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## Laois County Council

### Proposed Residential Development at Tyrrells Land, Portlaoise, Co. Laois

### Stage 3 Flood Risk Assessment



Document Control Sheet

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# 1. INTRODUCTION

TOBIN were appointed by Laois County Council in August 2023 to undertake a Flood Risk Assessment (FRA) for a proposed residential development at Tyrrells Land, Portlaoise, Co. Laois (see Figure 1-1 & Figure 1-2).

There are a number of hydraulic features in the vicinity of the subject site. The Maryborough Stream/Drain forms the southern boundary of the subject site. The stream flows in a northerly direction from its headwaters approximately 1.8km south of the subject site. The Maryborough stream outfalls into an adjacent lake which forms the eastern boundary of the subject site.

The lake is fed by the Derry Watercourse which outfalls into the southern side of the lake. The Derry Watercourse's headwaters originate approximately 3.1km south-east of the subject site.

The lake outfalls via a culvert under the adjacent Stradbally Road (N80). The culvert runs for over 800m. The culvert runs in a northerly direction from the lake to the R445 where it turns and flows in an easterly direction parallel to the road. The culvert crosses under the R445 and flows underneath the Midlands Prison before surfacing along the northern boundary of the prison.

The aim of this Flood Risk Assessment (FRA) is to “provide a quantitative appraisal of potential flood risk” [extract from PSFRM Guidelines] in relation to the proposed development.

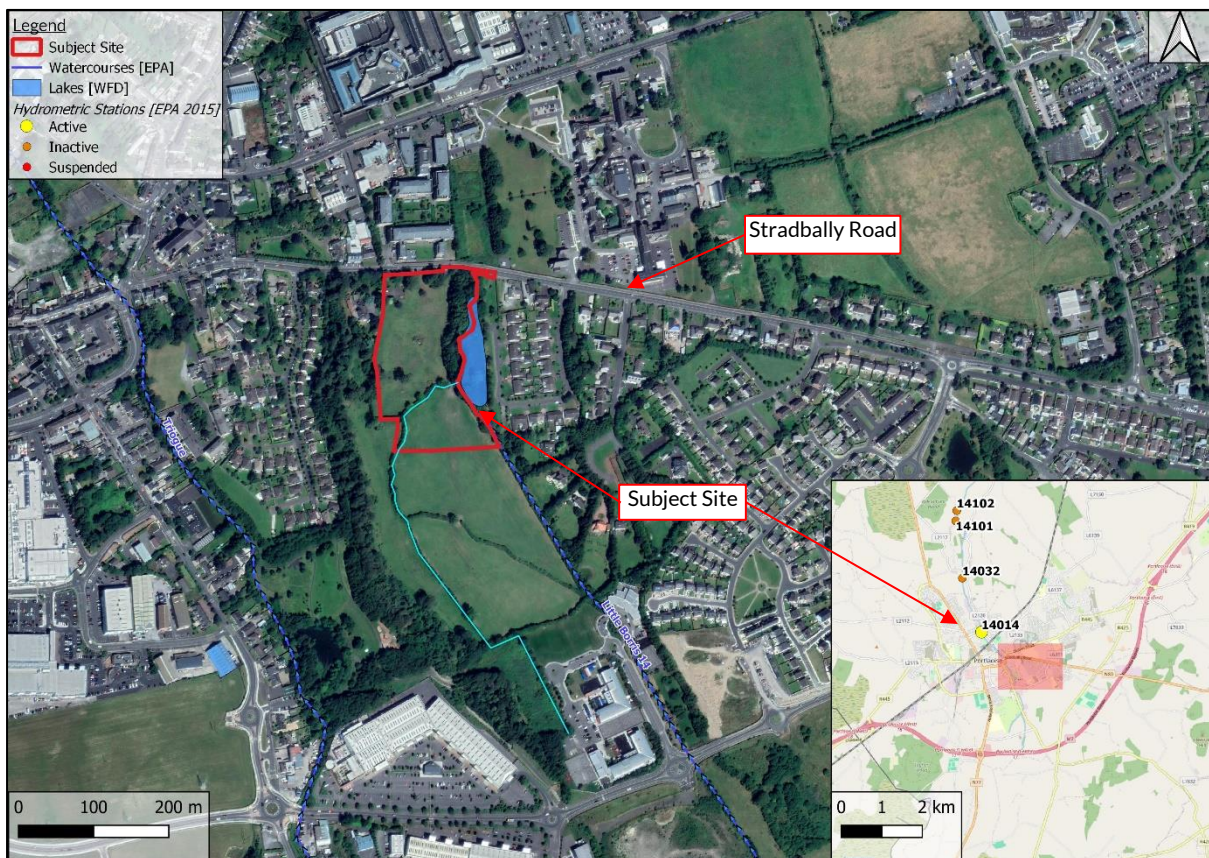


Figure 1-1 Site Location

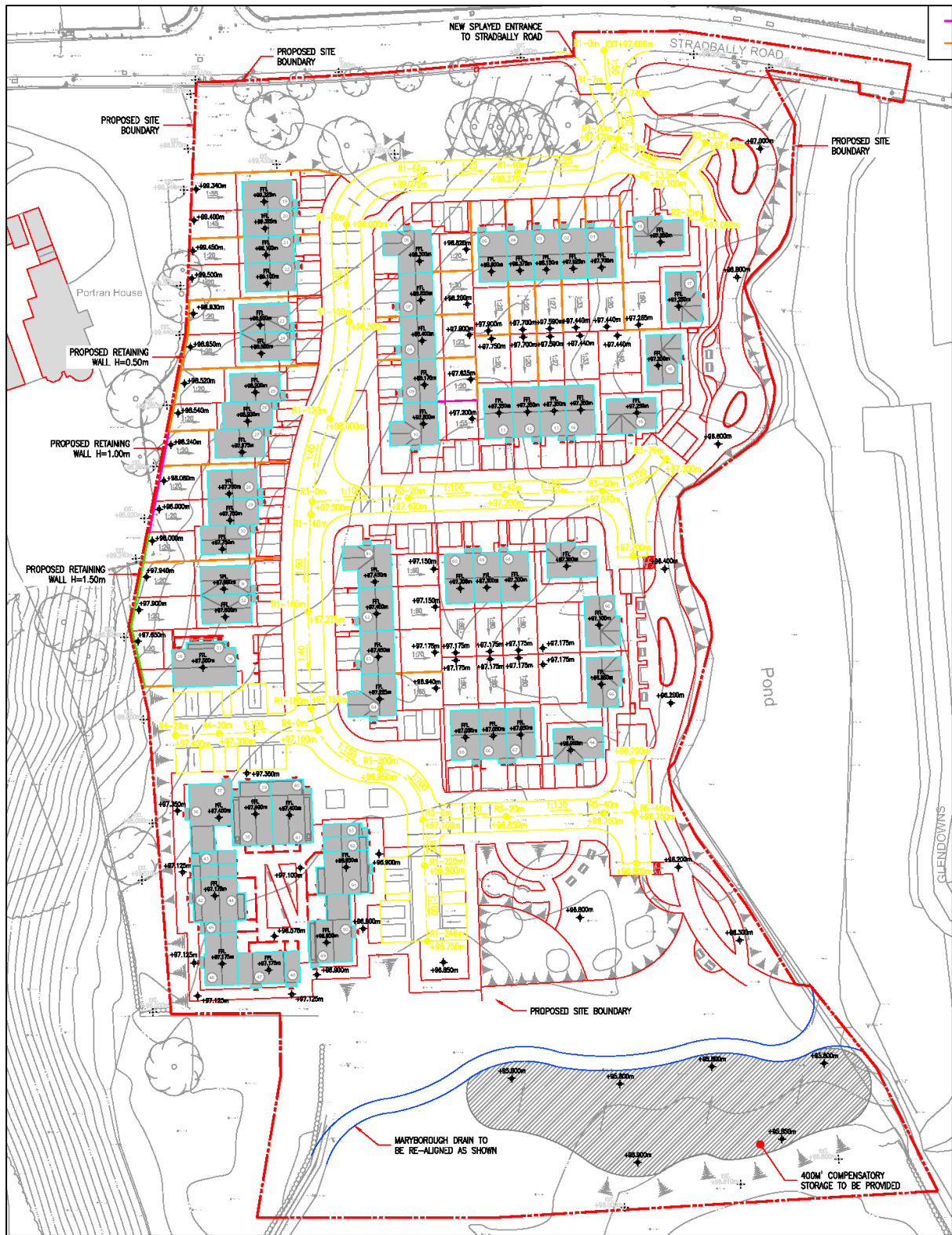


Figure 1-2 Site Layout

## 2. FLOOD RISK MANAGEMENT GUIDANCE

This Stage 3 Flood Risk Assessment was carried out in accordance with the following flood risk management guidance documents:

- The Planning System and Flood Risk Management Guidelines for Planning Authorities
- Flood Risk Management Climate Change Sectoral Adaptation Plan
- Laois County Development Plan 2021-2027

### 2.1 THE PLANNING SYSTEM AND FLOOD RISK MANAGEMENT GUIDELINES

The Planning System and Flood Risk Management Guidelines for Planning Authorities (PSFRM Guidelines) were published in 2009 by the Office of Public Works (OPW) and Department of the Environment, Heritage and Local Government (DoEHLG). Their aim is to ensure that flood risk is considered in development proposals and the assessment of planning applications.

#### 2.1.1 Flood Zones and Vulnerability Classes

The PSFRM Guidelines discuss flood risk in terms of flood zones A, B, and C, which correspond to areas of high, medium, or low probability of flooding, respectively. The extents of each flood zone are based on the Annual Exceedance Probability (AEP) of various flood events.

The PSFRM Guidelines also categorise different types of development into three vulnerability classes based on their sensitivity to flooding.

Table 2.1 shows a decision matrix that indicates which types of development are appropriate in each flood zone and when the Justification Test (see Section 2.1.2) must be satisfied. The annual exceedance probabilities used to define each flood zone are also provided.

Residential developments are classified as “highly vulnerable” developments; therefore, they are required to be located in Flood Zone C.

**Table 2.1 Decision Matrix for Determining the Appropriateness of a Development**

Flood Zone: (Probability)	Annual Exceedance Probability (AEP)	Highly Vulnerable	Less Vulnerable	Water Compatible
A (High)	<u>Fluvial &amp; Pluvial Flooding</u> More frequent than 1% AEP	Justification Test Required	Justification Test Required	Appropriate
	<u>Coastal Flooding</u> More frequent than 0.5% AEP			
B (Medium)	<u>Fluvial &amp; Pluvial Flooding</u> 0.1% to 1% AEP	Justification Test Required	Appropriate	Appropriate
	<u>Coastal Flooding</u> 0.1% to 0.5% AEP			
C (Low)	<u>Fluvial, Pluvial &amp; Coastal Flooding</u> Less frequent than 0.1% AEP	Appropriate	Appropriate	Appropriate

---

## 2.1.2 The Justification Test

Any proposed development being considered in an inappropriate flood zone (as determined by Table 2.1) must satisfy the criteria of the Justification Test outlined in Figure 2-1 (taken from the PSFRM Guidelines).

### 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.

**Figure 2-1 Criteria of the Justification Test**



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## 2.2 THE FLOOD RISK MANAGEMENT CLIMATE CHANGE ADAPTATION PLAN

The Flood Risk Management Climate Change Sectoral Adaptation Plan was published in 2019 under the National Adaptation Framework and Climate Action Plan. This plan outlines the OPW's approach to climate change adaptation in terms of flood risk management.

This approach is based on a current understanding of the potential impacts of climate change on flooding and flood risk. Research has shown that climate change is likely to worsen flooding through more extreme rainfall patterns, more severe river flows, and rising mean sea levels.

To account for these changes, the Adaptation Plan presents two future flood risk scenarios to consider when assessing flood risk:

- Mid-Range Future Scenario (MRFS)
- High-End Future Scenario (HEFS)

Table 2.1 indicates the allowances that should be added to estimates of extreme rainfall depths, peak flood flows, and mean sea levels for the future scenarios.

**Table 2.2 Climate Change Adaptation Allowances for Future Flood Risk Scenarios**

Parameter	Mid-Range Future Scenario (MRFS)	High-End Future Scenario (HEFS)
Extreme Rainfall Depths	+ 20%	+ 30%
Peak River Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 0.5 m	+ 1 m

For the purpose of this flood risk assessment, the proposed development has been assessed against the Mid-Range Future Scenario as it represents a likely future scenario.

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## 2.3 LAOIS COUNTY DEVELOPMENT PLAN 2021-2027

The current Laois County Development Plan 2021-2027 was adopted on 25<sup>th</sup> January 2022 and came into effect 8<sup>th</sup> March 2022. Chapter 10 outlines Laois County Council's strategy for Infrastructure.

Section 10.2.2 outlines Laois County Council's approach to flood risk management and sets out the following key policies:

- FRM 1        Ensure that flood risk management is incorporated into the preparation of all local area plans through the preparation in accordance with the requirements of the Planning System and Flood Risk Management-Guidelines for Planning Authorities (DoEHLG 2009).
  
- FRM 2        Ensure that all development proposals comply with the requirements of the Planning System and Flood Risk Management-Guidelines for Planning Authorities' (DEHLG 2009) and to ensure that the Justification Test for Development Management is applied to required development proposals and in accordance with methodology set out in the guidelines and new development does not increase flood risk elsewhere, including that which may arise from surface water runoff.
  
- FRM 3        Support the implementation of recommendations in the CFRAM Programme to ensure that flood risk management policies and infrastructure are progressively implemented.
  
- FRM 4        Support the implementation of recommendations in the Flood Risk Management Plans (FRMP's), including planned investment measures for managing and reducing flood risk.
  
- FRM 5        Consult with the OPW in relation to proposed developments in the vicinity of drainage channels and rivers for which the OPW are responsible, and to retain a strip on either side of such channels where required, to facilitate maintenance access thereto.
  
- FRM 6        Assist the OPW in developing catchment-based Flood Risk Management Plans for rivers in County Laois and have regard to their provisions/recommendations.
  
- FRM 7        Protect and enhance the County's floodplains and wetlands as 'green infrastructure' which provides space for storage and conveyance of floodwater, enabling flood risk to be more effectively managed and reducing the need to provide flood defenses in the future, subject to normal planning and environmental criteria.
  
- FRM 8        Protect the integrity of any formal (OPW or Laois County Council) flood risk management infrastructure, thereby ensuring that any new development does not negatively impact any existing defence infrastructure or compromise any proposed new infrastructure.
  
- FRM 9        Ensure that where flood risk management works take place that the natural and cultural heritage, rivers, streams and watercourses are protected and enhanced.

- FRM 10 Ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the OPW Climate Change Sectoral Adaptation Plan Flood Risk Management applicable at the time.
- FRM 11 Consult, where necessary, with Inland Fisheries Ireland, the National Parks and Wildlife Service and other relevant agencies in the provision of flood alleviation measures in the County.
- FRM 12 Prioritise plans for flood defence works in the towns as indicated in the Strategic Flood Risk Assessment in order to mitigate against potential flood risk.
- FRM 13 Ensure new development does not increase flood risk elsewhere, including that which may arise from surface water runoff.
- FRM 14 Protect water sinks because of their flood management function, as well as their biodiversity and amenity value and encourage the restoration or creation of water sinks as flood defence mechanisms, where appropriate.

As part of the County Development Plan the lands in Portlaoise has been zoned for land use. The subject site has been zoned as Residential 2, which is new proposed residential. The proposed development is suitable for the land use zoning.

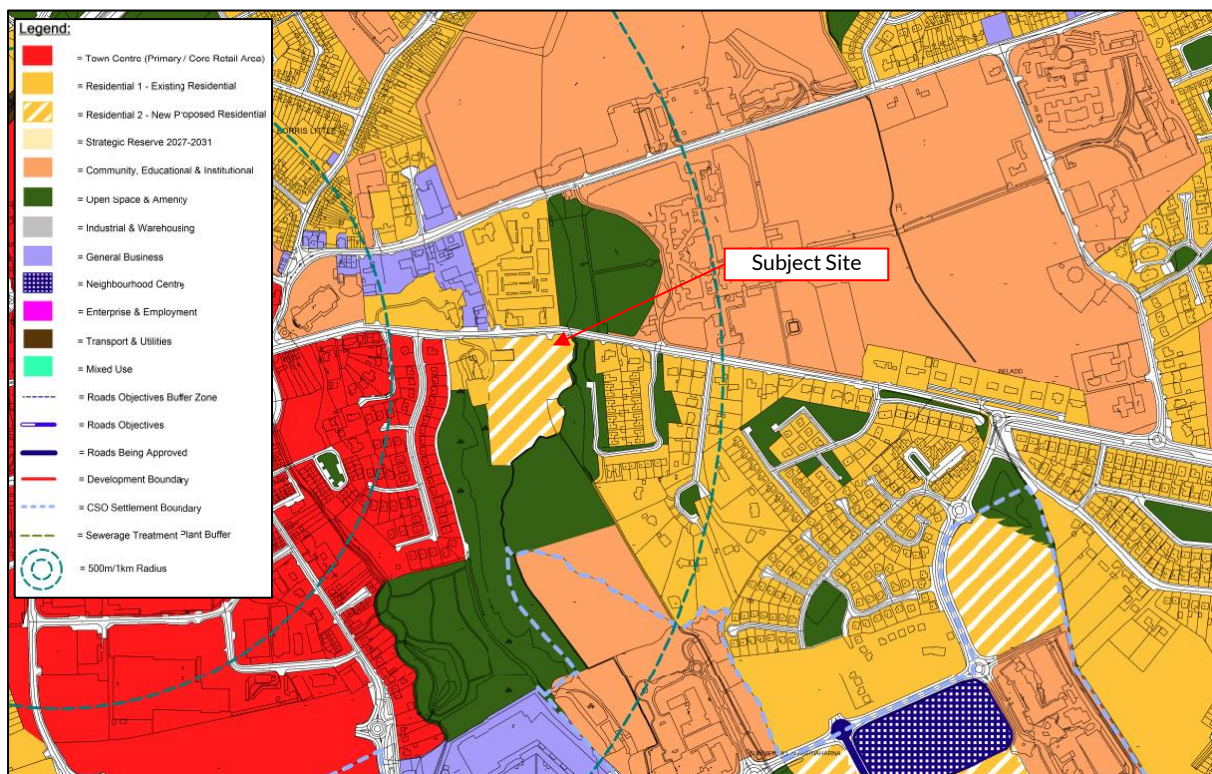


Figure 2-2 Laois CDP Land Zoning Mapping

## 2.4 COUNTY LAOIS STRATEGIC FLOOD RISK ASSESSMENT (SFRA)

A Strategic Flood Risk assessment (SFRA) was completed as part of the Laois County Development Plan. The town of Portlaoise is included as part of the Laois County Flood Risk Assessment. The flood zone data for the town is based on the CFRAM mapping.

The subject site has been identified as being adjacent to areas located in Flood Zone A or Flood Zone B, with portions of the redline boundary within these flood zones.

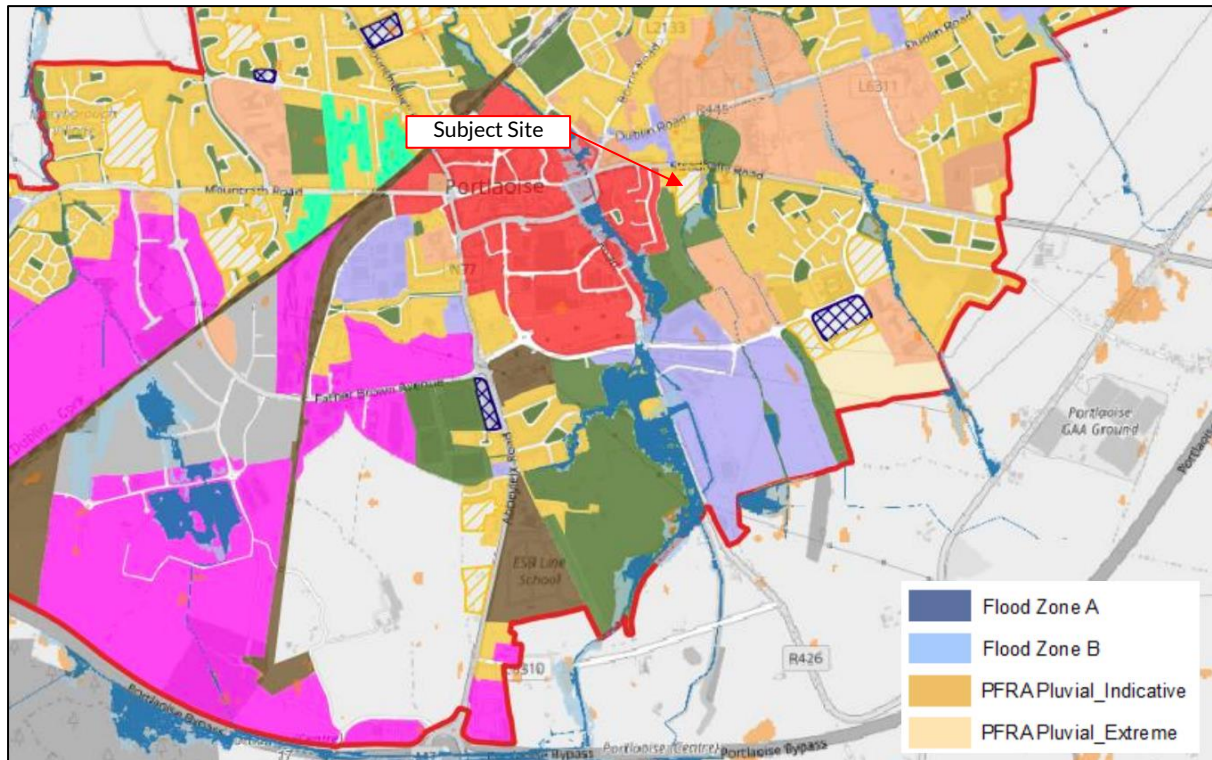


Figure 2-3 Laois SFRA Mapping

### 3. INITIAL FLOOD RISK ASSESSMENT

#### 3.1 PAST FLOOD EVENTS

The OPW's National Flood Information Portal<sup>1</sup> provides past flood event mapping with records of flooding reports, meeting minutes, photos, and/or hydrometric data. Based on the flood map shown in Figure 3-1, there are a number of flood events in the vicinity of the subject site.

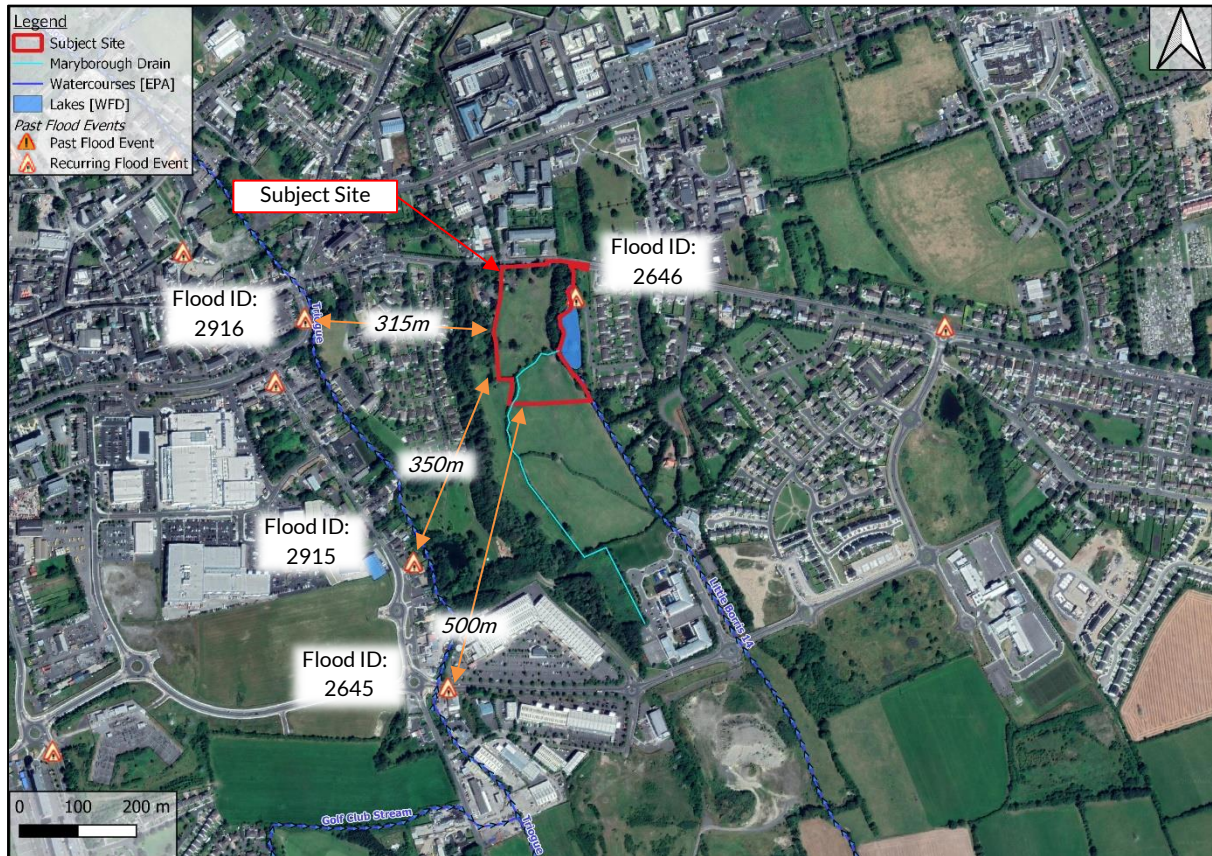


Figure 3-1 OPW Flood Map of Past Flood Events<sup>2</sup>

There is one recurring flood event located adjacent to the subject site. The flood event is described as follows:

- The flood event (Flood ID: 2646) is known as the Stradbally Road, Portlaoise Recurring. It is a recurring flood event that's source is noted as being from a river. The flood event occurs when a tributary of the River Triogue overflows its banks. Meeting minutes from a meeting with the Area Engineer it is stated that flooding last occurred in the winter of 1994/1995. Laois County Council and a developer undertook remedial work and there has been no flooding since.<sup>3</sup>

There are three recurring flood events located west of the subject site. These flood events are described as follows:

- The first flood event (Flood ID: 2645) is located approximately 500m south-west of the subject site. The event is known as the *Triogue Timahoe Road, Portlaoise Recurring*. The

<sup>1</sup> floodinfo.ie

<sup>2</sup> <https://www.floodinfo.ie/map/floodmaps/>

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flooding occurs after periods of heavy rain causing the River Triogue to overflow its banks. Meeting minutes from a meeting with the Area Engineer stated that flooding last occurred in the winter of 1994/1995. Laois County Council undertook remedial work and there has been no flooding since.<sup>3</sup>

- The second flood event (Flood ID: 2915) is located approximately 350m south-west of the subject site. The flood event is a recurring flood that occurs in an area of low-lying land. The land is located adjacent to the River Triogue.
- The third flood event (Flood ID: 2916) is located approximately 315m west of the subject site. The flood event is known as the Well Road, Portlaoise Recurring. The flood event is a recurring flood that occurs in an area of low-lying land. The land is located adjacent to the River Triogue.

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<sup>3</sup> Laois County Council Area Engineer Meeting Minutes from 27/09/2005

### 3.2 OPW PRELIMINARY FLOOD RISK ASSESSMENT (PFRA) STUDY

In 2009, the OPW produced a series of maps to assist in the development of a broad-scale FRA throughout Ireland. These maps were produced from several sources.

The OPW's National Preliminary Flood Risk Assessment (PFRA) Overview Report from March 2012 noted that *"the flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location"*.

Figure 3-2 provides an overview of the fluvial, coastal, pluviol, and groundwater indicative flood extents in the vicinity of the subject site.

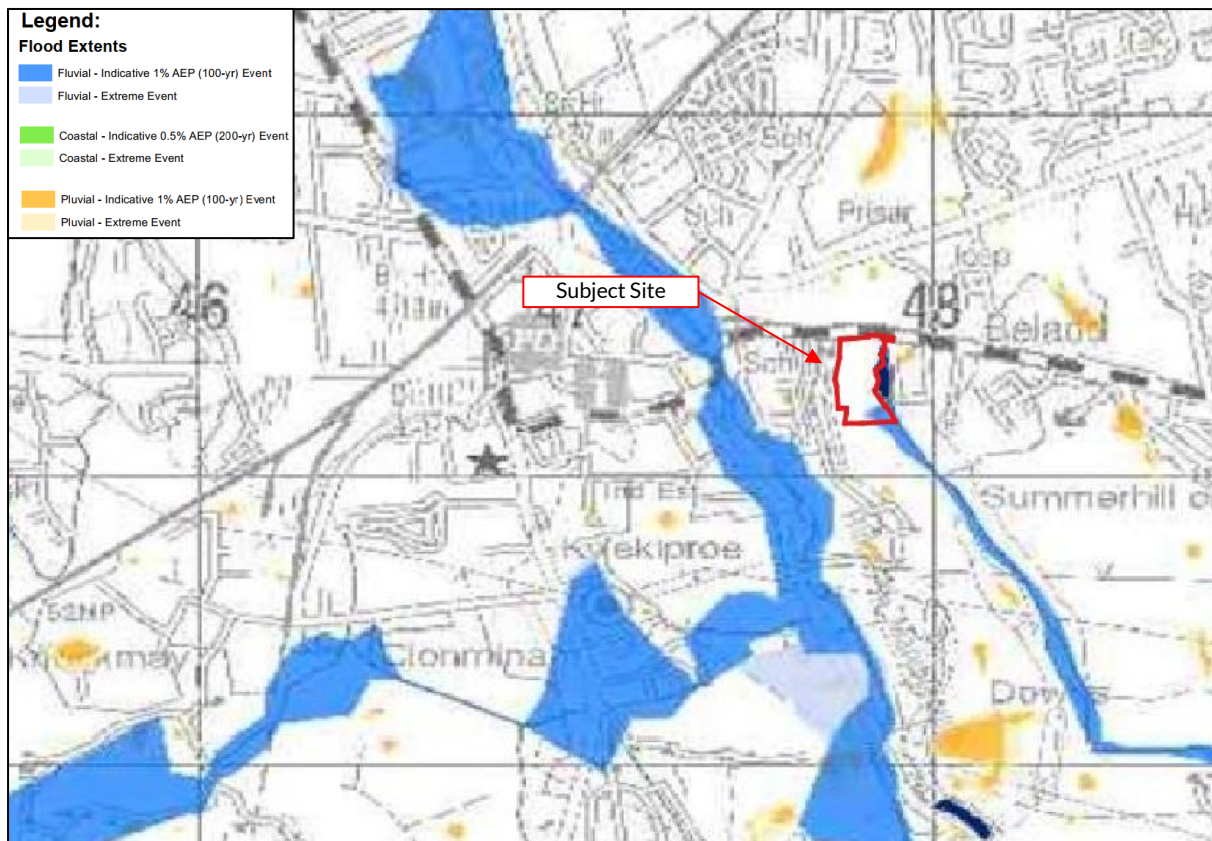


Figure 3-2 Indicative Flood Mapping [extract from PFRA Map 183/ 200]



**Figure 3-3 PFRA Flood Extents**

As per Figure 3-2, there are fluvial flood extents shown in the vicinity of the subject site at the Derry Watercourse, at the inlet to the adjacent lake (also identified on PFRA mapping).

Limitations on potential sources of error associated with the PFRA maps include:

- Assumed channel capacity (due to absence of channel survey information)
- Absence of flood defences and other drainage improvements and channel structures (bridges, weirs, culverts)
- Local errors in the national Digital Terrain Model (DTM)



### 3.3 CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

In 2015, the OPW produced flood maps as part of the Catchment Flood Risk Assessment and Management (CFRAM) Study. The flood extents in these maps are based on detailed modelling of Areas for Further Assessment identified by the National Preliminary Flood Risk Assessment.<sup>4</sup>

The South Eastern Study included modelling of the adjacent Maryborough Drain and Derry Watercourse. There are flood extents shown to the south of the subject site during the 1 in 1,000-year fluvial flood event. The adjacent lake is also identified in the modelled flood extents.

The modelled water level for the Maryborough Drain during the 1 in 1,000-year fluvial flood event at node no. 14MARY000011 is 95.98mOD. The modelled water level for the Derry Watercourse during the 1 in 1,000-year fluvial flood event at node no. 14DERY00091 is 95.88mOD.



Figure 3-4 CFRAM Current Scenario Flood Extents

The South Eastern CFRAM Study also makes an allowance for climate change. The study applied a Mid-Range Future Scenario (MRFS) which allowed for a 20% increase in the calculated flow rates used in the hydraulic model. The mapping for the MRFS is shown in Figure 3-5 below. The MRFS fluvial flood extents encroach onto the subject site. The subject site is inundated during the 1 in 1,000-year MRFS flood event.

<sup>4</sup> [https://www.floodinfo.ie/about\\_frm/](https://www.floodinfo.ie/about_frm/)



Figure 3-5 CFRAM MRFS Flood Extents

### 3.4 OPW DRAINAGE DISTRICTS AND ARTERIAL DRAINAGE SCHEMES

The OPW Drainage Districts were carried out by the commissioners of Public Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding.<sup>5</sup> The local authorities are charged with the responsibility to maintain Drainage Districts. There are no Drainage Districts in the vicinity of the subject site.

The OPW carried out a number of Arterial Drainage Schemes on catchments under the Arterial Drainage Act, 1945. Under section 37 of the 1945 Act, the OPW is required to maintain drainage works in proper repair and effective condition. Benefited lands are areas that were previously subject to poor drainage and/or flooding but that have benefited from the implementation of Arterial Drainage Schemes carried out under the Arterial Drainage Act 1945.

As shown in Figure 3-6, there are no lands in the vicinity of the subject site that have benefited from the Arterial Drainage Scheme.

As per the site layout (Figure 1-2) it is proposed to reroute the Maryborough drain, which is denoted as an arterial drainage channel. Therefore, these works must be consented appropriately through the OPW Section 9 Application process.

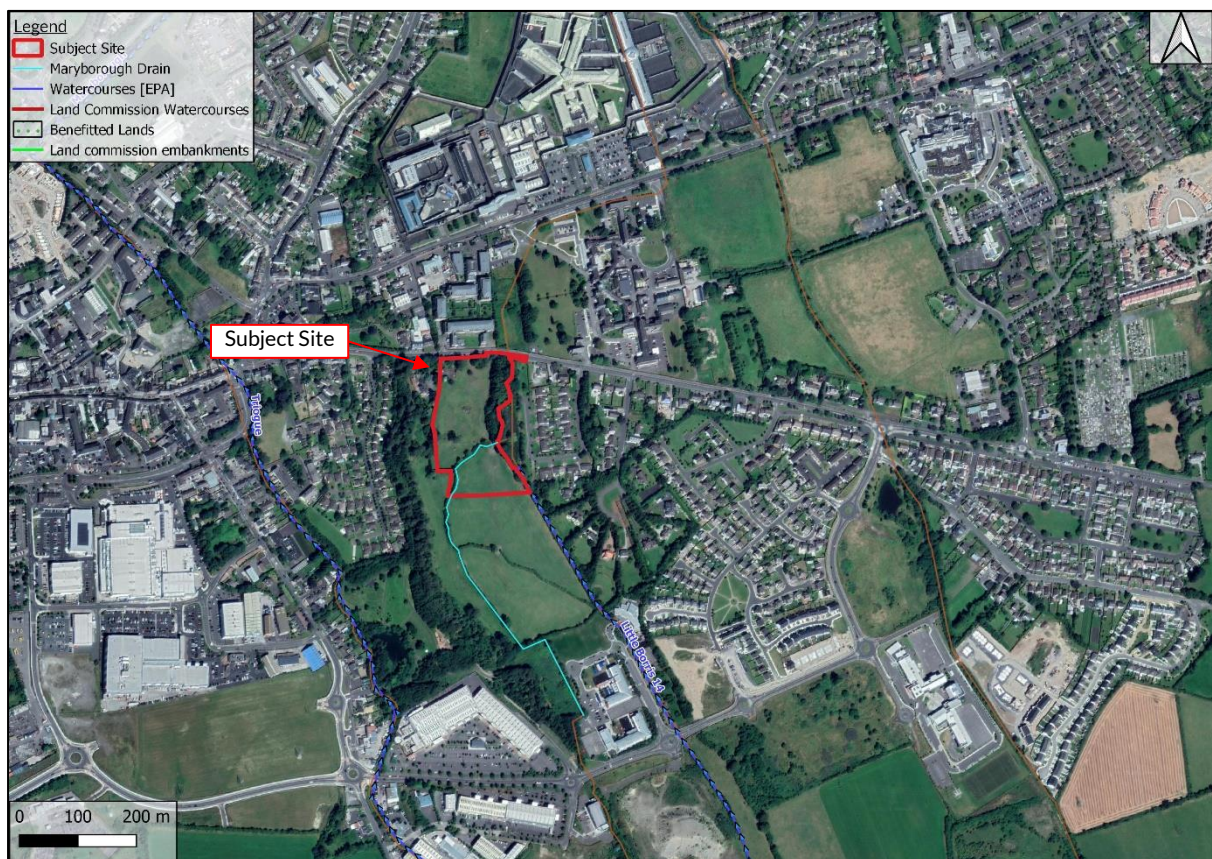


Figure 3-6 OPW Drainage District Scheme

<sup>5</sup> [www.floodinfo.ie](http://www.floodinfo.ie)

### 3.5 GEOLOGICAL SURVEY IRELAND MAPPING

The Geological Survey Ireland (GSI) provides mapping<sup>6</sup> with data related to Ireland’s subsurface. Based on the map shown in Figure 3-7, there are no Karst features in the vicinity of the study area. The closest Karst feature to the subject site is a borehole. This is located approximately 1.8km south-east of the subject site.



Figure 3-7 GSI Mapping of Karst Features

The GSI GW Flood Maps<sup>7</sup> of historic ground water and surface water flooding were also reviewed. These maps did not show any historic groundwater flooding in the vicinity of the study area. There was no historic surface water flooding located in the vicinity of the subject site. The closest reported historic surface water flooding in the vicinity of the subject site is located 1.2km south-west of the subject site.

<sup>6</sup> <https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx>

<sup>7</sup> [Groundwater Flooding Data Viewer \(arcgis.com\)](https://arcgis.com)

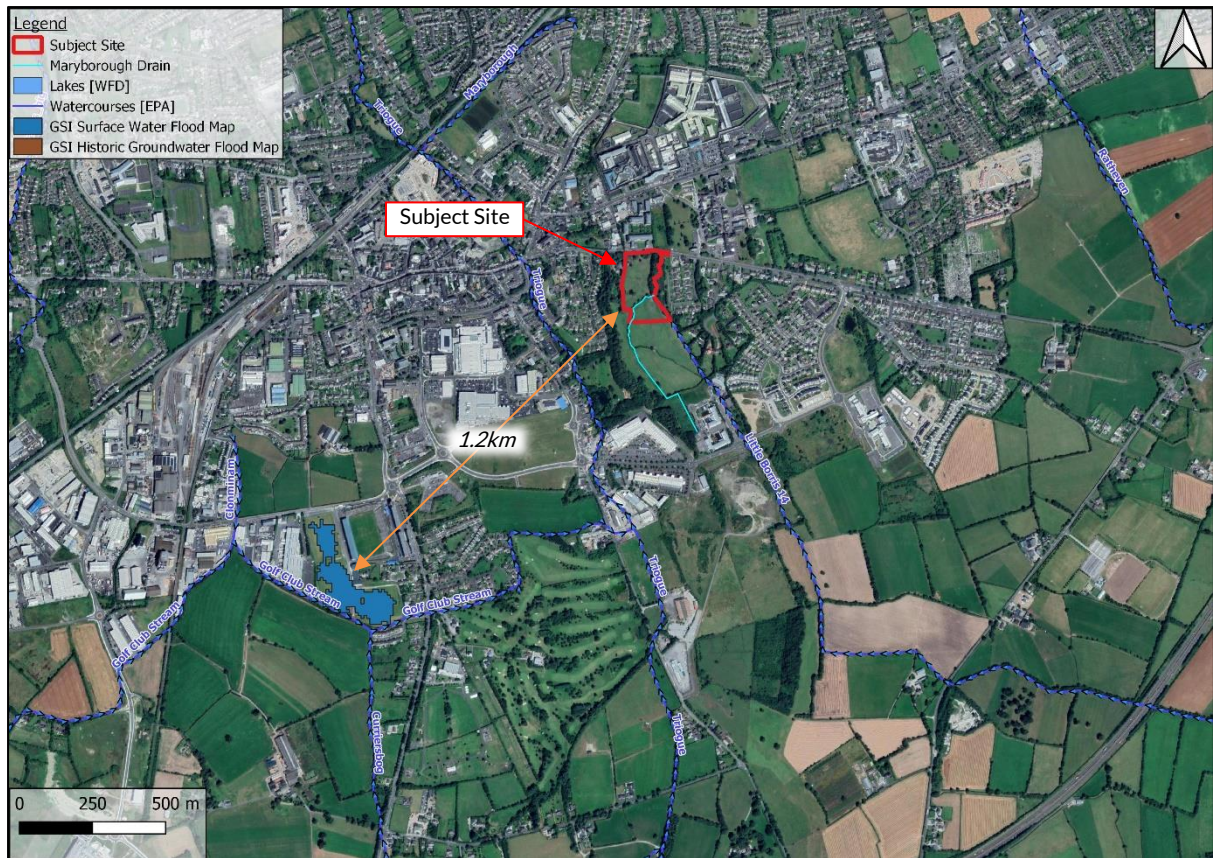


Figure 3-8 GSI Mapping of Historic Groundwater and Surface Water Flood Extents

## 4. HYDRAULIC MODEL

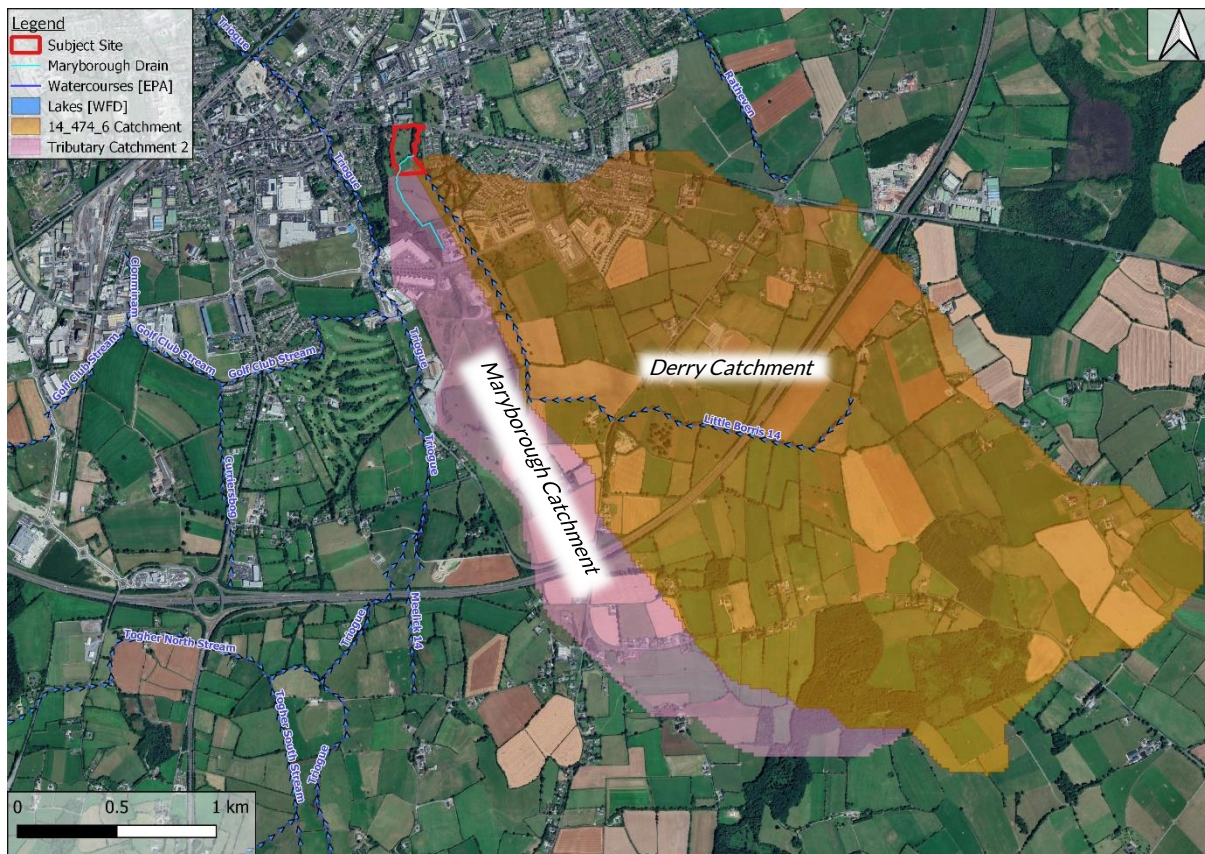
Site-specific hydraulic analysis has been carried out, as part of this report, to quantify the risk of fluvial flooding to the existing site and to perform analysis of any potential increase in flood risk associated with the proposed development.

### 4.1 FLOW ESTIMATION

There were 2 watercourses within the vicinity of the subject site, see Figure 4-1. These watercourses are as follows:

- A. Derry Watercourse
- B. Maryborough Drain

The delineation of these catchments is shown in Figure 4-1 based on the area's topography.



**Figure 4-1 Catchment Delineation**

The 100- and 1,000-year flows in each of the 2 watercourses was therefore estimated based on catchment descriptors, see Table 4.1. Four different methodologies were considered:

- Flood Studies Update (FSU) method
- The Centre for Ecology and Hydrology Flood Estimation Handbook (FEH) method
- The Institute of Hydrology Report No. 124 (IH124) method
- The Modified Rational Method (MRM)

Table 4.1 Summary of Catchment Descriptors

Descriptor	Units	Value	Value	Source
Location reference	-	A	B	TOBIN
Watercourse	-	<b>Derry Watercourse</b>	<b>Maryborough Drain</b>	OSI/(EPA)/[OPW]
Catchment	-	14_474_6	14_474_6	EPA
Catchment Area	km <sup>2</sup>	4.68	1.75	FSU/TOBIN
FSU	-	YES	NO	
FEH	-	YES	YES	
IH124	-	YES	YES	
MRM	-	NO	YES	
BFISOIL	-	0.6773	0.6773	FSU
SAAR	mm	859	859	FSU/MET
FARL	-	1	1	FSU
DRAIND	km/km <sup>2</sup>	0.458	0.458	FSU
S1085	m/km	4.670	4.670	FSU/DEM
ARTDRAIN2	-	0	0	FSU
URBEXT	-	0.0213	0.0213	FSU
S1		0	0	WRAP
S2		1	1	WRAP
S3		0	0	WRAP
S4		0	0	WRAP
S5		0	0	WRAP
i10	mm/hr	18.20	18.20	MET
i100	mm/hr	30.70	30.70	MET
i1000	mm/hr	46.94	46.94	MET
CWI	-	118	118	graph
URBAN	fraction	0.01	0.01	user

The largest flows from each methodology were compared for each catchment, and the largest was conservatively adopted as the design flow, see Table 4.2. The flows estimated as part of this report were more conservative than the flows modelled as part of the CFRAM Study.

**Table 4.2 Estimated Flows**

Descriptor	Units	Value	Value
Watercourse	-	<b>Derry Watercourse</b>	<b>Maryborough Drain</b>
Method adopted	-	FEH	FEH
10-year Flow	m <sup>3</sup> /s	1.44	0.62
100-year Flow	m <sup>3</sup> /s	2.78	0.94
1,000-year Flow	m <sup>3</sup> /s	2.89	1.25
100-year MRFS Flow	m <sup>3</sup> /s	3.34	1.13
1,000-year MRFS Flow	m <sup>3</sup> /s	3.47	1.50



## 4.2 HYDRAULIC MODEL CONSTRUCTION

A 1D-2D site-specific hydraulic model of the site area was developed using the latest version (6.0) of Jacob's Flood Modeller software. Flood Modeller is designed to perform one-dimensional and two-dimensional hydraulic calculations for a full network of natural and constructed channels. The three primary inputs into the Flood Modeller model are summarised below:

- Geometric Data: Cross-sectional survey of watercourse and culverts
- Inflow Data: 100- and 1,000-year design flows, with and without climate change
- Boundary Data: Normal depth downstream boundary

A cross sectional survey of watercourses, bridges, and culverts in the vicinity of the subject site was carried out as part of the CFRAM study. This was supplemented with high-resolution LiDAR terrain data, along with the site Topographical Survey to create a ground model of the streams and surrounding floodplain.

A 1D / 2D model was constructed to cater for the overland flow pathways which exist between the Derry Watercourse and Maryborough Drain (Figure 4-2). The slope of the downstream Midlands Prison Culvert was used as the Normal Depth Boundary Condition, given the size and length of the receiving culvert.

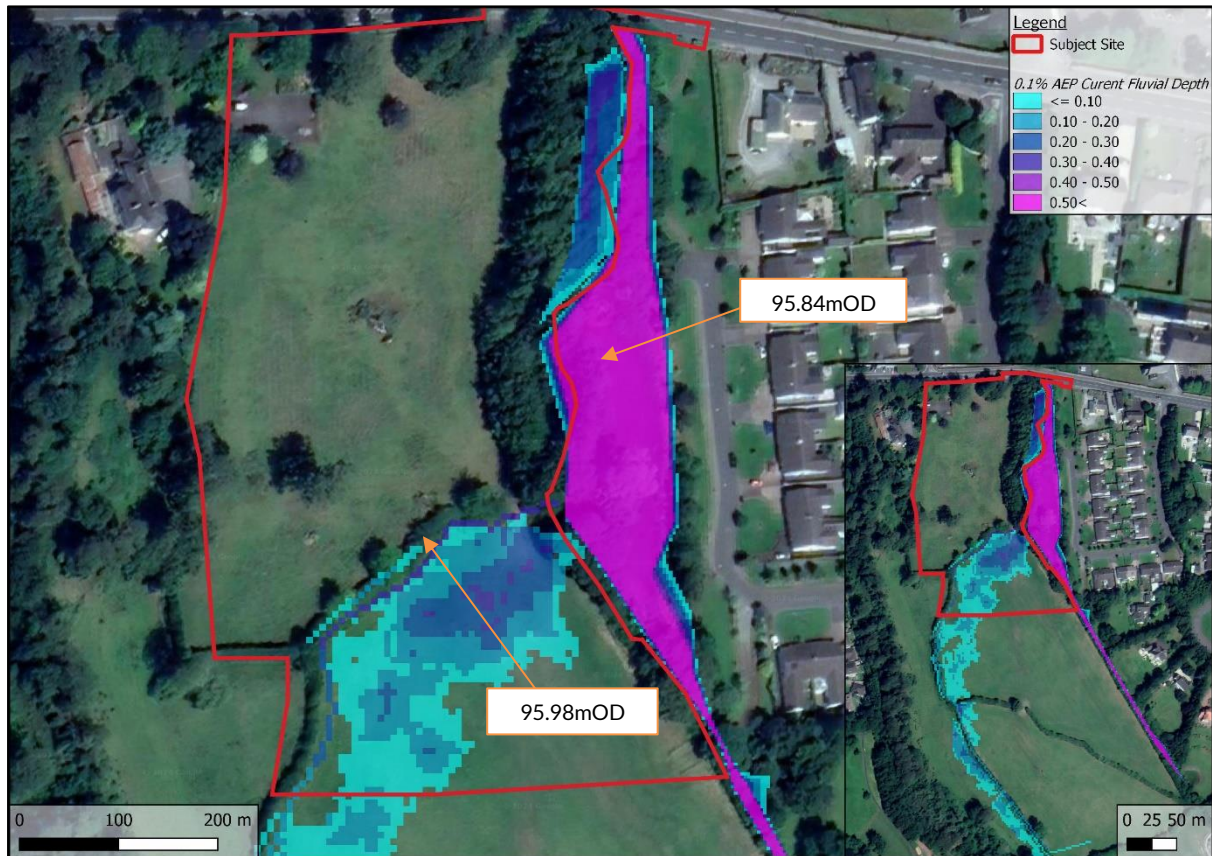
The model was used to run unsteady flow scenarios for the 100- and 1,000-year flood extents, with and without allowances for climate change. These events were simulated over a 2-day duration with 3 second computational timesteps. The results of the hydraulic modelling are given in Section 4.3.



Figure 4-2 Flood Modeller model configuration

### 4.3 HYDRAULIC MODEL RESULTS

Figure 4-3 shows the predicted 0.1% AEP (1000-yr) flood depths in the vicinity of the subject site. Based on these results of the model, it is estimated that the proposed residential development (subject of this FRA) is not at risk from predicted fluvial flooding in a current event. Flood levels are estimated to be 95.98mOD at the southern end of the site, and 95.84mOD adjacent to the Lake / Pond.



**Figure 4-3 Predicted Flood Depth at Existing Site [1,000- year event without climate change]**

In accordance with the Climate Change Sectorial Adaption Plan, the proposed development was assessed against a Mid-Range-Future-Scenario (MRFS) which includes a 20% increase in flow.

Figure 4-4 shows the 1,000-year MRFS flood extents estimated in the vicinity of the subject site using the hydraulic model. Flood levels are estimated to be 96.09mOD at the southern end of the site, and 95.92mOD adjacent to the Lake / Pond.

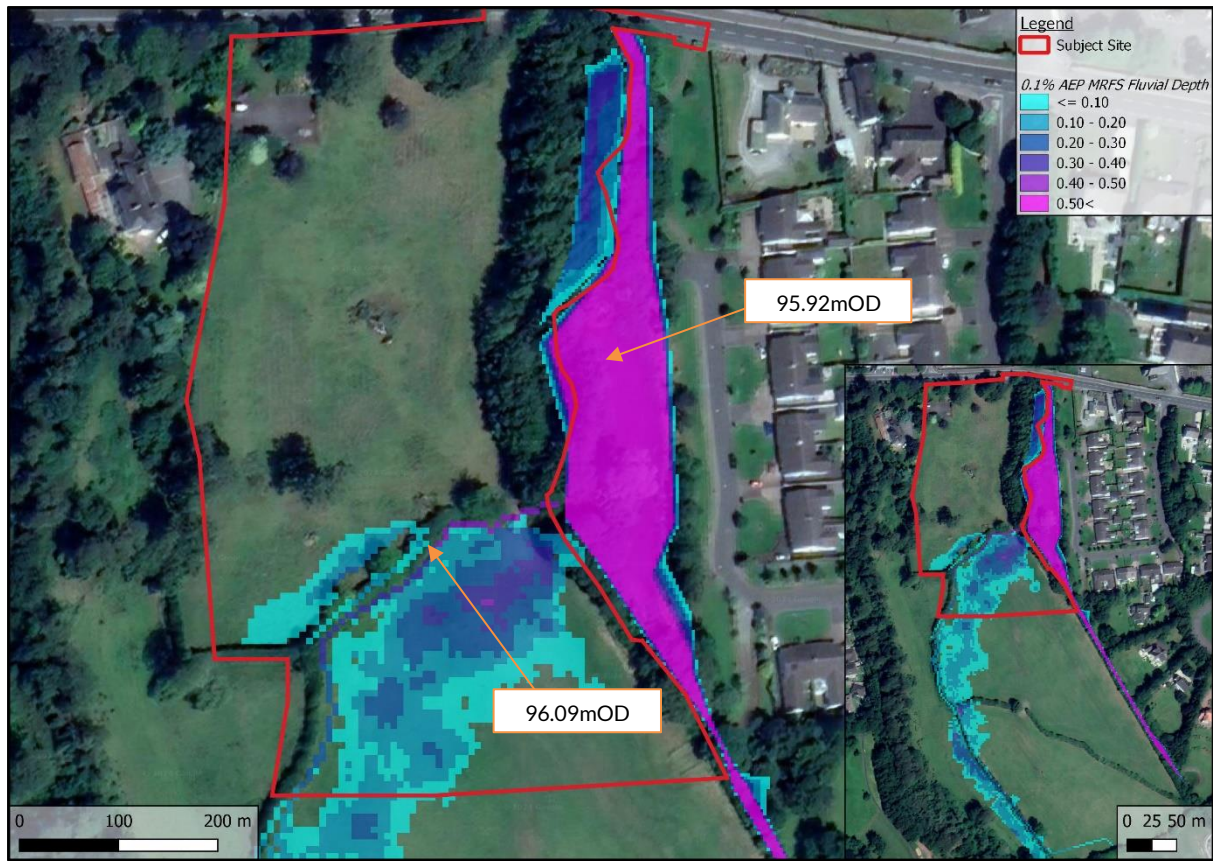


Figure 4-4 Predicted Flood Depths at Existing Site [1,000- year MRFS]

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## 5. DETAILED FLOOD RISK ASSESSMENT

### 5.1 FLUVIAL FLOODING

The Derry Watercourse and Maryborough Drain were modelled by the CFRAM studies, however, to fully understand the extent of flooding at the subject site and the impact of the proposed development, a site-specific hydraulic model was prepared for the subject site. The site-specific hydraulic model showed that the subject site is not predicted to be liable to flooding during the 1 in 1,000-year MRFS flood event.

A culvert capacity check was carried out using both Flood Modeller and CulvertMaster software. A review of the model showed that the culvert under the Midlands Prison have sufficient flows from the Cregg Stream. This is considerably less than the calculated 1 in 1,000-year flows in the Derry Watercourse.

Residential developments are defined as highly vulnerable in terms of their sensitivity to flooding and must be designed to be above the 1 in 1,000-year MRFS flood event. Flood levels are estimated to be approximately 96.09mOD at the southern end of the site, 95.92mOD adjacent to the Lake / Pond and 95.86mOD immediately upstream of the Midlands Prison Culvert in the 0.1% AEP MRFS event.

**All FFL are agreed to be at 96.95mOD or above** throughout the entire subject site. The highest recorded Flood level at the site is 96.09mOD, this will ensure dwellings are provided with a freeboard of at least 0.86m. These raised floor levels will ensure that a sequential approach is taken and that no residential properties are located within the flood zone. It is anticipated that the fluvial flood risk to the proposed development is minimal, with minimal pre work floodwater encroachment predicted at the subject site. Given the development proposes to raise ground levels at the southern and eastern ends of the subject site, adjacent to the Maryborough Drain and Derry Watercourse, it is **estimated that approximately 376.1m<sup>3</sup> of compensation storage will be required at the subject site** to ensure no impact to flood risk elsewhere. **400m<sup>3</sup> of compensatory storage is included in the proposed site layout, to the south of the Maryborough drain.**

As per the site layout (Figure 1-2) it is proposed to reroute the Maryborough drain, which is denoted as an arterial drainage channel. Therefore, these works must be consented appropriately through the OPW Section 9 Application process.

### 5.2 PLUVIAL FLOODING

There are no pluvial flood extents identified on the PFRA mapping for the subject site. There are no recorded surface water extents identified on the GSI surface water mapping.

A review of the subject site's topography was conducted to identify if there was any localised depression within the subject site where rainwater might pond. Ground levels within the subject site range from 95.55mOD along the southern boundary of the subject site to 100.04mOD along the northern boundary of the subject site. There was a localised depression located adjacent to the eastern boundary of the subject site. Ground levels in this area are approximately 1m lowered than the adjacent area. The proposed development will see the

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ground levels of the subject site to become uniform and it will remove this depression. Therefore, it removes the risk of ponding in this area.

Surface water arising at the subject site will be managed by a dedicated stormwater drainage system designed in accordance with Sustainable Drainage Systems (SuDS) principles, limiting discharge from the site to greenfield runoff rates.

### 5.3 GROUNDWATER FLOODING

Based on Geological Survey Ireland (GSI) subsurface mapping, there is no evidence of groundwater flooding at the proposed site.

### 5.4 COASTAL FLOODING

The subject site is located approximately 85km inland. The closest ICPSS node to the subject site is located approximately 90km east of the subject site. The modelled 1 in 1,000-year water level at this node (Node Name: Point 12) is 2.48mOD.<sup>8</sup>

### 5.5 THE JUSTIFICATION TEST

The PSFRM Guidelines classify residential developments as “highly vulnerable”, in terms of sensitivity to flooding. Such developments are considered appropriate in Flood Zone C—where there is less than a 0.1% Annual Exceedance Probability (AEP) of flooding.

As shown in Figure 5 1, all proposed residential dwellings and access roads are appropriately located within Flood Zone C. The Justification Test therefore does not apply.

The site has been assessed against the criteria of the Justification Test:

1. The site is zoned for residential development.
2. The development has been subjected a Flood Risk Assessment (this report).
  - i. The proposed development will include a dedicated stormwater drainage system in accordance with SuDS, limiting discharge from the site to greenfield runoff rates.

Given **376.1m<sup>3</sup> of compensation storage is incorporated appropriately into the proposed site** layout, the proposed development is not predicted to impact floodplain storage or flood risk elsewhere.
  - ii. Based on site specific hydraulic modelling, proposed finished floor levels of sensitive elements (dwellings) within the development will have at least **410mm freeboard above the 1000-year flood level, including considerations for climate change.**

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<sup>8</sup> South East Coast Flood Extent Map – Map No.: SE / RA / EXT / 6  
[09c7edd5dc8244fba2fed0ab62b039a7.pdf \(www.gov.ie\)](https://www.gov.ie/publications-and-statistics/publications/09c7edd5dc8244fba2fed0ab62b039a7.pdf)

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The proposed topography of the site provides safe exceedance flow paths and prevents surface water ponding to minimise residual risks associated with an extreme flood event or a scenario where the stormwater drainage system becomes blocked.

It is estimated that the mitigation measures included as part of the proposed development will minimise flood risk to people, property, the economy, and the environment.

- iii. Based on the results of this FRA, the proposed site access route is not considered liable to fluvial flooding and access to the site can be maintained during an extreme flood event. Raising of site levels to a minimum of 96.5mOD as per the proposed site layout is predicted to effectively raise the site out of the 0.1% AEP floodplain. On this basis it is assumed that residual risks to the site and to the proposed development during an extreme flood event can be managed to an acceptable level.
- iv. The proposed residential development is compatible with the wider planning objectives of the area, which promote sustainable growth and development.

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## 6. CONCLUSIONS

TOBIN Consulting Engineers were appointed by Laois County Council in August 2023 to undertake a Flood Risk Assessment (FRA) for a proposed residential development at Tyrrells Land, Portlaoise, Co. Laois.

The Planning System and Flood Risk Management Guidelines state that residential developments are appropriate within Flood Zone C, i.e., not liable to flooding during a 1-in-1,000-year event.

### Fluvial Flooding

To fully understand the extent of flooding at the subject site a site-specific hydraulic model was prepared for the subject site. The site-specific hydraulic model showed that portions of the subject site are predicted to be liable to flooding during the 1 in 1,000-year MRFS flood event. Residential developments are defined as highly vulnerable in terms of their sensitivity to flooding and should be located in Flood Zone C.

If the proposed development is designed to a minimum FFL of **96.4mOD**, and the sequential approach is taken by locating residential units outside the flood zone, it is anticipated that the fluvial flood risk to the proposed development is minimal, with minimal pre work floodwater encroachment predicted at the subject site.

However, the proposed site layout proposes residential buildings within the predicted flood zone. As such, the site has been assessed against the criteria of the Justification Test.

The minimum FFL of the dwellings across the subject site **is agreed to be at minimum 96.95mOD**. This agreed FFL will effectively raise the site out of the 0.1% AEP floodplain, providing a freeboard of 0.86m. On this basis it is assumed that residual risks to the site and to the proposed development during an extreme flood event can be managed to an acceptable level. **It is estimated that a minimum of 376.1m<sup>3</sup> of compensation storage will be required to ensure no impact to flood risk elsewhere. 400m<sup>3</sup> of compensatory storage is included in the proposed site layout, to the south of the Maryborough drain.**

As per the site layout (Figure 1-2) it is proposed to reroute the Maryborough drain, which is denoted as an arterial drainage channel. Therefore, these works must be consented appropriately through the OPW Section 9 Application process.

### Pluvial Flooding

There is no evidence to suggest that the subject site is at risk of pluvial flooding. There is one localised depression located within the subject site. However, this area will be removed as part of the proposed development.

### Groundwater Flooding

There is no evidence to suggest groundwater as a potential source of flood risk to the subject site.

### Coastal Flooding

The site is not at risk of coastal flooding due to its distance inland from coastal waters.

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## Appendix A SITE LAYOUT AND TOPOGRAPHICAL SURVEY





**GENERAL LEGEND**

- PROPOSED SITE BOUNDARY
- 0.4% EXISTING SPOT LEVEL & ELEVATION
- PROPOSED ROAD CENTRELINE
- R2-20m PROPOSED ROAD CHANGE & LEVEL
- +10.800m
- 1:40 PROPOSED ROAD GRADIENT & FALL DIRECTION
- + FFL 00.000m PROPOSED FINISHED FLOOR LEVEL
- + EXT. 00.000m EXISTING LEVEL
- + 00.000m PROPOSED SPOT LEVEL
- EXISTING BUILDING
- PROPOSED BUILDING
- 01 PROPOSED UNIT NUMBER
- ▲ PROPOSED ENTRANCE ARROW
- PROPOSED RETAINING WALL H=1.50m
- PROPOSED RETAINING WALL H=1.00m
- PROPOSED RETAINING WALL H=0.50m



QUALITY  
STANDARD

**ENGINEERS  
IRELAND**

cpd ACCREDITED COMPANY

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- NOTES:**
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT PROJECTS, SERVICE ENGINEERS DRAWINGS & SPECIFICATIONS.
  2. ALL LEVELS ARE STRUCTURAL UNLESS NOTED OTHERWISE.
  3. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT BUILDING REGULATIONS.
  4. DO NOT SCALE - WORK TO FIGURE DIMENSIONS ONLY.

Rev.	Date	Issue Register	Description	Drawn/Checked/Approved
PL1	01.03.24		PLANNING ISSUE	GO TO MP

**PLANNING**

**PROPOSED SITE LAYOUT**

Date:	28.02.24	Scale:	1:500 @ A1 / 1:1000 @ A3
Drawn By:	M.TOLEDO	Checked By:	T.DELANEY
Approved By:	N.PATTERSON		

LAOIS COUNTY COUNCIL

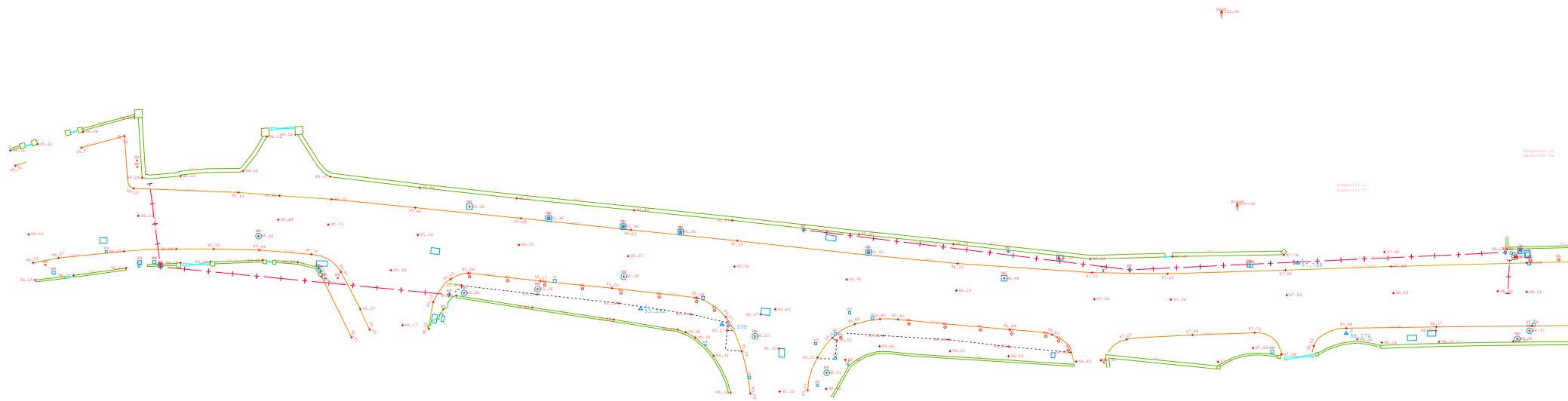
PROPOSED HOUSING DEVELOPMENT TYRRELLS LAND, PORTLAOISE, CO. LAOIS			
Project No:	23KK001	Drawing No:	C-002
			PL1

Hayes Higgins  
Partnership

Geo House Lane, Kilkenny.

051 79414    051 71022    051 71023    051 71024    051 71025    051 71026    051 71027    051 71028    051 71029    051 71030

**PROPOSED SITE LAYOUT**  
SCALE 1:500 @ A1 / 1:1000 @ A3



# LENMAR

Collinstown Business Park  
 Cloughran, Co. Dublin.  
 Tel: (086) 812 1988  
 (086) 820 9828  
 Fax: (01) 842 8401  
 E-mail: donal@lenmargroup.com

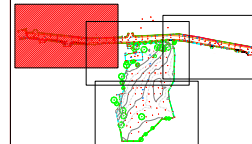
**LEGEND:**


**REVISIONS:**

No.	ISSUE	DATE

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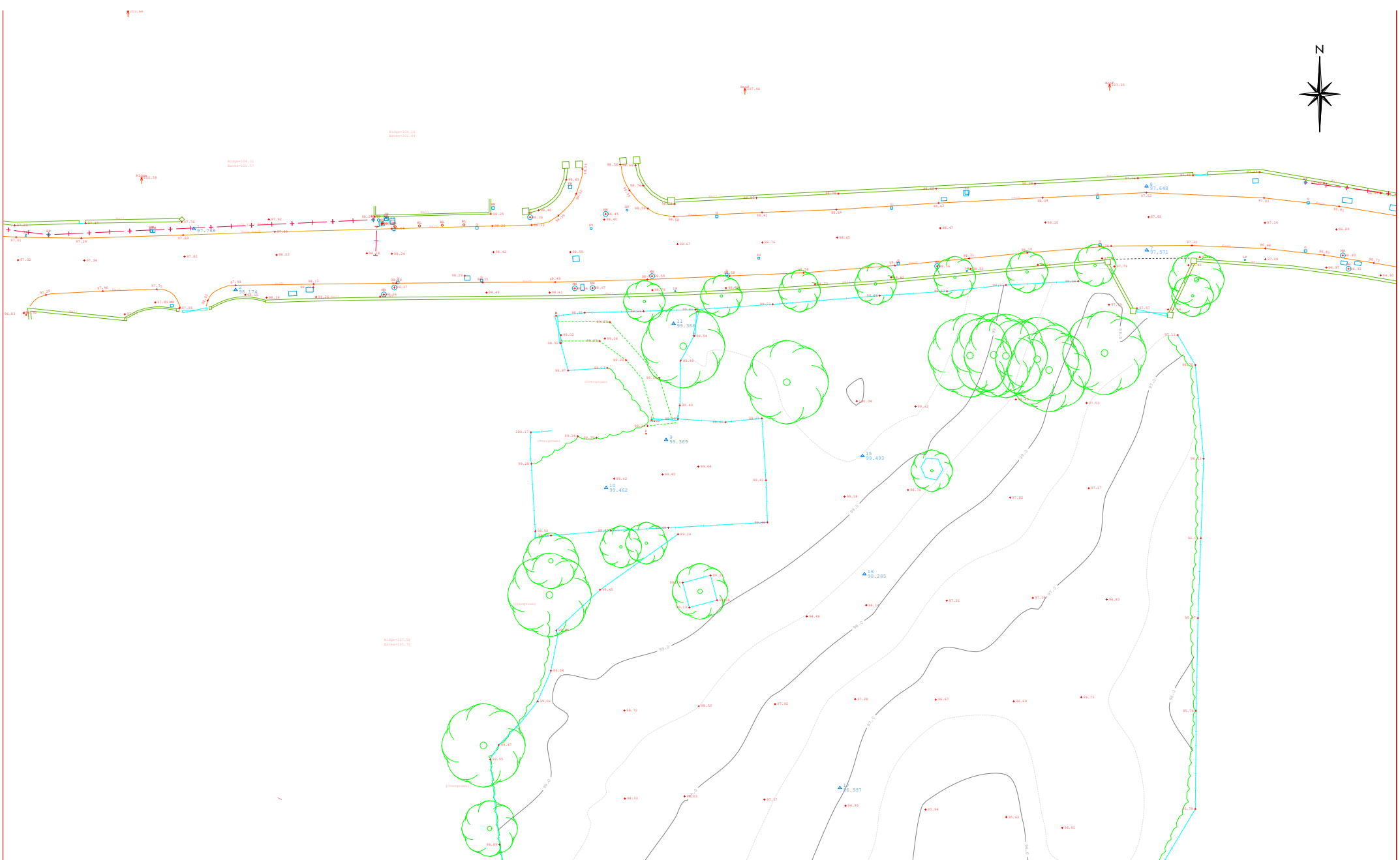
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2. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
3. ANY DISCREPANCIES IN THE SURVEY SHOULD BE REPORTED TO LENMAR IMMEDIATELY.
4. DO NOT SCALE. THIS SHALL ONLY BE PERMITTED IN DIGITAL FORM.
5. GRID IS 20m X 20m



CLIENT:  
 LAOIS COUNTY COUNCIL  
 C/O VAN DIJK ARCHITECTS  
 SITE:  
 TIRRELL'S LAND - PORTLAOISE

SCALE: 1/250 A1

DRG No. L\_01538\_1\_TP      DATE: AUG 2023  
 SURVEYED BY: C.C.



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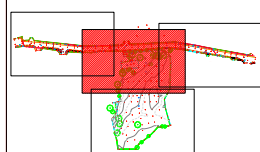
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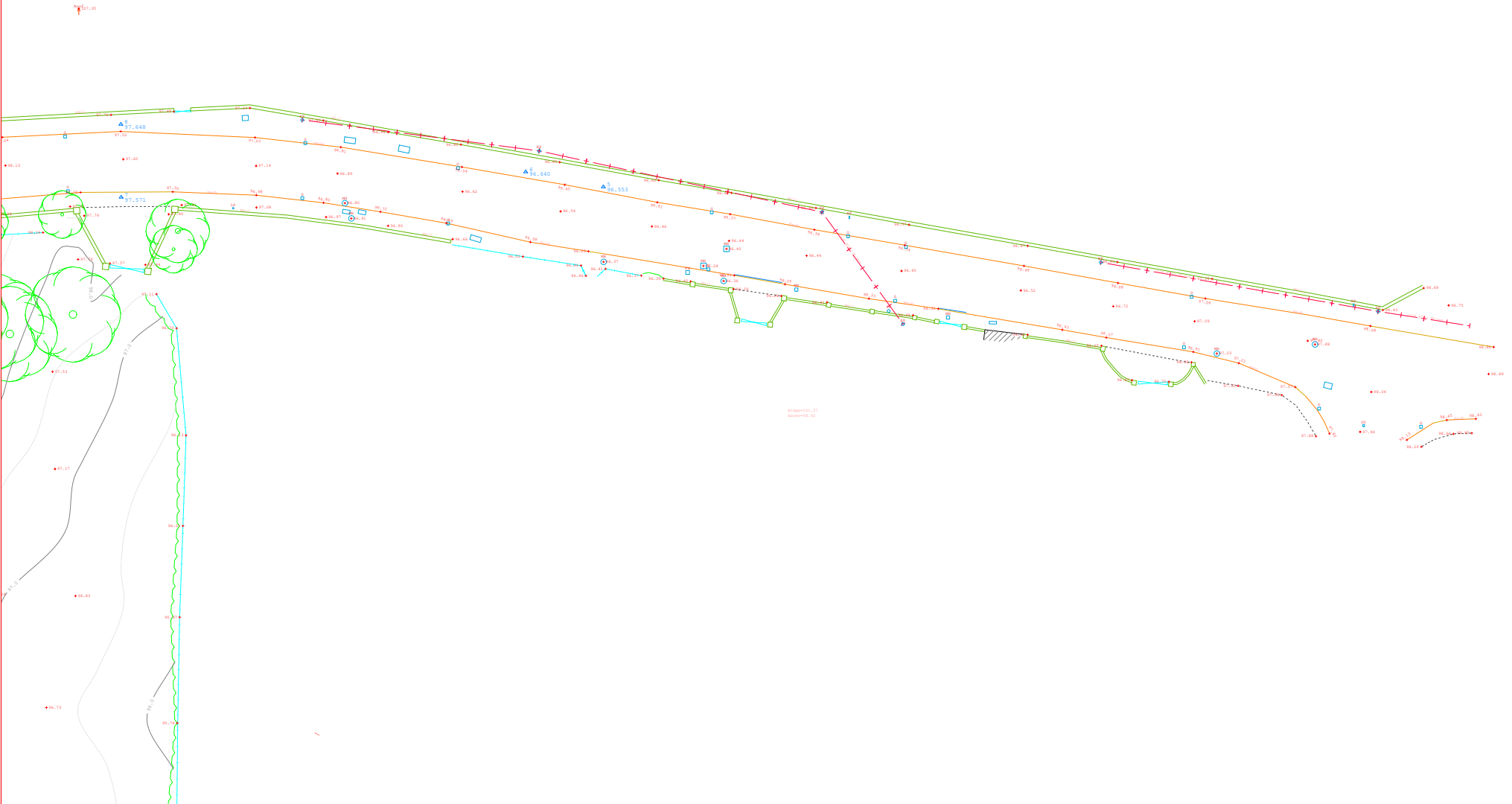
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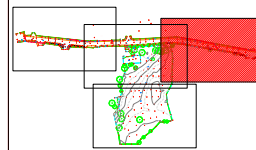
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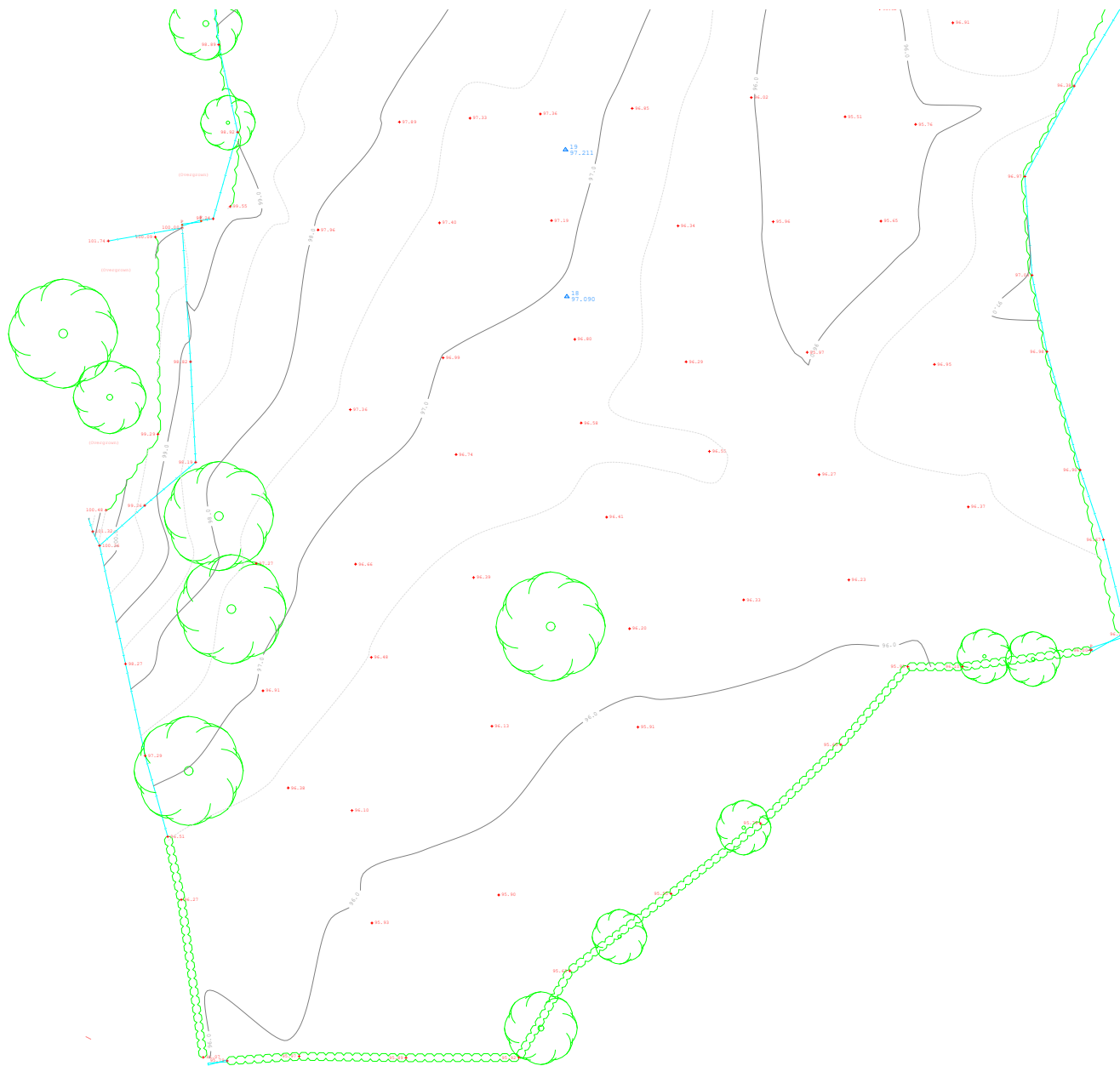


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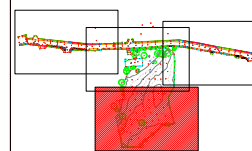
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