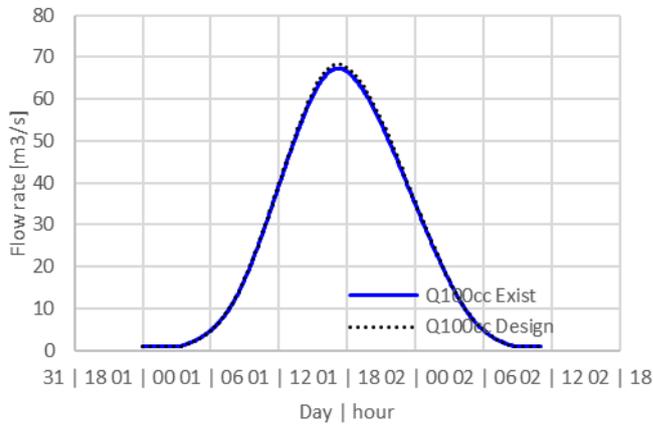
(c) Location rC - Output flow hydrographs for Q_{100cc}



Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
86.22	89.43	3.22	3.73%

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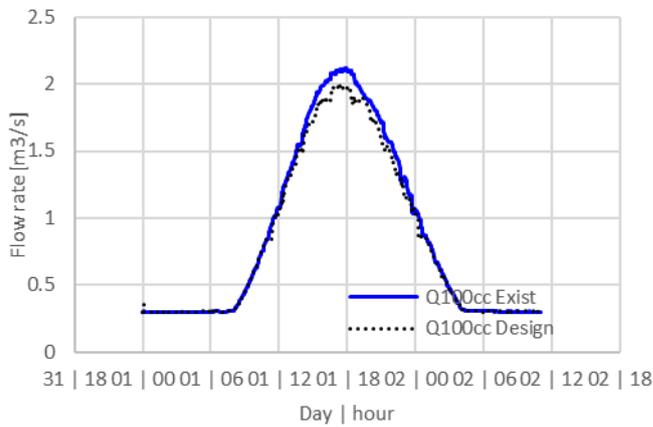
(d) Location rD - Output flow hydrographs for Q_{100cc}



Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
67.37	68.38	1.02	1.51%

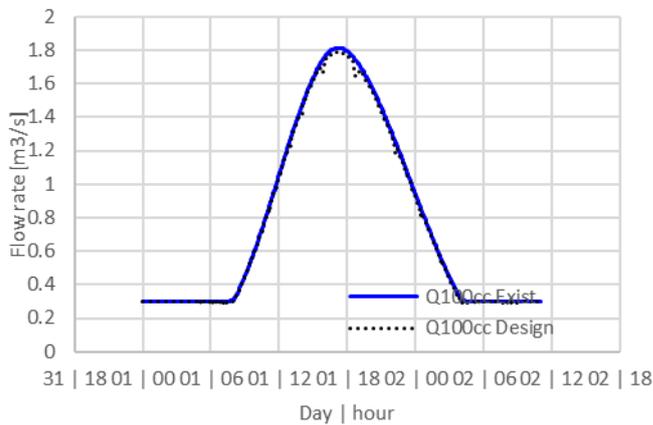
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(e) Location rE - Output flow hydrographs for Q_{100cc}



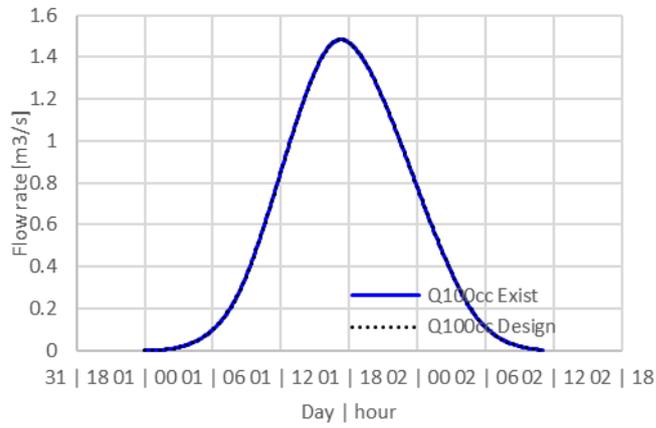
Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
2.12	1.99	-0.13	-6.2%

(f) Location rF - Output flow hydrographs for Q_{100cc}



Q _{100cc} Exist [m ³ /s]	Q _{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
1.81	1.79	-0.03	-1.4%

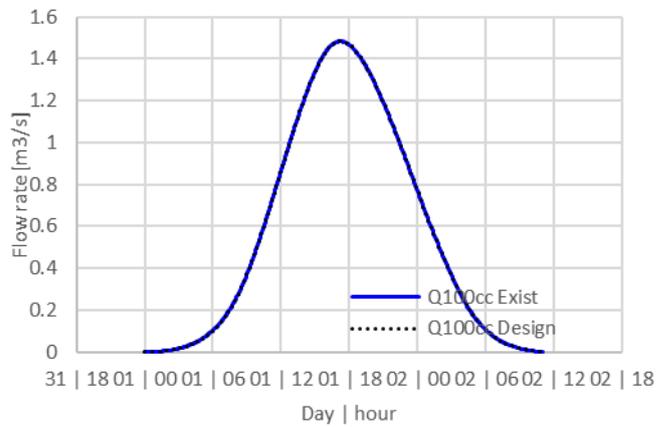
(g) Location rG - Output flow hydrographs for Q_{100cc}



Q_{100cc} Exist [m ³ /s]	Q_{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
1.48	1.48	0.00	0.0%

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(h) Location rH - Output flow hydrographs for Q_{100cc}



Q_{100cc} Exist [m ³ /s]	Q_{100cc} Design [m ³ /s]	ΔQ [m ³ /s]	ΔQ [%]
1.48	1.48	0.00	0.0%

6.4.5 Loss of storage

No loss of storage.

6.4.6 Increased run-off

The increase of run-off due to construction of hardstands is mitigated by incorporating a SuDS system of runoff management. The potential increase of the runoff due to construction of hardstands is estimated to be 0.85m³/s (see section 6.3.1). SuDS are therefore required. The runoff increase and proposed SuDS dimensions are given in section 6.3.1.

6.5 RESIDUAL RISKS

Residual flood risks include the failure of flood management infrastructure or a severe flood event that exceeds a flood design standard.

6.5.1 Failure scenarios and flood resilient building design

According to the OPW Guidance, assessment of flood defence breaching should be undertaken on the basis of a design event of the appropriate design standard. The flood protection system involving a raised terrace which is extremely stable, is not liable to structural failure in the same way as an embankment or levee and as such does not pose a risk due to failure.

In order to mitigate residual flood risk, it is proposed that the properties should be constructed with their finished floor/ground levels at such a height greater than:

(the 1000-year flood) + (an allowance for climate change) + freeboard

There is a single pronounced levee Figure 3.3 at the left bank of Raford river. The residual risk of this levee was tested by modelling of the system with and without (failure) of this levee. The analysis showed no difference in flood extent or water levels as the levee is overtopped and flooded for both Q_{100cc} and Q_{1000cc} flood flows. Therefore there is no risk associated with failure scenarios.

6.5.2 Access and egress

According to the flood extent maps and Figure 6.20, access and egress to and from the site is provided from the west by local road L3115.

Access and egress point is not prone to flooding.

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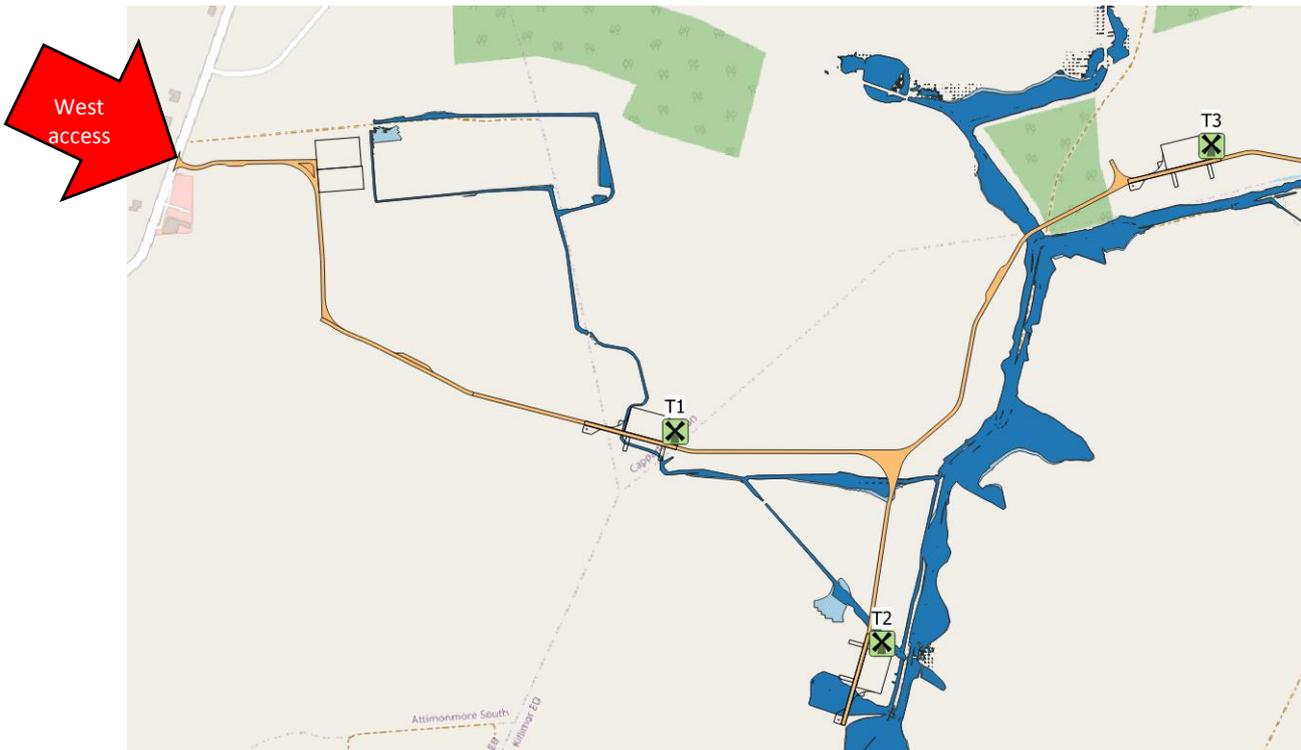


Figure 6.20. Layout of emergency access and egress road

6.6 JUSTIFICATION TEST

The Justification Test of the OPW Guidelines [1] has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk.

According to the requirements of the Guidelines, in the Justification Test, a sequentially-based decision-making process was applied, through Part 1 and Part 2 presented below.

The first is the Plan-making Justification Test described in chapter 4 of the Guidelines [1] and used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding. The second part relates to the development management.

6.6.1 Part 1 - Plan Making Justification Test

The majority of the proposed development site falls within Zone C with no risk of flooding.

As elements of the proposed development site (new bridges and culverts) fall within Zone A (Turbines T1, T2 and T8) with high risk of flooding, a Justification Test is undertaken to review issues of proper planning and sustainable development.

The proposed development site is located east of town Athenry in Co. Galway. The majority of the site is not under risk of fluvial flooding (Flood zone A), however some culverts are in Zone A (turbine T1, T2 and T8). Construction of hardstands for turbine T1 will require channel re-alignment in order to minimise flood risk, e.g. to place hardstands within Zone C. The site is outside of Local Area Plans as shown in Annex D. However, according the Co. Galway Energy plan as part of Development Plan 2022-2028 [12] the site is under "Priority Areas". Priority Areas are areas which have secured planning permission and where on-shore wind farms can be developed immediately.

Therefore it can be concluded that the requirements of Justification Test Part 1 are **satisfied**.

The proposed Wind Farm falls within areas of Priority Areas (Map 1 in Annex F) and is located between Open to consideration zone (Map 2 below in Annex F).

6.6.2 Part 2 – Development Management Justification Test

If the requirements of Part 1 are satisfied, then the following additional detailed criterion should also be met. The development has been the subject of a sufficiently detailed Flood Risk Assessment, as appropriate to the nature and scale of the development, and the potential risk that may arise, which is demonstrated below.

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This abstract from the OPW Guidelines [1] describe the Justification Test application.

”

Application of the Justification Test in development management

- 5.15 Where a planning authority is considering proposals for new development in areas at a high or moderate risk of flooding that include types of development that are vulnerable to flooding and that would generally be inappropriate as set out in Table 3.2, the planning authority must be satisfied that the development satisfies all of the criteria of the Justification Test as it applies to development management outlined in Box 5.1 below.

Box 5.1 Justification Test for development management (to be submitted by the applicant)

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
 - (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
 - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
 - (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
 - (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Refer to section 5.28 in relation to minor and infill developments.

1. The development lands have not been zoned by Galway County Council LAP.
 - i. The LAP zoning (Annex G) shows that the development is located outside of the any, e.g. Athenry Local Area Plan Zoning.
 - ii. However, Figure 8.13. Map 1 Suitability of wind farm development for Galway Co. Co. and Figure 8.14. Map 2 Wind Energy (in Annex F) suggest that the site is **within Priority Areas for New Wind Energy Development**
2. The proposal has been subject to an appropriate Flood Risk Assessment:
 - i. Annex H - HEC-RAS output tables and Figure 8.11-Figure 8.12 show detailed comparison in water levels between existing and design river system for Q_{100cc} and Q_{1000cc} respectively. For Q_{100cc} the increase in water levels is minimum, with some localised water level increase of maximum +0.06m for Q_{100cc} and +0.15m for Q_{1000cc} . The scoping process showed that the site area does not act as an effective

floodplain due to relatively low flow velocities and higher ground elevations at the site. The low flow velocities at the proposed site are confirmed in the hydraulic model. Comparison of flow velocities implies that there will be no increase in the potential for erosion, which was demonstrated by insignificant flow velocity increases. Calculations of the pre- and post-development peak run-off flow rate gave an increase in flow to the river of $0.85\text{m}^3/\text{s}$ for the critical rainfall event, and this relatively low flow (relative to river flows of up to $105\text{m}^3/\text{s}$) will have no effect on water levels. However SuDS design was proposed to mitigate increase of peak flood flows. Flood hydrograph comparison showed small increase or even reduction in peak flood runoff for $Q_{100\text{cc}}$ and $Q_{1000\text{cc}}$. Therefore, on the basis of performed calculations, it can be concluded that the site development **will not increase flood risk on the site or elsewhere**.

- ii. A design measures to minimise flood risk includes design of a high level flood terrace, e.g. turbine hardstands with and a 0.50m freeboard for floor levels with a ramps to wind farm road network that is to be placed at exiting ground levels. With the proposed measures the **flood risk to people, property and the environment is minimised** as far as reasonably possible. A comparison of water levels and flow velocity in the channel, between existing and design river system for Design Event 1 comprised 100 years (1% AEP) flows with included climate change of the Killimor river and Raford river imply that there would be no change in water levels and in flow velocities. This means that all normal river flow remains unaffected by the proposed flood protection works, and ensures that the existing river main channel remains intact. Therefore, it can be concluded the proposed flood mitigation measures **minimise flood risk to people, property and the environment** as far as reasonably possible.
- iii. Turbine T1 hardstand crosses over an existing stream. This can be mitigated by constructing c. 100m long culverts through the hardstand, or as proposed re-alignment the channels (see section 6.2.8.4). Turbine T2 hardstand also crosses an existing stream and it is proposed to mitigate this by installing a 1.5m diameter pipe culvert.
- iv. According to the flood extend maps, emergency access and egress to and from the site is provided on the west side of the development via the local road L3115. Access and egress location being outside flood Zone A and B. The proposed finished floor levels of hardstands ensure that the flooding of buildings that are part of Wind Farm are not affected and with on-site road network levels that remain at levels of existing ground ensure that **residual risks to the development can be managed to an acceptable level and that flooding elsewhere is mitigated. In general, road network is outside flood Zone A and Zone B**.
- v. The development flood alleviation measures in the form of a simple raised terrace and raised floor levels do not involve any major deviations from what would be considered good urban design.

According to the presented results, it can be concluded that the requirements of Justification Test Part 2 are **satisfied on all defined criteria**.

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6.7 FLOOD RISK BALANCE SHEET

Flood-risk indicator	Ultra-positive ++	Positive +	Neutral	Negative	Ultra-negative
<i>Is the development within existing flood-risk area?</i>			Road network and Turbines T3-T7 are in Flood Zone C. Turbine T1 requires channel re-alignment in order to remain in Zone C	New culverts and bridges overlap with flood Zone A; Turbine T8 hardstand within Zone A (hydraulic analysis showed no increase in flows and WL)	
<i>What are the scale and nature of flood risks?</i>	Understood, easy to warn	Predictable			
<i>What scale of residual risk measures will be required?</i>	Measures could eliminate risk to development				
<i>How will egress and access be assured? What will be the emergency planning impact?</i>	Emergency access and egress ensures safe evacuation for 0.1% AEP flow	Hardstands are designed with FFL 0.5m above 0.1% AEP flow levels			
<i>Will there be a change in number of people at risk?</i>			No increase or increase of people at risk		
<i>Will there be a change in number of properties at risk?</i>			Neutral impact		
<i>Will there be an impact of the mitigation measures elsewhere?</i>			Neutral impact		

6.8 CONCLUSIONS

1. In accordance with the OPW and the Department of the Environment, Heritage and Local Government Guidelines „The Planning System and Flood Risk Management - Guidelines for Planning Authorities“ from November 2009 [1] a flood risk assessment was carried out in three stages

Stage 1 - Flood risk identification

Stage 2 - Initial flood risk assessment.

Stage 3 - Detailed flood risk assessment

2. Stages 2&3 required hydrological and hydraulic analyses as follows:
3. The Q_{100cc} , and Q_{1000cc} (including a climate change factor of 1.2) flood flows were obtained from our loH124 hydrological study. The Q_{100cc} for Killimor is $18.47m^3/s$ and for Raford is $87.48m^3/s$. The Q_{100cc} runoff for total catchment area ($43.787km^2$) is $105.95m^3/s$. The drainage of the windfarm site is complex involving two main river channels viz. the River Killimor and Raford fed by a series of smaller stream and drainage channels. The hydrological model used reflects this complexity and is characterized by a network of Hydrological Estimation Points (HEPs) as described in Table 5.1.
4. A detailed river and bridge survey was carried out and used to develop a digital elevation model of the rivers and floodplains.
5. An unsteady flow analysis was required for the FRA to assess the development impact on storage and consequently a number of hydrographs for each of the constituent rivers, stream and channels were developed. The 1D2D hydraulic model HecRas v6.3.1 was created for Existing and Design River System. The 1D model covers a reach of c. 11km, defined by 611 cross sections and a 44 bridges/culverts (Existing river system model contains 30 bridges). The 2D model covers an area of $5km^2$.
6. The following results were obtained for stages 2 & 3
 - a. The Highest predicted water levels are +0.06m higher than existing water levels and are localised. The majority of predicted (design) water levels are circa. $\pm 0.01m$ relative to the existing water levels.
 - b. The results from the simulations showed that there is no change on the longitudinal profile water levels of the Q_{100cc} and Q_{1000cc} floods.
 - c. The flow velocities throughout the site range between 0.5m/s and 1.5m/s for the extreme flood event. These velocities are not considered to be of major concern.
 - d. The impact of the development of the storage capacity of the windfarm site was assessed and was demonstrated to be minor by comparing the hydrographs for existing and design river systems at a number of locations and at the downstream end of the site as shown in Figure 6.17 and Figure 6.18.

7. The WF development design is influenced by the above results as follows:
- Floor levels in the development should be set at a level above water levels for Q_{1000cc} (Climate Change) + 0.5m additional safety factor freeboard, see Table 6.3.
 - The proposed new roads should remain at the same level as existing ground levels in order to ensure natural flow paths over the floodplain and avoid backup of the water.
8. There is an increase in storm runoff from the site as a result of the increase in the impermeable. The increase in flow to the river peaks at a value of $0.85\text{m}^3/\text{s}$ and is mitigated with appropriate SuDS design.
9. The question of access and egress from the public road is dealt with as follows:
- Access and egress to and from the site can be provided on the west side via the local road L3115 at an elevation. Access and egress site is outside flood zone A and B.
10. Justification test
- The requirements of Justification Test Part 1 - Plan making Justification Test are satisfied on all defined criteria. For the planning elaboration, see the Planning Document.
 - The requirements of Justification Test Part 2 - Development Management Justification Test are satisfied on all defined criteria. For the planning elaboration, see the Planning Document.
11. A number of existing culverts throughout the site are function as throttles for flood flows and have the effect of flood flow attenuation. These culverts will not be altered by the wind farm layout design.
12. A number of new culverts and one bridge have been identified (Figure 6.11) and these can be hydraulically designed using the flows calculated in this study under Section 50 guidelines (Arterial Drainage Act, 1945).
13. Channel re-alignment around turbine T1 should be further hydraulically designed under Section 9 of Arterial Drainage Amendment Act from 1995.

7 References

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- [1] The Planning System and Flood Risk Management - Guidelines for Planning Authorities, OPW and the Department of the Environment, Heritage and Local Government, November 2009.
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- [19] Robson, A. J . and Reed, D. W. (1999) Statistical procedures for flood frequency estimation. Volume 3 of the Flood Estimation Handbook. Centre for Ecology & Hydrology, UK, 1999.
- [20] Kjeldsen, T. R., Jones, D. A., and Bayliss, A. C. Science Report: SC050050. Improving the FEH statistical procedures for flood frequency estimation., 2008.

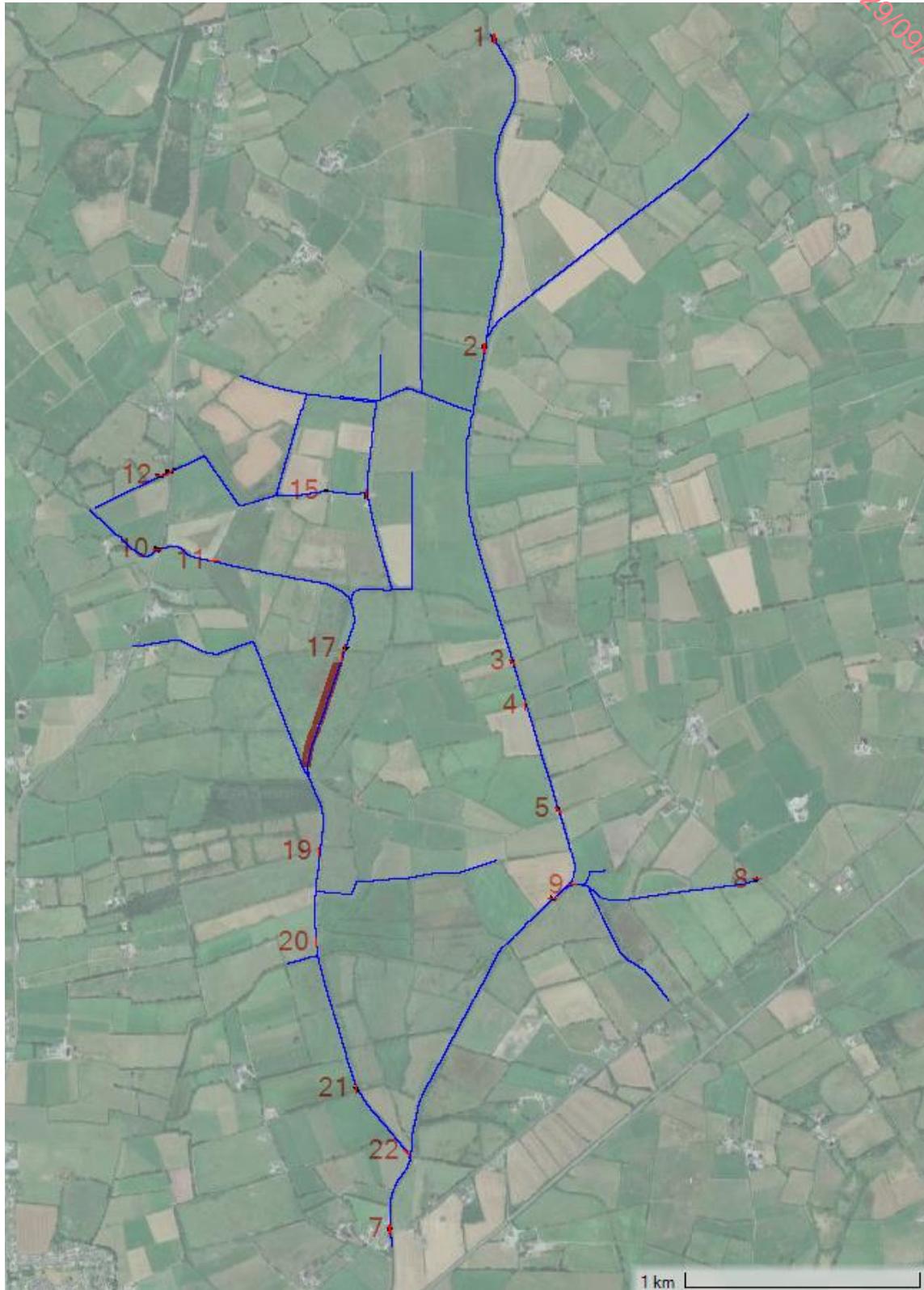
8 Appendices

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8.1 ANNEX A - PHOTOS OF HYDROLOGICAL FEATURES

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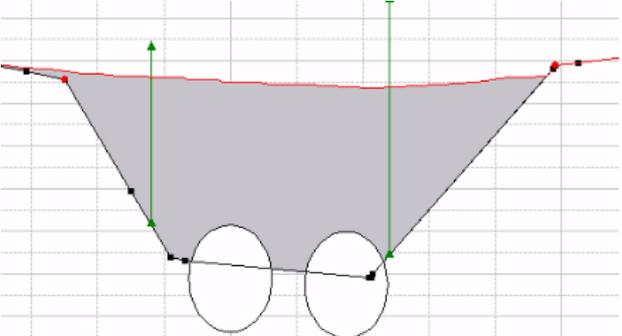
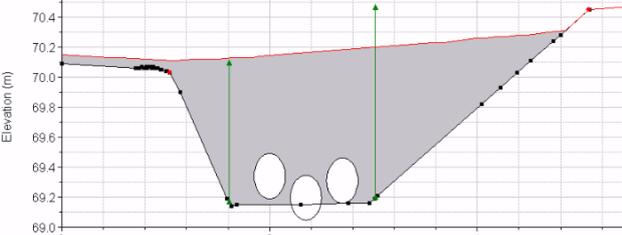
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Type of structure	Detail
Bridge	<p>01- Single span concrete bridge with irregular openings – U/s span square 2.2m, D/s span 1.6m</p> <p>u/s elevation</p>  <p>d/s elevation</p> 
Beams	<p>02-Deteriorated Farmer Crossing Single Span two beams 3.5m</p> <p>Not available</p>

<p>Wooden bridge</p>	<p>03- Single span 3.5m wooden farmer access bridge U/s elevation</p> 
<p>Beams</p>	<p>04- Deteriorated Farm Access (two wooden beams left)</p> 
<p>Bridge</p>	<p>05- Single span 3.5m wooden farmer access bridge Not available</p>
<p>Culvert</p>	<p>06-Pipe culvert 800mm</p>

	<p style="color: red; transform: rotate(-15deg); font-weight: bold;">RECEIVED: 29/09/2025</p>
<p>Bridge</p>	<p>07- Metal pipes no bridge Not available</p>
<p>Bridge</p>	<p>08- Pipe Culvert 1100mm Not available</p>
<p>Bridge</p>	<p>09- Concrete bridge single span 2m. Wall damaged. D/s elevation, looking upstream</p>

<p>Bridge</p>	<p>10- Pipe Culvert 600mm partially blocked at u/s end</p>
<p>Bridge</p>	<p>11- Two pipe culvert pipe 1 = 600mm pipe 2 = 300mm U/s elevation</p> <p>D/s elevation</p>

<p>Culvert</p>	<p>12- Two pipe 500mm pipes. Both pipes blocked with sediment 50% of height u/s elevation</p>  <p>u/s elevation</p> 
<p>Culvert</p>	<p>13-N62 road bridge North 770x1000mm box old stone culvert u/s elevation</p>  

<p>Wooden bridge</p>	<p>14- Farm wooden Bridge single span 2.5m wide</p>  <p>RECEIVED: 29/09/2025</p>
<p>Culvert</p>	<p>15- Culvert 600mm pipe crossing main farm road Looking from road</p> 

<p>Culvert</p>	<p>16- Culvert 300mm pipe</p> 	<p>RECEIVED: 29/09/2025</p>
<p>Culvert</p>	<p>17- Culvert 600mm pipe</p> 	

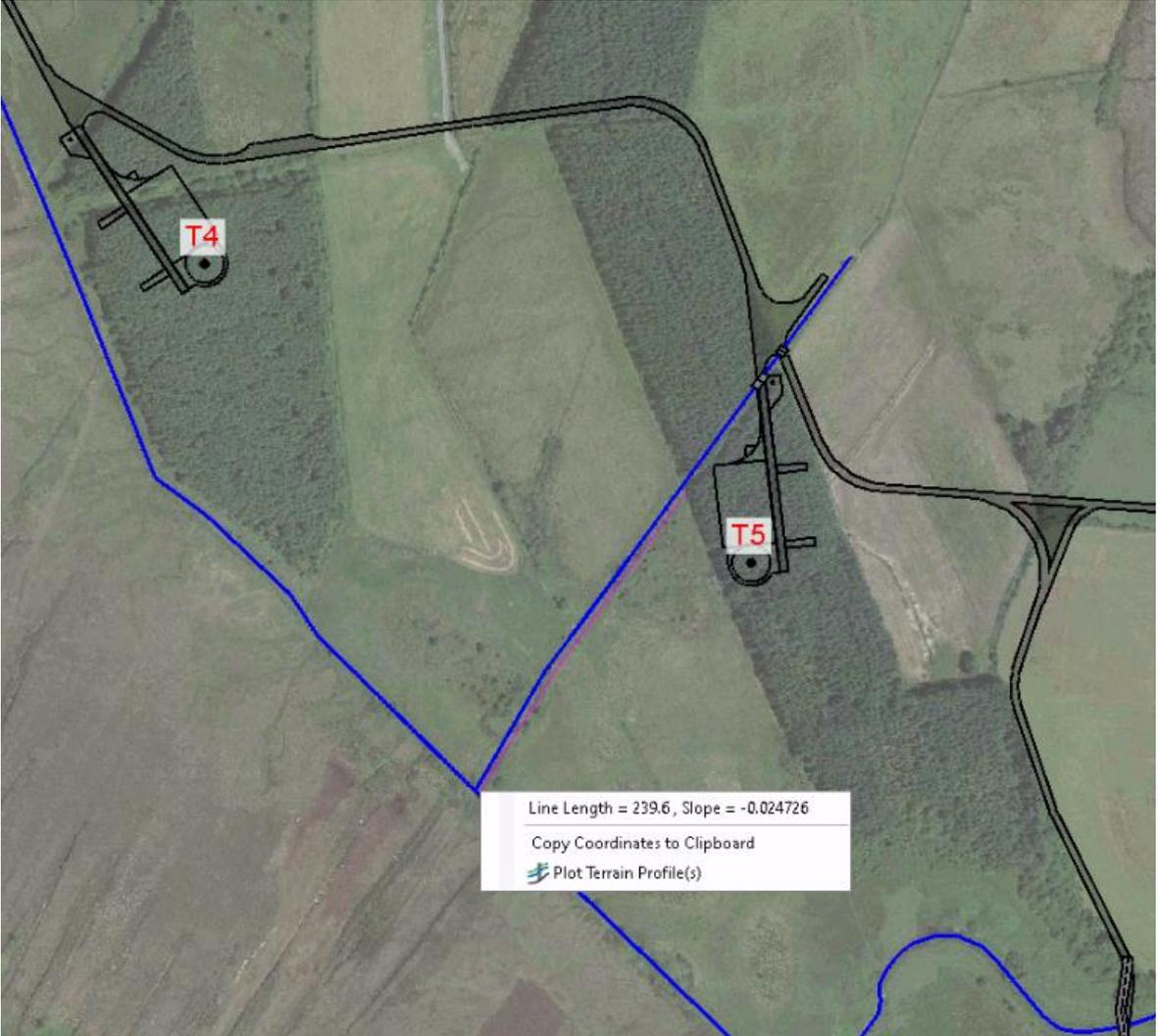
Culvert	<p>18- Culvert 900mm pipe</p>  <p>RECEIVED: 29/09/2025</p>
Culvert	<p>19- Culvert 900mm pipe</p> 
Culvert	<p>20- Culvert 750mm pipe</p> 

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<p>Beams</p>	<p>21-Metal beams D/s elevation</p> 
<p>Bridge</p>	<p>22- Single span bridge – wooden deck with concrete abutments D/s elevation</p> 

Culvert	<p>23-1200mm Pipe over main farm road</p> 
Culvert	<p>24-1200mm Pipe over main farm road</p> 
25	<p>25-600mm pipe with wingwals</p>
Culvert	<p>26-500mm pipe</p> 

Culvert	<p>27-500mm pipe</p>  <p>RECEIVED: 29/09/2025</p>
Bridge	<p>28-Single span concrete bridge 3.1m span with wing walls</p> 
Culvert	<p>29-750 mm pipe culvert</p> 

<p>Culvert</p>	<p>30-750mm pipe culvert</p>  <p>RECEIVED: 29/09/2025</p>
<p>Levee</p>	<p>240m Levee around Turbine 5 (see magenta line below)</p> 

8.2 ANNEX B - EXISTING FLOOD MAPS

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8.2.1 Existing Velocity distribution

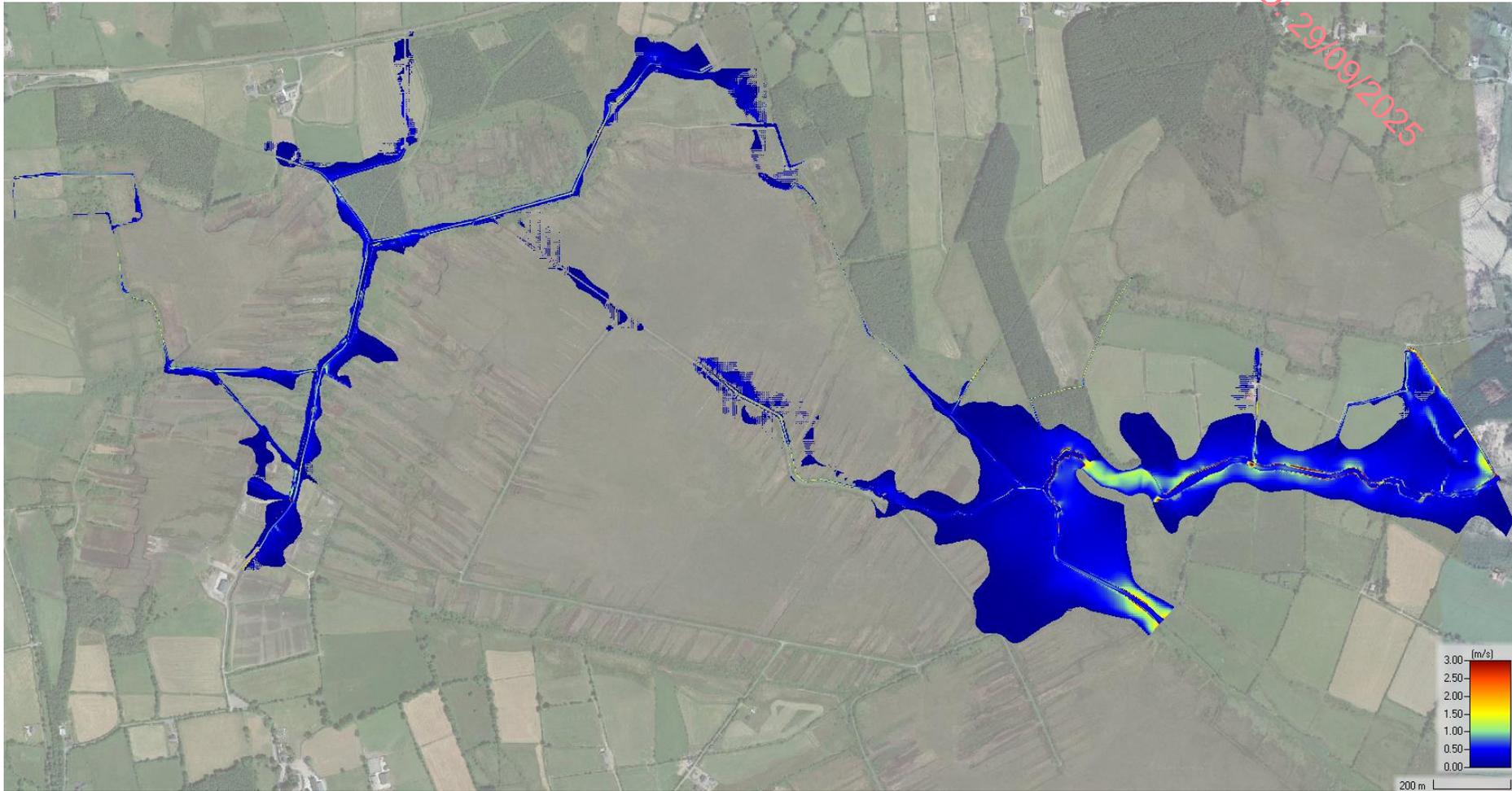


Figure 8.1. Flow Velocity distribution for Existing River System for Q_{100cc} .

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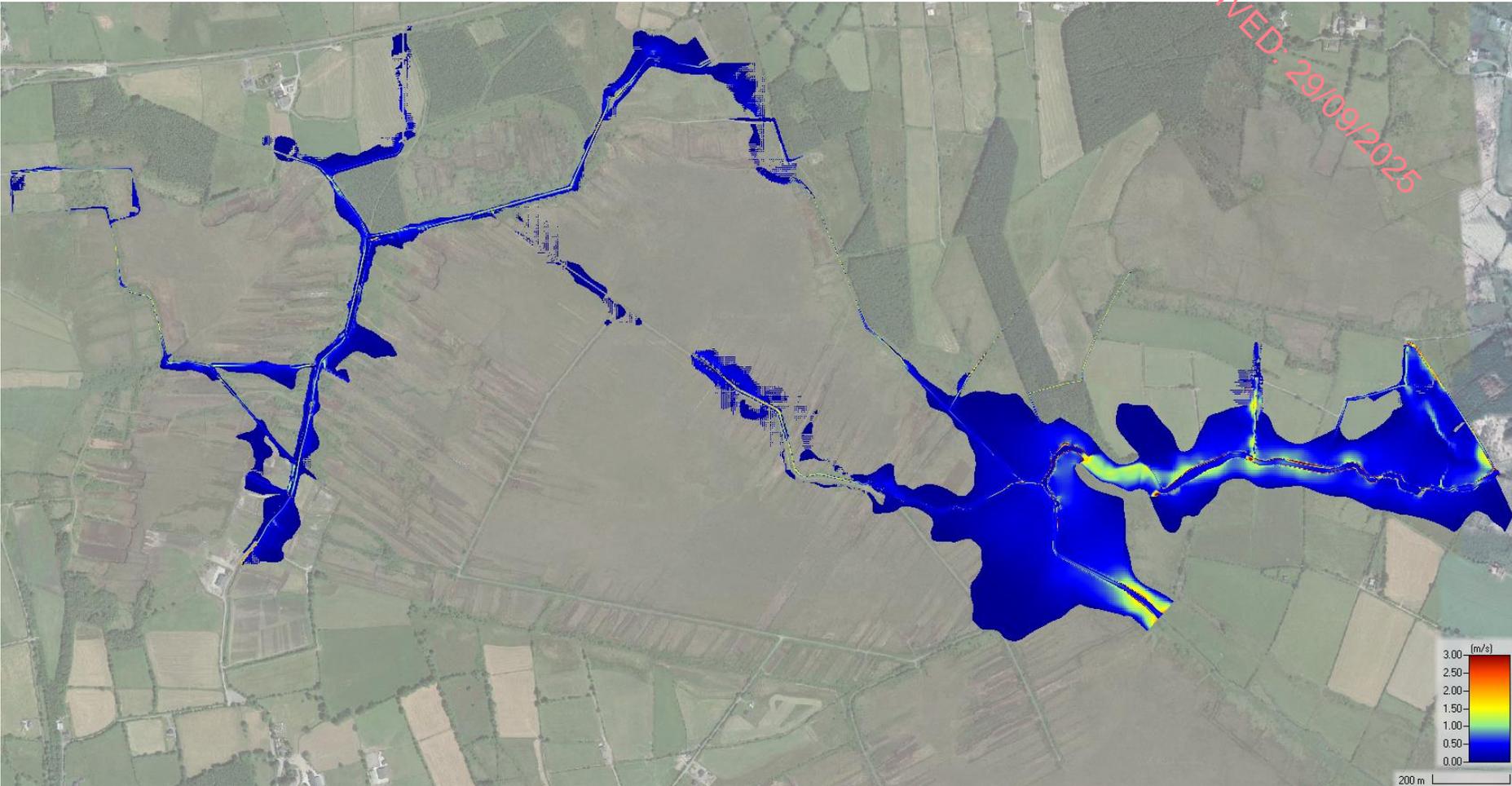


Figure 8.2. Flow Velocity distribution for Existing River System for Q_{100cc} .

RECEIVED: 29/09/2025

8.2.2 Existing Flood Maps

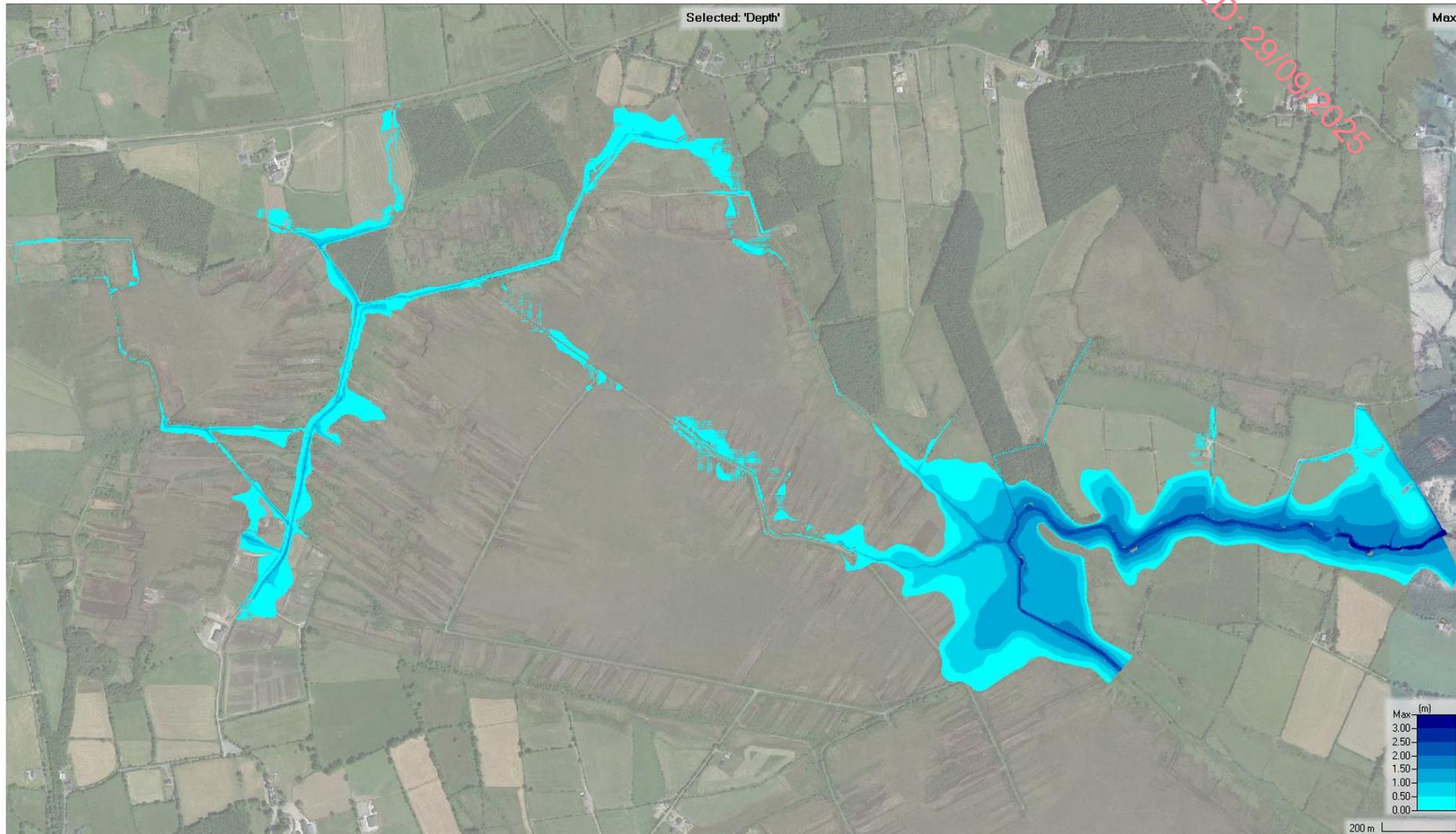


Figure 8.3. Flood map with water depths for Existing River System and Q_{100cc} design flow.

RECEIVED: 29/09/2025

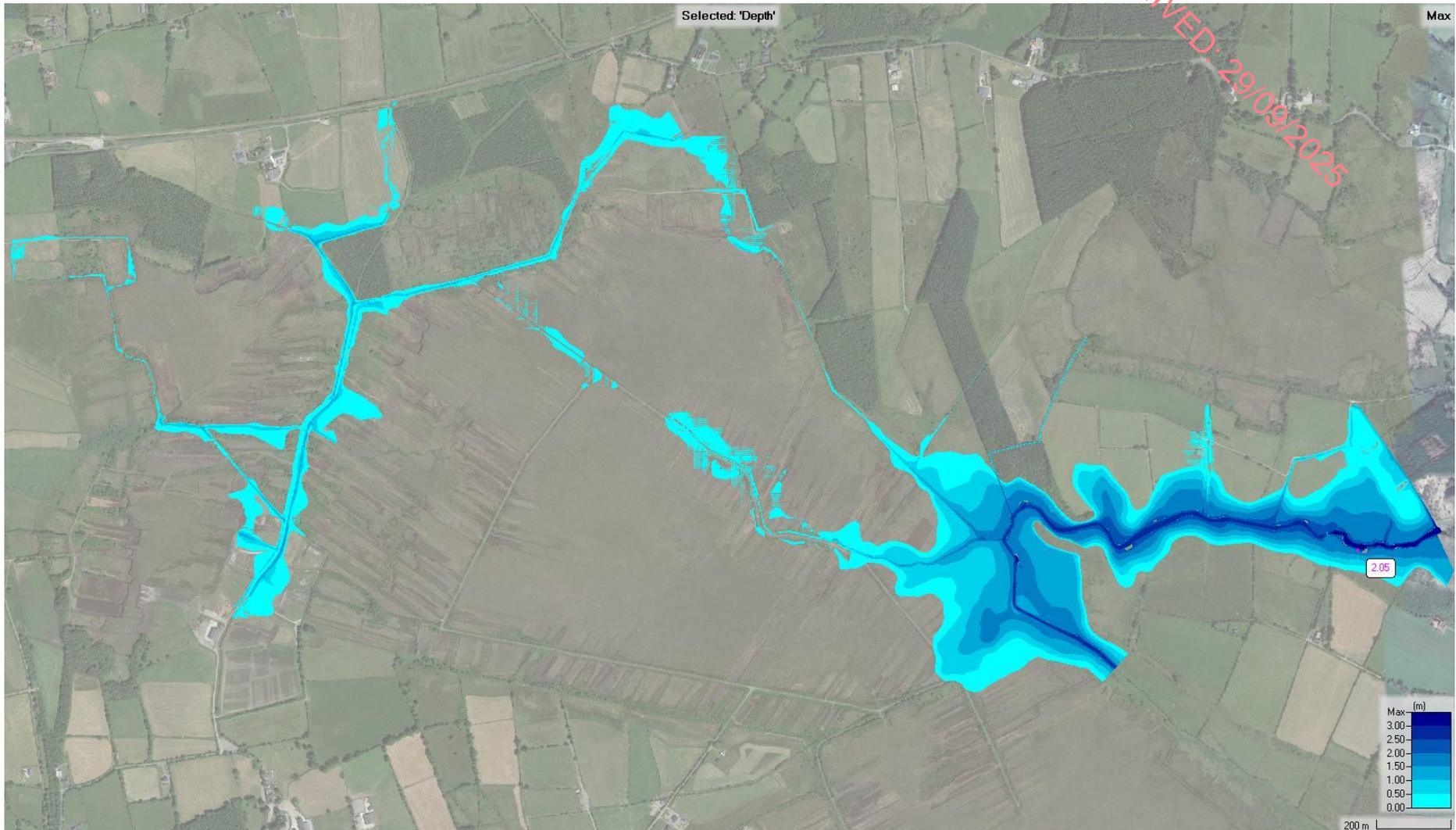


Figure 8.4. Flood map with water depths for Existing River System and Q_{100cc} design flow.

8.3 ANNEX C - PREDICTIVE FLOOD ZONES AND FLOOD MAPS

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8.3.1 Design Velocity distribution

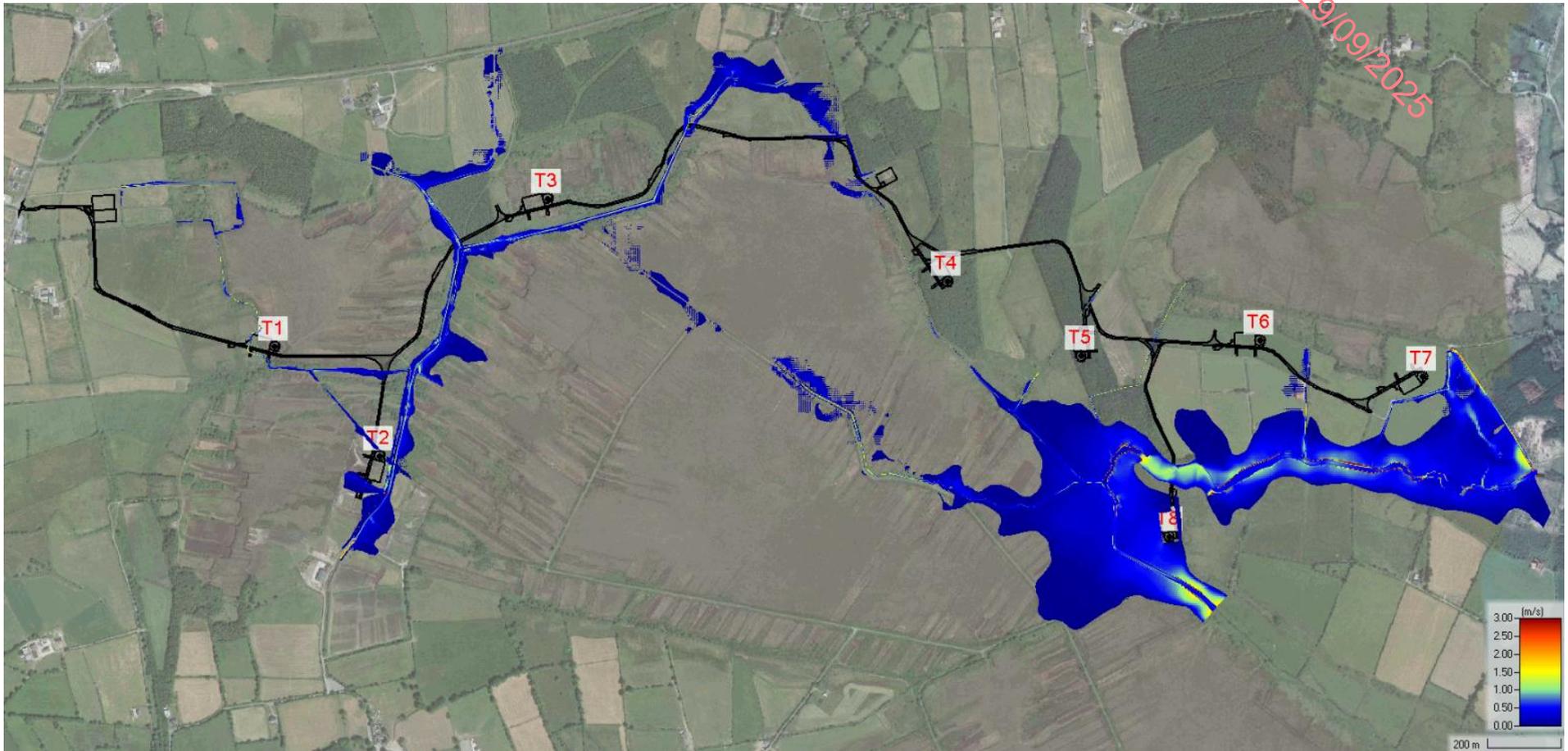


Figure 8.5. Flow Velocity distribution for Design River System for Q_{100cc} .

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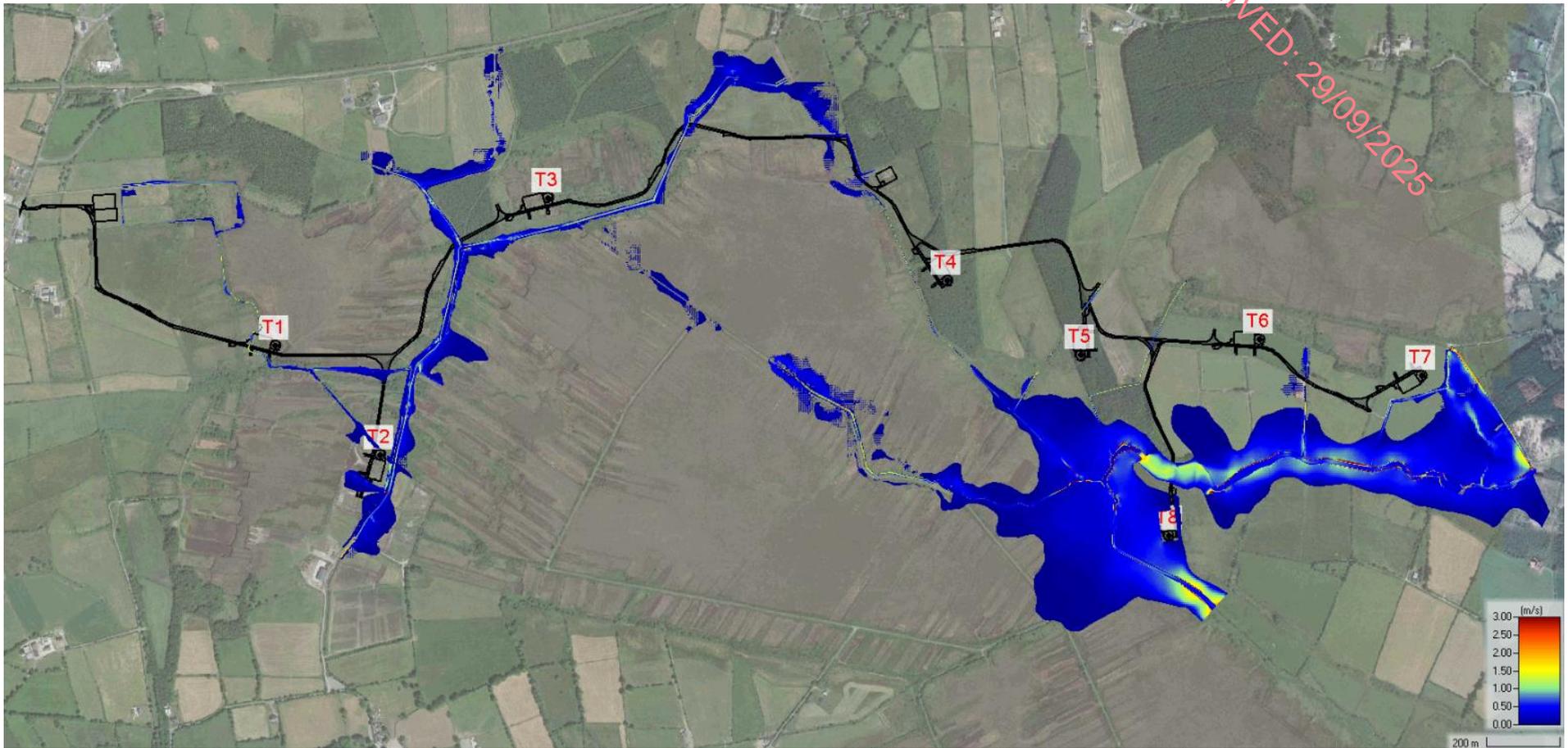


Figure 8.6. Flow Velocity distribution for Design River System for Q_{1000cc} .

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8.3.2 Design Flood Maps

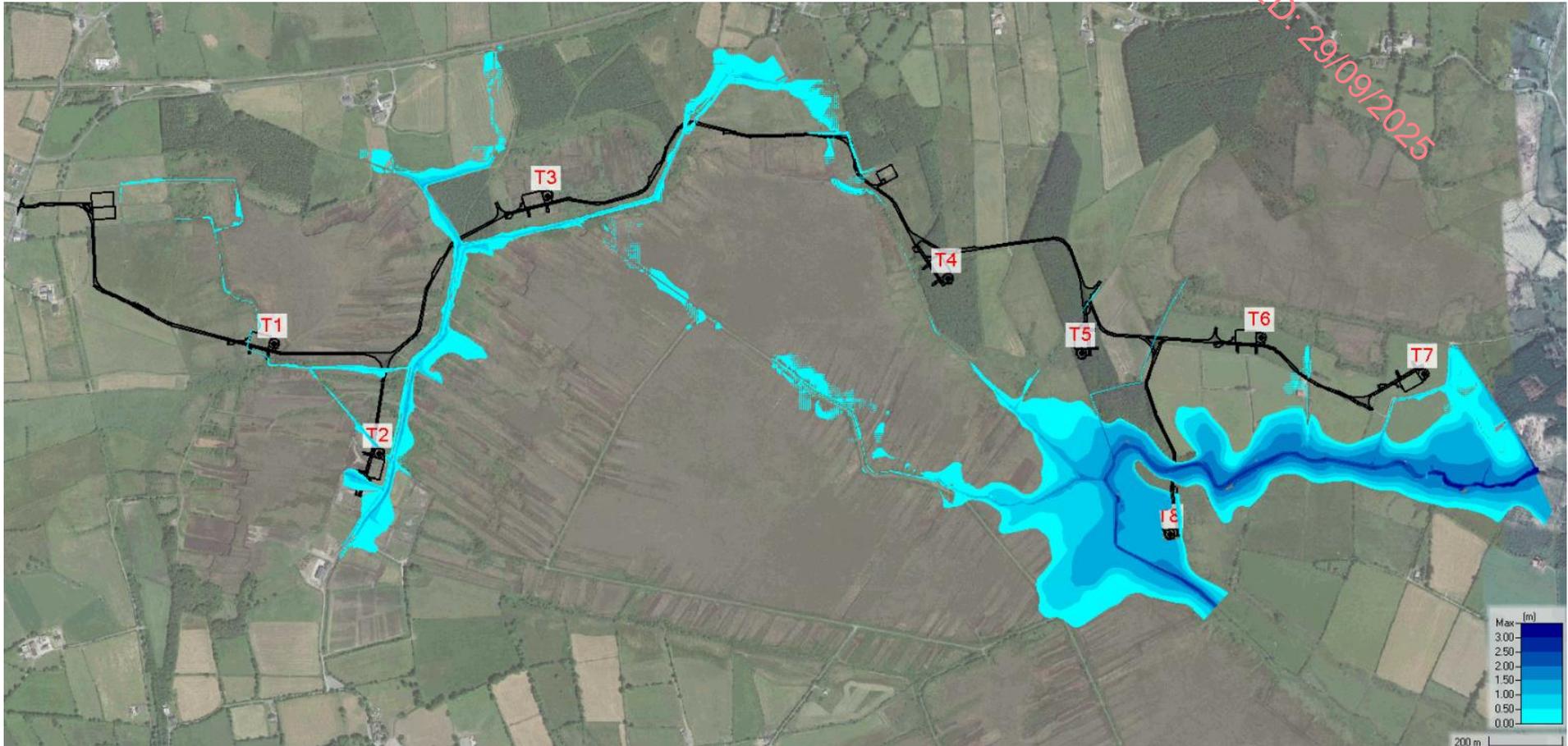


Figure 8.7. Flood map with water depths for Design River System and Q_{100cc} design flow – Zone A.

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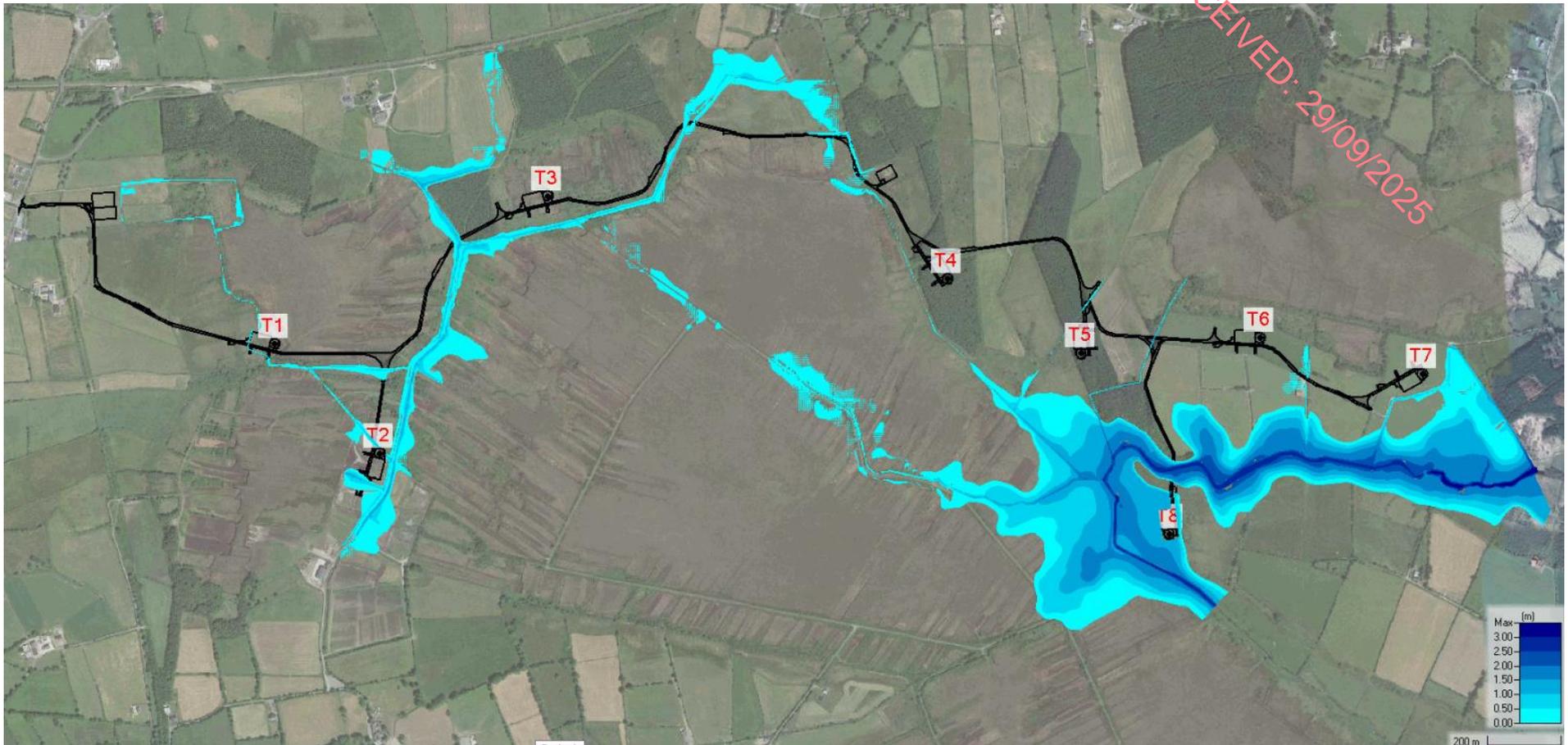


Figure 8.8. Flood map with water depths for Design River System and Q_{100cc} design flow – Zone B.

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Figure 8.9. Comparison of Existing and Design River System flood extent (Flood extent for Design System is shown in red hatch) for Q_{100cc} design flow – Zone A.

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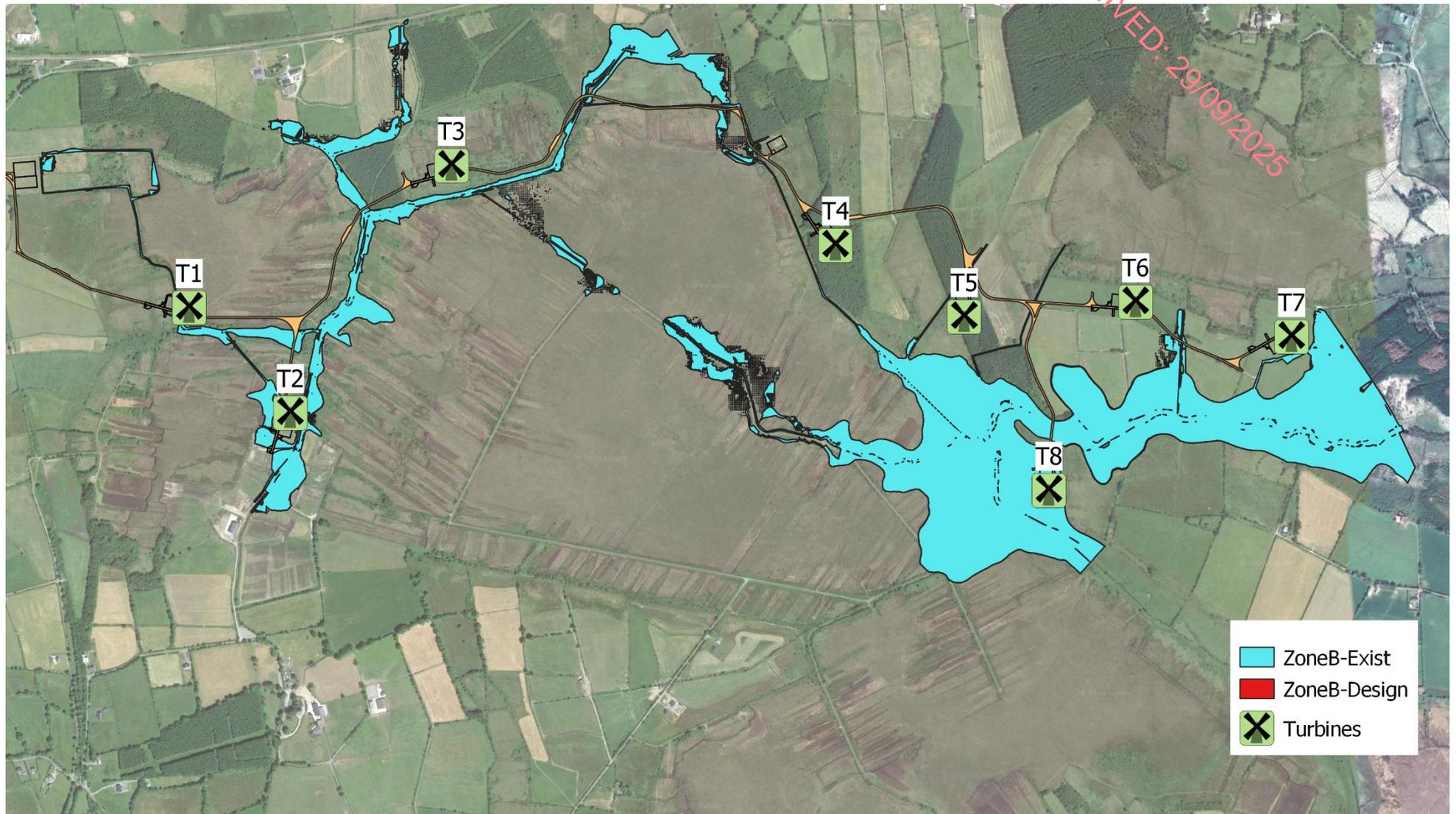
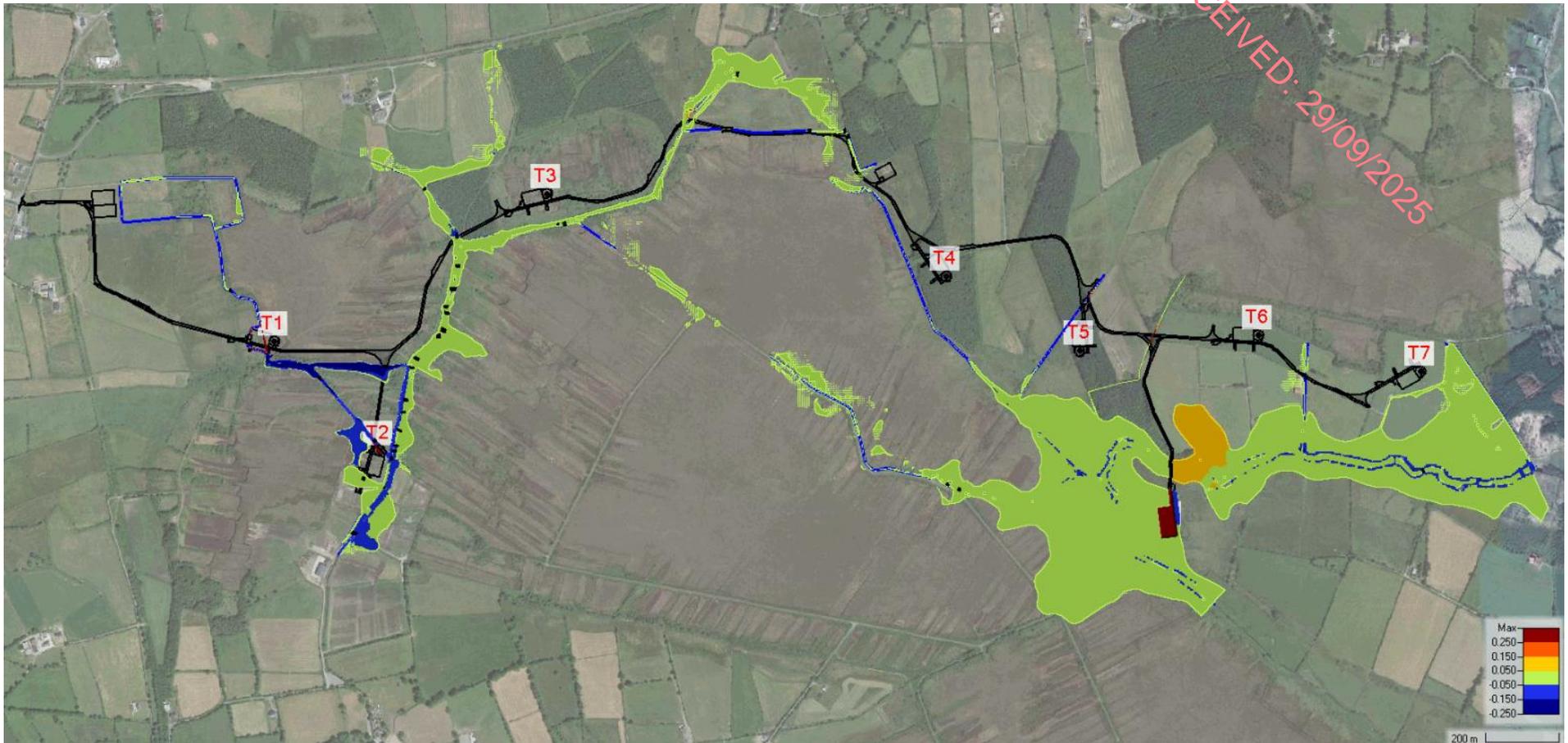


Figure 8.10. Comparison of Existing and Design River System flood extent (Flood extent for Design System is shown in red hatch) for Q_{100cc} design flow – Zone B.xx

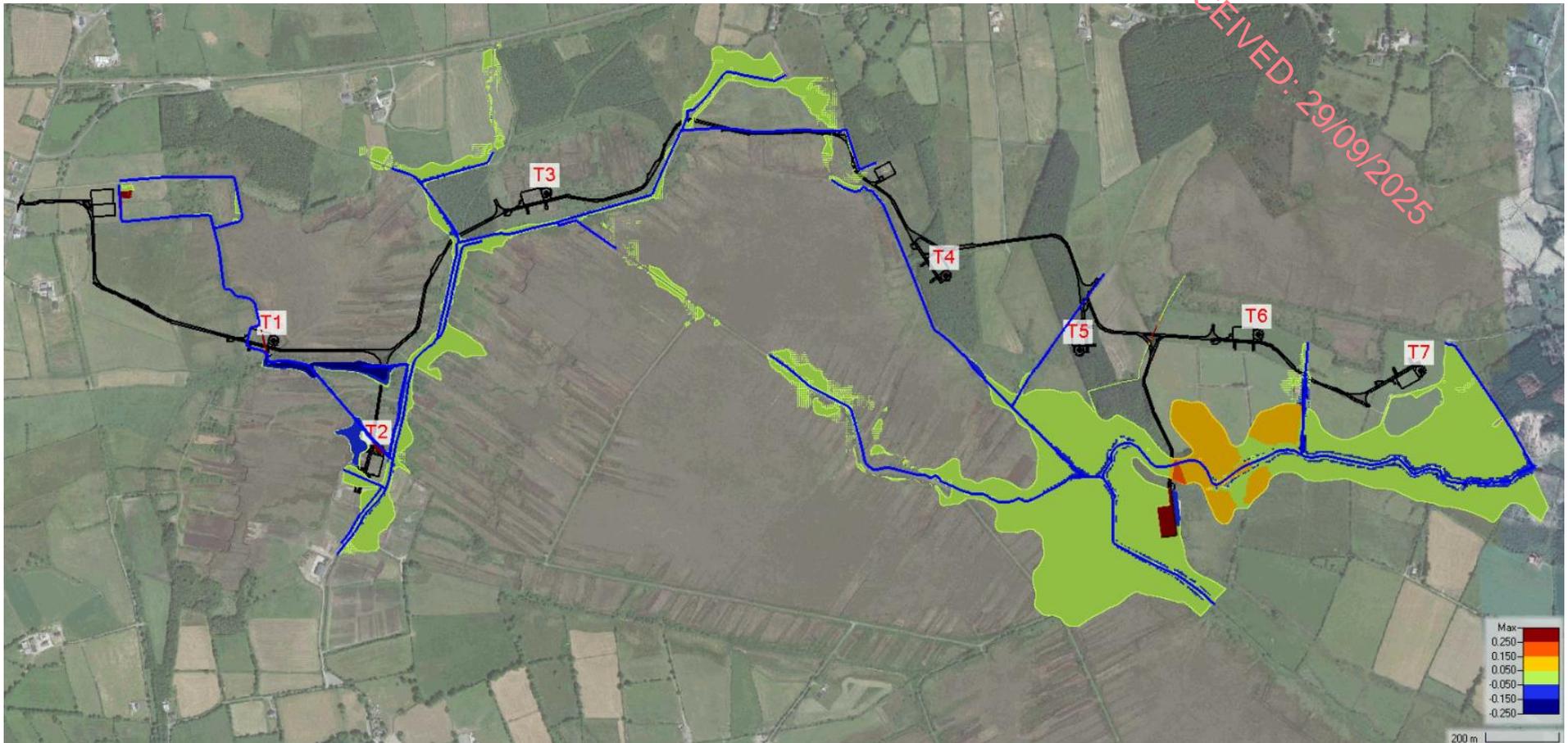
RECEIVED: 29/09/2025



*Design water level maximum difference higher for +0.05m (orange hatch)

Figure 8.11. Comparison of Existing and Design River System water levels for Q_{100cc} design flow – Zone A (negative values – green show lower WL in Design).

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* Design water level maximum difference higher for +0.15m (red hatch)

Figure 8.12. Comparison of Existing and Design River System water levels for Q_{1000cc} design flow – Zone B (negative values – green show lower WL in Design).

8.4 ANNEX D - Relevant Legislation and Regulations

8.4.1 Arterial Drainage Acts

The most important of these acts are the Arterial Drainage Act 1945 and the Arterial Drainage (Amendment) Act, 1995. These Acts provide for the drainage and improvement of land by the execution of works of arterial drainage and the maintenance of these works.

- Weirs: Subject to some exceptions, Section 47 of the 1945 Arterial Drainage Act requires the consent of OPW to erect, enlarge or alter any weir or other like construction in a watercourse where such erection, enlargement or alteration might cause flooding of any land.
- Bridges: Section 50 of the 1945 Arterial Drainage Act requires that no local authority, no railway company, canal company, or other similar body, and no industrial concern shall construct any new bridge or alter, reconstruct, or restore any existing bridge over any watercourse without the consent of the OPW.

8.4.2 Environmental Legislation and Regulations

This category covers a wide range of Acts and Regulations, both National and European, dealing with the protection and conservation of the environment. The most important of which are the various Wildlife Acts, Natural Habitat Regulations, and the Water Framework Directive. Significant aspects of the Arterial Water Framework Directive to flood risk management are specified in EU Floods Directive. The new Directive on the assessment and management of flood risks ("Floods Directive") which has been agreed between the EU Parliament and Council will increase the growing emphasis on flood risk management. This Directive is due to be transposed into Irish law by late 2009. This Directive will require that Member States take a long-term planning approach to reducing flood risks in three stages:

1. Member States will by 2011 undertake a preliminary flood risk assessment of their river basins and associated coastal zones.
2. Where real risks of flood damage exist, they must by 2013 develop flood hazard maps and flood risk maps.
3. Finally, by 2015 flood risk management plans must be drawn up for these zones.

These plans are to include measures to reduce the probability of flooding and its potential consequences. They will address all phases of the flood risk management cycle but focus particularly on prevention (i.e. preventing damage caused by floods by avoiding construction of houses and industries in present and future flood-prone areas or by adapting future developments to the risk of flooding), protection (by taking measures to reduce the likelihood of floods and/or the impact of floods in a specific location such as restoring flood plains and wetlands) and preparedness (e.g. providing instructions to the public on what to do in the event of flooding). These three steps are to be repeated in a six-year cycle to ensure that long-term developments are taken into account.

8.4.3 Planning and Development Management

The publication of the Guidelines on "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" (November 2009) have emphasised the importance of the FRA. Further information on the Guidelines is available through the document.

Extract from the Guidelines, Box 3.2 - Justification Test:

Where a planning authority is considering the future development of areas at a high or moderate probability of flooding that would include types of development that are inappropriate under the screening process set out in paragraphs 3.6 and 3.7, either in a development plan or development management context, the planning authority must be satisfied that the development is necessary on the basis of all of the following criteria:

PART 1

1. The area is within or adjoining the centre* of a city or town designated for growth in key policy documents such as the National Development Plan, the National Spatial Strategy, any Regional Planning Guidelines in force, planning guidelines/directives under Sections 28/29 of the Planning and Development Act 2000 and/or an operative City/County development plan which has been adopted taking adequate account of these guidelines.
2. The area comprises significant previously developed and/or underutilised lands within the urban envelope.
3. Development of the area is essential to facilitate regeneration or town and city centre expansion, as demonstrated in city and county development plans that have been assessed in accordance with these guidelines.
4. Strategic Environmental Assessment has been undertaken, where applicable, taking full account of flood risk.
5. There are no reasonable and available alternative development areas or sites that meet the wider strategic policy requirements as outlined at 1 above, within low or lower flood probability areas.

PART 2

If the requirements of Part 1 are satisfied, then the following additional detailed criterion should also be met. The development has been the subject of a sufficiently detailed flood risk assessment, as appropriate to the nature and scale of the development, and the potential risk that may arise, which demonstrates that:

- a) the development will not increase flood risk elsewhere and, if possible, will reduce overall flood risk;
- b) the development proposal includes measures to minimise flood risk to people, property and the economy and the environment as far as reasonably possible and to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures.

8.5 ANNEX E - NATIONAL FLOOD POLICY

The current Irish National policy on flood risk is outlined in the OPW document "OPW Planning and Development Flood Policy" published on www.flooding.ie. The document states that development should not itself be subject to an inappropriate risk of flooding nor should it cause or exacerbate such a risk at other locations, which is stated through the following guidelines:

1. **Development that is sensitive to the effects of flooding will generally not be permitted in flood prone or marginal areas.** Preventing such development, where flooding would result in significant hardship, financial losses or costs, will avoid increasing the existing level of risk and will protect the proposed new development from the human (stress and ill-health, for example) and financial costs of flood events. It will also eliminate or reduce expenditure on flood protection measures and compensation.
2. **Appropriately designed development, which is not sensitive to the effects of flooding, may be permissible in flood plains provided it does not reduce the flood plain area or otherwise restrict flow across floodplains.** Examples of such development might include park areas, sports pitches, certain types of industry, warehousing, etc. designed to be flood resistant and/or insensitive. Such development should only be permitted provided it incorporates adequate measures to cope with the ever-existent flood risk, e.g. adequate drainage systems, safety measures, emergency response facilities and/or warning and response systems and where it is considered that flooding would not result in significant hardship/financial loss or cost.
3. **Development must so far as is reasonably practicable incorporate the maximum provision to reduce the rate and quantity of runoff, e.g.:**
 - a. Hard surface areas (car parks, etc.), should be constructed in permeable or semi-permeable materials.
 - b. On site storm water ponds to store and/or attenuate additional runoff from the development should be provided.
 - c. Soakaways or French drains should be provided to increase infiltration and minimise additional runoff.

Such sustainable design/construction measures are desirable in most areas and essential in floodplains, areas liable to flooding, and areas where the conveyance capacity of watercourses is marginal. In all of these cases development that reduces the rate of absorption or increases the rate of runoff increases the risk of flooding of lands and properties downstream.

4. **For developments adjacent to watercourses of a significant conveyance capacity any structures (including hard landscaping) must be set back from the edge of the watercourse to allow access for channel clearing/maintenance.** A setback of 5m-10m is required depending on the width of the watercourse.
5. **Development consisting of construction of embankments, wide bridge piers, or similar structures will not normally be permitted in or across flood plains or river channels.** Such structures restrict/obstruct flow and increase the risk of flooding to property and land upstream. If it is considered necessary, in exceptional cases, to permit such structures, they should be designed to minimise and/or compensate for any potential negative effects.
6. **All new development must be designed and constructed to meet the following minimum flood design standards:**
 - a. For Urban areas or where developments (existing, proposed or anticipated) are involved - the 100 year flood.
 - b. For Rural areas or where further developments (existing, proposed or anticipated) are not involved - the 25 year flood.

- c. Along the Coast and Estuaries - the 200 year tide level.
- d. Where streams open drains or other watercourses are being culverted – the minimum permissible culvert diameter is 900mm. (Access should be provided for maintenance as appropriate.)

The application of higher design standards may be appropriate in certain cases where the level of risk and/or uncertainty warrant it e.g. hospitals or other emergency services, main roads, chemical plants, cultural repositories, areas of karst etc.

- 7. A flood impact assessment and proposals for the storage or attenuation of run/off discharges** (including foul drains) to ensure the development does not increase the flood risk in the relevant catchment **must accompany applications for Planning Permission** for development of **areas exceeding 1 hectare**.
- 8. A certificate from a competent person that the development will not contribute to flooding** within the relevant catchment must accompany applications for Planning Permission **for development of areas of 1 hectare or less**.

8.6 ANNEX F - LOCAL POLICY ON FLOOD MANAGEMENT

8.6.1 County Galway Draft Local Authority Renewable Energy Strategy from Draft Galway County Development Plan 2022-2028

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Analysis of permitted and commissioned commercial scale wind energy developments across County Galway shows that there is an approximate commissioned capacity of 446MW, with a further 124MW of permitted un-commissioned capacity at the time of writing. This demonstrates that there is a combined potential wind energy MW capacity of 570MW from permitted wind energy development across County Galway.

Installed wind capacity in Galway is currently 446MW, with a further 124MW of permitted but uncommissioned capacity. It is identified that there is capacity to develop significantly more wind energy from terrestrial sources by 2030.

The proposed Wind Farm falls within areas of Priority Areas (Map 1) and is located between Open to consideration zone (Map 2 below). Priority Areas are areas which have secured planning permission and where on shore wind farms can be developed immediately.

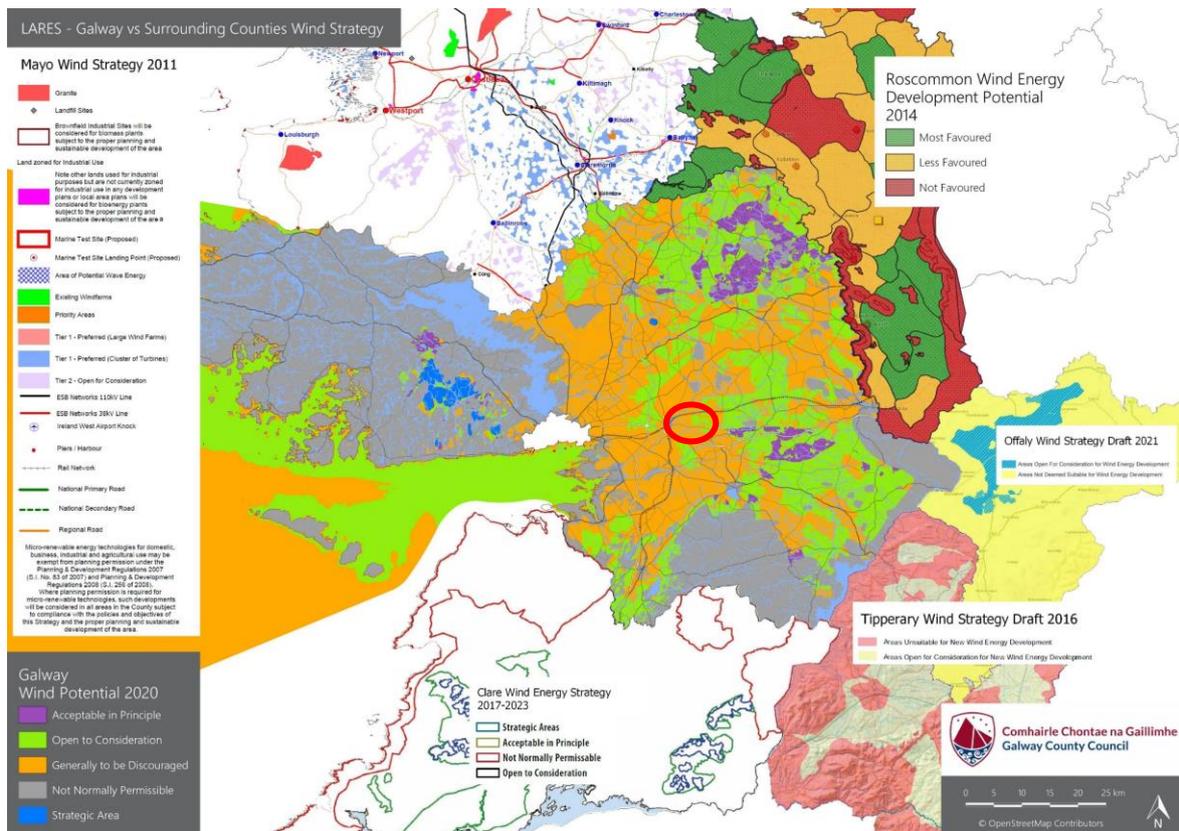


Figure 8.13. Map 1 Suitability of wind farm development for Galway Co. Co.

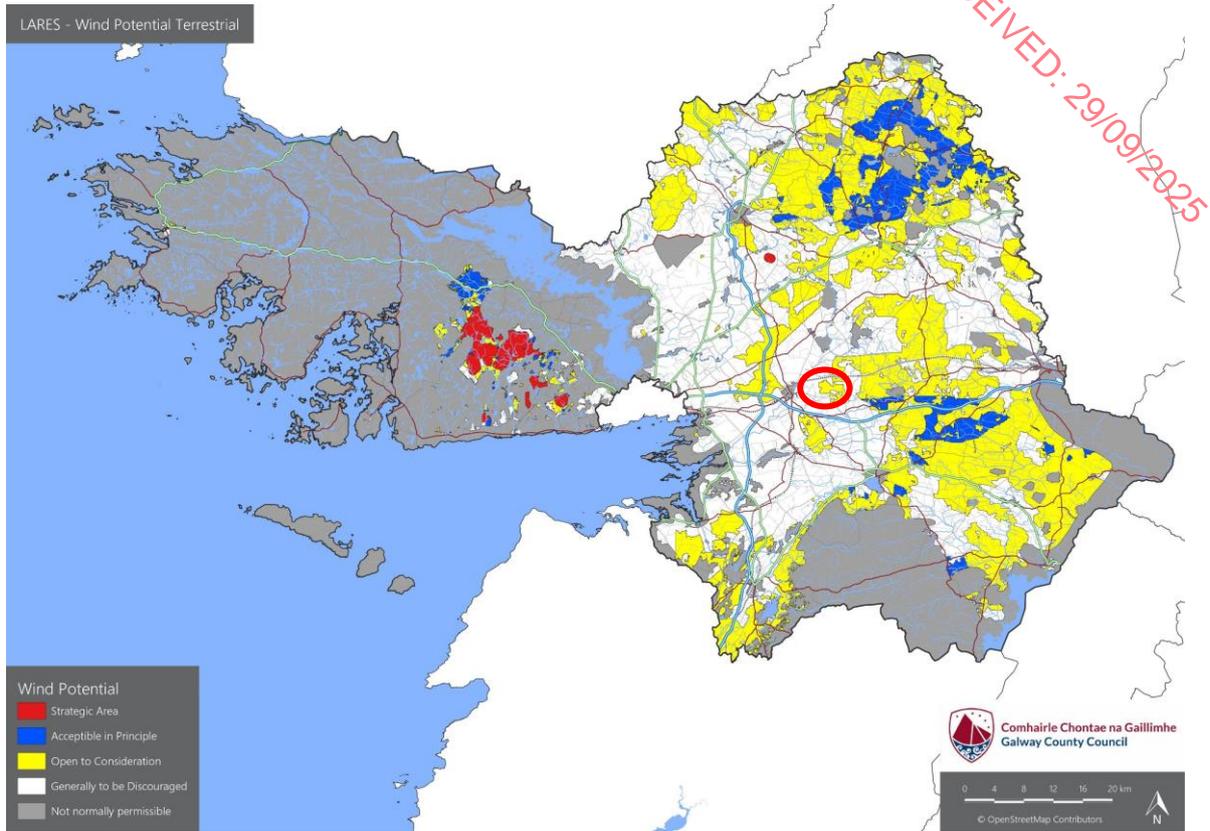
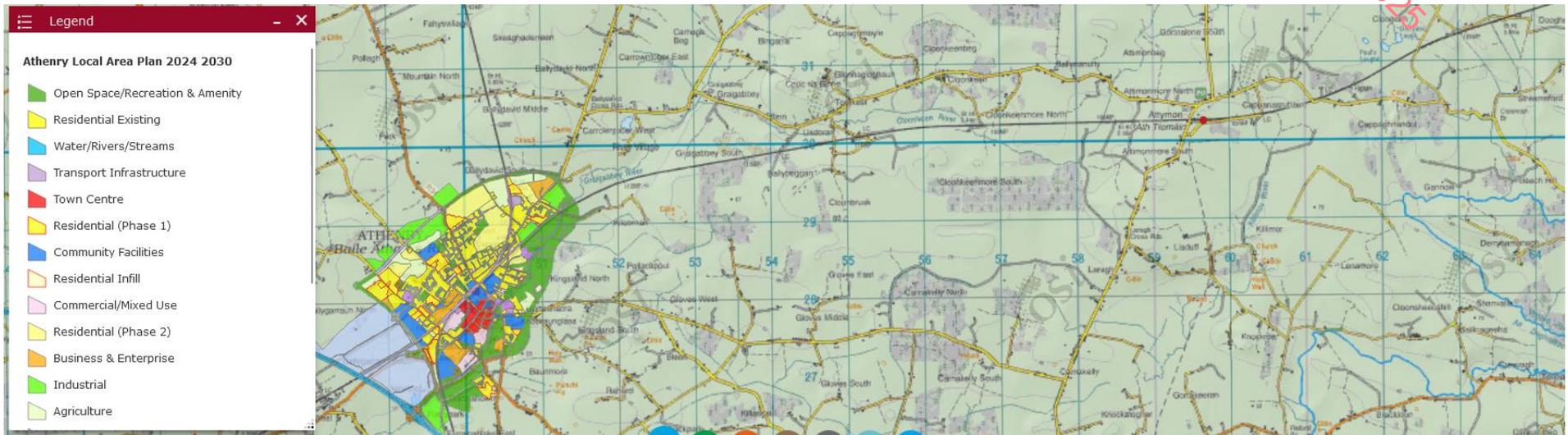


Figure 8.14. Map 2 Wind Energy Potential

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8.7 ANNEX G - LAP ZONING / SETTLEMENT MAP

Athlery Local Area Plan is the closest, therefore most relevant to the site.



Source: myplan.ie
<https://galwaycoco.maps.arcgis.com/apps/webappviewer/>

8.8 ANNEX H - HEC-RAS OUTPUT TABLES

8.8.1 Hec-Ras output tables for Q_{100cc} - Zone A

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Table 8.1. HEC-RAS results showing water levels and velocities for Existing and Design Systems for Q_{100cc} (Zone A).

No	River	Reach	River Station [m]	Min Ch El [mOD]	Q [m3/s]			W.S. Elev [mOD]			Vel Chnl [m/s]		
					Exist	Design	ΔQ [m3/s]	Exist	Design	ΔH [m]	Exist	Design	Δv [m/s]
1	Kill-TribR1-L	Kill-TribR1-L	500.6	75.91	1.24	1.20	-0.04	76.41	76.41	0.00	1.09	1.08	-0.01
2	Kill-TribR1-L	Kill-TribR1-L	395.1	75.04	1.21	1.17	-0.04	75.67	75.68	0.01	0.70	0.69	-0.01
3	Kill-TribR1-L	Kill-TribR1-L	304	74.73	1.22	1.22	0.00	75.31	75.32	0.01	0.76	0.75	-0.01
4	Kill-TribR1-L	Kill-TribR1-L	203.2	74.39	1.22	1.22	0.00	75.03	75.03	0.00	0.52	0.51	-0.01
5	Kill-TribR1-L	Kill-TribR1-L	191.7	74.35	1.21	1.22	0.01	75.01	75.01	0.00	0.51	0.50	-0.01
6	Kill-TribR1-L	Kill-TribR1-L	174.3	74.25	1.21	1.15	-0.06	74.94	74.95	0.01	0.80	0.77	-0.03
7	Kill-TribR1-L	Kill-TribR1-L	100.6	73.46	0.59	0.59	0.00	74.81	74.81	0.00	0.21	0.20	-0.01
8	Kill-TribR1-L	Kill-TribR1-L	85.7	73.62	1.21	1.21	0.00	74.79	74.80	0.01	0.38	0.37	-0.01
9	Kill-TribR1-L	Kill-TribR1-L	75.4	73.59	1.20	1.21	0.01	74.78	74.78	0.00	0.47	0.46	-0.01
10	Kill-TribR1-L	Kill-TribR1-L	62.1	73.56	0.93	0.94	0.01	74.78	74.78	0.00	0.39	0.37	-0.02
11	Kill-TribR1-L	Kill-TribR1-L	34.9	73.6	1.22	1.22	0.00	74.74	74.74	0.00	0.55	0.53	-0.02
12	Kill-TribR1-L	Kill-TribR1-L	19.9	73.62	1.22	1.22	0.00	74.72	74.72	0.00	0.56	0.54	-0.02
13	Kill-TribR1-L	Kill-TribR1-L	4.6	73.6	1.22	1.22	0.00	74.71	74.71	0.00	0.20	0.19	-0.01
14	Killimor	Killimor-W-L	1322.9	69.23	2.39	2.45	0.06	70.90	70.90	0.00	0.55	0.55	0.00
15	Killimor	Killimor-W-L	1300.4	69.34	2.08	2.05	-0.03	70.89	70.89	0.00	0.51	0.48	-0.03
16	Killimor	Killimor-W-L	1294.9	69.29	1.99	2.00	0.01	70.89	70.89	0.00	0.59	0.56	-0.03
17	Killimor	Killimor-W-L	1289.4	69.23	1.88	2.04	0.16	70.88	70.89	0.01	0.47	0.47	0.00
18	Killimor	Killimor-W-L	1225.6	69.12	1.29	1.25	-0.04	70.86	70.87	0.01	0.31	0.29	-0.02
19	Killimor	Killimor-W-L	1189.9	69.17	1.53	1.38	-0.15	70.85	70.86	0.01	0.32	0.29	-0.03
20	Killimor	Killimor-W-L	1147.4	69.05	1.33	1.30	-0.03	70.85	70.86	0.01	0.28	0.26	-0.02
21	Killimor	Killimor-W-L	1117.7	68.97	1.70	0.89	-0.81	70.84	70.86	0.02	0.34	0.16	-0.18
22	Killimor	Killimor-W-L	1107.8	69.03	2.42	2.41	-0.01	70.82	70.83	0.01	0.53	0.53	0.00
23	Killimor	Killimor-W	1103.2	69.04	6.02	5.67	-0.35	70.82	70.83	0.01	1.16	1.14	-0.02
24	Killimor	Killimor-W	1098.3	69.05	5.77	5.34	-0.43	70.81	70.83	0.02	1.04	0.44	-0.60
25	Killimor	Killimor-W	1092.9	69.05	6.79	6.67	-0.12	70.76	70.76	0.00	0.75	1.32	0.57
26	Killimor	Killimor-W	1087.5	69.04	6.77	6.67	-0.10	70.90	70.91	0.01	1.25	1.26	0.01
27	Killimor	Killimor-W	1079.7	69.01	5.75	7.04	1.29	70.93	70.94	0.01	1.00	1.02	0.02
28	Killimor	Killimor-W	1057.2	69.04	4.51	4.57	0.06	70.68	70.66	-0.02	1.76	1.87	0.11
29	Killimor	Killimor-W	1041.1	69.02	3.38	3.39	0.01	70.59	70.56	-0.03	0.81	0.84	0.03
30	Killimor	Killimor-W	1018.7	68.84	3.37	3.34	-0.03	70.57	70.55	-0.02	0.69	0.71	0.02
31	Killimor	Killimor-W	988	68.72	3.24	3.17	-0.07	70.55	70.51	-0.04	0.70	0.73	0.03
32	Killimor	Killimor-W	973.4	68.61	3.14	3.33	0.19	70.53	70.48	-0.05	0.70	0.81	0.11
33	Killimor	Killimor-W	958	68.56	3.32	2.79	-0.53	70.51	70.48	-0.03	0.71	0.65	-0.06
34	Killimor	Killimor-W	945.6	68.53	3.36	4.53	1.17	70.49	70.38	-0.11	0.69	1.09	0.40

35	Killimor	Killimor-W	943	68.65	3.36	2.58	-0.78	70.49	70.33	-0.16	0.72	0.76	0.04
36	Killimor	Killimor-W	941.4	68.66	3.33	3.14	-0.19	70.49	70.31	-0.18	0.71	0.84	0.13
37	Killimor	Killimor-W	933.2	68.68	3.44	5.48	2.04	70.46	70.45	-0.03	0.76	1.29	0.53
38	Killimor	Killimor-W	927.8	68.66	3.29	4.82	1.53	70.46	70.44	-0.02	0.74	1.15	0.41
39	Killimor	Killimor-W	920.9	68.55	4.11	4.70	0.59	70.43	70.42	-0.01	0.84	1.05	0.21
40	Killimor	Killimor-Up	915.3	68.62	2.30	2.75	0.45	70.43	70.42	-0.01	0.35	0.49	0.14
41	Killimor	Killimor-Up	905.1	68.74	3.36	3.09	-0.27	70.40	70.40	0.00	0.63	0.67	0.04
42	Killimor	Killimor-Up	873.1	68.64	5.00	5.04	0.04	70.30	70.30	0.00	1.05	1.07	0.02
43	Killimor	Killimor-Up	828.7	68.44	4.91	4.50	-0.41	70.16	70.16	0.00	1.11	1.12	0.01
44	Killimor	Killimor-Up	791.7	68.25	5.14	5.02	-0.12	70.06	70.06	0.00	1.08	1.07	-0.01
45	Killimor	Killimor-Up	754.1	68.05	5.03	4.68	-0.35	69.96	69.96	0.00	1.12	1.10	-0.02
46	Killimor	Killimor-Up	745.4	68.01	4.61	4.63	0.02	69.98	69.98	0.00	0.84	0.85	0.01
47	Killimor	Killimor-Up	741.3	68.02	6.07	6.07	0.00	69.85	69.84	-0.01	0.90	0.91	0.01
48	Killimor	Killimor-Up	723.9	67.97	6.35	7.42	1.07	69.77	69.76	-0.01	1.12	1.13	0.01
49	Killimor	Killimor-Up	699.5	67.91	5.55	5.92	0.37	69.73	69.72	-0.01	0.96	0.97	0.01
50	Killimor	Killimor-Up	679.9	67.86	4.33	4.52	0.19	69.73	69.72	-0.01	0.75	0.76	0.01
51	Killimor	Killimor-Up	671.5	67.84	4.05	4.32	0.27	69.73	69.72	-0.01	0.69	0.69	0.00
52	Killimor	Killimor-Up	666.2	67.75	2.26	2.32	0.06	69.75	69.74	-0.01	0.26	0.27	0.01
53	Killimor	Killimor-Up	658.6	67.92	2.13	2.20	0.07	69.72	69.71	-0.01	0.32	0.33	0.01
54	Killimor	Killimor-Up	657.5	67.9	2.10	2.20	0.10	69.72	69.71	-0.01	0.27	0.28	0.01
55	Killimor	Killimor-Mid1	655.3	67.89	5.19	5.49	0.30	69.72	69.71	-0.01	0.99	1.04	0.05
56	Killimor	Killimor-Mid1	652.3	67.87	5.24	5.28	0.04	69.71	69.70	-0.01	1.06	1.07	0.01
57	Killimor	Killimor-Mid1	643.5	67.82	5.79	5.91	0.12	69.70	69.69	-0.01	0.85	0.89	0.04
58	Killimor	Killimor-Mid1	634.9	67.77	6.07	6.18	0.11	69.70	69.68	-0.02	0.72	0.74	0.02
59	Killimor	Killimor-Mid1	624.1	67.71	5.16	5.31	0.15	69.67	69.66	-0.01	0.96	1.00	0.04
60	Killimor	Killimor-Mid1	606	67.6	4.96	4.90	-0.06	69.64	69.62	-0.02	1.03	1.01	-0.02
61	Killimor	Killimor-Mid1	592.5	67.51	4.74	4.75	0.01	69.61	69.60	-0.01	0.92	0.91	-0.01
62	Killimor	Killimor-Mid1	586.9	67.48	4.77	4.74	-0.03	69.61	69.60	-0.01	0.86	0.84	-0.02
63	Killimor	Killimor-Mid1	583.5	67.46	4.76	4.74	-0.02	69.60	69.59	-0.01	0.83	0.82	-0.01
64	Killimor	Killimor-Mid1	580.3	67.44	4.20	4.19	-0.01	69.62	69.61	-0.01	0.70	0.70	0.00
65	Killimor	Killimor-Mid1	573.2	67.51	4.20	4.19	-0.01	69.60	69.59	-0.01	0.64	0.65	0.01
66	Killimor	Killimor-Mid1	568.3	67.45	4.07	4.07	0.00	69.59	69.59	0.00	0.64	0.63	-0.01
67	Killimor	Killimor-Mid1	559.9	67.35	4.82	4.83	0.01	69.56	69.55	-0.01	0.80	0.81	0.01
68	Killimor	Killimor-Mid1	555.7	67.3	5.25	5.25	0.00	69.53	69.53	0.00	1.00	1.00	0.00
69	Killimor	Killimor-Mid1	552	67.25	5.92	5.92	0.00	69.47	69.46	-0.01	1.35	1.36	0.01
70	Killimor	Killimor-Mid1	548.3	67.27	5.91	5.91	0.00	69.54	69.54	0.00	1.15	1.16	0.01
71	Killimor	Killimor-Mid1	540.7	67.36	5.95	6.02	0.07	69.55	69.53	-0.02	0.87	0.91	0.04
72	Killimor	Killimor-Mid1	527.9	67.5	5.84	5.87	0.03	69.53	69.53	0.00	0.76	0.77	0.01
73	Killimor	Killimor-Mid1	515.6	67.63	5.86	5.90	0.04	69.50	69.49	-0.01	0.96	0.99	0.03
74	Killimor	Killimor-Mid1	491	67.39	5.39	5.47	0.08	69.46	69.45	-0.01	0.82	0.84	0.02
75	Killimor	Killimor-Mid1	471	67.19	4.60	4.48	-0.12	69.46	69.45	-0.01	0.63	0.63	0.00
76	Killimor	Killimor-Mid1	465.4	67.14	5.12	5.07	-0.05	69.40	69.40	0.00	0.72	0.72	0.00
77	Killimor	Killimor-Mid1	459.7	67.29	5.12	5.07	-0.05	69.45	69.45	0.00	0.67	0.67	0.00
78	Killimor	Killimor-Mid1	451.5	67.25	3.62	3.33	-0.29	69.45	69.45	0.00	0.49	0.47	-0.02
79	Killimor	Killimor-Mid1	436.3	67.17	4.25	3.80	-0.45	69.42	69.44	0.02	0.63	0.57	-0.06

80	Killimor	Killimor-Mid1	431	67.14	5.39	5.50	0.11	69.39	69.37	-0.02	0.85	0.88	0.03
81	Killimor	Killimor-Mid1	425.9	67.25	7.52	7.55	0.03	69.42	69.42	0.00	1.11	1.12	0.01
82	Killimor	Killimor-Mid1	417.1	67.24	7.18	6.43	-0.75	69.39	69.38	-0.01	1.12	1.16	0.04
83	Killimor	Killimor-Mid1	387.1	67.12	5.95	5.35	-0.60	69.36	69.35	-0.01	0.81	0.78	-0.03
84	Killimor	Killimor-Mid1	382.1	67.1	5.54	4.79	-0.75	69.36	69.35	-0.01	0.74	0.72	-0.02
85	Killimor	Killimor-Mid1	377.4	67.08	5.54	4.79	-0.75	69.35	69.35	0.00	0.80	0.78	-0.02
86	Killimor	Killimor-Mid1	366.9	67.04	5.01	4.42	-0.59	69.36	69.34	-0.02	0.71	0.72	0.01
87	Killimor	Killimor-Mid1	347.5	66.97	5.19	4.66	-0.53	69.32	69.30	-0.02	0.79	0.83	0.04
88	Killimor	Killimor-Mid1	340.7	66.94	5.67	5.64	-0.03	69.26	69.24	-0.02	1.07	1.09	0.02
89	Killimor	Killimor-Mid1	335.9	66.99	6.48	6.42	-0.06	69.21	69.13	-0.08	1.21	1.17	-0.04
90	Killimor	Killimor-Mid1	332.4	66.99	6.76	6.73	-0.03	69.19	69.10	-0.09	1.25	1.22	-0.03
91	Killimor	Killimor-Mid1	325.7	67	7.04	7.09	0.05	69.15	69.07	-0.08	1.30	1.27	-0.03
92	Killimor	Killimor-Mid1	319.5	67.01	6.47	7.03	0.56	69.04	68.99	-0.05	1.33	1.28	-0.05
93	Killimor	Killimor-Mid1	311.6	67.02	6.49	6.99	0.50	69.01	68.96	-0.05	1.21	1.25	0.04
94	Killimor	Killimor-Mid1	304.8	67.03	6.47	7.26	0.79	68.99	68.94	-0.05	1.16	1.20	0.04
95	Killimor	Killimor-Mid2	297.1	67.03	7.64	7.15	-0.49	68.99	68.94	-0.05	1.13	1.01	-0.12
96	Killimor	Killimor-Mid2	283.4	67.05	7.41	6.95	-0.46	69.00	68.94	-0.06	0.82	0.74	-0.08
97	Killimor	Killimor-Mid2	270.5	67.04	8.62	8.17	-0.45	68.97	68.92	-0.05	0.85	0.78	-0.07
98	Killimor	Killimor-Mid2	241.5	66.94	8.64	7.84	-0.80	68.94	68.89	-0.05	0.86	0.79	-0.07
99	Killimor	Killimor-Mid2	223	66.85	8.47	7.77	-0.70	68.93	68.88	-0.05	0.66	0.62	-0.04
100	Killimor	Killimor-Ds	217.1	66.82	6.87	6.50	-0.37	68.93	68.88	-0.05	0.57	0.55	-0.02
101	Killimor	Killimor-Ds	208.1	66.78	6.50	6.21	-0.29	68.93	68.88	-0.05	0.60	0.59	-0.01
102	Killimor	Killimor-Ds	186.4	66.69	5.48	5.50	0.02	68.93	68.87	-0.06	0.54	0.54	0.00
103	Killimor	Killimor-Ds	137.9	66.93	4.54	3.89	-0.65	68.91	68.86	-0.05	0.56	0.50	-0.06
104	Killimor	Killimor-Ds	107.3	66.85	4.58	4.28	-0.30	68.89	68.83	-0.06	0.62	0.62	0.00
105	Killimor	Killimor-Ds	86	66.79	5.43	5.28	-0.15	68.86	68.79	-0.07	0.75	0.78	0.03
106	Killimor	Killimor-Ds	76	66.77	5.75	5.59	-0.16	68.84	68.77	-0.07	0.80	0.95	0.15
107	Killimor	Killimor-Ds	66.4	66.96	5.75	5.59	-0.16	68.02	67.97	-0.05	2.29	2.36	0.07
108	Killimor	Killimor-Ds	48.9	66.67	6.76	6.32	-0.44	67.83	67.77	-0.06	1.80	1.80	0.00
109	Killimor	Killimor-Ds	16.6	66.29	7.12	6.47	-0.65	67.55	67.48	-0.07	1.64	1.59	-0.05
110	Killimor	Killimor-Ds	2.2	66.21	7.12	6.47	-0.65	67.38	67.31	-0.07	1.90	1.85	-0.05
111	Killimor-E	Killimor-E-Up	1096.2	74.28	4.33	4.33	0.00	75.63	75.63	0.00	0.74	0.75	0.01
112	Killimor-E	Killimor-E-Up	1066.3	74.12	4.31	4.32	0.01	75.55	75.54	-0.01	0.96	0.96	0.00
113	Killimor-E	Killimor-E-Up	1062.2	74.1	4.30	4.33	0.03	75.55	75.54	-0.01	0.84	0.85	0.01
114	Killimor-E	Killimor-E-Up	971.8	73.64	1.60	1.41	-0.19	75.49	75.49	0.00	0.21	0.19	-0.02
115	Killimor-E	Killimor-E-Up	961.7	74.12	1.94	1.94	0.00	75.48	75.47	-0.01	0.34	0.34	0.00
116	Killimor-E	Killimor-E-Up	958.4	73.96	1.94	1.94	0.00	75.06	75.06	0.00	0.73	0.73	0.00
117	Killimor-E	Killimor-E-Up	948.8	73.78	2.65	2.65	0.00	75.04	75.04	0.00	0.62	0.61	-0.01
118	Killimor-E	Killimor-E-Up	938.2	73.57	2.73	2.73	0.00	75.03	75.03	0.00	0.58	0.58	0.00
119	Killimor-E	Killimor-E-Up	931	73.55	2.86	2.85	-0.01	75.00	75.00	0.00	0.87	0.87	0.00
120	Killimor-E	Killimor-E-Up	923.8	73.53	3.03	3.02	-0.01	74.99	74.99	0.00	0.64	0.64	0.00
121	Killimor-E	Killimor-E-Up	913.9	73.3	2.75	2.73	-0.02	74.99	74.99	0.00	0.50	0.49	-0.01
122	Killimor-E	Killimor-E-Up	872.3	73.77	3.17	3.15	-0.02	74.84	74.84	0.00	1.05	1.04	-0.01
123	Killimor-E	Killimor-E-Up	835.6	73.53	3.17	3.15	-0.02	74.65	74.66	0.01	1.08	1.06	-0.02
124	Killimor-E	Killimor-E-Up	804.2	73.33	3.17	3.15	-0.02	74.39	74.44	0.05	1.42	1.30	-0.12

125	Killimor-E	Killimor-E-Up	800.9	73.31	3.17	3.15	-0.02	74.37	74.43	0.06	1.28	1.16	-0.12
126	Killimor-E	Killimor-E-Up	786.1	73.19	3.16	3.15	-0.01	74.32	74.40	0.08	0.97	0.88	-0.09
127	Killimor-E	Killimor-E-Up	777	73.11	3.18	3.16	-0.02	74.31	74.39	0.08	0.75	0.68	-0.07
128	Killimor-E	Killimor-E-Up	765.1	73.02	3.27	3.27	0.00	74.27	74.32	0.05	0.91	1.08	0.17
129	Killimor-E	Killimor-E-Up	749.1	72.87	-	3.79	-	74.19	-	-	1.31	-	-
130	Killimor-E	Killimor-E-Up	733	72.73	4.50	4.49	-0.01	74.03	74.06	0.03	1.40	1.33	-0.07
131	Killimor-E	Killimor-E-Mid	721	72.89	4.79	4.78	-0.01	74.03	74.06	0.03	1.47	1.39	-0.08
132	Killimor-E	Killimor-E-Mid	701	72.64	4.81	4.80	-0.01	73.85	73.82	-0.03	1.51	1.54	0.03
133	Killimor-E	Killimor-E-Mid	695.5	72.57	4.81	4.80	-0.01	73.80	73.76	-0.04	1.51	1.64	0.13
134	Killimor-E	Killimor-E-Mid	679.8	72.25	4.77	4.77	0.00	73.68	73.69	0.01	1.47	1.27	-0.20
135	Killimor-E	Killimor-E-Mid	669.8	72.25	4.74	4.74	0.00	73.62	73.62	0.00	1.41	1.41	0.00
136	Killimor-E	Killimor-E-Mid	616.3	71.98	4.79	4.80	0.01	73.29	73.29	0.00	1.43	1.42	-0.01
137	Killimor-E	Killimor-E-Mid	568.3	71.61	4.07	4.58	0.51	69.59	73.07	3.48	0.64	1.15	0.51
138	Killimor-E	Killimor-E-Mid	540.3	71.58	4.21	4.22	0.01	72.87	72.86	-0.01	1.49	1.50	0.01
139	Killimor-E	Killimor-E-Mid	536.9	71.57	4.21	4.24	0.03	72.83	72.82	-0.01	1.47	1.49	0.02
140	Killimor-E	Killimor-E-Mid	520.9	71.47	4.53	4.56	0.03	72.72	72.72	0.00	1.24	1.25	0.01
141	Killimor-E	Killimor-E-Mid	498.1	71.37	4.55	4.47	-0.08	72.60	72.59	-0.01	1.29	1.29	0.00
142	Killimor-E	Killimor-E-Mid	456.7	70.98	4.40	4.52	0.12	72.35	72.34	-0.01	1.43	1.45	0.02
143	Killimor-E	Killimor-E-Mid	425.1	70.76	4.61	4.54	-0.07	72.13	72.13	0.00	1.49	1.48	-0.01
144	Killimor-E	Killimor-E-Mid	394.4	70.55	4.55	4.56	0.01	71.94	71.94	0.00	1.43	1.41	-0.02
145	Killimor-E	Killimor-E-Mid	357.9	70.29	4.66	4.68	0.02	71.70	71.70	0.00	1.43	1.42	-0.01
146	Killimor-E	Killimor-E-Mid	325	70.06	4.49	4.60	0.11	71.50	71.50	0.00	1.33	1.36	0.03
147	Killimor-E	Killimor-E-Mid	312.3	69.98	4.73	4.65	-0.08	71.42	71.42	0.00	1.34	1.36	0.02
148	Killimor-E	Killimor-E-Mid	295.2	69.86	4.70	4.59	-0.11	71.33	71.33	0.00	1.27	1.26	-0.01
149	Killimor-E	Killimor-E-Mid	279.9	69.85	4.32	4.20	-0.12	71.34	71.33	-0.01	0.68	0.69	0.01
150	Killimor-E	Killimor-E-Mid	274.7	69.84	3.97	3.89	-0.08	71.34	71.33	-0.01	0.57	0.58	0.01
151	Killimor-E	Killimor-E-Ds	270.9	69.83	5.07	4.87	-0.20	71.34	71.33	-0.01	0.76	0.77	0.01
152	Killimor-E	Killimor-E-Ds	250.7	69.75	4.75	4.46	-0.29	71.29	71.28	-0.01	0.89	0.89	0.00
153	Killimor-E	Killimor-E-Ds	232.8	69.68	4.86	4.83	-0.03	71.22	71.21	-0.01	1.21	1.24	0.03
154	Killimor-E	Killimor-E-Ds	202	69.6	4.30	4.14	-0.16	71.14	71.13	-0.01	1.01	1.02	0.01
155	Killimor-E	Killimor-E-Ds	174.9	69.49	3.42	3.28	-0.14	71.11	71.10	-0.01	0.92	0.95	0.03
156	Killimor-E	Killimor-E-Ds	138.3	69.41	2.84	2.63	-0.21	70.91	70.90	-0.01	1.28	1.25	-0.03
157	Killimor-E	Killimor-E-Ds	136.5	69.41	2.79	2.66	-0.13	70.91	70.90	-0.01	1.04	1.07	0.03
158	Killimor-E	Killimor-E-Ds	129.8	69.4	3.40	3.39	-0.01	70.88	70.86	-0.02	0.90	0.95	0.05
159	Killimor-E	Killimor-E-Ds	118.6	69.39	2.82	2.67	-0.15	70.86	70.84	-0.02	0.90	0.95	0.05
160	Killimor-E	Killimor-E-Ds	103.9	69.37	2.72	2.80	0.08	70.79	70.77	-0.02	0.94	1.02	0.08
161	Killimor-E	Killimor-E-Ds	87.1	69.32	2.92	2.53	-0.39	70.71	70.69	-0.02	1.10	1.07	-0.03
162	Killimor-E	Killimor-E-Ds	67.4	69.25	3.41	3.42	0.01	70.51	70.51	0.00	1.56	1.51	-0.05
163	Killimor-E	Killimor-E-Ds	41.5	69.09	1.87	1.50	-0.37	70.46	70.45	-0.01	0.84	0.82	-0.02
164	Killimor-E	Killimor-E-Ds	5.2	68.78	0.00	0.00	0.00	70.43	70.42	-0.01	-0.19	-0.19	0.00
165	Killimor-TribL1	Killimor-TribL1	188.7	72.51	1.21	1.21	0.00	73.44	73.45	0.01	1.24	1.24	0.00
166	Killimor-TribL1	Killimor-TribL1	134.2	71.92	1.21	1.21	0.00	72.88	72.86	-0.02	1.02	1.05	0.03
167	Killimor-TribL1	Killimor-TribL1	97.5	71.21	1.21	1.21	0.00	71.92	71.93	0.01	1.87	1.90	0.03
168	Killimor-TribL1	Killimor-TribL1	73	70.39	0.95	1.19	0.24	71.37	71.37	0.00	0.73	0.78	0.05
169	Killimor-TribL1	Killimor-TribL1	63.6	70.07	0.93	1.20	0.27	71.37	71.37	0.00	0.36	0.41	0.05

170	Killimor-TribL1	Killimor-TribL1	55.5	69.99	0.86	1.19	0.33	71.37	71.36	-0.01	0.30	0.36	0.06
171	Killimor-TribL1	Killimor-TribL1	30	69.95	0.95	1.18	0.23	71.33	71.34	0.01	0.40	0.42	0.02
172	Killimor-TribL1	Killimor-TribL1	27.7	70.01	0.94	1.19	0.25	71.33	71.34	-0.01	0.40	0.41	0.01
173	Killimor-TribL1	Killimor-TribL1	20.7	70.04	1.21	1.19	-0.02	71.35	71.34	-0.01	0.53	0.43	-0.10
174	Killimor-TribL1	Killimor-TribL1	14.7	70.02	1.13	1.20	0.07	71.35	71.34	-0.01	0.44	0.36	-0.08
175	Killimor-TribL1	Killimor-TribL1	7.2	70.04	1.17	1.17	0.00	71.35	71.34	-0.01	0.22	0.22	-0.05
176	Killimor-TribL1	Killimor-TribL1	6.8	70.35	1.14	1.13	-0.01	71.35	71.34	-0.01	0.36	0.30	-0.06
177	Killimor-TribL1	Killimor-TribL1	0.9	69.84	1.16	1.13	-0.03	71.34	71.33	-0.01	0.17	0.17	0.00
178	Killimor-TribL1	Killimor-TribL1	0.3	69.84	1.10	0.99	-0.11	71.34	71.33	-0.01	0.12	0.12	0.00
179	Killimor-TribL2	Killimor-TribL2	311.5	68.92	1.90	1.90	0.00	70.62	70.61	-0.01	0.47	0.48	0.01
180	Killimor-TribL2	Killimor-TribL2	287.9	69.01	1.87	1.94	0.07	70.60	70.59	-0.01	0.33	0.33	0.00
181	Killimor-TribL2	Killimor-TribL2	282.2	69.03	1.69	1.68	-0.01	70.61	70.59	-0.02	0.27	0.27	0.00
182	Killimor-TribL2	Killimor-TribL2	275.3	68.89	2.22	2.25	0.03	70.58	70.57	-0.01	0.45	0.45	0.00
183	Killimor-TribL2	Killimor-TribL2	262.5	69.19	2.82	2.76	-0.06	70.56	70.54	-0.02	0.49	0.47	-0.02
184	Killimor-TribL2	Killimor-TribL2	256.8	69.28	2.86	2.77	-0.09	70.55	70.54	-0.01	0.56	0.53	-0.03
185	Killimor-TribL2	Killimor-TribL2	252.2	69.34	2.61	2.59	-0.02	70.54	70.53	-0.01	0.72	0.70	-0.02
186	Killimor-TribL2	Killimor-TribL2	222	69.21	1.83	1.82	-0.01	70.52	70.51	-0.01	0.48	0.45	-0.03
187	Killimor-TribL2	Killimor-TribL2	207.6	69.14	1.27	1.24	-0.03	70.52	70.51	-0.01	0.31	0.30	-0.01
188	Killimor-TribL2	Killimor-TribL2	201.9	69.05	1.26	1.24	-0.02	70.40	70.39	-0.01	0.33	0.33	0.00
189	Killimor-TribL2	Killimor-TribL2	177.1	69.34	1.76	1.75	-0.01	70.37	70.36	-0.01	0.56	0.55	-0.01
190	Killimor-TribL2	Killimor-TribL2	168.5	69.21	1.68	1.67	-0.01	70.36	70.35	-0.01	0.58	0.58	0.00
191	Killimor-TribL2	Killimor-TribL2	150.7	69.14	2.09	2.09	0.00	70.32	70.31	-0.01	0.67	0.67	0.00
192	Killimor-TribL2	Killimor-TribL2	145.1	68.98	1.92	1.92	0.00	70.31	70.30	-0.01	0.58	0.59	0.01
193	Killimor-TribL2	Killimor-TribL2	138.3	69.02	2.84	1.86	-0.98	70.91	69.92	-0.99	1.28	1.32	0.04
194	Killimor-TribL2	Killimor-TribL2	130.1	68.98	1.99	2.02	0.03	69.92	69.91	-0.01	0.87	0.87	0.00
195	Killimor-TribL2	Killimor-TribL2	104.5	68.86	1.96	1.91	-0.05	69.88	69.87	-0.01	0.53	0.51	-0.02
196	Killimor-TribL2	Killimor-TribL2	88.7	68.37	2.09	2.09	0.00	69.85	69.84	-0.01	0.66	0.65	-0.01
197	Killimor-TribL2	Killimor-TribL2	78.8	68.05	2.22	2.30	0.08	69.83	69.83	0.00	0.55	0.55	0.00
198	Killimor-TribL2	Killimor-TribL2	73.9	68.45	2.19	2.19	0.00	69.75	69.76	0.01	0.63	0.57	-0.06
199	Killimor-TribL2	Killimor-TribL2	66.3	68.33	2.39	2.40	0.01	69.75	69.74	-0.01	0.58	0.58	0.00
200	Killimor-TribL2	Killimor-TribL2	47.6	68.05	2.94	2.06	-0.88	69.74	69.74	0.00	0.49	0.40	-0.09
201	Killimor-TribL2	Killimor-TribL2	33.3	67.84	3.44	3.42	-0.02	69.72	69.71	-0.01	0.56	0.56	0.00
202	Killimor-TribL2	Killimor-TribL2	25.2	67.71	3.40	3.41	0.01	69.73	69.72	-0.01	0.53	0.51	-0.02
203	Killimor-TribL2	Killimor-TribL2	18.4	67.68	3.34	3.42	0.08	69.72	69.72	0.00	0.47	0.48	0.01
204	Killimor-TribL2	Killimor-TribL2	10.1	67.66	3.65	3.64	-0.01	69.72	69.71	-0.01	0.48	0.48	0.00
205	Killimor-TribL2	Killimor-TribL2	5	67.68	3.10	3.28	0.18	69.72	69.71	-0.01	0.51	0.54	0.03
206	Killimor-TribL3	Killimor-TribL3	607.2	77.4	0.70	0.70	0.00	77.73	77.73	0.00	1.56	1.56	0.00
207	Killimor-TribL3	Killimor-TribL3	595.4	77.03	0.69	0.70	0.01	77.45	77.46	0.01	0.63	0.63	0.00
208	Killimor-TribL3	Killimor-TribL3	561.7	76.91	0.59	0.55	-0.04	77.31	77.34	0.03	0.50	0.44	-0.06
209	Killimor-TribL3	Killimor-TribL3	554.6	76.87	0.59	0.55	-0.04	77.30	77.33	0.03	0.40	0.34	-0.06
210	Killimor-TribL3	Killimor-TribL3	536	76.73	0.55	0.49	-0.06	77.28	77.31	0.03	0.30	0.25	-0.05
211	Killimor-TribL3	Killimor-TribL3	505.3	76.51	0.55	0.49	-0.06	77.27	77.31	0.04	0.22	0.19	-0.03
212	Killimor-TribL3	Killimor-TribL3	467.5	76.24	0.55	0.45	-0.10	77.26	77.30	0.04	0.17	0.14	-0.03
213	Killimor-TribL3	Killimor-TribL3	450.2	76.12	0.54	0.45	-0.09	77.26	77.25	-0.01	0.16	0.14	-0.02
214	Killimor-TribL3	Killimor-TribL3	446	76.09	0.50	0.44	-0.06	77.26	77.25	-0.01	0.13	0.12	-0.01

215	Killimor-TribL3	Killimor-TribL3	441.4	76.08	0.54	0.48	-0.06	77.23	77.23	0.00	0.67	0.63	-0.04
216	Killimor-TribL3	Killimor-TribL3	440.5	76.09	0.55	0.49	-0.06	77.24	77.23	-0.01	0.20	0.18	-0.02
218	Killimor-TribL3	Killimor-TribL3	428.2	75.94	0.56	0.49	-0.07	77.22	77.22	0.00	0.10	0.09	-0.01
219	Killimor-TribL3	Killimor-TribL3	400	76.22	0.34	0.31	-0.03	77.22	77.22	0.00	0.09	0.09	0.00
220	Killimor-TribL3	Killimor-TribL3	365.9	76.56	0.13	0.12	-0.01	77.22	77.22	0.00	0.07	0.07	0.00
221	Killimor-TribL3	Killimor-TribL3	348	76.67	0.13	0.12	-0.01	77.22	77.22	0.00	0.12	0.12	0.00
222	Killimor-TribL3	Killimor-TribL3	340.9	76.71	0.13	0.12	-0.01	77.18	77.18	0.00	0.16	0.16	0.00
223	Killimor-TribL3	Killimor-TribL3	329.3	76.79	0.13	0.12	-0.01	77.18	77.17	-0.01	0.21	0.21	0.00
224	Killimor-TribL3	Killimor-TribL3	317.5	76.86	0.13	0.12	-0.01	77.12	77.12	0.00	0.52	0.51	-0.01
225	Killimor-TribL3	Killimor-TribL3	294	76.68	0.13	0.12	-0.01	76.93	76.92	-0.01	0.55	0.55	0.00
226	Killimor-TribL3	Killimor-TribL3	263.1	76.45	0.13	0.12	-0.01	76.67	76.67	0.00	0.56	0.56	0.00
227	Killimor-TribL3	Killimor-TribL3	252.2	76.35	2.61	0.12	-2.49	70.54	76.56	6.02	0.72	0.74	0.02
228	Killimor-TribL3	Killimor-TribL3	245.5	76.25	0.13	0.12	-0.01	76.54	76.53	-0.01	0.58	0.58	0.00
229	Killimor-TribL3	Killimor-TribL3	236.8	76.21	0.13	0.12	-0.01	76.46	76.45	-0.01	0.59	0.59	0.00
230	Killimor-TribL3	Killimor-TribL3	215	76.03	0.13	0.12	-0.01	76.26	76.26	0.00	0.58	0.58	0.00
231	Killimor-TribL3	Killimor-TribL3	201.2	75.87	0.13	0.12	-0.01	76.13	76.13	0.00	0.59	0.57	-0.02
232	Killimor-TribL3	Killimor-TribL3	197.1	75.84	0.13	0.12	-0.01	76.10	76.10	0.00	0.57	0.55	-0.02
233	Killimor-TribL3	Killimor-TribL3	167.5	75.66	0.13	0.12	-0.01	75.85	75.84	-0.01	0.54	0.56	0.02
234	Killimor-TribL3	Killimor-TribL3	140.2	75.41	0.13	0.12	-0.01	75.62	75.69	0.07	0.55	0.34	-0.21
235	Killimor-TribL3	Killimor-TribL3	136.3	75.38	0.13	0.12	-0.01	75.59	75.68	0.09	0.52	0.29	-0.23
236	Killimor-TribL3	Killimor-TribL3	106	75.08	0.13	0.10	-0.03	75.25	75.25	0.00	0.49	0.51	0.02
237	Killimor-TribL3	Killimor-TribL3	99.9	74.99	0.12	-0.03	-0.15	75.17	75.17	0.00	0.56	0.29	-0.27
238	Killimor-TribL3	Killimor-TribL3	55.1	74.29	0.10	0.10	0.00	74.46	74.42	-0.04	0.30	0.41	0.11
239	Killimor-TribL3	Killimor-TribL3	21.7	73.71	0.12	0.12	0.00	74.04	74.07	0.03	0.15	0.13	-0.02
240	Killimor-TribL3	Killimor-TribL3	5.9	73.29	0.29	0.29	0.00	74.03	74.06	0.03	0.17	0.15	-0.02
241	Killimor-TribR1	Kill-TribR1-R	1288	75.61	-	0.53		-	76.03		-	0.66	
242	Killimor-TribR1	Kill-TribR1-R	1246	75.36	-	0.57		-	75.84		-	0.61	
243	Killimor-TribR1	Kill-TribR1-R	1204	75.08	-	0.57		-	75.72		-	0.47	
244	Killimor-TribR1	Kill-TribR1-R	1192	75.18	-	0.57		-	75.67		-	0.63	
245	Killimor-TribR1	Kill-TribR1-R	1188	75.18	-	0.50		-	75.65		-	0.71	
246	Killimor-TribR1	Kill-TribR1-R	1101	74.64	-	0.51		-	75.05		-	0.70	
247	Killimor-TribR1	Kill-TribR1-R	1035	74.17	-	0.57		-	74.77		-	0.39	
248	Killimor-TribR1	Kill-TribR1-R	959	73.66	-	0.57		-	74.72		-	0.13	
249	Killimor-TribR1	Kill-TribR1-R	947	73.66	-	0.57		-	74.71		-	0.12	
250	Killimor-TribR1	Kill-TribR1-R	921	73.61	-	0.57		-	74.71		-	0.15	
251	Killimor-TribR1	Kill-TribR1-Up	909	73.62	-	1.78		-	74.71		-	0.52	
252	Killimor-TribR1	Kill-TribR1-Up	863	73.72	-	1.70		-	74.34		-	1.31	
253	Killimor-TribR1	Kill-TribR1-Up	811	73	-	1.53		-	73.85		-	0.79	
254	Killimor-TribR1	Kill-TribR1-Up	761	72.25	-	1.44		-	73.74		-	0.35	
255	Killimor-TribR1	Kill-TribR1-Up	753	72.18	-	1.39		-	73.74		-	0.30	
256	Killimor-TribR1	Kill-TribR1-Up	745	72.1	-	1.29		-	73.73		-	0.37	
257	Killimor-TribR1	Kill-TribR1-Up	741	72.06	-	1.44		-	73.71		-	0.59	
258	Killimor-TribR1	Kill-TribR1-Up	736	71.82	-	1.78		-	73.01		-	2.06	
259	Killimor-TribR1	Kill-TribR1-Up	731	71.76	-	1.78		-	72.95		-	1.35	
260	Killimor-TribR1	Kill-TribR1-Up	720	71.62	-	1.78		-	72.75		-	1.49	

312	Killimor-TribR1	Kill-TribR1-Ds	1.2	67.07	1.17	-0.11	-1.28	68.99	68.94	-0.05	0.12	0.01	-0.11
313	Killimor-TribR2	Killimor-TribR2	369.7	68.47	0.63	0.63	0.00	69.52	69.32	-0.20	0.17	0.24	0.07
314	Killimor-TribR2	Killimor-TribR2	322	67.98	-	1.48		-	69.30		-	0.28	
315	Killimor-TribR2	Killimor-TribR2	306	67.84	-	1.48		-	69.17		-	0.36	
316	Killimor-TribR2	Killimor-TribR2	296.4	67.95	3.75	1.55	-2.20	69.40	69.16	-0.24	0.89	0.46	-0.43
317	Killimor-TribR2	Killimor-TribR2	284.6	68.34	4.05	1.54	-2.51	69.34	69.14	-0.20	1.11	0.58	-0.53
318	Killimor-TribR2	Killimor-TribR2	268.7	67.95	4.37	1.56	-2.81	69.27	69.13	-0.14	1.03	0.44	-0.59
319	Killimor-TribR2	Killimor-TribR2	255.1	68.19	4.51	1.59	-2.92	69.14	69.10	-0.04	1.77	0.64	-1.13
320	Killimor-TribR2	Killimor-TribR2	250.1	68.29	5.92	3.05	-2.87	69.09	69.06	-0.03	1.23	0.62	-0.61
321	Killimor-TribR2	Killimor-TribR2	249.4	68.3	1.17	0.74	-0.43	69.21	69.10	-0.11	0.31	0.26	-0.05
322	Killimor-TribR2	Killimor-TribR2	243.7	68.14	1.07	0.73	-0.34	69.21	69.10	-0.11	0.37	0.31	-0.06
323	Killimor-TribR2	Killimor-TribR2	240.7	68.15	1.06	0.73	-0.33	69.20	69.10	-0.10	0.38	0.32	-0.06
324	Killimor-TribR2	Killimor-TribR2	235.8	68.16	1.05	0.73	-0.32	69.20	69.09	-0.11	0.38	0.32	-0.06
325	Killimor-TribR2	Killimor-TribR2	223.3	68.18	1.04	0.73	-0.31	69.19	69.09	-0.10	0.39	0.33	-0.06
326	Killimor-TribR2	Killimor-TribR2	187.3	68.26	1.04	0.73	-0.31	69.17	69.06	-0.11	0.40	0.38	-0.02
327	Killimor-TribR2	Killimor-TribR2	146.5	68.19	1.04	0.73	-0.31	69.14	69.03	-0.11	0.35	0.36	0.01
328	Killimor-TribR2	Killimor-TribR2	123.7	68.14	1.04	0.72	-0.32	69.12	69.00	-0.12	0.43	0.39	-0.04
329	Killimor-TribR2	Killimor-TribR2	83.7	68.23	1.04	0.68	-0.36	69.08	68.97	-0.11	0.38	0.35	-0.03
330	Killimor-TribR2	Killimor-TribR2	42.9	68.01	0.91	0.66	-0.25	69.05	68.95	-0.10	0.33	0.29	-0.04
331	Killimor-TribR2	Killimor-TribR2	4.4	67.72	0.77	0.64	-0.13	69.04	68.93	-0.11	0.29	0.24	-0.05
332	Killimor-TribR3	Kill-TribR3-Up	123.8	66.66	0.13	0.15	0.02	68.81	68.80	-0.01	0.02	0.03	0.01
333	Killimor-TribR3	Kill-TribR3-Up	86.2	66.9	0.08	0.05	-0.03	68.81	68.80	-0.01	0.01	0.02	0.01
334	Killimor-TribR3	Kill-TribR3-Up	78.5	66.95	0.09	-0.02	-0.11	68.81	68.80	-0.01	0.01	0.02	0.01
335	Killimor-TribR3	Kill-TribR3-Up	72.1	66.99	0.08	0.04	-0.04	68.81	68.80	-0.01	0.01	0.02	0.01
336	Killimor-TribR3	Kill-TribR3-Up	63.9	67.05	0.11	0.04	-0.07	68.80	68.80	0.00	0.01	0.02	0.01
337	Killimor-TribR3	Kill-TribR3-Up	43	67.18	0.00	-0.21	-0.21	68.80	68.80	0.00	0.00	0.03	0.03
338	Killimor-TribR3	Kill-TribR3-Up	18.4	67.34	3.34	0.00	-3.34	69.72	68.79	-0.93	0.47	-0.05	-0.52
339	Killimor-TribR3	Kill-TribR3-Up	13.2	67.15	0.25	-0.18	-0.43	68.80	68.79	-0.01	0.02	0.01	-0.01
340	Killimor-TribR3	Kill-TribR3-Up	11.4	67.1	1.29	0.84	-0.45	68.80	68.79	-0.01	0.25	0.21	-0.04
341	Killimor-TribR3	Kill-TribR3-Ds	11.1	67.12	0.00	0.00	0.00	68.80	68.79	-0.01	-0.36	-0.30	0.06
342	Killimor-TribR3	Kill-TribR3-Ds	10.9	67.08	-1.30	0.00	1.30	-	68.79		-	-0.32	
343	Killimor-TribR3	Kill-TribR3-Ds	10.6	67.05	0.00	0.00	0.00	68.79	68.79	0.00	-0.39	-0.33	0.06
344	Killimor-TribR3	Kill-TribR3-Ds	1.2	67	1.17	0.00	-1.17	68.99	68.88	-0.11	0.12	-0.21	-0.33
345	Killimor-TribR3	Kill-TribR3-Ds	0.7	66.93	0.00	0.00	0.00	68.93	68.88	-0.05	-0.25	-0.20	0.05
346	Killimor-TribR4	Killimor-TribR4	186.4	67.6	5.48	0.15	-5.33	68.93	68.86	-0.07	0.54	0.03	-0.51
347	Killimor-TribR4	Killimor-TribR4	154.8	67.54	0.13	0.15	0.02	68.86	68.86	0.00	0.03	0.03	0.00
348	Killimor-TribR4	Killimor-TribR4	126.7	67.45	0.13	0.16	0.03	68.86	68.85	-0.01	0.03	0.03	0.00
349	Killimor-TribR4	Killimor-TribR4	101.1	67.38	0.16	0.19	0.03	68.86	68.85	-0.01	0.04	0.05	0.01
350	Killimor-TribR4	Killimor-TribR4	78.9	67.31	0.14	0.25	0.11	68.85	68.84	-0.01	0.04	0.06	0.02
351	Killimor-TribR4	Killimor-TribR4	34.7	67.18	0.06	0.00	-0.06	68.85	68.83	-0.02	0.01	-0.01	-0.02
352	Killimor-TribR4	Killimor-TribR4	11.4	67.12	1.29	0.00	-1.29	68.80	68.82	0.02	0.25	-0.12	-0.37
353	Killimor-TribR4	Killimor-TribR4	3	67.26	0.00	0.00	0.00	68.80	68.79	-0.01	-0.66	-0.54	0.12
354	Killimor-W	Killimor-W-R	89.7	69.45	3.89	3.99	0.10	70.91	70.92	0.01	1.15	1.14	-0.01
355	Killimor-W	Killimor-W-R	80	69.38	3.86	3.93	0.07	70.88	70.89	0.01	1.12	1.12	0.00
356	Killimor-W	Killimor-W-R	61.2	69.33	3.53	3.63	0.10	70.87	70.88	0.01	0.72	0.71	-0.01

357	Killimor-W	Killimor-W-R	46.3	69.25	3.13	3.14	0.01	70.86	70.87	0.01	0.71	0.69	-0.02
358	Killimor-W	Killimor-W-R	41.2	69.22	3.07	3.16	0.09	70.85	70.86	0.01	0.72	0.71	-0.01
359	Killimor-W	Killimor-W-R	29.2	69.16	2.80	2.83	0.03	70.86	70.86	0.00	0.61	0.60	-0.01
360	Killimor-W	Killimor-W-R	23.4	69.12	2.67	2.78	0.11	70.85	70.86	0.01	0.60	0.60	0.00
361	Killimor-W	Killimor-W-R	13.4	69.07	2.58	2.22	-0.36	70.86	70.86	0.00	0.51	0.46	-0.05
362	Killimor-W	Killimor-W-R	3.3	68.94	3.59	3.26	-0.33	70.82	70.83	0.01	0.75	0.72	-0.03
363	Raford	RafordIN	1871.5	67.97	86.23	85.91	-0.32	71.57	71.52	-0.05	1.87	1.90	0.03
364	Raford	RafordIN	1866.4	67.7	84.81	85.83	1.02	71.65	71.60	-0.05	1.27	1.31	0.04
365	Raford	Raford-Up	1859.1	67.7	58.43	56.05	-2.38	71.65	71.60	-0.05	0.50	0.41	-0.09
366	Raford	Raford-Up	1847.4	67.7	55.77	43.18		71.63	71.59	-0.04	0.66	0.52	-0.14
367	Raford	Raford-Up	1832.6	67.7	47.99	45.03	-2.96	71.63	71.58	-0.05	0.69	0.59	-0.10
368	Raford	Raford-Up	1813	67.7	46.35	35.03		71.60	71.56	-0.04	0.90	0.77	-0.13
369	Raford	Raford-Up	1797.1	67.77	50.66	42.63	-8.03	71.60	71.56	-0.04	0.67	0.55	-0.12
370	Raford	Raford-Up	1787.8	67.83	44.78	42.86	-1.92	71.61	71.57	-0.04	0.55	0.49	-0.06
371	Raford	Raford-Up	1779.2	67.88	39.48	36.78	-2.70	71.61	71.56	-0.05	0.60	0.57	-0.03
372	Raford	Raford-Up	1767.9	67.95	36.86	37.89	1.03	71.60	71.56	-0.04	0.52	0.49	-0.03
373	Raford	Raford-Up	1756.7	67.86	36.11	34.38	-1.73	71.59	71.56	-0.03	0.60	0.58	-0.02
374	Raford	Raford-Up	1748.4	67.59	25.88	26.29	0.41	71.61	71.56	-0.05	0.65	0.60	-0.05
375	Raford	Raford-Up	1742.6	67.41	23.30	21.05	-2.25	71.58	71.54	-0.04	0.94	0.88	-0.06
376	Raford	Raford-Up	1728.2	67.7	25.02	23.92	-1.10	71.60	71.55	-0.05	0.63	0.60	-0.03
377	Raford	Raford-Up	1713.8	67.7	24.14	23.65	-0.49	71.58	71.54	-0.04	0.58	0.56	-0.02
378	Raford	Raford-Up	1707	67.7	24.11	23.81	-0.30	71.60	71.55	-0.05	0.53	0.51	-0.02
379	Raford	Raford-Up	1698.3	67.7	23.94	22.98	-0.96	71.61	71.55	-0.06	0.53	0.50	-0.03
380	Raford	Raford-Up	1692.6	67.66	25.81	22.33	-3.48	71.58	71.54	-0.04	0.65	0.56	-0.09
381	Raford	Raford-Up	1684.7	67.54	17.92	20.59	2.67	71.59	71.55	-0.04	0.33	0.32	-0.01
382	Raford	Raford-Up	1675.1	67.4	16.64	13.93	-2.71	71.56	71.53	-0.03	0.77	0.68	-0.09
383	Raford	Raford-Up	1659.1	67.56	19.19	15.65	-3.54	71.54	71.51	-0.03	0.73	0.64	-0.09
384	Raford	Raford-Up	1646.2	67.69	20.80	21.71	0.91	71.56	71.52	-0.04	0.27	0.29	0.02
385	Raford	Raford-Up	1629.4	67.78	19.13	22.54	3.41	71.55	71.52	-0.03	0.33	0.37	0.04
386	Raford	Raford-Up	1612.8	67.87	17.52	22.89	5.37	71.56	71.52	-0.04	0.27	0.32	0.05
387	Raford	Raford-Up	1598.7	67.92	16.99	19.03	2.04	71.57	71.52	-0.05	0.27	0.29	0.02
388	Raford	Raford-Up	1586.9	67.94	15.62	14.68	-0.94	71.54	71.51	-0.03	0.37	0.36	-0.01
389	Raford	Raford-Up	1581.4	67.95	15.50	17.32	1.82	71.55	71.51	-0.04	0.36	0.40	0.04
390	Raford	Raford-Up	1577.5	67.95	17.99	18.97	0.98	71.54	71.50	-0.04	0.50	0.51	0.01
391	Raford	Raford-Up	1569.7	68.06	17.70	19.39	1.69	71.54	71.50	-0.04	0.39	0.40	0.01
392	Raford	Raford-Up	1560.4	68.23	16.42	18.53	2.11	71.55	71.51	-0.04	0.35	0.36	0.01
393	Raford	Raford-Up	1549.9	68.42	16.42	15.56	-0.86	71.53	71.50	-0.03	0.53	0.47	-0.06
394	Raford	Raford-Up	1543.7	68.54	16.01	12.75	-3.26	71.53	71.50	-0.03	0.59	0.49	-0.10
395	Raford	Raford-Up	1538.3	68.67	17.82	17.64	-0.18	71.48	71.43	-0.05	1.12	1.14	0.02
396	Raford	Raford-Up	1534.5	68.81	17.81	17.64	-0.17	71.52	71.49	-0.03	1.01	1.02	0.01
397	Raford	Raford-Up	1522.4	68.89	18.24	19.76	1.52	71.53	71.49	-0.04	0.59	0.64	0.05
398	Raford	Raford-Up	1513.9	68.94	18.22	20.17	1.95	71.53	71.48	-0.05	0.61	0.66	0.05
399	Raford	Raford-Up	1504.5	68.98	18.12	19.38	1.26	71.52	71.48	-0.04	0.63	0.69	0.06
400	Raford	Raford-Up	1492.9	68.97	16.52	14.82	-1.70	71.51	71.49	-0.02	0.53	0.54	0.01
401	Raford	Raford-Up	1479.5	68.94	14.81	13.67	-1.14	71.50	71.48	-0.02	0.51	0.47	-0.04

402	Raford	Raford-Up	1467	68.92	16.58	14.10	-2.48	71.47	71.46	-0.01	0.58	0.46	-0.12
403	Raford	Raford-Up	1452.7	68.81	22.61	22.93	0.32	71.46	71.43	-0.03	0.53	0.54	0.01
404	Raford	Raford-Up	1442.1	68.75	21.14	24.54	3.40	71.48	71.45	-0.05	0.54	0.60	0.06
405	Raford	Raford-Up	1435.9	68.84	22.87	22.95	0.08	71.47	71.42	-0.05	0.50	0.55	0.05
406	Raford	Raford-Up	1427	68.88	18.81	18.59	-0.22	71.46	71.43	-0.03	0.52	0.51	-0.01
407	Raford	Raford-Up	1421.5	68.86	17.40	16.51	-0.89	71.45	71.42	-0.03	0.60	0.56	-0.04
408	Raford	Raford-Up	1416.2	68.87	18.18	16.06	-2.12	71.44	71.42	-0.02	0.65	0.58	-0.07
409	Raford	Raford-Up	1397.7	68.84	17.88	17.26	-0.62	71.43	71.40	-0.03	0.68	0.67	-0.01
410	Raford	Raford-Up	1376.4	68.71	19.96	18.60	-1.36	71.42	71.39	-0.03	0.55	0.52	-0.03
411	Raford	Raford-Up	1366.1	68.7	20.39	19.67	-0.72	71.41	71.38	-0.03	0.52	0.51	-0.01
412	Raford	Raford-Up	1313.9	68.66	25.61	27.31	1.70	71.34	71.32	-0.02	0.66	0.70	0.04
413	Raford	Raford-Up	1263.9	68.62	25.64	29.70	4.06	71.29	71.25	-0.04	0.67	0.74	0.07
414	Raford	Raford-Up	1240.1	68.6	23.81	24.98	1.17	71.27	71.25	-0.02	0.60	0.63	0.03
415	Raford	Raford-Up	1216.1	68.58	23.53	21.78	-1.75	71.25	71.21	-0.04	0.79	0.78	-0.01
416	Raford	Raford-Up	1201.3	68.57	25.17	22.78	-2.39	71.22	71.21	-0.01	0.81	0.75	-0.06
417	Raford	Raford-Up	1187.9	68.55	26.49	24.62	-1.87	71.19	71.17	-0.02	0.98	0.90	-0.08
418	Raford	Raford-Mid	1178.5	68.54	36.73	27.28	-9.45	71.19	71.17	-0.02	0.95	0.87	-0.08
419	Raford	Raford-Mid	1163.4	68.53	30.99	24.79	-6.20	71.16	71.15	-0.01	0.72	0.67	-0.05
420	Raford	Raford-Mid	1157	68.52	23.24	21.58	-1.66	71.16	71.15	-0.01	0.56	0.58	0.02
421	Raford	Raford-Mid	1140.1	68.5	18.35	14.93	-3.42	71.14	71.14	0.00	0.56	0.50	-0.06
422	Raford	Raford-Mid	1121.7	68.48	20.23	15.35	-4.88	71.11	71.11	0.00	0.50	0.42	-0.08
423	Raford	Raford-Mid	1115.1	68.47	18.96	14.51	-4.45	71.10	71.11	0.01	0.48	0.42	-0.06
424	Raford	Raford-Mid	1092	68.45	22.40	21.70	-0.70	71.08	71.08	0.00	0.44	0.46	0.02
425	Raford	Raford-Mid	1058	68.46	23.67	21.77	-1.90	71.04	71.04	0.00	0.50	0.50	0.00
426	Raford	Raford-Mid	1014.1	68.41	33.45	33.60	0.15	70.96	70.98	0.02	0.53	0.56	0.03
427	Raford	Raford-Mid	970.7	68.35	14.31	17.52	3.21	70.94	70.96	0.02	0.42	0.49	0.07
428	Raford	Raford-Mid	937.5	68.25	15.45	11.14	-4.31	70.90	70.94	0.04	0.41	0.32	-0.09
429	Raford	Raford-Mid	920.6	68.27	32.08	26.14	-5.94	70.85	70.91	0.06	0.58	0.56	-0.02
430	Raford	Raford-Mid	910.8	68.26	35.28	30.15	-5.13	70.85	70.89	0.04	0.71	0.63	-0.08
431	Raford	Raford-Mid	876	68.13	63.35	65.18	1.83	70.75	70.81	0.06	0.98	0.93	-0.05
432	Raford	Raford-Mid	850	68.09			2.49	70.64	70.71	0.07	1.29	1.22	-0.07
433	Raford	Raford-Mid	836.2	68.06			2.61	70.62	70.70	0.08	1.08	1.01	-0.07
434	Raford	Raford-Mid	818.9	67.99			2.66	70.58	70.66	0.08	1.20	1.12	-0.08
435	Raford	Raford-Mid	804.5	68			2.37	70.55	70.63	0.08	1.17	1.10	-0.07
436	Raford	Raford-Mid	789.9	68			2.44	70.52	70.61	0.09	1.11	1.04	-0.07
437	Raford	Raford-Mid	777.8	67.89			2.44	70.51	70.60	0.09	1.00	0.92	-0.08
438	Raford	Raford-Mid	763.6	67.91			2.48	70.47	70.47	0.00	1.13	1.14	0.01
439	Raford	Raford-Mid	755	67.9			2.49	70.45	70.45	0.00	1.13	1.14	0.01
440	Raford	Raford-Mid	737.5	67.94			2.50	70.43	70.42	-0.01	0.99	0.99	0.00
441	Raford	Raford-Mid	721.5	67.92			2.57	70.40	70.39	-0.01	1.06	1.06	0.00
442	Raford	Raford-Mid	697.2	67.86			2.60	70.35	70.34	-0.01	1.08	1.08	0.00
443	Raford	Raford-Mid	681.2	67.82			2.70	70.26	70.25	-0.01	1.53	1.54	0.01
444	Raford	Raford-Mid	657.5	67.75	2.10	63.20	61.10	69.72	70.17	0.45	0.27	1.56	1.29
445	Raford	Raford-Mid	631.2	67.69	34.89	35.58	0.69	70.13	70.10	-0.03	1.14	1.14	0.00
446	Raford	Raford-Mid	618.6	67.66	31.58	33.58	2.00	70.14	70.11	-0.03	0.51	0.53	0.02

447	Raford	Raford-Mid	601.7	67.61	18.72	18.14	-0.58	70.13	70.10	-0.03	0.47	0.46	-0.01
448	Raford	Raford-Mid	586.3	67.56	10.50	11.73	1.23	70.11	70.08	-0.03	0.38	0.41	0.03
449	Raford	Raford-Mid	575.8	67.53	13.22	12.47	-0.75	70.10	70.08	-0.02	0.36	0.34	-0.02
450	Raford	Raford-Mid	560.6	67.49	10.31	9.73	-0.58	70.07	70.06	-0.01	0.49	0.51	0.02
451	Raford	Raford-Mid	547.7	67.45	8.01	9.03	1.02	70.07	70.05	-0.02	0.33	0.39	0.06
452	Raford	Raford-Mid	533	67.4	6.09	6.48	0.39	70.07	70.05	-0.02	0.25	0.30	0.05
453	Raford	Raford-Mid	519.9	67.36	7.62	6.95	-0.67	70.06	70.05	-0.01	0.32	0.34	0.02
454	Raford	Raford-Mid	509.2	67.28	10.20	11.07	0.87	70.04	70.04	0.00	0.25	0.28	0.03
455	Raford	Raford-Ds	502.2	67.22	13.44	13.42	-0.02	70.04	70.04	0.00	0.37	0.40	0.03
456	Raford	Raford-Ds	494.1	66.47	10.25	10.23	-0.02	70.06	70.04	-0.02	0.41	0.42	0.01
457	Raford	Raford-Ds	478.1	66.88	8.68	7.46	-1.22	70.04	70.03	-0.01	0.44	0.41	-0.03
458	Raford	Raford-Ds	460.1	67.35	9.21	7.39	-1.82	70.02	70.01	-0.01	0.51	0.47	-0.04
459	Raford	Raford-Ds	449.4	66.63	10.91	9.91	-1.00	70.01	70.00	-0.01	0.34	0.29	-0.05
460	Raford	Raford-Ds	443	66.7	6.64	7.30	0.66	70.02	70.01	-0.01	0.19	0.18	-0.01
461	Raford	Raford-Ds	438.6	66.84	3.66	4.52	0.86	70.00	70.00	0.00	0.18	0.19	0.01
462	Raford	Raford-Ds	434.2	66.91	8.55	6.12	-2.43	70.00	70.00	0.00	0.46	0.36	-0.10
463	Raford	Raford-Ds	415.7	67.05	8.11	6.51	-1.60	69.99	69.99	0.00	0.37	0.33	-0.04
464	Raford	Raford-Ds	382.2	67.08	7.70	6.61	-1.09	69.98	69.98	0.00	0.30	0.28	-0.02
465	Raford	Raford-Ds	365	66.97	7.31	6.24	-1.07	69.98	69.98	0.00	0.33	0.31	-0.02
466	Raford	Raford-Ds	336.2	66.89	7.12	5.97	-1.15	69.98	69.98	0.00	0.26	0.25	-0.01
467	Raford	Raford-Ds	322.5	66.83	6.81	6.49	-0.32	69.98	69.97	-0.01	0.33	0.34	0.01
468	Raford	Raford-Ds	312.6	66.98	6.45	6.21	-0.24	69.96	69.97	0.01	0.24	0.25	0.01
469	Raford	Raford-Ds	243.7	66.98	1.07	9.10	8.03	69.21	69.93	0.72	0.37	0.41	0.04
470	Raford	Raford-Ds	165.8	66.97	8.82	9.92	1.10	69.89	69.87	-0.02	0.37	0.43	0.06
471	Raford	Raford-Ds	130.9	66.91	20.28	17.93	-2.35	69.80	69.80	0.00	0.63	0.58	-0.05
472	Raford	Raford-Ds	97.8	66.86	30.58	30.93	0.35	69.68	69.68	0.00	0.81	0.81	0.00
473	Raford	Raford-Ds	65	66.81	45.68	46.45	0.77	69.47	69.47	0.00	1.10	1.11	0.01
474	Raford	Raford-Ds	5.7	66.7	19.93	19.91	-0.02	69.36	69.37	0.01	0.56	0.56	0.00
475	Raford-Trib1	Raford-Trib1	405.4	71.8	19.00	19.00	0.00	73.33	73.33	0.00	3.00	3.00	0.00
476	Raford-Trib1	Raford-Trib1	389.5	71.52	13.56	13.72	0.16	73.13	73.13	0.00	1.48	1.47	-0.01
477	Raford-Trib1	Raford-Trib1	381	71.4	13.31	12.84	-0.47	73.03	73.02	-0.01	2.27	2.32	0.05
478	Raford-Trib1	Raford-Trib1	328.9	70.99	7.00	7.28	0.28	72.50	72.50	0.00	1.65	1.68	0.03
479	Raford-Trib1	Raford-Trib1	289.3	70.6	8.37	8.78	0.41	72.10	72.09	-0.01	1.86	1.92	0.06
480	Raford-Trib1	Raford-Trib1	241	70.09	2.70	2.70	0.00	72.00	72.00	0.00	0.43	0.48	0.05
481	Raford-Trib1	Raford-Trib1	188	69.87	0.00	0.00	0.00	72.01	72.01	0.00	-0.05	-0.10	-0.05
482	Raford-Trib1	Raford-Trib1	121.8	69.51	0.00	0.00	0.00	72.00	71.99	-0.01	-0.86	-0.99	-0.13
483	Raford-Trib1	Raford-Trib1	82.1	68.92	0.00	0.00	0.00	71.97	71.96	-0.01	-1.10	-1.18	-0.08
485	Raford-Trib1	Raford-Trib1	11.5	67.86	0.00	0.00	0.00	71.65	71.60	-0.05	-2.75	-3.30	-0.55
486	Raford-Trib2	Raford-Trib2	297.7	74.9	0.50	0.50	0.00	75.47	75.46	-0.01	1.07	1.13	0.06
487	Raford-Trib2	Raford-Trib2	258.5	74.15	1.60	0.50	-1.10	74.69	74.71	0.02	1.17	1.09	-0.08
488	Raford-Trib2	Raford-Trib2	225.6	73.52	0.58	0.58	0.00	74.14	74.10	-0.04	1.04	1.21	0.17
489	Raford-Trib2	Raford-Trib2	216.5	73.34	0.51	0.53	0.02	74.09	74.02	-0.07	0.32	0.63	0.31
491	Raford-Trib2	Raford-Trib2	196.1	72.94	-0.50	0.24	0.74	73.28	73.28	0.00	0.81	0.69	-0.12
492	Raford-Trib2	Raford-Trib2	176.4	72.49	-1.04	0.06	1.10	72.84	72.84	0.00	0.43	0.66	0.23
493	Raford-Trib2	Raford-Trib2	155.7	72.03	-6.69	-0.19	6.50	72.34	72.33	-0.01	0.78	0.80	0.02

494	Raford-Trib2	Raford-Trib2	122.2	71.26	0.00	0.00	0.00	71.61	71.62	0.01	-1.09	-0.91	0.18
495	Raford-Trib2	Raford-Trib2	81.7	70.32	0.00	0.00	0.00	71.05	71.08	0.03	-1.57	-1.29	0.28
496	Raford-Trib2	Raford-Trib2	41.9	69.39	-7.26	0.00	7.26	71.22	71.19	-0.03	0.04	-0.48	-0.52
497	Raford-Trib2	Raford-Trib2	9.4	69.12	10.24	2.66	-7.58	71.19	71.17	-0.02	0.67	0.56	-0.11
498	Raford-Trib3	Raford-Trib3-Up	1096.2	73.84	4.33	1.09	-3.24	75.63	74.71	-0.92	0.74	0.35	-0.39
499	Raford-Trib3	Raford-Trib3-Up	1061.7	73.58	1.13	1.13	0.00	74.69	74.70	0.01	0.17	0.17	0.00
500	Raford-Trib3	Raford-Trib3-Up	1025.6	73.94	1.18	1.20	0.02	74.67	74.68	0.01	0.43	0.43	0.00
501	Raford-Trib3	Raford-Trib3-Up	1010	74.1	1.25	1.29	0.04	74.61	74.63	0.02	0.74	0.74	0.00
502	Raford-Trib3	Raford-Trib3-Up	1000.1	74.04	1.25	1.29	0.04	74.58	74.60	0.02	0.70	0.70	0.00
503	Raford-Trib3	Raford-Trib3-Up	993.5	73.98	1.26	1.30	0.04	74.54	74.56	0.02	0.86	0.86	0.00
504	Raford-Trib3	Raford-Trib3-Up	982.7	73.9	1.26	1.30	0.04	74.53	74.54	0.01	0.49	0.49	0.00
505	Raford-Trib3	Raford-Trib3-Up	971.7	73.82	1.26	1.29	0.03	74.48	74.50	0.02	0.80	0.80	0.00
506	Raford-Trib3	Raford-Trib3-Up	954.4	73.68	1.26	1.29	0.03	74.42	74.43	0.01	0.85	0.85	0.00
507	Raford-Trib3	Raford-Trib3-Up	936.4	73.54	1.25	1.29	0.04	74.31	74.32	0.01	1.00	1.01	0.01
508	Raford-Trib3	Raford-Trib3-Up	930.1	73.49	1.25	1.29	0.04	74.25	74.26	0.01	1.14	1.14	0.00
509	Raford-Trib3	Raford-Trib3-Up	925.6	73.49	1.25	1.28	0.03	74.21	74.22	0.01	1.12	1.12	0.00
510	Raford-Trib3	Raford-Trib3-Up	919.9	73.45	1.25	1.28	0.03	74.16	74.17	0.01	1.12	1.12	0.00
511	Raford-Trib3	Raford-Trib3-Up	883.4	73.15	1.24	1.26	0.02	73.82	73.84	0.02	1.12	1.11	-0.01
512	Raford-Trib3	Raford-Trib3-Up	848.3	72.86	1.23	1.21	-0.02	73.50	73.51	0.01	1.12	1.12	0.00
513	Raford-Trib3	Raford-Trib3-Up	815.6	72.59	1.23	1.16	-0.07	73.19	73.19	0.00	1.12	1.12	0.00
514	Raford-Trib3	Raford-Trib3-Up	758.3	72.12	1.23	1.14	-0.09	72.66	72.66	0.00	1.08	1.06	-0.02
515	Raford-Trib3	Raford-Trib3-Up	719.4	71.81	1.23	1.14	-0.09	72.41	72.42	0.01	0.88	0.85	-0.03
516	Raford-Trib3	Raford-Trib3-Up	644.3	71.15	1.23	1.14	-0.09	71.79	71.78	-0.01	1.20	1.20	0.00
517	Raford-Trib3	Raford-Trib3-Up	570.7	70.57	1.74	1.13	-0.61	71.34	71.31	-0.03	0.56	0.54	-0.02
518	Raford-Trib3	Raford-Trib3-Up	565.6	70.57	1.76	1.12	-0.64	71.33	71.30	-0.03	0.60	0.57	-0.03
519	Raford-Trib3	Raford-Trib3-Up	526.4	70.49	1.93	1.07	-0.86	71.12	71.10	-0.02	1.00	0.97	-0.03
520	Raford-Trib3	Raford-Trib3-Up	486.7	70.24	1.93	1.00	-0.93	70.85	70.81	-0.04	0.96	0.94	-0.02
521	Raford-Trib3	Raford-Trib3-Up	450	70.02	1.92	1.01	-0.91	70.57	70.55	-0.02	1.05	0.95	-0.10
522	Raford-Trib3	Raford-Trib3-Up	445.3	69.94	1.76	0.98	-0.78	70.53	70.50	-0.03	1.16	1.15	-0.01
523	Raford-Trib3	Raford-Trib3-Up	417.7	69.46	0.09	0.25	0.16	70.23	70.21	-0.02	0.63	0.75	0.12
524	Raford-Trib3	Raford-Trib3-Up	410.6	69.42	0.53	0.51	-0.02	70.20	70.18	-0.02	0.43	0.50	0.07
525	Raford-Trib3	Raford-Trib3-Up	353.4	69.08	0.84	0.45	-0.39	70.13	70.11	-0.02	0.25	0.30	0.05
526	Raford-Trib3	Raford-Trib3-Up	273.6	68.65	0.83	1.12	0.29	70.10	70.08	-0.02	0.19	0.25	0.06
527	Raford-Trib3	Raford-Trib3-Ds	266.4	68.61	1.76	2.12	0.36	70.10	70.08	-0.02	0.31	0.39	0.08
528	Raford-Trib3	Raford-Trib3-Ds	249.7	68.5	1.54	1.08	-0.46	70.10	70.08	-0.02	0.24	0.32	0.08
529	Raford-Trib3	Raford-Trib3-Ds	223.2	68.43	0.94	-2.87	-3.81	70.10	70.08	-0.02	0.14	0.21	0.07
530	Raford-Trib3	Raford-Trib3-Ds	191.1	68.35	0.99	-4.09	-5.08	70.09	70.07	-0.02	0.15	0.17	0.02
531	Raford-Trib3	Raford-Trib3-Ds	163.9	68.27	0.49	-5.95	-6.44	70.09	70.07	-0.02	0.07	0.15	0.08
532	Raford-Trib3	Raford-Trib3-Ds	130.8	68.17	1.81	-8.12	-9.93	70.08	70.07	-0.01	0.30	0.09	-0.21
533	Raford-Trib3	Raford-Trib3-Ds	95.5	68.06	1.82	-13.80		70.09	70.06	-0.03	0.27	0.24	-0.03
534	Raford-Trib3	Raford-Trib3-Ds	61.1	67.96	1.88	14.44	12.56	70.08	70.06	-0.02	0.34	0.23	-0.11
535	Raford-Trib3	Raford-Trib3-Ds	30.3	67.86	0.51	-3.30	-3.81	70.11	70.06	-0.05	0.08	0.13	0.05
536	Raford-Trib3	Raford-Trib3-Ds	17.3	67.56	0.00	0.00	0.00	70.15	70.08	-0.07	-0.11	-0.03	0.08
537	Raford-Trib3	Raford-Trib3-Ds	3.1	67.22	2.52	9.99	7.47	70.07	70.05	-0.02	0.45	0.41	-0.04
538	Raford-Trib4	Raford-Trib4-Up	1099.7	75.47	3.07	3.07	0.00	76.68	76.68	0.00	1.55	1.55	0.00

539	Raford-Trib4	Raford-Trib4-Up	1045.6	74.7	2.11	2.11	0.00	75.61	75.61	0.00	1.94	1.94	0.00
540	Raford-Trib4	Raford-Trib4-Up	966.2	73.48	2.09	2.09	0.00	74.14	74.14	0.00	1.60	1.60	0.00
541	Raford-Trib4	Raford-Trib4-Up	953.6	73.29	1.99	1.99	0.00	73.96	73.96	0.00	1.53	1.53	0.00
542	Raford-Trib4	Raford-Trib4-Up	901.4	72.53	2.67	2.67	0.00	73.25	73.25	0.00	1.59	1.59	0.00
543	Raford-Trib4	Raford-Trib4-Up	854.1	71.83	3.00	3.00	0.00	72.56	72.56	0.00	1.70	1.70	0.00
544	Raford-Trib4	Raford-Trib4-Up	842.8	71.68	3.02	3.02	0.00	72.40	72.40	0.00	1.47	1.47	0.00
545	Raford-Trib4	Raford-Trib4-Up	831.6	71.54	3.04	3.04	0.00	72.32	72.32	0.00	1.25	1.25	0.00
546	Raford-Trib4	Raford-Trib4-Up	774.1	70.8	3.05	3.05	0.00	72.08	72.08	0.00	0.86	0.86	0.00
547	Raford-Trib4	Raford-Trib4-Up	766	70.7	3.05	3.05	0.00	72.06	72.06	0.00	0.83	0.83	0.00
548	Raford-Trib4	Raford-Trib4-Up	758.6	70.9	3.05	3.05	0.00	71.97	71.97	0.00	1.50	1.50	0.00
549	Raford-Trib4	Raford-Trib4-Up	748.7	70.83	3.05	3.05	0.00	71.87	71.87	0.00	1.49	1.49	0.00
550	Raford-Trib4	Raford-Trib4-Up	718.8	70.64	3.05	3.05	0.00	71.56	71.56	0.00	1.46	1.46	0.00
551	Raford-Trib4	Raford-Trib4-Up	692.5	70.47	3.05	3.05	0.00	71.29	71.29	0.00	1.51	1.51	0.00
552	Raford-Trib4	Raford-Trib4-Up	688	70.44	3.05	3.05	0.00	71.25	71.25	0.00	1.33	1.33	0.00
553	Raford-Trib4	Raford-Trib4-Up	675.6	70.35	3.05	3.05	0.00	71.19	71.19	0.00	1.06	1.06	0.00
554	Raford-Trib4	Raford-Trib4-Up	663.2	70.26	3.05	3.05	0.00	71.09	71.09	0.00	1.37	1.37	0.00
555	Raford-Trib4	Raford-Trib4-Up	656.4	70.21	3.05	3.05	0.00	71.03	71.03	0.00	1.33	1.33	0.00
556	Raford-Trib4	Raford-Trib4-Up	623.5	69.98	3.05	3.05	0.00	70.82	70.82	0.00	1.20	1.20	0.00
557	Raford-Trib4	Raford-Trib4-Up	615.3	69.93	3.05	3.05	0.00	70.79	70.79	0.00	1.06	1.06	0.00
558	Raford-Trib4	Raford-Trib4-Up	575.7	69.67	3.05	3.05	0.00	70.58	70.58	0.00	1.18	1.18	0.00
559	Raford-Trib4	Raford-Trib4-Up	537.5	69.41	3.05	3.05	0.00	70.40	70.40	0.00	1.08	1.08	0.00
560	Raford-Trib4	Raford-Trib4-Up	520.8	69.29	3.02	3.02	0.00	70.39	70.39	0.00	0.62	0.62	0.00
561	Raford-Trib4	Raford-Trib4-Up	511.4	69.24	3.02	3.02	0.00	70.38	70.38	0.00	0.62	0.62	0.00
562	Raford-Trib4	Raford-Trib4-Up	501.9	69.18	3.02	3.02	0.00	70.36	70.36	0.00	0.67	0.67	0.00
563	Raford-Trib4	Raford-Trib4-Up	491	69.1	5.39	2.90	-2.49	69.46	70.37	0.91	0.82	0.46	-0.36
564	Raford-Trib4	Raford-Trib4-Up	485.9	69.07	2.63	2.63	0.00	70.37	70.37	0.00	0.36	0.36	0.00
565	Raford-Trib4	Raford-Trib4-Up	464.8	68.94	1.65	1.66	0.01	70.37	70.37	0.00	0.29	0.29	0.00
566	Raford-Trib4	Raford-Trib4-Up	453	68.87	0.70	0.70	0.00	70.38	70.38	0.00	0.14	0.14	0.00
567	Raford-Trib4	Raford-Trib4-Up	447.1	68.69	0.70	0.70	0.00	70.16	70.16	0.00	0.24	0.24	0.00
568	Raford-Trib4	Raford-Trib4-Up	437.7	68.66	1.03	1.03	0.00	70.16	70.16	0.00	0.21	0.21	0.00
569	Raford-Trib4	Raford-Trib4-Up	426	68.64	1.26	1.26	0.00	70.16	70.16	0.00	0.25	0.25	0.00
570	Raford-Trib4	Raford-Trib4-Up	420.8	68.62	1.03	1.02	-0.01	70.16	70.16	0.00	0.19	0.19	0.00
571	Raford-Trib4	Raford-Trib4-Up	409	68.6	1.03	1.02	-0.01	70.05	70.05	0.00	0.22	0.22	0.00
572	Raford-Trib4	Raford-Trib4-Up	400.5	68.58	1.49	1.51	0.02	70.05	70.04	-0.01	0.28	0.28	0.00
573	Raford-Trib4	Raford-Trib4-Up	379	68.53	2.00	2.06	0.06	70.04	70.04	0.00	0.30	0.30	0.00
574	Raford-Trib4	Raford-Trib4-Up	371.5	68.51	1.96	2.07	0.11	70.04	70.03	-0.01	0.31	0.32	0.01
575	Raford-Trib4	Raford-Trib4-Up	355.1	68.47	1.98	2.07	0.09	70.03	70.03	0.00	0.38	0.38	0.00
576	Raford-Trib4	Raford-Trib4-Up	345.2	68.45	1.91	2.05	0.14	70.03	70.03	0.00	0.28	0.30	0.02
577	Raford-Trib4	Raford-Trib4-Up	337.3	68.43	1.99	1.85	-0.14	70.03	70.03	0.00	0.31	0.30	-0.01
578	Raford-Trib4	Raford-Trib4-Up	309.7	68.37	1.82	1.69	-0.13	70.03	70.03	0.00	0.25	0.23	-0.02
579	Raford-Trib4	Raford-Trib4-Up	301.3	68.35	1.65	1.64	-0.01	70.03	70.03	0.00	0.21	0.18	-0.03
580	Raford-Trib4	Raford-Trib4-Up	277.8	68.3	1.36	1.24	-0.12	70.03	70.03	0.00	0.21	0.20	-0.01
581	Raford-Trib4	Raford-Trib4-Up	256.7	68.25	0.76	0.91	0.15	70.03	70.03	0.00	0.16	0.16	0.00
582	Raford-Trib4	Raford-Trib4-Up	249.7	68.24	1.54	0.50	-1.04	70.10	70.03	-0.07	0.24	0.12	-0.12
583	Raford-Trib4	Raford-Trib4-Up	245.6	68.23	0.55	0.17	-0.38	70.04	70.03	-0.01	0.15	0.14	-0.01

584	Raford-Trib4	Raford-Trib4-Up	240.5	68.21	0.68	-0.42	-1.10	70.03	70.03	0.00	0.17	0.16	-0.01
585	Raford-Trib4	Raford-Trib4-Up	230.8	68.19	0.72	-0.97	-1.69	70.03	70.02	-0.01	0.17	0.18	0.01
586	Raford-Trib4	Raford-Trib4-Up	223.6	68.16	0.46	-1.13	-1.59	70.03	70.03	0.00	0.09	0.11	0.02
587	Raford-Trib4	Raford-Trib4-Up	213	68.1	0.48	-1.47	-1.95	70.04	70.03	-0.01	0.05	0.06	0.01
588	Raford-Trib4	Raford-Trib4-Up	206.1	68.06	0.00	0.00	0.00	70.03	70.03	0.00	0.00	-0.02	-0.02
589	Raford-Trib4	Raford-Trib4-Up	162.9	67.81	0.00	0.00	0.00	70.03	70.02	-0.01	-0.19	-0.21	-0.02
590	Raford-Trib4	Raford-Trib4-Up	117.2	67.55	0.00	0.00	0.00	70.03	70.03	0.00	-0.30	-0.26	0.04
591	Raford-Trib4	Raford-Trib4-Up	105.4	67.49	0.00	0.00	0.00	70.03	70.03	0.00	-0.29	-0.29	0.00
592	Raford-Trib4	Raford-Trib4-Up	87.7	67.4	0.00	0.00	0.00	70.06	70.04	-0.02	-0.31	-0.32	-0.01
593	Raford-Trib4	Raford-Trib4-Up	82	67.37	0.00	0.00	0.00	70.05	70.04	-0.01	-0.34	-0.30	0.04
594	Raford-Trib4	Raford-Trib4-Up	60.3	67.25	0.00	0.00	0.00	70.07	70.05	-0.02	-0.33	-0.35	-0.02
595	Raford-Trib4	Raford-Trib4-Up	55	67.22	0.00	0.00	0.00	70.12	70.07	-0.05	-0.22	-0.40	-0.18
596	Raford-Trib4	Raford-Trib4-Up	50.9	67.2	0.00	0.00	0.00	70.07	70.05	-0.02	-0.08	-0.38	-0.30
597	Raford-Trib4	Raford-Trib4-Ds	46.4	67.8	0.87	0.00	-0.87	70.07	70.05	-0.02	0.36	-0.07	-0.43
598	Raford-Trib4	Raford-Trib4-Ds	28.7	67.62	0.29	0.58	0.29	70.07	70.05	-0.02	0.27	0.08	-0.19
599	Raford-Trib4	Raford-Trib4-Ds	9.5	67.66	3.24	2.35	-0.89	70.04	70.04	0.00	0.41	0.37	-0.04
600	Raford-Trib5	Raford-Trib5	471.7	75.63	-	2.29	-	-	76.36	-	-	1.57	-
601	Raford-Trib5	Raford-Trib5	451.5	75.31	3.62	2.29	-1.33	69.45	76.09	6.64	0.49	1.44	0.95
602	Raford-Trib5	Raford-Trib5	431.2	74.99	-	2.29	-	-	75.95	-	-	1.04	-
603	Raford-Trib5	Raford-Trib5	410.9	74.66	-	2.29	-	-	75.91	-	-	0.66	-
604	Raford-Trib5	Raford-Trib5	390.6	74.34	-	2.29	-	-	75.46	-	-	0.81	-
605	Raford-Trib5	Raford-Trib5	381.8	74.2	-	2.29	-	-	75.45	-	-	0.67	-
606	Raford-Trib5	Raford-Trib5	355.7	73.77	-	2.29	-	-	74.54	-	-	1.68	-
607	Raford-Trib5	Raford-Trib5	285.9	72.63	-	2.25	-	-	73.55	-	-	1.37	-
608	Raford-Trib5	Raford-Trib5	245.1	71.97	-	2.22	-	-	72.77	-	-	1.98	-
609	Raford-Trib5	Raford-Trib5	228.5	71.64	-	2.08	-	-	72.44	-	-	1.34	-
610	Raford-Trib5	Raford-Trib5	114	70.11	2.07	1.98	-0.09	70.80	70.80	0.00	1.43	1.46	0.03
611	Raford-Trib5	Raford-Trib5	91.8	69.77	1.63	1.73	0.10	70.50	70.48	-0.02	1.09	1.21	0.12
612	Raford-Trib5	Raford-Trib5	48.6	69.23	1.82	1.90	0.08	70.14	70.11	-0.03	0.74	0.82	0.08
613	Raford-Trib5	Raford-Trib5	3.1	68.66	2.52	1.00	-1.52	70.07	70.08	0.01	0.45	0.16	-0.29
1	Kill-TribR1-L	Kill-TribR1-L	500.6	75.91	1.24	1.20	-0.04	76.41	76.41	0.00	1.09	1.08	-0.01
2	Kill-TribR1-L	Kill-TribR1-L	395.1	75.04	1.21	1.17	-0.04	75.67	75.68	0.01	0.70	0.69	-0.01
3	Kill-TribR1-L	Kill-TribR1-L	304	74.73	1.22	1.22	0.00	75.31	75.32	0.01	0.76	0.75	-0.01
4	Kill-TribR1-L	Kill-TribR1-L	203.2	74.39	1.22	1.22	0.00	75.03	75.03	0.00	0.52	0.51	-0.01

8.8.2 Hec-Ras output tables for Q_{1000cc} - Zone B

Table 8.2. HEC-RAS results showing water levels and velocities for Existing and Design Systems for Q_{1000cc} (Zone B)

No	River	Reach	River Station [m]	Min Ch El [mOD]	Q [m3/s]			W.S. Elev [mOD]			Vel Chnl [m/s]		
					Exist	Design	ΔQ [m3/s]	Exist	Design	ΔH [m]	Exist	Design	Δv [m/s]
1	Kill-TribR1-L	Kill-TribR1-L	500.6	75.91	1.24	1.20	-0.04	76.45	76.45	0.00	1.15	1.11	-0.04
2	Kill-TribR1-L	Kill-TribR1-L	395.1	75.04	1.21	1.17	-0.04	75.72	75.72	0.00	0.72	0.70	-0.02
3	Kill-TribR1-L	Kill-TribR1-L	304	74.73	1.22	1.22	0.00	75.37	75.36	-0.01	0.79	0.79	0.00
4	Kill-TribR1-L	Kill-TribR1-L	203.2	74.39	1.22	1.22	0.00	75.09	75.09	0.00	0.53	0.53	0.00
5	Kill-TribR1-L	Kill-TribR1-L	191.7	74.35	1.21	1.22	0.01	75.07	75.07	0.00	0.52	0.53	0.01
6	Kill-TribR1-L	Kill-TribR1-L	174.3	74.25	1.21	1.15	-0.06	75.00	75.00	0.00	0.82	0.78	-0.04
7	Kill-TribR1-L	Kill-TribR1-L	100.6	73.46	0.59	0.59	0.00	74.87	74.87	0.00	0.21	0.21	0.00
8	Kill-TribR1-L	Kill-TribR1-L	85.7	73.62	1.21	1.21	0.00	74.85	74.85	0.00	0.42	0.42	0.00
9	Kill-TribR1-L	Kill-TribR1-L	75.4	73.59	1.20	1.21	0.01	74.84	74.84	0.00	0.51	0.51	0.00
10	Kill-TribR1-L	Kill-TribR1-L	62.1	73.56	0.93	0.94	0.01	74.84	74.84	0.00	0.42	0.42	0.00
11	Kill-TribR1-L	Kill-TribR1-L	34.9	73.6	1.22	1.22	0.00	74.80	74.80	0.00	0.60	0.60	0.00
12	Kill-TribR1-L	Kill-TribR1-L	19.9	73.62	1.22	1.22	0.00	74.77	74.77	0.00	0.62	0.62	0.00
13	Kill-TribR1-L	Kill-TribR1-L	4.6	73.6	1.22	1.22	0.00	74.77	74.77	0.00	0.22	0.22	0.00
14	Killimor	Killimor-W-L	1322.9	69.23	2.39	2.45	0.06	71.03	71.00	-0.03	0.55	0.57	0.02
15	Killimor	Killimor-W-L	1300.4	69.34	2.08	2.05	-0.03	71.02	71.00	-0.02	0.47	0.48	0.01
16	Killimor	Killimor-W-L	1294.9	69.29	1.99	2.00	0.01	71.03	70.99	-0.04	0.52	0.54	0.02
17	Killimor	Killimor-W-L	1289.4	69.23	1.88	2.04	0.16	71.02	70.99	-0.03	0.41	0.46	0.05
18	Killimor	Killimor-W-L	1225.6	69.12	1.29	1.25	-0.04	71.01	70.98	-0.03	0.27	0.27	0.00
19	Killimor	Killimor-W-L	1189.9	69.17	1.53	1.38	-0.15	71.01	70.98	-0.03	0.27	0.25	-0.02
20	Killimor	Killimor-W-L	1147.4	69.05	1.33	1.30	-0.03	71.00	70.97	-0.03	0.26	0.26	0.00
21	Killimor	Killimor-W-L	1117.7	68.97	1.70	0.89	-0.81	70.99	70.97	-0.02	0.33	0.18	-0.15
22	Killimor	Killimor-W-L	1107.8	69.03	2.42	2.41	-0.01	70.97	70.95	-0.02	0.48	0.48	0.00
23	Killimor	Killimor-W	1103.2	69.04	6.02	5.67	-0.35	70.97	70.95	-0.02	1.10	1.05	-0.05
24	Killimor	Killimor-W	1098.3	69.05	5.77	5.34	-0.43	70.96	70.94	-0.02	1.04	0.97	-0.07
25	Killimor	Killimor-W	1092.9	69.05	6.79	6.67	-0.12	70.90	70.87	-0.03	1.28	1.29	0.01
26	Killimor	Killimor-W	1087.5	69.04	6.77	6.67	-0.10	70.95	70.94	-0.01	1.34	1.33	-0.01
27	Killimor	Killimor-W	1079.7	69.01	5.75	7.04	1.29	70.97	71.01	0.04	1.12	1.33	0.21
28	Killimor	Killimor-W	1057.2	69.04	4.51	4.57	0.06	70.72	70.69	-0.03	1.79	1.89	0.10
29	Killimor	Killimor-W	1041.1	69.02	3.38	3.39	0.01	70.64	70.60	-0.04	0.82	0.85	0.03
30	Killimor	Killimor-W	1018.7	68.84	3.37	3.34	-0.03	70.62	70.58	-0.04	0.71	0.72	0.01
31	Killimor	Killimor-W	988	68.72	3.24	3.17	-0.07	70.59	70.55	-0.04	0.72	0.73	0.01
32	Killimor	Killimor-W	973.4	68.61	3.14	3.33	0.19	70.57	70.52	-0.05	0.73	0.80	0.07
33	Killimor	Killimor-W	958	68.56	3.32	2.79	-0.53	70.55	70.52	-0.03	0.74	0.64	-0.10
34	Killimor	Killimor-W	945.6	68.53	3.36	4.53	1.17	70.53	70.42	-0.11	0.73	1.06	0.33
35	Killimor	Killimor-W	943	68.65	3.36	2.58	-0.78	70.53	70.35	-0.18	0.76	0.67	-0.09
36	Killimor	Killimor-W	941.4	68.66	3.33	3.14	-0.19	70.53	70.31	-0.22	0.75	0.84	0.09

37	Killimor	Killimor-W	933.2	68.68	3.44	5.48	2.04	70.50	70.48	-0.02	0.78	1.27	0.49
38	Killimor	Killimor-W	927.8	68.66	3.29	4.82	1.53	70.50	70.49	-0.01	0.74	1.09	0.35
39	Killimor	Killimor-W	920.9	68.55	4.11	4.70	0.59	70.47	70.47	0.00	0.86	0.99	0.13
40	Killimor	Killimor-Up	915.3	68.62	2.30	2.75	0.45	70.47	70.47	0.00	0.29	0.35	0.06
41	Killimor	Killimor-Up	905.1	68.74	3.36	3.09	-0.27	70.45	70.47	0.02	0.51	0.46	-0.05
42	Killimor	Killimor-Up	873.1	68.64	5.00	5.04	0.04	70.36	70.36	0.00	0.98	0.99	0.01
43	Killimor	Killimor-Up	828.7	68.44	4.91	4.50	-0.41	70.22	70.25	0.03	0.98	0.87	-0.11
44	Killimor	Killimor-Up	791.7	68.25	5.14	5.02	-0.12	70.11	70.11	0.00	1.01	0.98	-0.03
45	Killimor	Killimor-Up	754.1	68.05	5.03	4.68	-0.35	70.02	70.04	0.02	0.96	0.87	-0.09
46	Killimor	Killimor-Up	745.4	68.01	4.61	4.63	0.02	70.00	70.00	0.00	0.87	0.87	0.00
47	Killimor	Killimor-Up	741.3	68.02	6.07	6.07	0.00	69.90	69.92	0.02	1.18	1.16	-0.02
48	Killimor	Killimor-Up	723.9	67.97	6.35	7.42	1.07	69.81	69.83	0.02	1.26	1.45	0.19
49	Killimor	Killimor-Up	699.5	67.91	5.55	5.92	0.37	69.76	69.78	0.02	1.07	1.12	0.05
50	Killimor	Killimor-Up	679.9	67.86	4.33	4.52	0.19	69.76	69.75	-0.01	0.79	0.83	0.04
51	Killimor	Killimor-Up	671.5	67.84	4.05	4.32	0.27	69.75	69.76	0.01	0.73	0.77	0.04
52	Killimor	Killimor-Up	666.2	67.75	2.26	2.32	0.06	69.78	69.77	-0.01	0.30	0.31	0.01
53	Killimor	Killimor-Up	658.6	67.92	2.13	2.20	0.07	69.75	69.74	-0.01	0.34	0.36	0.02
54	Killimor	Killimor-Up	657.5	67.9	2.10	2.20	0.10	69.75	69.74	-0.01	0.29	0.31	0.02
55	Killimor	Killimor-Mid1	655.3	67.89	5.19	5.49	0.30	69.75	69.74	-0.01	1.00	1.07	0.07
56	Killimor	Killimor-Mid1	652.3	67.87	5.24	5.28	0.04	69.74	69.73	-0.01	1.09	1.10	0.01
57	Killimor	Killimor-Mid1	643.5	67.82	5.79	5.91	0.12	69.73	69.72	-0.01	0.87	0.90	0.03
58	Killimor	Killimor-Mid1	634.9	67.77	6.07	6.18	0.11	69.73	69.71	-0.02	0.72	0.75	0.03
59	Killimor	Killimor-Mid1	624.1	67.71	5.16	5.31	0.15	69.70	69.69	-0.01	0.96	1.00	0.04
60	Killimor	Killimor-Mid1	606	67.6	4.96	4.90	-0.06	69.67	69.65	-0.02	1.03	1.04	0.01
61	Killimor	Killimor-Mid1	592.5	67.51	4.74	4.75	0.01	69.64	69.63	-0.01	0.92	0.93	0.01
62	Killimor	Killimor-Mid1	586.9	67.48	4.77	4.74	-0.03	69.64	69.63	-0.01	0.86	0.86	0.00
63	Killimor	Killimor-Mid1	583.5	67.46	4.76	4.74	-0.02	69.63	69.63	0.00	0.82	0.82	0.00
64	Killimor	Killimor-Mid1	580.3	67.44	4.20	4.19	-0.01	69.65	69.64	-0.01	0.68	0.68	0.00
65	Killimor	Killimor-Mid1	573.2	67.51	4.20	4.19	-0.01	69.63	69.62	-0.01	0.63	0.63	0.00
66	Killimor	Killimor-Mid1	568.3	67.45	4.07	4.07	0.00	69.62	69.61	-0.01	0.64	0.64	0.00
67	Killimor	Killimor-Mid1	559.9	67.35	4.82	4.83	0.01	69.59	69.58	-0.01	0.80	0.81	0.01
68	Killimor	Killimor-Mid1	555.7	67.3	5.25	5.25	0.00	69.56	69.56	0.00	0.97	0.97	0.00
69	Killimor	Killimor-Mid1	552	67.25	5.92	5.92	0.00	69.51	69.50	-0.01	1.28	1.29	0.01
70	Killimor	Killimor-Mid1	548.3	67.27	5.91	5.91	0.00	69.54	69.53	-0.01	1.15	1.17	0.02
71	Killimor	Killimor-Mid1	540.7	67.36	5.95	6.02	0.07	69.55	69.53	-0.02	0.88	0.90	0.02
72	Killimor	Killimor-Mid1	527.9	67.5	5.84	5.87	0.03	69.53	69.52	-0.01	0.76	0.77	0.01
73	Killimor	Killimor-Mid1	515.6	67.63	5.86	5.90	0.04	69.50	69.49	-0.01	0.96	0.97	0.01
74	Killimor	Killimor-Mid1	491	67.39	5.39	5.47	0.08	69.46	69.45	-0.01	0.82	0.84	0.02
75	Killimor	Killimor-Mid1	471	67.19	4.60	4.48	-0.12	69.46	69.45	-0.01	0.63	0.62	-0.01
76	Killimor	Killimor-Mid1	465.4	67.14	5.12	5.07	-0.05	69.40	69.39	-0.01	0.72	0.72	0.00
77	Killimor	Killimor-Mid1	459.7	67.29	5.12	5.07	-0.05	69.45	69.46	0.01	0.67	0.66	-0.01
78	Killimor	Killimor-Mid1	451.5	67.25	3.62	3.33	-0.29	69.45	69.45	0.00	0.49	0.45	-0.04
79	Killimor	Killimor-Mid1	436.3	67.17	4.25	3.80	-0.45	69.42	69.47	0.05	0.63	0.54	-0.09
80	Killimor	Killimor-Mid1	431	67.14	5.39	5.50	0.11	69.39	69.36	-0.03	0.85	0.89	0.04
81	Killimor	Killimor-Mid1	425.9	67.25	7.52	7.55	0.03	69.42	69.43	0.01	1.11	1.11	0.00

82	Killimor	Killimor-Mid1	417.1	67.24	7.18	6.43	-0.75	69.39	69.39	0.00	1.12	1.01	-0.11
83	Killimor	Killimor-Mid1	387.1	67.12	5.95	5.35	-0.60	69.36	69.37	0.01	0.85	0.75	-0.10
84	Killimor	Killimor-Mid1	382.1	67.1	5.54	4.79	-0.75	69.36	69.38	0.02	0.77	0.65	-0.12
85	Killimor	Killimor-Mid1	377.4	67.08	5.54	4.79	-0.75	69.35	69.37	0.02	0.84	0.71	-0.13
86	Killimor	Killimor-Mid1	366.9	67.04	5.01	4.42	-0.59	69.35	69.37	0.02	0.75	0.65	-0.10
87	Killimor	Killimor-Mid1	347.5	66.97	5.19	4.66	-0.53	69.31	69.34	0.03	0.81	0.71	-0.10
88	Killimor	Killimor-Mid1	340.7	66.94	5.67	5.64	-0.03	69.26	69.26	0.00	1.07	1.06	-0.01
89	Killimor	Killimor-Mid1	335.9	66.99	6.48	6.42	-0.06	69.21	69.21	0.00	1.21	1.20	-0.01
90	Killimor	Killimor-Mid1	332.4	66.99	6.76	6.73	-0.03	69.19	69.19	0.00	1.25	1.25	0.00
91	Killimor	Killimor-Mid1	325.7	67	7.04	7.09	0.05	69.15	69.15	0.00	1.29	1.31	0.02
92	Killimor	Killimor-Mid1	319.5	67.01	6.47	7.03	0.56	69.05	69.04	-0.01	1.25	1.37	0.12
93	Killimor	Killimor-Mid1	311.6	67.02	6.49	6.99	0.50	69.03	69.00	-0.03	1.19	1.32	0.13
94	Killimor	Killimor-Mid1	304.8	67.03	6.47	7.26	0.79	69.01	68.97	-0.04	1.14	1.33	0.19
95	Killimor	Killimor-Mid2	297.1	67.03	7.64	7.15	-0.49	69.01	68.97	-0.04	1.13	1.09	-0.04
96	Killimor	Killimor-Mid2	283.4	67.05	7.41	6.95	-0.46	69.02	68.98	-0.04	0.82	0.79	-0.03
97	Killimor	Killimor-Mid2	270.5	67.04	8.62	8.17	-0.45	68.99	68.95	-0.04	0.87	0.85	-0.02
98	Killimor	Killimor-Mid2	241.5	66.94	8.64	7.84	-0.80	68.95	68.91	-0.04	0.88	0.83	-0.05
99	Killimor	Killimor-Mid2	223	66.85	8.47	7.77	-0.70	68.95	68.91	-0.04	0.68	0.64	-0.04
100	Killimor	Killimor-Ds	217.1	66.82	6.87	6.50	-0.37	68.95	68.91	-0.04	0.58	0.57	-0.01
101	Killimor	Killimor-Ds	208.1	66.78	6.50	6.21	-0.29	68.94	68.90	-0.04	0.61	0.60	-0.01
102	Killimor	Killimor-Ds	186.4	66.69	5.48	5.50	0.02	68.94	68.90	-0.04	0.54	0.56	0.02
103	Killimor	Killimor-Ds	137.9	66.93	4.54	3.89	-0.65	68.93	68.89	-0.04	0.57	0.50	-0.07
104	Killimor	Killimor-Ds	107.3	66.85	4.58	4.28	-0.30	68.91	68.86	-0.05	0.62	0.60	-0.02
105	Killimor	Killimor-Ds	86	66.79	5.43	5.28	-0.15	68.87	68.83	-0.04	0.75	0.76	0.01
106	Killimor	Killimor-Ds	76	66.77	5.75	5.59	-0.16	68.86	68.81	-0.05	0.80	0.81	0.01
107	Killimor	Killimor-Ds	66.4	66.96	5.75	5.59	-0.16	68.04	67.99	-0.05	2.28	2.33	0.05
108	Killimor	Killimor-Ds	48.9	66.67	6.76	6.32	-0.44	67.86	67.80	-0.06	1.80	1.81	0.01
109	Killimor	Killimor-Ds	16.6	66.29	7.12	6.47	-0.65	67.58	67.51	-0.07	1.66	1.61	-0.05
110	Killimor	Killimor-Ds	2.2	66.21	7.12	6.47	-0.65	67.41	67.34	-0.07	1.92	1.87	-0.05
111	Killimor-E	Killimor-E-Up	1096.2	74.28	4.33	4.33	0.00	75.67	75.66	-0.01	0.80	0.80	0.00
112	Killimor-E	Killimor-E-Up	1066.3	74.12	4.31	4.32	0.01	75.57	75.56	-0.01	1.04	1.05	0.01
113	Killimor-E	Killimor-E-Up	1062.2	74.1	4.30	4.33	0.03	75.57	75.56	-0.01	0.91	0.93	0.02
114	Killimor-E	Killimor-E-Up	971.8	73.64	1.60	1.41	-0.19	75.51	75.51	0.00	0.21	0.19	-0.02
115	Killimor-E	Killimor-E-Up	961.7	74.12	1.94	1.94	0.00	75.50	75.49	-0.01	0.33	0.33	0.00
116	Killimor-E	Killimor-E-Up	958.4	73.96	1.94	1.94	0.00	75.10	75.10	0.00	0.71	0.70	-0.01
117	Killimor-E	Killimor-E-Up	948.8	73.78	2.65	2.65	0.00	75.08	75.08	0.00	0.61	0.60	-0.01
118	Killimor-E	Killimor-E-Up	938.2	73.57	2.73	2.73	0.00	75.07	75.07	0.00	0.58	0.58	0.00
119	Killimor-E	Killimor-E-Up	931	73.55	2.86	2.85	-0.01	75.03	75.03	0.00	0.88	0.87	-0.01
120	Killimor-E	Killimor-E-Up	923.8	73.53	3.03	3.02	-0.01	75.03	75.03	0.00	0.65	0.65	0.00
121	Killimor-E	Killimor-E-Up	913.9	73.3	2.75	2.73	-0.02	75.03	75.03	0.00	0.49	0.48	-0.01
122	Killimor-E	Killimor-E-Up	872.3	73.77	3.17	3.15	-0.02	74.87	74.88	0.01	1.06	1.05	-0.01
123	Killimor-E	Killimor-E-Up	835.6	73.53	3.17	3.15	-0.02	74.69	74.70	0.01	1.10	1.06	-0.04
124	Killimor-E	Killimor-E-Up	804.2	73.33	3.17	3.15	-0.02	74.44	74.50	0.06	1.40	1.27	-0.13
125	Killimor-E	Killimor-E-Up	800.9	73.31	3.17	3.15	-0.02	74.43	74.50	0.07	1.26	1.13	-0.13
126	Killimor-E	Killimor-E-Up	786.1	73.19	3.16	3.15	-0.01	74.38	74.47	0.09	0.96	0.86	-0.10

127	Killimor-E	Killimor-E-Up	777	73.11	3.18	3.16	-0.02	74.38	74.46	0.08	0.75	0.67	-0.08
128	Killimor-E	Killimor-E-Up	765.1	73.02	3.27	3.27	0.00	74.33	74.39	0.06	0.91	1.10	0.19
129	Killimor-E	Killimor-E-Up	749.1	72.87	-	3.79	-	-	74.25	-	-	1.37	-
130	Killimor-E	Killimor-E-Up	733	72.73	4.50	4.49	-0.01	74.08	74.11	0.03	1.45	1.39	-0.06
131	Killimor-E	Killimor-E-Mid	721	72.89	4.79	4.78	-0.01	74.08	74.11	0.03	1.51	1.45	-0.06
132	Killimor-E	Killimor-E-Mid	701	72.64	4.81	4.80	-0.01	73.90	73.87	-0.03	1.56	1.61	0.05
133	Killimor-E	Killimor-E-Mid	695.5	72.57	4.81	4.80	-0.01	73.85	73.81	-0.04	1.56	1.74	0.18
134	Killimor-E	Killimor-E-Mid	679.8	72.25	4.77	4.77	0.00	73.73	73.74	0.01	1.51	1.32	-0.19
135	Killimor-E	Killimor-E-Mid	669.8	72.25	4.74	4.74	0.00	73.68	73.67	-0.01	1.44	1.44	0.00
136	Killimor-E	Killimor-E-Mid	616.3	71.98	4.79	4.80	0.01	73.33	73.33	0.00	1.47	1.48	0.01
137	Killimor-E	Killimor-E-Mid	568.3	71.61	4.07	4.58	0.51	69.62	73.11	3.49	0.64	1.18	0.54
138	Killimor-E	Killimor-E-Mid	540.3	71.58	4.21	4.22	0.01	72.92	72.91	-0.01	1.44	1.46	0.02
139	Killimor-E	Killimor-E-Mid	536.9	71.57	4.21	4.24	0.03	72.88	72.87	-0.01	1.42	1.47	0.05
140	Killimor-E	Killimor-E-Mid	520.9	71.47	4.53	4.56	0.03	72.77	72.76	-0.01	1.24	1.27	0.03
141	Killimor-E	Killimor-E-Mid	498.1	71.37	4.55	4.47	-0.08	72.64	72.64	0.00	1.30	1.28	-0.02
142	Killimor-E	Killimor-E-Mid	456.7	70.98	4.40	4.52	0.12	72.40	72.39	-0.01	1.41	1.47	0.06
143	Killimor-E	Killimor-E-Mid	425.1	70.76	4.61	4.54	-0.07	72.18	72.19	0.01	1.48	1.46	-0.02
144	Killimor-E	Killimor-E-Mid	394.4	70.55	4.55	4.56	0.01	71.99	72.00	0.01	1.41	1.41	0.00
145	Killimor-E	Killimor-E-Mid	357.9	70.29	4.66	4.68	0.02	71.74	71.75	0.01	1.44	1.45	0.01
146	Killimor-E	Killimor-E-Mid	325	70.06	4.49	4.60	0.11	71.56	71.54	-0.02	1.31	1.37	0.06
147	Killimor-E	Killimor-E-Mid	312.3	69.98	4.73	4.65	-0.08	71.47	71.46	-0.01	1.38	1.38	0.00
148	Killimor-E	Killimor-E-Mid	295.2	69.86	4.70	4.59	-0.11	71.37	71.36	-0.01	1.32	1.31	-0.01
149	Killimor-E	Killimor-E-Mid	279.9	69.85	4.32	4.20	-0.12	71.37	71.37	0.00	0.72	0.71	-0.01
150	Killimor-E	Killimor-E-Mid	274.7	69.84	3.97	3.89	-0.08	71.38	71.37	-0.01	0.59	0.59	0.00
151	Killimor-E	Killimor-E-Ds	270.9	69.83	5.07	4.87	-0.20	71.38	71.37	-0.01	0.82	0.79	-0.03
152	Killimor-E	Killimor-E-Ds	250.7	69.75	4.75	4.46	-0.29	71.32	71.32	0.00	0.94	0.88	-0.06
153	Killimor-E	Killimor-E-Ds	232.8	69.68	4.86	4.83	-0.03	71.24	71.24	0.00	1.28	1.28	0.00
154	Killimor-E	Killimor-E-Ds	202	69.6	4.30	4.14	-0.16	71.17	71.16	-0.01	1.08	1.04	-0.04
155	Killimor-E	Killimor-E-Ds	174.9	69.49	3.42	3.28	-0.14	71.14	71.13	-0.01	0.95	0.92	-0.03
156	Killimor-E	Killimor-E-Ds	138.3	69.41	2.84	2.63	-0.21	70.93	70.93	0.00	1.28	1.18	-0.10
157	Killimor-E	Killimor-E-Ds	136.5	69.41	2.79	2.66	-0.13	70.93	70.94	0.01	1.06	1.01	-0.05
158	Killimor-E	Killimor-E-Ds	129.8	69.4	3.40	3.39	-0.01	70.90	70.90	0.00	0.92	0.91	-0.01
159	Killimor-E	Killimor-E-Ds	118.6	69.39	2.82	2.67	-0.15	70.88	70.89	0.01	0.90	0.84	-0.06
160	Killimor-E	Killimor-E-Ds	103.9	69.37	2.72	2.80	0.08	70.81	70.81	0.00	0.90	0.93	0.03
161	Killimor-E	Killimor-E-Ds	87.1	69.32	2.92	2.53	-0.39	70.74	70.76	0.02	1.02	0.86	-0.16
162	Killimor-E	Killimor-E-Ds	67.4	69.25	3.41	3.42	0.01	70.55	70.55	0.00	1.43	1.41	-0.02
163	Killimor-E	Killimor-E-Ds	41.5	69.09	1.87	1.50	-0.37	70.51	70.53	0.02	0.69	0.54	-0.15
164	Killimor-E	Killimor-E-Ds	5.2	68.78	0.00	0.00	0.00	70.47	70.47	0.00	-0.27	-0.29	-0.02
165	Killimor-TribL1	Killimor-TribL1	188.7	72.51	1.21	1.21	0.00	73.52	73.52	0.00	1.29	1.29	0.00
166	Killimor-TribL1	Killimor-TribL1	134.2	71.92	1.21	1.21	0.00	72.96	72.93	-0.03	1.05	1.09	0.04
167	Killimor-TribL1	Killimor-TribL1	97.5	71.21	1.21	1.21	0.00	71.98	71.99	0.01	2.05	2.00	-0.05
168	Killimor-TribL1	Killimor-TribL1	73	70.39	0.95	1.19	0.24	71.36	71.41	0.05	0.75	0.85	0.10
169	Killimor-TribL1	Killimor-TribL1	63.6	70.07	0.93	1.20	0.27	71.36	71.41	0.05	0.37	0.45	0.08
170	Killimor-TribL1	Killimor-TribL1	55.5	69.99	0.86	1.19	0.33	71.36	71.40	0.04	0.31	0.40	0.09
171	Killimor-TribL1	Killimor-TribL1	30	69.95	0.95	1.18	0.23	71.33	71.38	0.05	0.41	0.46	0.05

172	Killimor-TribL1	Killimor-TribL1	27.7	70.01	0.94	1.19	0.25	71.32	71.38	0.06	0.40	0.45	0.05
173	Killimor-TribL1	Killimor-TribL1	20.7	70.04	1.21	1.19	-0.02	71.38	71.38	0.00	0.47	0.47	0.00
174	Killimor-TribL1	Killimor-TribL1	14.7	70.02	1.13	1.20	0.07	71.38	71.38	0.00	0.37	0.39	0.02
175	Killimor-TribL1	Killimor-TribL1	7.2	70.04	1.17	1.17	0.00	71.38	71.38	0.00	0.24	0.24	0.00
176	Killimor-TribL1	Killimor-TribL1	6.8	70.35	1.14	1.13	-0.01	71.38	71.38	0.00	0.33	0.33	0.00
177	Killimor-TribL1	Killimor-TribL1	0.9	69.84	1.16	1.13	-0.03	71.38	71.37	-0.01	0.20	0.19	-0.01
178	Killimor-TribL1	Killimor-TribL1	0.3	69.84	1.10	0.99	-0.11	71.38	71.37	-0.01	0.14	0.13	-0.01
179	Killimor-TribL2	Killimor-TribL2	311.5	68.92	1.90	1.90	0.00	70.66	70.64	-0.02	0.52	0.52	0.00
180	Killimor-TribL2	Killimor-TribL2	287.9	69.01	1.87	1.94	0.07	70.63	70.63	0.00	0.36	0.37	0.01
181	Killimor-TribL2	Killimor-TribL2	282.2	69.03	1.69	1.68	-0.01	70.63	70.63	0.00	0.30	0.30	0.00
182	Killimor-TribL2	Killimor-TribL2	275.3	68.89	2.22	2.25	0.03	70.60	70.60	0.00	0.48	0.49	0.01
183	Killimor-TribL2	Killimor-TribL2	262.5	69.19	2.82	2.76	-0.06	70.57	70.57	0.00	0.54	0.53	-0.01
184	Killimor-TribL2	Killimor-TribL2	256.8	69.28	2.86	2.77	-0.09	70.57	70.56	-0.01	0.62	0.60	-0.02
185	Killimor-TribL2	Killimor-TribL2	252.2	69.34	2.61	2.59	-0.02	70.56	70.55	-0.01	0.79	0.79	0.00
186	Killimor-TribL2	Killimor-TribL2	222	69.21	1.83	1.82	-0.01	70.53	70.53	0.00	0.51	0.51	0.00
187	Killimor-TribL2	Killimor-TribL2	207.6	69.14	1.27	1.24	-0.03	70.53	70.53	0.00	0.31	0.30	-0.01
188	Killimor-TribL2	Killimor-TribL2	201.9	69.05	1.26	1.24	-0.02	70.41	70.41	0.00	0.33	0.33	0.00
189	Killimor-TribL2	Killimor-TribL2	177.1	69.34	1.76	1.75	-0.01	70.38	70.38	0.00	0.57	0.57	0.00
190	Killimor-TribL2	Killimor-TribL2	168.5	69.21	1.68	1.67	-0.01	70.37	70.37	0.00	0.60	0.60	0.00
191	Killimor-TribL2	Killimor-TribL2	150.7	69.14	2.09	2.09	0.00	70.33	70.33	0.00	0.69	0.69	0.00
192	Killimor-TribL2	Killimor-TribL2	145.1	68.98	1.92	1.92	0.00	70.32	70.32	0.00	0.58	0.59	0.01
193	Killimor-TribL2	Killimor-TribL2	138.3	69.02	2.84	1.86	-0.98	70.93	69.93	-1.00	1.28	1.31	0.03
194	Killimor-TribL2	Killimor-TribL2	130.1	68.98	1.99	2.02	0.03	69.93	69.93	0.00	0.84	0.85	0.01
195	Killimor-TribL2	Killimor-TribL2	104.5	68.86	1.96	1.91	-0.05	69.89	69.89	0.00	0.53	0.52	-0.01
196	Killimor-TribL2	Killimor-TribL2	88.7	68.37	2.09	2.09	0.00	69.86	69.86	0.00	0.62	0.61	-0.01
197	Killimor-TribL2	Killimor-TribL2	78.8	68.05	2.22	2.30	0.08	69.83	69.84	0.01	0.59	0.61	0.02
198	Killimor-TribL2	Killimor-TribL2	73.9	68.45	2.19	2.19	0.00	69.79	69.79	0.00	0.63	0.63	0.00
199	Killimor-TribL2	Killimor-TribL2	66.3	68.33	2.39	2.40	0.01	69.78	69.78	0.00	0.61	0.61	0.00
200	Killimor-TribL2	Killimor-TribL2	47.6	68.05	2.94	2.06	-0.88	69.76	69.76	0.00	0.56	0.40	-0.16
201	Killimor-TribL2	Killimor-TribL2	33.3	67.84	3.44	3.42	-0.02	69.75	69.75	0.00	0.56	0.56	0.00
202	Killimor-TribL2	Killimor-TribL2	25.2	67.71	3.40	3.41	0.01	69.75	69.75	0.00	0.53	0.53	0.00
203	Killimor-TribL2	Killimor-TribL2	18.4	67.68	3.34	3.42	0.08	69.75	69.75	0.00	0.47	0.49	0.02
204	Killimor-TribL2	Killimor-TribL2	10.1	67.66	3.65	3.64	-0.01	69.75	69.74	-0.01	0.48	0.48	0.00
205	Killimor-TribL2	Killimor-TribL2	5	67.68	3.10	3.28	0.18	69.75	69.74	-0.01	0.51	0.54	0.03
206	Killimor-TribL3	Killimor-TribL3	607.2	77.4	0.70	0.70	0.00	77.76	77.76	0.00	1.65	1.65	0.00
207	Killimor-TribL3	Killimor-TribL3	595.4	77.03	0.69	0.70	0.01	77.49	77.49	0.00	0.67	0.68	0.01
208	Killimor-TribL3	Killimor-TribL3	561.7	76.91	0.59	0.55	-0.04	77.34	77.36	0.02	0.54	0.47	-0.07
209	Killimor-TribL3	Killimor-TribL3	554.6	76.87	0.59	0.55	-0.04	77.32	77.35	0.03	0.43	0.37	-0.06
210	Killimor-TribL3	Killimor-TribL3	536	76.73	0.55	0.49	-0.06	77.30	77.34	0.04	0.33	0.27	-0.06
211	Killimor-TribL3	Killimor-TribL3	505.3	76.51	0.55	0.49	-0.06	77.28	77.33	0.05	0.24	0.20	-0.04
212	Killimor-TribL3	Killimor-TribL3	467.5	76.24	0.55	0.45	-0.10	77.28	77.32	0.04	0.19	0.15	-0.04
213	Killimor-TribL3	Killimor-TribL3	450.2	76.12	0.54	0.45	-0.09	77.28	77.26	-0.02	0.18	0.15	-0.03
214	Killimor-TribL3	Killimor-TribL3	446	76.09	0.50	0.44	-0.06	77.28	77.26	-0.02	0.15	0.13	-0.02
215	Killimor-TribL3	Killimor-TribL3	441.4	76.08	0.54	0.48	-0.06	77.24	77.24	0.00	0.73	0.67	-0.06
216	Killimor-TribL3	Killimor-TribL3	440.5	76.09	0.55	0.49	-0.06	77.25	77.24	-0.01	0.23	0.20	-0.03

218	Killimor-TribL3	Killimor-TribL3	428.2	75.94	0.56	0.49	-0.07	77.23	77.23	0.00	0.11	0.10	-0.01
219	Killimor-TribL3	Killimor-TribL3	400	76.22	0.34	0.31	-0.03	77.23	77.23	0.00	0.10	0.10	0.00
220	Killimor-TribL3	Killimor-TribL3	365.9	76.56	0.13	0.12	-0.01	77.23	77.23	0.00	0.07	0.07	0.00
221	Killimor-TribL3	Killimor-TribL3	348	76.67	0.13	0.12	-0.01	77.23	77.22	-0.01	0.13	0.12	-0.01
222	Killimor-TribL3	Killimor-TribL3	340.9	76.71	0.13	0.12	-0.01	77.19	77.18	-0.01	0.17	0.16	-0.01
223	Killimor-TribL3	Killimor-TribL3	329.3	76.79	0.13	0.12	-0.01	77.18	77.18	0.00	0.22	0.21	-0.01
224	Killimor-TribL3	Killimor-TribL3	317.5	76.86	0.13	0.12	-0.01	77.13	77.12	-0.01	0.53	0.52	-0.01
225	Killimor-TribL3	Killimor-TribL3	294	76.68	0.13	0.12	-0.01	76.93	76.93	0.00	0.56	0.56	0.00
226	Killimor-TribL3	Killimor-TribL3	263.1	76.45	0.13	0.12	-0.01	76.68	76.67	-0.01	0.57	0.56	-0.01
227	Killimor-TribL3	Killimor-TribL3	252.2	76.35	2.61	0.12	-2.49	70.56	76.57	6.01	0.79	0.75	-0.04
228	Killimor-TribL3	Killimor-TribL3	245.5	76.25	0.13	0.12	-0.01	76.54	76.54	0.00	0.59	0.58	-0.01
229	Killimor-TribL3	Killimor-TribL3	236.8	76.21	0.13	0.12	-0.01	76.46	76.46	0.00	0.60	0.60	0.00
230	Killimor-TribL3	Killimor-TribL3	215	76.03	0.13	0.12	-0.01	76.27	76.26	-0.01	0.59	0.58	-0.01
231	Killimor-TribL3	Killimor-TribL3	201.2	75.87	0.13	0.12	-0.01	76.14	76.14	0.00	0.59	0.58	-0.01
232	Killimor-TribL3	Killimor-TribL3	197.1	75.84	0.13	0.12	-0.01	76.11	76.10	-0.01	0.57	0.56	-0.01
233	Killimor-TribL3	Killimor-TribL3	167.5	75.66	0.13	0.12	-0.01	75.86	75.85	-0.01	0.54	0.57	0.03
234	Killimor-TribL3	Killimor-TribL3	140.2	75.41	0.13	0.12	-0.01	75.62	75.69	0.07	0.56	0.35	-0.21
235	Killimor-TribL3	Killimor-TribL3	136.3	75.38	0.13	0.12	-0.01	75.59	75.69	0.10	0.52	0.29	-0.23
236	Killimor-TribL3	Killimor-TribL3	106	75.08	0.13	0.10	-0.03	75.26	75.27	0.01	0.62	0.43	-0.19
237	Killimor-TribL3	Killimor-TribL3	99.9	74.99	0.12	0.00	-0.12	75.17	75.18	0.01	0.57	-0.11	-0.68
238	Killimor-TribL3	Killimor-TribL3	55.1	74.29	0.10	0.10	0.00	74.46	74.42	-0.04	0.30	0.41	0.11
239	Killimor-TribL3	Killimor-TribL3	21.7	73.71	0.12	0.12	0.00	74.09	74.12	0.03	0.13	0.11	-0.02
240	Killimor-TribL3	Killimor-TribL3	5.9	73.29	0.29	0.29	0.00	74.08	74.11	0.03	0.16	0.15	-0.01
241	Killimor-TribR1	Kill-TribR1-R	1288	75.61	-	0.53	-	-	76.08	-	-	0.67	-
242	Killimor-TribR1	Kill-TribR1-R	1246	75.36	-	0.57	-	-	75.90	-	-	0.66	-
243	Killimor-TribR1	Kill-TribR1-R	1204	75.08	-	0.57	-	-	75.78	-	-	0.53	-
244	Killimor-TribR1	Kill-TribR1-R	1192	75.18	-	0.57	-	-	75.73	-	-	0.70	-
245	Killimor-TribR1	Kill-TribR1-R	1188	75.18	-	0.50	-	-	75.70	-	-	0.73	-
246	Killimor-TribR1	Kill-TribR1-R	1101	74.64	-	0.51	-	-	75.10	-	-	0.72	-
247	Killimor-TribR1	Kill-TribR1-R	1035	74.17	-	0.57	-	-	74.83	-	-	0.46	-
248	Killimor-TribR1	Kill-TribR1-R	959	73.66	-	0.57	-	-	74.77	-	-	0.17	-
249	Killimor-TribR1	Kill-TribR1-R	947	73.66	-	0.57	-	-	74.77	-	-	0.15	-
250	Killimor-TribR1	Kill-TribR1-R	921	73.61	-	0.57	-	-	74.77	-	-	0.20	-
251	Killimor-TribR1	Kill-TribR1-Up	909	73.62	-	1.78	-	-	74.77	-	-	0.63	-
252	Killimor-TribR1	Kill-TribR1-Up	863	73.72	-	1.70	-	-	74.38	-	-	1.33	-
253	Killimor-TribR1	Kill-TribR1-Up	811	73	-	1.53	-	-	73.87	-	-	0.85	-
254	Killimor-TribR1	Kill-TribR1-Up	761	72.25	-	1.44	-	-	73.74	-	-	0.36	-
255	Killimor-TribR1	Kill-TribR1-Up	753	72.18	-	1.39	-	-	73.74	-	-	0.30	-
256	Killimor-TribR1	Kill-TribR1-Up	745	72.1	-	1.29	-	-	73.74	-	-	0.35	-
257	Killimor-TribR1	Kill-TribR1-Up	741	72.06	-	1.44	-	-	73.71	-	-	0.59	-
258	Killimor-TribR1	Kill-TribR1-Up	736	71.82	-	1.78	-	-	73.01	-	-	2.06	-
259	Killimor-TribR1	Kill-TribR1-Up	731	71.76	-	1.78	-	-	72.96	-	-	1.35	-
260	Killimor-TribR1	Kill-TribR1-Up	720	71.62	-	1.78	-	-	72.76	-	-	1.49	-
261	Killimor-TribR1	Kill-TribR1-Up	717	71.58	-	1.78	-	-	72.71	-	-	1.37	-
262	Killimor-TribR1	Kill-TribR1-Up	708	71.47	-	1.78	-	-	72.55	-	-	1.41	-

263	Killimor-TribR1	Kill-TribR1-Up	699	71.35	-	1.78	-	-	72.38	-	-	1.43	-
265	Killimor-TribR1	Kill-TribR1-Up	677	71.08	-	1.78	-	-	72.10	-	-	1.08	-
266	Killimor-TribR1	Kill-TribR1-Up	668	70.96	-	1.78	-	-	71.92	-	-	1.63	-
267	Killimor-TribR1	Kill-TribR1-Up	658	70.81	-	1.78	-	-	71.67	-	-	1.50	-
268	Killimor-TribR1	Kill-TribR1-Up	647	70.66	-	1.78	-	-	71.48	-	-	1.50	-
271	Killimor-TribR1	Kill-TribR1-Up	617	70.25	-	1.78	-	-	71.08	-	-	1.26	-
272	Killimor-TribR1	Kill-TribR1-Up	593	69.99	-	1.78	-	-	70.91	-	-	1.05	-
273	Killimor-TribR1	Kill-TribR1-Up	581	69.85	-	1.78	-	-	70.77	-	-	1.53	-
274	Killimor-TribR1	Kill-TribR1-Up	572	69.76	-	1.78	-	-	70.73	-	-	0.76	-
275	Killimor-TribR1	Kill-TribR1-Up	560	69.62	-	1.78	-	-	70.71	-	-	0.63	-
276	Killimor-TribR1	Kill-TribR1-Up	533	69.32	6.09	1.78	-4.31	70.24	69.98	-0.26	0.26	1.49	1.23
277	Killimor-TribR1	Kill-TribR1-Up	519	69.17	-	1.78	-	-	69.88	-	-	1.44	-
278	Killimor-TribR1	Kill-TribR1-Up	507	69.03	-	1.78	-	-	69.84	-	-	1.18	-
279	Killimor-TribR1	Kill-TribR1-Up	498	68.94	-	1.78	-	-	69.78	-	-	1.10	-
280	Killimor-TribR1	Kill-TribR1-Up	486	68.81	-	1.78	-	-	69.72	-	-	0.95	-
281	Killimor-TribR1	Kill-TribR1-Up	476	68.69	-	1.78	-	-	69.70	-	-	0.78	-
282	Killimor-TribR1	Kill-TribR1-Up	465	68.56	-	1.78	-	-	69.66	-	-	0.78	-
283	Killimor-TribR1	Kill-TribR1-Up	457	68.5	-	1.78	-	-	69.65	-	-	0.60	-
284	Killimor-TribR1	Kill-TribR1-Up	448	68.46	-	1.78	-	-	69.65	-	-	0.44	-
285	Killimor-TribR1	Kill-TribR1-Up	440	68.4	-	1.78	-	-	69.62	-	-	0.72	-
286	Killimor-TribR1	Kill-TribR1-Up	399	68.1	-	1.67	-	-	69.56	-	-	0.55	-
287	Killimor-TribR1	Kill-TribR1-Up	384	68.07	-	1.68	-	-	69.55	-	-	0.55	-
288	Killimor-TribR1	Kill-TribR1-Up	342	67.92	-	1.78	-	-	69.50	-	-	0.54	-
289	Killimor-TribR1	Kill-TribR1-Up	333	67.96	3.72	0.86	-2.86	69.98	69.52	-0.46	0.52	0.19	-0.33
290	Killimor-TribR1	Kill-TribR1-Up	309	68.11	-	0.86	-	-	69.51	-	-	0.26	-
292	Killimor-TribR1	Kill-TribR1-Up	299	68.12	-	0.86	-	-	69.49	-	-	0.60	-
293	Killimor-TribR1	Kill-TribR1-Up	291	67.99	-	0.86	-	-	69.05	-	-	0.72	-
294	Killimor-TribR1	Kill-TribR1-Up	284	67.96	-	0.86	-	-	69.06	-	-	0.46	-
295	Killimor-TribR1	Kill-TribR1-Up	269	67.87	-	0.86	-	-	69.05	-	-	0.42	-
296	Killimor-TribR1	Kill-TribR1-Up	249	67.76	-	0.86	-	-	69.03	-	-	0.37	-
297	Killimor-TribR1	Kill-TribR1-Up	229	67.65	-	0.86	-	-	69.03	-	-	0.33	-
298	Killimor-TribR1	Kill-TribR1-Up	204	67.5	-	0.86	-	-	69.02	-	-	0.29	-
299	Killimor-TribR1	Kill-TribR1-Up	143	67.16	-	0.85	-	-	69.01	-	-	0.20	-
300	Killimor-TribR1	Kill-TribR1-Up	97	66.9	-	0.85	-	-	69.00	-	-	0.16	-
301	Killimor-TribR1	Kill-TribR1-Up	88	66.87	-	0.84	-	-	69.00	-	-	0.15	-
302	Killimor-TribR1	Kill-TribR1-Up	76	66.96	5.75	0.85	-4.90	68.86	69.00	0.14	0.80	0.15	-0.65
303	Killimor-TribR1	Kill-TribR1-Up	63	67.06	2.14	0.85	-1.29	69.06	69.00	-0.06	0.34	0.14	-0.20
304	Killimor-TribR1	Kill-TribR1-Up	59.2	67.06	-	0.85	-	-	69.00	-	-	0.14	-
305	Killimor-TribR1	Kill-TribR1-Up	25	67.04	-	0.76	-	-	68.96	-	-	0.13	-
306	Killimor-TribR1	Kill-TribR1-Up	19	67.02	-	0.76	-	-	68.96	-	-	0.14	-
307	Killimor-TribR1	Kill-TribR1-Up	16	66.95	-	0.76	-	-	68.96	-	-	0.11	-
308	Killimor-TribR1	Kill-TribR1-Ds	12.2	66.88	3.03	1.40	-1.63	69.05	68.96	-0.09	0.40	0.20	-0.20
309	Killimor-TribR1	Kill-TribR1-Ds	9.7	66.83	3.02	1.40	-1.62	69.05	68.96	-0.09	0.39	0.20	-0.19
310	Killimor-TribR1	Kill-TribR1-Ds	7.9	66.83	1.21	0.00	-1.21	69.06	68.97	-0.09	0.26	-0.03	-0.29
311	Killimor-TribR1	Kill-TribR1-Ds	1.7	67.08	1.22	0.00	-1.22	69.01	68.97	-0.04	0.16	-0.01	-0.17

312	Killimor-TribR1	Kill-TribR1-Ds	1.2	67.07	1.17	0.00	-1.17	69.01	68.97	-0.04	0.14	-0.01	-0.15
313	Killimor-TribR2	Killimor-TribR2	369.7	68.47	0.63	0.63	0.00	69.62	69.38	-0.24	0.19	0.26	0.07
314	Killimor-TribR2	Killimor-TribR2	322	67.98	-	1.48	-	-	69.35	-	-	0.33	-
315	Killimor-TribR2	Killimor-TribR2	306	67.84	-	1.48	-	-	69.24	-	-	0.41	-
316	Killimor-TribR2	Killimor-TribR2	296.4	67.95	3.75	1.55	-2.20	69.50	69.22	-0.28	0.90	0.54	-0.36
317	Killimor-TribR2	Killimor-TribR2	284.6	68.34	4.05	1.54	-2.51	69.43	69.20	-0.23	1.17	0.67	-0.50
318	Killimor-TribR2	Killimor-TribR2	268.7	67.95	4.37	1.56	-2.81	69.34	69.18	-0.16	1.17	0.53	-0.64
319	Killimor-TribR2	Killimor-TribR2	255.1	68.19	4.51	1.59	-2.92	69.18	69.13	-0.05	2.10	0.82	-1.28
320	Killimor-TribR2	Killimor-TribR2	250.1	68.29	5.92	3.05	-2.87	69.11	69.08	-0.03	1.52	0.83	-0.69
321	Killimor-TribR2	Killimor-TribR2	249.4	68.3	1.17	0.74	-0.43	69.25	69.14	-0.11	0.35	0.28	-0.07
322	Killimor-TribR2	Killimor-TribR2	243.7	68.14	1.07	0.73	-0.34	69.24	69.14	-0.10	0.42	0.34	-0.08
323	Killimor-TribR2	Killimor-TribR2	240.7	68.15	1.06	0.73	-0.33	69.24	69.14	-0.10	0.42	0.34	-0.08
324	Killimor-TribR2	Killimor-TribR2	235.8	68.16	1.05	0.73	-0.32	69.24	69.13	-0.11	0.42	0.35	-0.07
325	Killimor-TribR2	Killimor-TribR2	223.3	68.18	1.04	0.73	-0.31	69.23	69.13	-0.10	0.43	0.36	-0.07
326	Killimor-TribR2	Killimor-TribR2	187.3	68.26	1.04	0.73	-0.31	69.20	69.10	-0.10	0.44	0.40	-0.04
327	Killimor-TribR2	Killimor-TribR2	146.5	68.19	1.04	0.73	-0.31	69.17	69.06	-0.11	0.38	0.37	-0.01
328	Killimor-TribR2	Killimor-TribR2	123.7	68.14	1.04	0.72	-0.32	69.14	69.04	-0.10	0.49	0.42	-0.07
329	Killimor-TribR2	Killimor-TribR2	83.7	68.23	1.04	0.68	-0.36	69.09	69.00	-0.09	0.44	0.35	-0.09
330	Killimor-TribR2	Killimor-TribR2	42.9	68.01	0.91	0.66	-0.25	69.06	68.98	-0.08	0.35	0.29	-0.06
331	Killimor-TribR2	Killimor-TribR2	4.4	67.72	0.77	0.64	-0.13	69.05	68.96	-0.09	0.26	0.24	-0.02
332	Killimor-TribR3	Kill-TribR3-Up	123.8	66.66	0.13	0.15	0.02	68.81	68.81	0.00	0.03	0.03	0.00
333	Killimor-TribR3	Kill-TribR3-Up	86.2	66.9	0.08	0.05	-0.03	68.81	68.81	0.00	0.02	0.01	-0.01
334	Killimor-TribR3	Kill-TribR3-Up	78.5	66.95	0.09	0.00	-0.09	68.81	68.80	-0.01	0.02	-0.01	-0.03
335	Killimor-TribR3	Kill-TribR3-Up	72.1	66.99	0.08	0.04	-0.04	68.81	68.80	-0.01	0.02	0.01	-0.01
336	Killimor-TribR3	Kill-TribR3-Up	63.9	67.05	0.11	0.04	-0.07	68.81	68.80	-0.01	0.02	0.01	-0.01
337	Killimor-TribR3	Kill-TribR3-Up	43	67.18	0.04	0.00	-0.04	68.80	68.80	0.00	0.01	-0.05	-0.06
339	Killimor-TribR3	Kill-TribR3-Up	13.2	67.15	0.25	0.00	-0.25	68.80	68.80	0.00	0.03	-0.02	-0.05
340	Killimor-TribR3	Kill-TribR3-Up	11.4	67.1	1.29	0.84	-0.45	68.80	68.80	0.00	0.27	0.17	-0.10
341	Killimor-TribR3	Kill-TribR3-Ds	11.1	67.12	0.00	0.00	0.00	68.80	68.80	0.00	-0.35	-0.34	0.01
342	Killimor-TribR3	Kill-TribR3-Ds	10.9	67.08	0.00	0.00	0.00	68.79	68.80	0.01	-0.37	-0.36	0.01
343	Killimor-TribR3	Kill-TribR3-Ds	10.6	67.05	0.00	0.00	0.00	68.79	68.79	0.00	-0.37	-0.37	0.00
344	Killimor-TribR3	Kill-TribR3-Ds	1.2	67	1.17	0.00	-1.17	69.01	68.91	-0.10	0.14	-0.23	-0.37
345	Killimor-TribR3	Kill-TribR3-Ds	0.7	66.93	0.00	0.00	0.00	68.95	68.91	-0.04	-0.27	-0.22	0.05
346	Killimor-TribR4	Killimor-TribR4	186.4	67.6	5.48	0.15	-5.33	68.94	68.87	-0.07	0.54	0.04	-0.50
347	Killimor-TribR4	Killimor-TribR4	154.8	67.54	0.13	0.15	0.02	68.87	68.87	0.00	0.03	0.04	0.01
348	Killimor-TribR4	Killimor-TribR4	126.7	67.45	0.13	0.16	0.03	68.86	68.86	0.00	0.03	0.04	0.01
349	Killimor-TribR4	Killimor-TribR4	101.1	67.38	0.16	0.19	0.03	68.86	68.86	0.00	0.05	0.06	0.01
350	Killimor-TribR4	Killimor-TribR4	78.9	67.31	0.14	0.25	0.11	68.86	68.85	-0.01	0.04	0.08	0.04
351	Killimor-TribR4	Killimor-TribR4	34.7	67.18	0.06	0.00	-0.06	68.85	68.84	-0.01	0.02	-0.01	-0.03
352	Killimor-TribR4	Killimor-TribR4	11.4	67.12	1.29	0.00	-1.29	68.80	68.83	0.03	0.27	-0.15	-0.42
353	Killimor-TribR4	Killimor-TribR4	3	67.26	0.00	0.00	0.00	68.80	68.80	0.00	-0.66	-0.48	0.18
354	Killimor-W	Killimor-W-R	89.7	69.45	3.89	3.99	0.10	71.04	71.01	-0.03	1.11	1.17	0.06
355	Killimor-W	Killimor-W-R	80	69.38	3.86	3.93	0.07	71.02	70.99	-0.03	1.05	1.10	0.05
356	Killimor-W	Killimor-W-R	61.2	69.33	3.53	3.63	0.10	71.02	70.99	-0.03	0.69	0.72	0.03
357	Killimor-W	Killimor-W-R	46.3	69.25	3.13	3.14	0.01	71.01	70.98	-0.03	0.67	0.69	0.02

358	Killimor-W	Killimor-W-R	41.2	69.22	3.07	3.16	0.09	71.00	70.97	-0.03	0.68	0.71	0.03
359	Killimor-W	Killimor-W-R	29.2	69.16	2.80	2.83	0.03	71.02	70.97	-0.05	0.55	0.58	0.03
360	Killimor-W	Killimor-W-R	23.4	69.12	2.67	2.78	0.11	71.00	70.97	-0.03	0.56	0.60	0.04
361	Killimor-W	Killimor-W-R	13.4	69.07	2.58	2.22	-0.36	71.02	70.97	-0.05	0.50	0.44	-0.06
362	Killimor-W	Killimor-W-R	3.3	68.94	3.59	3.26	-0.33	70.97	70.95	-0.02	0.73	0.68	-0.05
363	Raford	RafordIN	1871.5	67.97	86.23	85.91	-0.32	71.80	71.73	-0.07	2.16	2.21	0.05
364	Raford	RafordIN	1866.4	67.7	84.81	85.83	1.02	71.90	71.82	-0.08	1.49	1.55	0.06
365	Raford	Raford-Up	1859.1	67.7	58.43	56.05	-2.38	71.90	71.82	-0.08	0.90	0.88	-0.02
366	Raford	Raford-Up	1847.4	67.7	55.77	43.18	-	71.86	71.80	-0.06	1.12	0.88	-0.24
367	Raford	Raford-Up	1832.6	67.7	47.99	45.03	-2.96	71.88	71.80	-0.08	1.06	1.01	-0.05
368	Raford	Raford-Up	1813	67.7	46.35	35.03	-	71.81	71.77	-0.04	1.37	1.05	-0.32
369	Raford	Raford-Up	1797.1	67.77	50.66	42.63	-8.03	71.82	71.78	-0.04	1.00	0.86	-0.14
370	Raford	Raford-Up	1787.8	67.83	44.78	42.86	-1.92	71.85	71.79	-0.06	0.82	0.80	-0.02
371	Raford	Raford-Up	1779.2	67.88	39.48	36.78	-2.70	71.84	71.78	-0.06	0.90	0.86	-0.04
372	Raford	Raford-Up	1767.9	67.95	36.86	37.89	1.03	71.84	71.78	-0.06	0.77	0.80	0.03
373	Raford	Raford-Up	1756.7	67.86	36.11	34.38	-1.73	71.82	71.78	-0.04	0.93	0.89	-0.04
374	Raford	Raford-Up	1748.4	67.59	25.88	26.29	0.41	71.85	71.80	-0.05	0.91	0.94	0.03
375	Raford	Raford-Up	1742.6	67.41	23.30	21.05	-2.25	71.80	71.76	-0.04	1.31	1.20	-0.11
376	Raford	Raford-Up	1728.2	67.7	25.02	23.92	-1.10	71.83	71.77	-0.06	0.88	0.86	-0.02
377	Raford	Raford-Up	1713.8	67.7	24.14	23.65	-0.49	71.81	71.76	-0.05	0.81	0.81	0.00
378	Raford	Raford-Up	1707	67.7	24.11	23.81	-0.30	71.82	71.77	-0.05	0.74	0.74	0.00
379	Raford	Raford-Up	1698.3	67.7	23.94	22.98	-0.96	71.84	71.77	-0.07	0.71	0.70	-0.01
380	Raford	Raford-Up	1692.6	67.66	25.81	22.33	-3.48	71.81	71.76	-0.05	0.87	0.76	-0.11
381	Raford	Raford-Up	1684.7	67.54	17.92	20.59	2.67	71.83	71.77	-0.06	0.44	0.51	0.07
382	Raford	Raford-Up	1675.1	67.4	16.64	13.93	-2.71	71.79	71.76	-0.03	0.96	0.82	-0.14
383	Raford	Raford-Up	1659.1	67.56	19.19	15.65	-3.54	71.77	71.74	-0.03	0.89	0.73	-0.16
384	Raford	Raford-Up	1646.2	67.69	20.80	21.71	0.91	71.79	71.75	-0.04	0.32	0.34	0.02
385	Raford	Raford-Up	1629.4	67.78	19.13	22.54	3.41	71.78	71.74	-0.04	0.38	0.45	0.07
386	Raford	Raford-Up	1612.8	67.87	17.52	22.89	5.37	71.79	71.74	-0.05	0.31	0.41	0.10
387	Raford	Raford-Up	1598.7	67.92	16.99	19.03	2.04	71.80	71.74	-0.06	0.30	0.35	0.05
388	Raford	Raford-Up	1586.9	67.94	15.62	14.68	-0.94	71.77	71.74	-0.03	0.43	0.40	-0.03
389	Raford	Raford-Up	1581.4	67.95	15.50	17.32	1.82	71.78	71.73	-0.05	0.40	0.45	0.05
390	Raford	Raford-Up	1577.5	67.95	17.99	18.97	0.98	71.77	71.72	-0.05	0.53	0.57	0.04
391	Raford	Raford-Up	1569.7	68.06	17.70	19.39	1.69	71.76	71.73	-0.03	0.41	0.46	0.05
392	Raford	Raford-Up	1560.4	68.23	16.42	18.53	2.11	71.77	71.73	-0.04	0.37	0.43	0.06
393	Raford	Raford-Up	1549.9	68.42	16.42	15.56	-0.86	71.76	71.72	-0.04	0.56	0.53	-0.03
394	Raford	Raford-Up	1543.7	68.54	16.01	12.75	-3.26	71.75	71.73	-0.02	0.61	0.49	-0.12
395	Raford	Raford-Up	1538.3	68.67	17.82	17.64	-0.18	71.71	71.66	-0.05	1.06	1.07	0.01
396	Raford	Raford-Up	1534.5	68.81	17.81	17.64	-0.17	71.75	71.71	-0.04	0.98	0.98	0.00
397	Raford	Raford-Up	1522.4	68.89	18.24	19.76	1.52	71.75	71.72	-0.03	0.57	0.62	0.05
398	Raford	Raford-Up	1513.9	68.94	18.22	20.17	1.95	71.76	71.70	-0.06	0.57	0.65	0.08
399	Raford	Raford-Up	1504.5	68.98	18.12	19.38	1.26	71.74	71.70	-0.04	0.63	0.69	0.06
400	Raford	Raford-Up	1492.9	68.97	16.52	14.82	-1.70	71.72	71.71	-0.01	0.60	0.54	-0.06
401	Raford	Raford-Up	1479.5	68.94	14.81	13.67	-1.14	71.73	71.70	-0.03	0.50	0.46	-0.04
402	Raford	Raford-Up	1467	68.92	16.58	14.10	-2.48	71.70	71.69	-0.01	0.51	0.44	-0.07

403	Raford	Raford-Up	1452.7	68.81	22.61	22.93	0.32	71.68	71.66	-0.02	0.51	0.52	0.01
404	Raford	Raford-Up	1442.1	68.75	21.14	24.54	3.40	71.71	71.65	-0.06	0.51	0.60	0.09
405	Raford	Raford-Up	1435.9	68.84	22.87	22.95	0.08	71.70	71.65	-0.05	0.48	0.49	0.01
406	Raford	Raford-Up	1427	68.88	18.81	18.59	-0.22	71.68	71.66	-0.02	0.50	0.49	-0.01
407	Raford	Raford-Up	1421.5	68.86	17.40	16.51	-0.89	71.67	71.65	-0.02	0.57	0.54	-0.03
408	Raford	Raford-Up	1416.2	68.87	18.18	16.06	-2.12	71.67	71.65	-0.02	0.52	0.55	-0.07
409	Raford	Raford-Up	1397.7	68.84	17.88	17.26	-0.62	71.65	71.63	-0.02	0.67	0.65	-0.02
410	Raford	Raford-Up	1376.4	68.71	19.96	18.60	-1.36	71.64	71.62	-0.02	0.54	0.51	-0.03
411	Raford	Raford-Up	1366.1	68.7	20.39	19.67	-0.72	71.63	71.62	-0.01	0.51	0.50	-0.01
412	Raford	Raford-Up	1313.9	68.66	25.61	27.31	1.70	71.57	71.55	-0.02	0.65	0.70	0.05
413	Raford	Raford-Up	1263.9	68.62	25.64	29.70	4.06	71.52	71.49	-0.03	0.65	0.77	0.12
414	Raford	Raford-Up	1240.1	68.6	23.81	24.98	1.17	71.50	71.48	-0.02	0.59	0.63	0.04
415	Raford	Raford-Up	1216.1	68.58	23.53	21.78	-1.75	71.49	71.46	-0.03	0.79	0.73	-0.06
416	Raford	Raford-Up	1201.3	68.57	25.17	22.78	-2.39	71.45	71.45	0.00	0.81	0.74	-0.07
417	Raford	Raford-Up	1187.9	68.55	26.49	24.62	-1.87	71.44	71.42	-0.02	0.92	0.86	-0.06
418	Raford	Raford-Mid	1178.5	68.54	36.73	27.28	-9.45	71.44	71.42	-0.02	1.07	0.80	-0.27
419	Raford	Raford-Mid	1163.4	68.53	30.99	24.79	-6.20	71.40	71.40	0.00	0.78	0.62	-0.16
420	Raford	Raford-Mid	1157	68.52	23.24	21.58	-1.66	71.39	71.40	0.01	0.60	0.56	-0.04
421	Raford	Raford-Mid	1140.1	68.5	18.35	14.93	-3.42	71.37	71.39	0.02	0.59	0.48	-0.11
422	Raford	Raford-Mid	1121.7	68.48	20.23	15.35	-4.88	71.33	71.37	0.04	0.53	0.40	-0.13
423	Raford	Raford-Mid	1115.1	68.47	18.96	14.51	-4.45	71.33	71.37	0.04	0.50	0.38	-0.12
424	Raford	Raford-Mid	1092	68.45	22.40	21.70	-0.70	71.31	71.34	0.03	0.45	0.43	-0.02
425	Raford	Raford-Mid	1058	68.46	23.67	21.77	-1.90	71.27	71.31	0.04	0.50	0.46	-0.04
426	Raford	Raford-Mid	1014.1	68.41	33.45	33.60	0.15	71.19	71.25	0.06	0.52	0.51	-0.01
427	Raford	Raford-Mid	970.7	68.35	14.31	17.52	3.21	71.18	71.23	0.05	0.33	0.39	0.06
428	Raford	Raford-Mid	937.5	68.25	15.45	11.14	-4.31	71.14	71.23	0.09	0.44	0.31	-0.13
429	Raford	Raford-Mid	920.6	68.27	32.08	26.14	-5.94	71.08	71.19	0.11	0.67	0.52	-0.15
430	Raford	Raford-Mid	910.8	68.26	35.28	30.15	-5.13	71.08	71.18	0.10	0.77	0.62	-0.15
431	Raford	Raford-Mid	876	68.13	63.35	65.18	1.83	70.98	71.09	0.11	1.05	1.00	-0.05
432	Raford	Raford-Mid	850	68.09	-	-	2.49	70.85	70.98	0.13	1.36	1.28	-0.08
433	Raford	Raford-Mid	836.2	68.06	-	-	2.61	70.84	70.98	0.14	1.13	1.07	-0.06
434	Raford	Raford-Mid	818.9	67.99	-	-	2.66	70.80	70.94	0.14	1.26	1.18	-0.08
435	Raford	Raford-Mid	804.5	68	-	-	2.37	70.77	70.91	0.14	1.24	1.16	-0.08
436	Raford	Raford-Mid	789.9	68	-	-	2.44	70.75	70.90	0.15	1.17	1.09	-0.08
437	Raford	Raford-Mid	777.8	67.89	-	-	2.44	70.73	70.89	0.16	1.04	0.95	-0.09
438	Raford	Raford-Mid	763.6	67.91	-	-	2.48	70.69	70.70	0.01	1.21	1.24	0.03
439	Raford	Raford-Mid	755	67.9	-	-	2.49	70.67	70.68	0.01	1.21	1.23	0.02
440	Raford	Raford-Mid	737.5	67.94	-	-	2.50	70.65	70.66	0.01	1.07	1.09	0.02
441	Raford	Raford-Mid	721.5	67.92	-	-	2.57	70.62	70.62	0.00	1.14	1.16	0.02
442	Raford	Raford-Mid	697.2	67.86	-	-	2.60	70.57	70.57	0.00	1.15	1.18	0.03
443	Raford	Raford-Mid	681.2	67.82	-	-	2.70	70.46	70.45	-0.01	1.69	1.74	0.05
444	Raford	Raford-Mid	657.5	67.75	2.10	63.20	61.10	69.75	70.34	0.59	0.29	1.85	1.56
445	Raford	Raford-Mid	631.2	67.69	34.89	35.58	0.69	70.30	70.26	-0.04	1.30	1.35	0.05
446	Raford	Raford-Mid	618.6	67.66	31.58	33.58	2.00	70.31	70.26	-0.05	0.57	0.62	0.05
447	Raford	Raford-Mid	601.7	67.61	18.72	18.14	-0.58	70.30	70.25	-0.05	0.52	0.52	0.00

448	Raford	Raford-Mid	586.3	67.56	10.50	11.73	1.23	70.25	70.24	-0.04	0.41	0.47	0.06
449	Raford	Raford-Mid	575.8	67.53	13.22	12.47	-0.75	70.27	70.23	-0.04	0.39	0.37	-0.02
450	Raford	Raford-Mid	560.6	67.49	10.31	9.73	-0.58	70.24	70.21	-0.03	0.53	0.51	-0.02
451	Raford	Raford-Mid	547.7	67.45	8.01	9.03	1.02	70.23	70.20	-0.03	0.35	0.40	0.05
452	Raford	Raford-Mid	533	67.4	6.09	6.48	0.39	70.24	70.21	-0.03	0.26	0.28	0.02
453	Raford	Raford-Mid	519.9	67.36	7.62	6.95	-0.67	70.23	70.20	-0.03	0.34	0.31	-0.03
454	Raford	Raford-Mid	509.2	67.28	10.20	11.07	0.87	70.20	70.19	-0.01	0.26	0.29	0.03
455	Raford	Raford-Ds	502.2	67.22	13.44	13.42	-0.02	70.20	70.19	-0.01	0.40	0.40	0.00
456	Raford	Raford-Ds	494.1	66.47	10.25	10.23	-0.02	70.23	70.19	-0.04	0.43	0.43	0.00
457	Raford	Raford-Ds	478.1	66.88	8.68	7.46	-1.22	70.20	70.18	-0.02	0.47	0.40	-0.07
458	Raford	Raford-Ds	460.1	67.35	9.21	7.39	-1.82	70.18	70.16	-0.02	0.54	0.43	-0.11
459	Raford	Raford-Ds	449.4	66.63	10.91	9.91	-1.00	70.17	70.15	-0.02	0.36	0.32	-0.04
460	Raford	Raford-Ds	443	66.7	6.64	7.30	0.66	70.18	70.16	-0.02	0.19	0.21	0.02
461	Raford	Raford-Ds	438.6	66.84	3.66	4.52	0.86	70.16	70.16	0.00	0.17	0.21	0.04
462	Raford	Raford-Ds	434.2	66.91	8.55	6.12	-2.43	70.16	70.16	0.00	0.47	0.34	-0.13
463	Raford	Raford-Ds	415.7	67.05	8.11	6.51	-1.60	70.15	70.15	0.00	0.39	0.31	-0.08
464	Raford	Raford-Ds	382.2	67.08	7.70	6.61	-1.09	70.14	70.14	0.00	0.31	0.27	-0.04
465	Raford	Raford-Ds	365	66.97	7.31	6.24	-1.07	70.14	70.14	0.00	0.34	0.29	-0.05
466	Raford	Raford-Ds	336.2	66.89	7.12	5.97	-1.15	70.13	70.14	0.01	0.27	0.23	-0.04
467	Raford	Raford-Ds	322.5	66.83	6.81	6.49	-0.32	70.14	70.13	-0.01	0.33	0.32	-0.01
468	Raford	Raford-Ds	312.6	66.98	6.45	6.21	-0.24	70.12	70.13	0.01	0.24	0.23	-0.01
469	Raford	Raford-Ds	243.7	66.98	1.07	9.10	8.03	69.24	70.09	0.85	0.42	0.41	-0.01
470	Raford	Raford-Ds	165.8	66.97	8.82	9.92	1.10	70.04	70.03	-0.01	0.39	0.44	0.05
471	Raford	Raford-Ds	130.9	66.91	20.28	17.93	-2.35	69.95	69.96	0.01	0.66	0.58	-0.08
472	Raford	Raford-Ds	97.8	66.86	30.58	30.93	0.35	69.82	69.82	0.00	0.83	0.84	0.01
473	Raford	Raford-Ds	65	66.81	45.68	46.45	0.77	69.59	69.59	0.00	1.15	1.17	0.02
474	Raford	Raford-Ds	5.7	66.7	19.93	19.91	-0.02	69.49	69.48	-0.01	0.56	0.56	0.00
475	Raford-Trib1	Raford-Trib1	405.4	71.8	19.00	19.00	0.00	73.46	73.45	-0.01	3.27	3.27	0.00
476	Raford-Trib1	Raford-Trib1	389.5	71.52	13.56	13.72	0.16	73.24	73.23	-0.01	1.62	1.64	0.02
477	Raford-Trib1	Raford-Trib1	381	71.4	13.31	12.84	-0.47	73.13	73.13	0.00	2.67	2.57	-0.10
478	Raford-Trib1	Raford-Trib1	328.9	70.99	7.00	7.28	0.28	72.55	72.55	0.00	1.54	1.60	0.06
479	Raford-Trib1	Raford-Trib1	289.3	70.6	8.37	8.78	0.41	72.13	72.12	-0.01	1.94	2.04	0.10
480	Raford-Trib1	Raford-Trib1	241	70.09	2.70	2.70	0.00	72.01	72.03	0.02	0.48	0.47	-0.01
481	Raford-Trib1	Raford-Trib1	188	69.87	0.17	0.00	-0.17	72.02	72.03	0.01	0.02	-0.33	-0.35
482	Raford-Trib1	Raford-Trib1	121.8	69.51	0.00	0.00	0.00	72.01	72.06	0.05	-0.90	-0.93	-0.03
483	Raford-Trib1	Raford-Trib1	82.1	68.92	0.00	0.00	0.00	71.98	72.01	0.03	-1.10	-1.25	-0.15
484	Raford-Trib1	Raford-Trib1	46.3	68.38	3.13	0.00	-3.13	71.01	71.85	0.84	0.67	-1.87	-2.54
485	Raford-Trib1	Raford-Trib1	11.5	67.86	0.00	0.00	0.00	71.90	71.82	-0.08	-1.82	-2.10	-0.28
486	Raford-Trib2	Raford-Trib2	297.7	74.9	0.50	0.50	0.00	75.47	75.46	-0.01	1.07	1.13	0.06
487	Raford-Trib2	Raford-Trib2	258.5	74.15	1.60	0.50	-1.10	74.74	74.71	-0.03	3.13	1.09	-2.04
488	Raford-Trib2	Raford-Trib2	225.6	73.52	0.58	0.58	0.00	74.14	74.10	-0.04	1.04	1.22	0.18
489	Raford-Trib2	Raford-Trib2	216.5	73.34	0.51	0.53	0.02	74.09	74.03	-0.06	0.32	0.63	0.31
490	Raford-Trib2	Raford-Trib2	203.2	73.1	1.22	0.47	-0.75	75.09	73.45	-1.64	0.53	1.35	0.82
491	Raford-Trib2	Raford-Trib2	196.1	72.94	0.00	0.24	0.24	73.35	73.28	-0.07	-0.87	0.54	1.41
492	Raford-Trib2	Raford-Trib2	176.4	72.49	0.00	0.06	0.06	72.91	72.85	-0.06	-1.65	0.12	1.77

493	Raford-Trib2	Raford-Trib2	155.7	72.03	0.00	0.00	0.00	72.50	72.33	-0.17	-6.91	-0.37	6.54
494	Raford-Trib2	Raford-Trib2	122.2	71.26	0.00	0.00	0.00	71.72	71.66	-0.06	-1.50	-0.69	0.81
496	Raford-Trib2	Raford-Trib2	41.9	69.39	0.00	0.69	0.69	71.60	71.44	-0.16	-1.27	0.13	1.40
497	Raford-Trib2	Raford-Trib2	9.4	69.12	10.24	2.66	-7.58	71.44	71.42	-0.02	1.60	0.42	-1.18
498	Raford-Trib3	Raford-Trib3-Up	1096.2	73.84	4.33	1.09	-3.24	75.67	74.80	-0.87	0.80	0.38	-0.42
499	Raford-Trib3	Raford-Trib3-Up	1061.7	73.58	1.13	1.13	0.00	74.78	74.79	0.01	0.19	0.19	0.00
500	Raford-Trib3	Raford-Trib3-Up	1025.6	73.94	1.18	1.20	0.02	74.75	74.77	0.02	0.47	0.47	0.00
501	Raford-Trib3	Raford-Trib3-Up	1010	74.1	1.25	1.29	0.04	74.70	74.71	0.01	0.77	0.77	0.00
502	Raford-Trib3	Raford-Trib3-Up	1000.1	74.04	1.25	1.29	0.04	74.67	74.69	0.02	0.72	0.72	0.00
503	Raford-Trib3	Raford-Trib3-Up	993.5	73.98	1.26	1.30	0.04	74.64	74.65	0.01	0.88	0.87	-0.01
504	Raford-Trib3	Raford-Trib3-Up	982.7	73.9	1.26	1.30	0.04	74.63	74.64	0.01	0.50	0.50	0.00
505	Raford-Trib3	Raford-Trib3-Up	971.7	73.82	1.26	1.29	0.03	74.58	74.59	0.01	0.86	0.86	0.00
506	Raford-Trib3	Raford-Trib3-Up	954.4	73.68	1.26	1.29	0.03	74.51	74.52	0.01	0.92	0.92	0.00
507	Raford-Trib3	Raford-Trib3-Up	936.4	73.54	1.25	1.29	0.04	74.39	74.41	0.02	1.09	1.09	0.00
508	Raford-Trib3	Raford-Trib3-Up	930.1	73.49	1.25	1.29	0.04	74.33	74.34	0.01	1.23	1.24	0.01
509	Raford-Trib3	Raford-Trib3-Up	925.6	73.49	1.25	1.28	0.03	74.29	74.30	0.01	1.20	1.19	-0.01
510	Raford-Trib3	Raford-Trib3-Up	919.9	73.45	1.25	1.28	0.03	74.24	74.25	0.01	1.19	1.20	0.01
511	Raford-Trib3	Raford-Trib3-Up	883.4	73.15	1.24	1.26	0.02	73.90	73.90	0.00	1.19	1.20	0.01
512	Raford-Trib3	Raford-Trib3-Up	848.3	72.86	1.23	1.21	-0.02	73.58	73.57	-0.01	1.18	1.18	0.00
513	Raford-Trib3	Raford-Trib3-Up	815.6	72.59	1.23	1.16	-0.07	73.26	73.24	-0.02	1.19	1.17	-0.02
514	Raford-Trib3	Raford-Trib3-Up	758.3	72.12	1.23	1.14	-0.09	72.74	72.72	-0.02	1.12	1.08	-0.04
515	Raford-Trib3	Raford-Trib3-Up	719.4	71.81	1.23	1.14	-0.09	72.47	72.48	0.01	0.99	0.89	-0.10
516	Raford-Trib3	Raford-Trib3-Up	644.3	71.15	1.23	1.14	-0.09	71.90	71.83	-0.07	1.16	1.25	0.09
517	Raford-Trib3	Raford-Trib3-Up	570.7	70.57	1.74	1.13	-0.61	71.53	71.35	-0.18	0.62	0.58	-0.04
518	Raford-Trib3	Raford-Trib3-Up	565.6	70.57	1.76	1.12	-0.64	71.51	71.34	-0.17	0.67	0.61	-0.06
519	Raford-Trib3	Raford-Trib3-Up	526.4	70.49	1.93	1.07	-0.86	71.30	71.12	-0.18	1.19	1.00	-0.19
520	Raford-Trib3	Raford-Trib3-Up	486.7	70.24	1.93	1.00	-0.93	71.04	70.85	-0.19	1.15	0.93	-0.22
521	Raford-Trib3	Raford-Trib3-Up	450	70.02	1.92	1.01	-0.91	70.71	70.56	-0.15	1.36	1.04	-0.32
522	Raford-Trib3	Raford-Trib3-Up	445.3	69.94	1.76	0.98	-0.78	70.66	70.52	-0.14	1.50	1.20	-0.30
523	Raford-Trib3	Raford-Trib3-Up	417.7	69.46	0.09	0.25	0.16	70.38	70.30	-0.08	0.08	0.28	0.20
524	Raford-Trib3	Raford-Trib3-Up	410.6	69.42	0.53	0.51	-0.02	70.37	70.29	-0.08	0.28	0.31	0.03
525	Raford-Trib3	Raford-Trib3-Up	353.4	69.08	0.84	0.45	-0.39	70.31	70.27	-0.04	0.28	0.16	-0.12
526	Raford-Trib3	Raford-Trib3-Up	273.6	68.65	0.83	1.12	0.29	70.27	70.24	-0.03	0.19	0.26	0.07
527	Raford-Trib3	Raford-Trib3-Ds	266.4	68.61	1.76	2.12	0.36	70.27	70.24	-0.03	0.39	0.48	0.09
528	Raford-Trib3	Raford-Trib3-Ds	249.7	68.5	1.54	1.08	-0.46	70.27	70.26	-0.01	0.33	0.23	-0.10
529	Raford-Trib3	Raford-Trib3-Ds	223.2	68.43	0.94	0.00	-0.94	70.27	70.24	-0.03	0.19	-0.60	-0.79
530	Raford-Trib3	Raford-Trib3-Ds	191.1	68.35	0.99	0.00	-0.99	70.26	70.24	-0.02	0.20	-0.82	-1.02
531	Raford-Trib3	Raford-Trib3-Ds	163.9	68.27	0.49	0.00	-0.49	70.25	70.23	-0.02	0.09	-1.17	-1.26
532	Raford-Trib3	Raford-Trib3-Ds	130.8	68.17	1.81	0.00	-1.81	70.25	70.23	-0.02	0.34	-1.54	-1.88
533	Raford-Trib3	Raford-Trib3-Ds	95.5	68.06	1.82	0.00	-1.82	70.26	70.21	-0.05	0.33	-2.54	-2.87
534	Raford-Trib3	Raford-Trib3-Ds	61.1	67.96	1.88	14.44	12.56	70.25	70.10	-0.15	0.33	2.76	2.43
535	Raford-Trib3	Raford-Trib3-Ds	30.3	67.86	0.51	0.00	-0.51	70.28	70.38	0.10	0.22	-1.34	-1.56
536	Raford-Trib3	Raford-Trib3-Ds	17.3	67.56	0.00	0.00	0.00	70.34	70.09	-0.25	-0.03	-2.78	-2.75
537	Raford-Trib3	Raford-Trib3-Ds	3.1	67.22	2.52	9.99	7.47	70.23	70.20	-0.03	0.53	2.10	1.57
538	Raford-Trib4	Raford-Trib4-Up	1099.7	75.47	3.07	3.07	0.00	76.84	76.84	0.00	1.49	1.49	0.00

539	Raford-Trib4	Raford-Trib4-Up	1045.6	74.7	2.11	2.11	0.00	75.61	75.61	0.00	1.94	1.94	0.00
540	Raford-Trib4	Raford-Trib4-Up	966.2	73.48	2.09	2.09	0.00	74.14	74.14	0.00	1.60	1.60	0.00
541	Raford-Trib4	Raford-Trib4-Up	953.6	73.29	1.99	1.99	0.00	73.97	73.97	0.00	1.44	1.44	0.00
542	Raford-Trib4	Raford-Trib4-Up	901.4	72.53	2.67	2.67	0.00	73.30	73.30	0.00	1.62	1.62	0.00
543	Raford-Trib4	Raford-Trib4-Up	854.1	71.83	3.00	3.00	0.00	72.64	72.64	0.00	1.77	1.77	0.00
544	Raford-Trib4	Raford-Trib4-Up	842.8	71.68	3.02	3.02	0.00	72.49	72.49	0.00	1.52	1.52	0.00
545	Raford-Trib4	Raford-Trib4-Up	831.6	71.54	3.04	3.04	0.00	72.41	72.41	0.00	1.30	1.30	0.00
546	Raford-Trib4	Raford-Trib4-Up	774.1	70.8	3.05	3.05	0.00	72.18	72.18	0.00	0.96	0.96	0.00
547	Raford-Trib4	Raford-Trib4-Up	766	70.7	3.05	3.05	0.00	72.16	72.16	0.00	0.93	0.93	0.00
548	Raford-Trib4	Raford-Trib4-Up	758.6	70.9	3.05	3.05	0.00	72.07	72.07	0.00	1.59	1.59	0.00
549	Raford-Trib4	Raford-Trib4-Up	748.7	70.83	3.05	3.05	0.00	71.96	71.96	0.00	1.58	1.58	0.00
550	Raford-Trib4	Raford-Trib4-Up	718.8	70.64	3.05	3.05	0.00	71.65	71.65	0.00	1.56	1.56	0.00
551	Raford-Trib4	Raford-Trib4-Up	692.5	70.47	3.05	3.05	0.00	71.37	71.37	0.00	1.59	1.59	0.00
552	Raford-Trib4	Raford-Trib4-Up	688	70.44	3.05	3.05	0.00	71.35	71.35	0.00	1.39	1.39	0.00
553	Raford-Trib4	Raford-Trib4-Up	675.6	70.35	3.05	3.05	0.00	71.29	71.29	0.00	1.12	1.12	0.00
554	Raford-Trib4	Raford-Trib4-Up	663.2	70.26	3.05	3.05	0.00	71.18	71.18	0.00	1.46	1.46	0.00
555	Raford-Trib4	Raford-Trib4-Up	656.4	70.21	3.05	3.05	0.00	71.13	71.13	0.00	1.41	1.41	0.00
556	Raford-Trib4	Raford-Trib4-Up	623.5	69.98	3.05	3.05	0.00	70.91	70.91	0.00	1.27	1.27	0.00
557	Raford-Trib4	Raford-Trib4-Up	615.3	69.93	3.05	3.05	0.00	70.88	70.88	0.00	1.13	1.13	0.00
558	Raford-Trib4	Raford-Trib4-Up	575.7	69.67	3.05	3.05	0.00	70.66	70.66	0.00	1.28	1.28	0.00
559	Raford-Trib4	Raford-Trib4-Up	537.5	69.41	3.05	3.05	0.00	70.44	70.44	0.00	1.28	1.28	0.00
560	Raford-Trib4	Raford-Trib4-Up	520.8	69.29	3.02	3.02	0.00	70.42	70.42	0.00	0.74	0.74	0.00
561	Raford-Trib4	Raford-Trib4-Up	511.4	69.24	3.02	3.02	0.00	70.41	70.41	0.00	0.75	0.75	0.00
562	Raford-Trib4	Raford-Trib4-Up	501.9	69.18	3.02	3.02	0.00	70.39	70.39	0.00	0.81	0.81	0.00
563	Raford-Trib4	Raford-Trib4-Up	491	69.1	5.39	2.90	-2.49	69.46	70.39	0.93	0.82	0.55	-0.27
564	Raford-Trib4	Raford-Trib4-Up	485.9	69.07	2.63	2.63	0.00	70.40	70.40	0.00	0.42	0.42	0.00
565	Raford-Trib4	Raford-Trib4-Up	464.8	68.94	1.65	1.66	0.01	70.40	70.40	0.00	0.33	0.34	0.01
566	Raford-Trib4	Raford-Trib4-Up	453	68.87	0.70	0.70	0.00	70.41	70.41	0.00	0.15	0.15	0.00
567	Raford-Trib4	Raford-Trib4-Up	447.1	68.69	0.70	0.70	0.00	70.24	70.24	0.00	0.17	0.17	0.00
568	Raford-Trib4	Raford-Trib4-Up	437.7	68.66	1.03	1.03	0.00	70.24	70.23	-0.01	0.23	0.23	0.00
569	Raford-Trib4	Raford-Trib4-Up	426	68.64	1.26	1.26	0.00	70.23	70.23	0.00	0.25	0.25	0.00
570	Raford-Trib4	Raford-Trib4-Up	420.8	68.62	1.03	1.02	-0.01	70.24	70.23	-0.01	0.19	0.19	0.00
571	Raford-Trib4	Raford-Trib4-Up	409	68.6	1.03	1.02	-0.01	70.20	70.20	0.00	0.18	0.18	0.00
572	Raford-Trib4	Raford-Trib4-Up	400.5	68.58	1.49	1.51	0.02	70.20	70.19	-0.01	0.24	0.25	0.01
573	Raford-Trib4	Raford-Trib4-Up	379	68.53	2.00	2.06	0.06	70.19	70.19	0.00	0.26	0.27	0.01
574	Raford-Trib4	Raford-Trib4-Up	371.5	68.51	1.96	2.07	0.11	70.19	70.19	0.00	0.26	0.28	0.02
575	Raford-Trib4	Raford-Trib4-Up	355.1	68.47	1.98	2.07	0.09	70.19	70.18	-0.01	0.33	0.34	0.01
576	Raford-Trib4	Raford-Trib4-Up	345.2	68.45	1.91	2.05	0.14	70.19	70.18	-0.01	0.25	0.27	0.02
577	Raford-Trib4	Raford-Trib4-Up	337.3	68.43	1.99	1.85	-0.14	70.19	70.18	-0.01	0.29	0.27	-0.02
578	Raford-Trib4	Raford-Trib4-Up	309.7	68.37	1.82	1.69	-0.13	70.19	70.18	-0.01	0.24	0.22	-0.02
579	Raford-Trib4	Raford-Trib4-Up	301.3	68.35	1.65	1.64	-0.01	70.19	70.18	-0.01	0.18	0.18	0.00
580	Raford-Trib4	Raford-Trib4-Up	277.8	68.3	1.36	1.24	-0.12	70.19	70.18	-0.01	0.19	0.18	-0.01
581	Raford-Trib4	Raford-Trib4-Up	256.7	68.25	0.76	0.91	0.15	70.19	70.18	-0.01	0.12	0.15	0.03
582	Raford-Trib4	Raford-Trib4-Up	249.7	68.24	1.54	0.50	-1.04	70.27	70.18	-0.09	0.33	0.09	-0.24
583	Raford-Trib4	Raford-Trib4-Up	245.6	68.23	0.55	0.17	-0.38	70.19	70.18	-0.01	0.10	0.03	-0.07

584	Raford-Trib4	Raford-Trib4-Up	240.5	68.21	0.68	0.00	-0.68	70.19	70.18	-0.01	0.14	-0.09	-0.23
585	Raford-Trib4	Raford-Trib4-Up	230.8	68.19	0.72	0.00	-0.72	70.19	70.18	-0.01	0.15	-0.21	-0.36
586	Raford-Trib4	Raford-Trib4-Up	223.6	68.16	0.46	0.00	-0.46	70.19	70.18	-0.01	0.07	-0.18	-0.25
587	Raford-Trib4	Raford-Trib4-Up	213	68.1	0.48	0.00	-0.48	70.19	70.18	-0.01	0.06	-0.18	-0.24
588	Raford-Trib4	Raford-Trib4-Up	206.1	68.06	0.00	0.00	0.00	70.19	70.18	-0.01	0.01	-0.22	-0.21
589	Raford-Trib4	Raford-Trib4-Up	162.9	67.81	0.00	0.00	0.00	70.18	70.18	0.00	-0.23	-0.32	-0.09
590	Raford-Trib4	Raford-Trib4-Up	117.2	67.55	0.00	0.00	0.00	70.19	70.18	-0.01	-0.34	-0.54	-0.20
591	Raford-Trib4	Raford-Trib4-Up	105.4	67.49	0.00	0.00	0.00	70.19	70.18	-0.01	-0.36	-0.63	-0.27
592	Raford-Trib4	Raford-Trib4-Up	87.7	67.4	0.00	0.00	0.00	70.22	70.19	-0.03	-0.42	-0.86	-0.44
593	Raford-Trib4	Raford-Trib4-Up	82	67.37	0.00	0.00	0.00	70.21	70.19	-0.02	-0.46	-0.93	-0.47
594	Raford-Trib4	Raford-Trib4-Up	60.3	67.25	0.00	0.00	0.00	70.24	70.18	-0.06	-0.52	-1.23	-0.71
595	Raford-Trib4	Raford-Trib4-Up	55	67.22	0.00	0.00	0.00	70.29	70.17	-0.12	-0.45	-1.62	-1.17
596	Raford-Trib4	Raford-Trib4-Up	50.9	67.2	0.00	0.00	0.00	70.23	70.20	-0.03	-0.28	-1.58	-1.30
597	Raford-Trib4	Raford-Trib4-Ds	46.4	67.8	0.87	0.63	-0.24	70.23	70.20	-0.03	0.19	0.14	-0.05
598	Raford-Trib4	Raford-Trib4-Ds	28.7	67.62	0.29	0.58	0.29	70.23	70.20	-0.03	0.05	0.11	0.06
599	Raford-Trib4	Raford-Trib4-Ds	9.5	67.66	3.24	2.35	-0.89	70.20	70.19	-0.01	0.50	0.36	-0.14
600	Raford-Trib5	Raford-Trib5	471.7	75.63	-	2.29	-	-	76.44	-	-	1.64	-
602	Raford-Trib5	Raford-Trib5	431.2	74.99	-	2.29	-	-	76.09	-	-	1.02	-
603	Raford-Trib5	Raford-Trib5	410.9	74.66	-	2.29	-	-	76.06	-	-	0.68	-
604	Raford-Trib5	Raford-Trib5	390.6	74.34	-	2.29	-	-	75.66	-	-	0.76	-
605	Raford-Trib5	Raford-Trib5	381.8	74.2	-	2.29	-	-	75.65	-	-	0.64	-
606	Raford-Trib5	Raford-Trib5	355.7	73.77	-	2.29	-	-	74.62	-	-	1.76	-
607	Raford-Trib5	Raford-Trib5	285.9	72.63	-	2.25	-	-	73.63	-	-	1.49	-
608	Raford-Trib5	Raford-Trib5	245.1	71.97	-	2.22	-	-	72.84	-	-	2.05	-
609	Raford-Trib5	Raford-Trib5	228.5	71.64	-	2.08	-	-	72.51	-	-	1.42	-
610	Raford-Trib5	Raford-Trib5	114	70.11	2.07	1.98	-0.09	70.87	70.85	-0.02	1.51	1.49	-0.02
611	Raford-Trib5	Raford-Trib5	91.8	69.77	1.63	1.73	0.10	70.57	70.55	-0.02	1.05	1.16	0.11
612	Raford-Trib5	Raford-Trib5	48.6	69.23	1.82	1.90	0.08	70.30	70.27	-0.03	0.72	0.79	0.07
613	Raford-Trib5	Raford-Trib5	3.1	68.66	2.52	1.00	-1.52	70.23	70.24	0.01	0.53	0.26	-0.27

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8.9 ANNEX I – MET EIREANN RETURN PERIOD RAINFALL DEPTHS TABLE

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 161442, Northing: 229737,

DURATION	Interval		Years											
	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	120,	
5 mins	2.6,	3.5,	4.0,	4.7,	5.2,	5.5,	6.6,	7.9,	8.7,	9.8,	10.7,	11.5,	12.0,	
10 mins	3.7,	4.9,	5.6,	6.6,	7.2,	7.7,	9.2,	11.0,	12.1,	13.6,	15.0,	16.0,	16.7,	
15 mins	4.3,	5.8,	6.6,	7.7,	8.5,	9.0,	10.9,	12.9,	14.2,	16.0,	17.6,	18.8,	19.6,	
30 mins	5.7,	7.6,	8.5,	9.9,	10.8,	11.6,	13.8,	16.2,	17.8,	20.0,	21.9,	23.3,	24.2,	
1 hours	7.6,	9.9,	11.1,	12.8,	13.9,	14.8,	17.5,	20.4,	22.3,	24.9,	27.1,	28.8,	29.9,	
2 hours	10.0,	12.9,	14.3,	16.5,	17.8,	18.9,	22.2,	25.7,	27.9,	31.0,	33.6,	35.6,	36.9,	
3 hours	11.8,	15.0,	16.7,	19.1,	20.6,	21.8,	25.5,	29.4,	31.8,	35.2,	38.1,	40.3,	41.7,	
4 hours	13.2,	16.8,	18.6,	21.2,	22.9,	24.1,	28.1,	32.3,	35.0,	38.6,	41.7,	44.0,	45.5,	
6 hours	15.5,	19.6,	21.7,	24.6,	26.4,	27.9,	32.3,	36.9,	39.9,	43.9,	47.3,	49.8,	51.5,	
9 hours	18.3,	22.9,	25.2,	28.5,	30.6,	32.2,	37.1,	42.2,	45.5,	49.9,	53.6,	56.4,	58.3,	
12 hours	20.5,	25.6,	28.1,	31.6,	33.9,	35.6,	40.9,	46.5,	49.9,	54.6,	58.6,	61.6,	63.6,	
18 hours	24.2,	29.9,	32.7,	36.7,	39.2,	41.1,	47.0,	53.1,	57.0,	62.1,	66.5,	69.7,	71.9,	
24 hours	27.2,	33.4,	36.4,	40.7,	43.5,	45.5,	51.8,	58.4,	62.5,	68.0,	72.7,	76.2,	78.4,	
2 days	34.8,	42.1,	45.6,	50.5,	53.6,	55.9,	63.0,	70.4,	74.9,	80.9,	86.0,	89.7,	92.2,	
3 days	41.4,	49.5,	53.4,	58.9,	62.3,	64.9,	72.6,	80.6,	85.5,	92.0,	97.4,	101.5,	104.1,	
4 days	47.4,	56.3,	60.5,	66.4,	70.1,	72.9,	81.3,	89.8,	95.1,	102.0,	107.8,	112.1,	114.9,	
6 days	58.2,	68.5,	73.4,	80.1,	84.3,	87.4,	96.9,	106.5,	112.3,	120.0,	126.4,	131.1,	134.2,	
8 days	68.3,	79.8,	85.2,	92.6,	97.3,	100.7,	111.1,	121.6,	127.9,	136.3,	143.3,	148.4,	151.7,	
10 days	77.8,	90.3,	96.3,	104.4,	109.4,	113.1,	124.4,	135.7,	142.5,	151.5,	159.0,	164.5,	168.0,	
12 days	86.9,	100.5,	106.9,	115.6,	121.0,	125.0,	137.0,	149.1,	156.4,	165.9,	173.9,	179.7,	183.4,	
16 days	104.3,	119.8,	127.1,	136.9,	143.0,	147.5,	160.9,	174.4,	182.5,	193.1,	201.9,	208.3,	212.5,	
20 days	121.1,	138.3,	146.3,	157.2,	163.9,	168.9,	183.6,	198.3,	207.2,	218.7,	228.3,	235.2,	239.7,	
25 days	141.4,	160.6,	169.5,	181.6,	189.0,	194.5,	210.8,	226.9,	236.7,	249.3,	259.7,	267.3,	272.2,	

NOTES:

These values are derived from a Depth Duration Frequency (DDF) Model update 2023

For details refer to:

'Mateus C., and Coonan, B. 2023. Estimation of point rainfall frequencies in Ireland. Technical Note No. 68. Met Eireann',

Available for download at:

<http://hdl.handle.net/2262/102417>

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