Marlfield Lake Flood Relief Scheme

1. Scheme Introduction

Comhairle Contae Thiobraid Árann
Tipperary County Council

OPW Oifig na nOibreacha Poiblí Office of Public Works

NICHOLAS O'DWYER an RSK company

Nicholas O'Dwyer Limited (NOD) has been commissioned to carry out the Marlfield Lake Flood Relief Scheme (FRS) by Tipperary County Council, working in partnership with the Office Public Works (OPW).

The overall objectives of this project are to improve the resilience of Marlfield Dam, and the identification, design, and submission (for planning consent) of a Flood Relief Scheme that is technically, socially, environmentally, and economically acceptable, to alleviate the risk of flooding to the community of Marlfield.

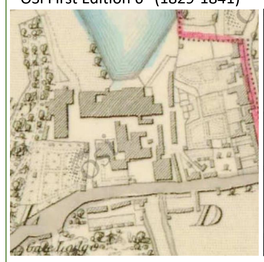
LOCATION

The study area for the Marlfield Flood Alleviation Works is shown by the red line in the top right image above.

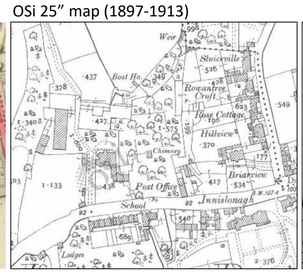
Marlfield Lake is a freshwater, artificial lake covering an area of approximately 56,000m^2 (5.6 ha) and with an upstream surface catchment of approximately 19 km^2.

HISTORY

OSi First Edition 6" (1829-1841)



OSi 25" map (1897-1913)



OSi current vector map

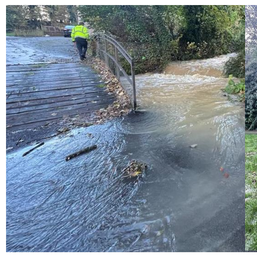
The lake was created by damming the stream to run mill machinery in the mid-1700's.

The mill was recorded as being built in 1769, becoming a distillery from 1817, until closure around 1857.

Marlfield house estate used a hydroelectric turbine on one sluice outlet to power the house.

Two hydraulic ram pumps provided water supply from the lake for the locality in the past.

FLOOD HISTORY



Flooding has occurred on several occasions in the recent past causing significant damage.

Flooding is reported to have occurred in Marlfield on dates including:

- 19th & 20th November 2009
- 14th November 2014
- 29th December- 2nd January 2013/2014

Marlfield Lake
Flood Relief Scheme

2. Environment

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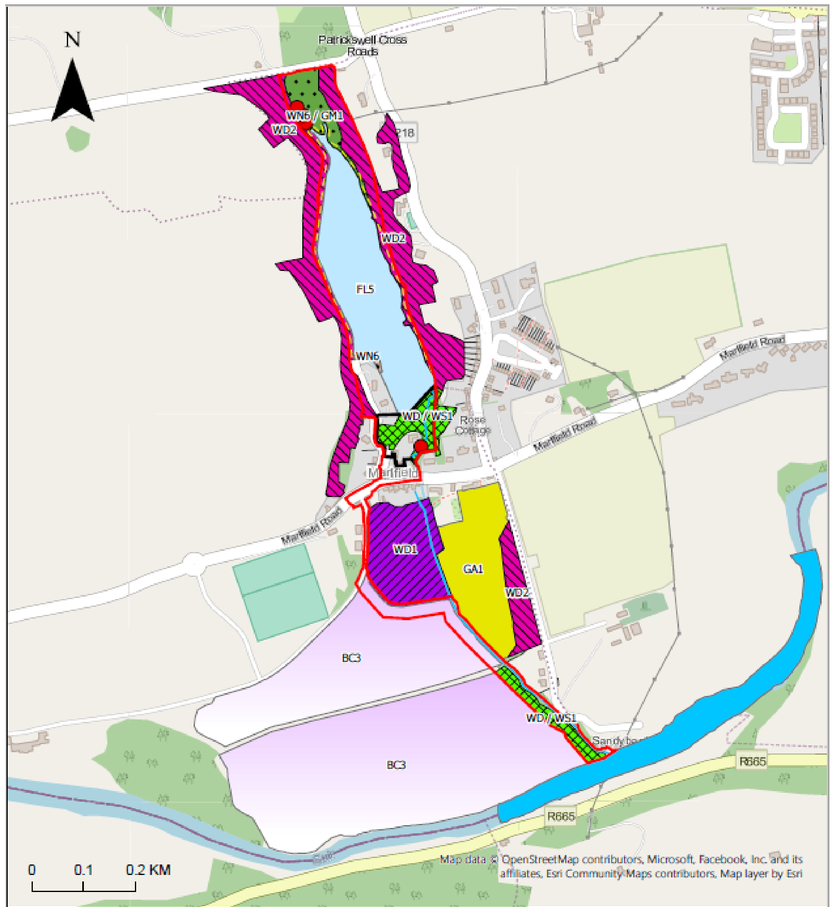
Baseline environmental data was collected to inform the assessments. The following surveys and assessments have been carried out to date:

Preliminary AA Screening (2018), Winter bird survey (Winter 2020), Baseline ecological survey, Freshwater Crayfish survey, Breeding Bird survey (Summer 2021),

Bat survey (Summer 2021), Archaeological and Built Heritage assessment (August 2021), and Arboriculture Assessment & Impact (August 2021)

HABITATS MAP

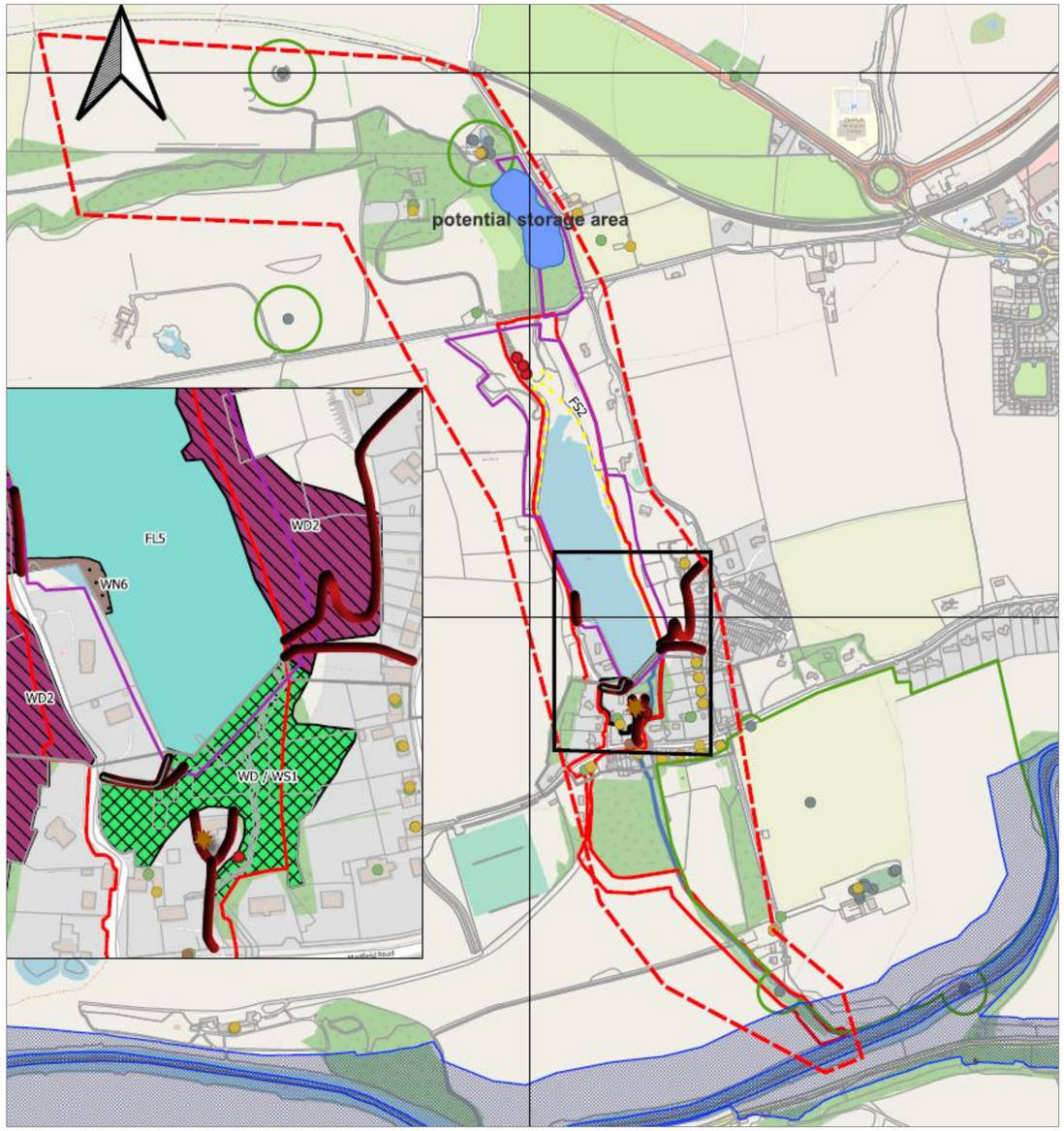


Marlfield Baseline Surveys Habitat Map

Symbol	Habitat Code and Description	Symbol	Habitat Code and Description
	FL5 - Eutrophic Lakes		BC3 - Tilled Land
	WD / WS1 - Mixed Woodland / Scrub		River
	WD1 - Mixed broad-leaved woodland		Japanese Knotweed
	WD2 - Mixed broad-leaved and conifer woodland		Tall herb swamp
	WN6 - Wet willow-alder-ash woodland		River
	WN6 / GM1 - Wet willow-alder-ash woodland / Freshwater marsh		Study Area
	GA1 - Improved agricultural grassland		Baseline Survey

EirEco Environmental Consultants | Nicholas O'Dwyer Ltd

ENVIRONMENTAL CONSTRAINTS MAP



Legend:

- Extended scheme area
- potential_upstream_storage
- proposed access points
- SPA_ITM_2019_06
- SAC_ITM_2019_06
- pNHA_ITM_2015_11
- NHA_ITM_2019_06
- SMRZONE
- Register_of_Protected_Structures
- Proposed_Register_of_Protected_Structures
- Significant bat roost
- NIAH_Sites
- National_Monuments
- Architectural_Conservation_Areas
- Japanese Knotweed

Habitat Line

- FS2 - Tall herb swamp
- River
- Baseline Survey
- Basemap

Habitat Area

- BC3 - Tilled Land
- FL5 - Eutrophic Lakes
- GA1 - Improved agricultural grassland
- WD / WS1 - Mixed woodland / Scrub
- WD1 - Mixed broad-leaved woodland
- WD2 - Mixed broad-leaved and conifer woodland
- WD2 / WS1 - Mixed Woodland / Scrub
- WN6 - Wet willow-alder-ash woodland
- WN6 / GM1 - Wet willow-alder-ash woodland / Freshwater marsh
- others
- WD / WS1 - Mixed Woodland / Scrub

OpenStreetMap

Marlfield Lake
Flood Relief Scheme

3. Flood Model

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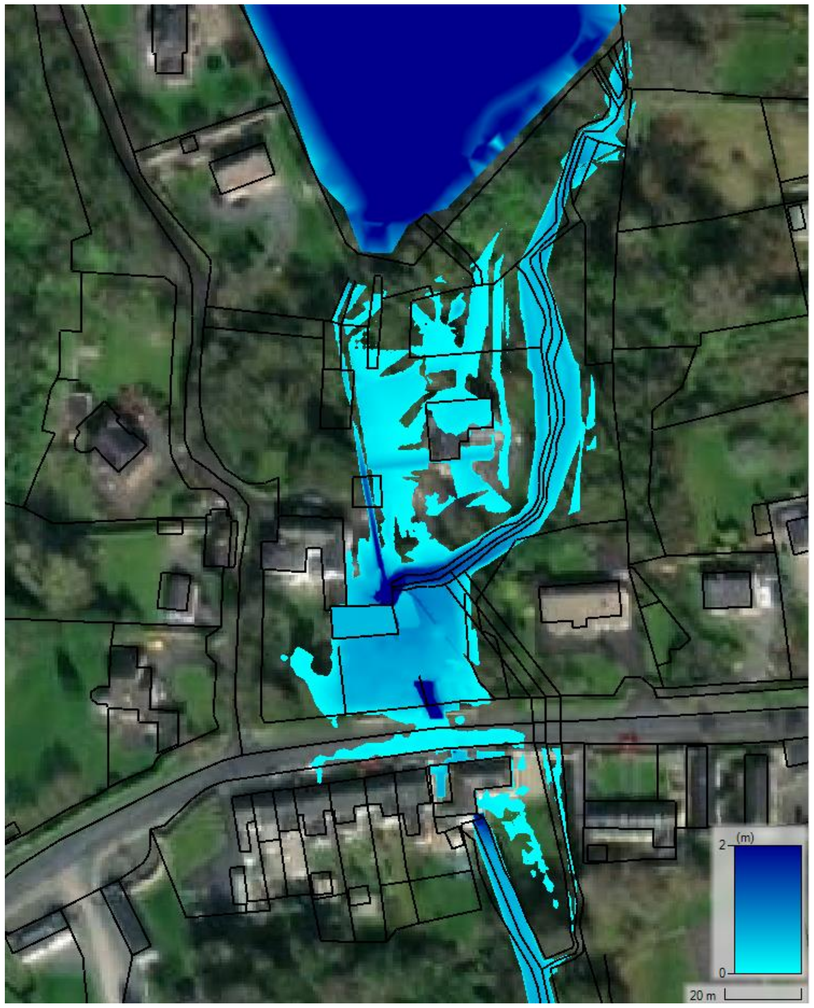
The current situation has been modelled using a two-dimensional computer model.

Flood events are presented in terms of their probability of occurring in any given year (e.g. the 1% AEP event has a 1% or 1 in 100 probability of happening in any year)

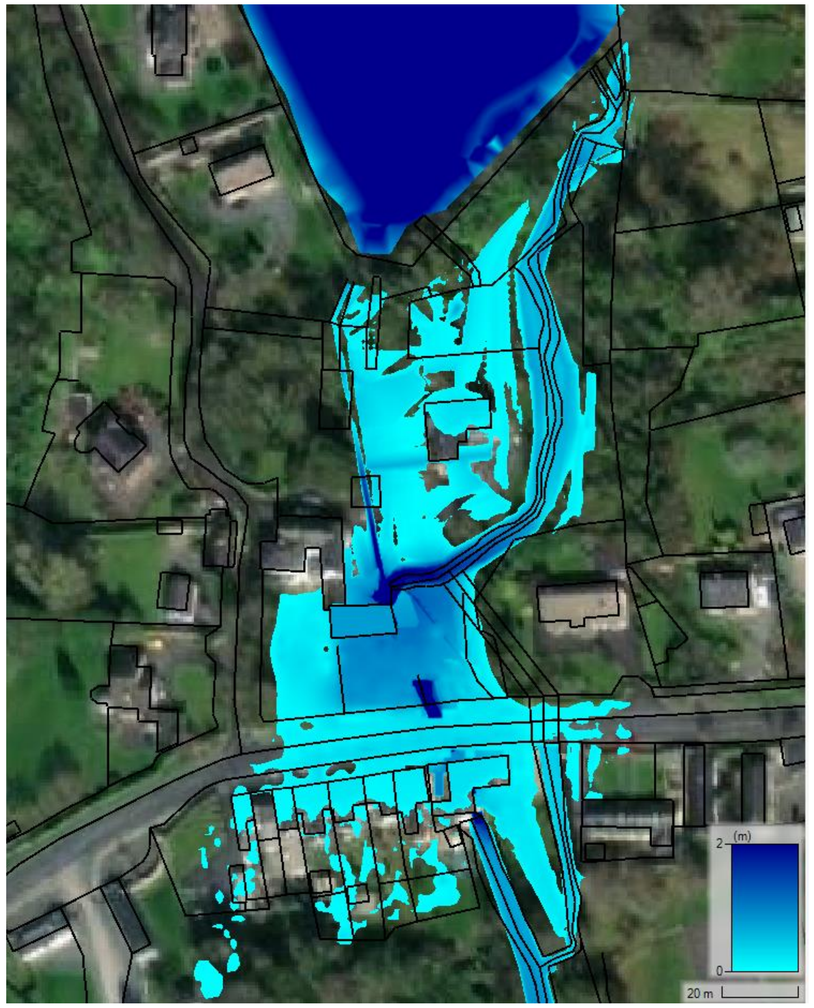
To examine the downstream risk from a failure of the dam, a dam breach analysis model run was also carried out.

MODELLED FLOOD EXTENTS

20% AEP (1 in 5-year Event)



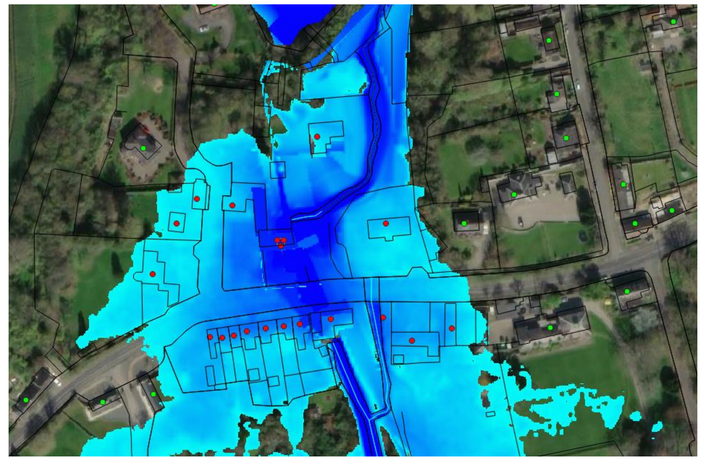
1% AEP (1 in 100-year Event)



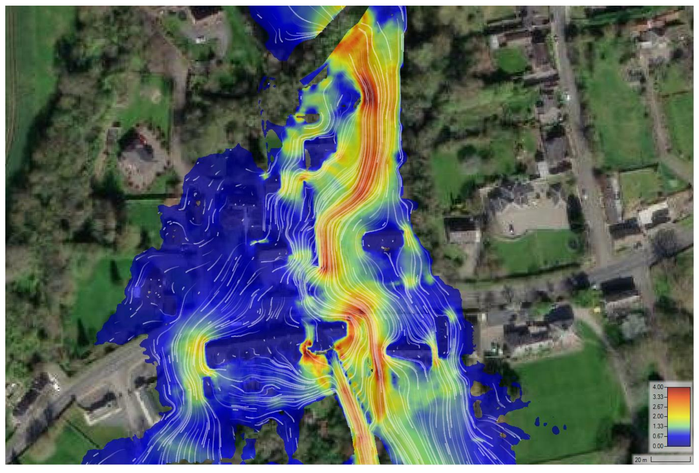
(AEP = Annual Exceedence Probability = chances of a flood of this magnitude or larger occurring in any particular year)

DAM BREACH - MODELLED FLOOD EXTENTS

Flow Depth (0-2m)



Flow Velocity (0-4m/s)



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4. Measures Screening

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An initial screening was carried out of an extensive set of flood relief measures.

Options were developed and the options were assessed based on their effectiveness at improving dam safety and mitigating flooding.

Environmental and technical considerations were screened for obvious “showstoppers”.

Feedback from this consultation process will also feed into the selection of a preferred option.

PRELIMINARY SCREENING

A preliminary screening was carried out to identify the objective targets of the Flood Relief Scheme

Dam

- **Reduce the water level in the lake** by at least 500mm, OR **Increase the dam crest level**

AND

- **Remove the trees** from the dam and **Protect the toe** of the dam from erosion

Village

- **Reduce the flow** through the village, OR **Increase the conveyance capacity** in the village

TYPES OF MEASURES CONSIDERED

Provision of Upstream Storage

Improvement of Channel Conveyance (e.g. deepening channels, increasing culverts sizes, etc.)

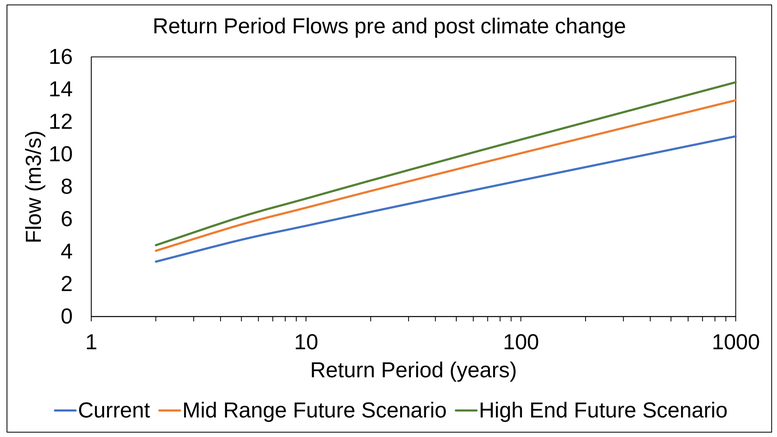
Hard Defenses (e.g. Concrete Walls, Embankments, Barriers)

Flow diversion through new culvert(s) or open channel(s)

Relocation of affected residents

DESIGN CONSIDERATIONS

Climate change



The design needs to be adaptable for future climate change.

Scenario	Return Period					
Current	5y	10y	20y	50y	100y	1000y
	In future could become:					
After MRFS	3y	5y	8y	20y	30y	150y
After HEFS	2.5y	3.5y	6y	15y	20y	80y

Additional design considerations include:

- Impact on environment and amenity value, particularly in the shallow northern half of the lake (typically less than 500mm / 1.5 ft deep)
- Impact on quality and fish passage
- Impacts on the downstream River Suir SAC
- Management of invasive species
- Marlfield village is an Architectural Conservation Area

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Flood Relief Scheme

5. Options 1, 2, 3

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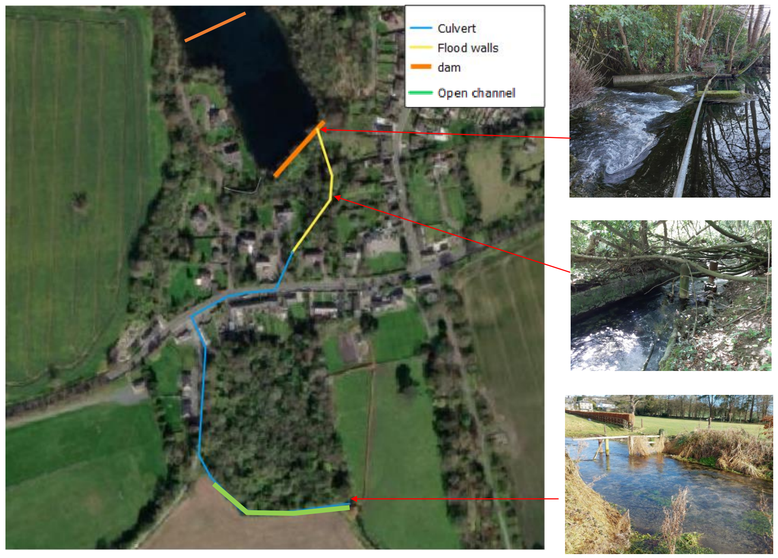
Option 1

Lower the weir and upgrade the existing spillway with walls and a downstream diversion



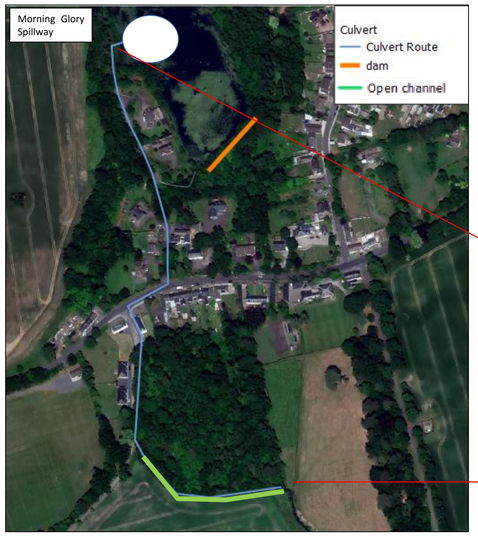
- Lower the existing lake outlet weir
- New mid-lake dam to retain water level in northern part of lake
- Flood walls for approx. 90m along the spillway
- Diversion of the channel into a new culvert approx. 340m long
- Culvert discharges to an open channel approx. 190m long

Potential constraints

- Site access during weir works
- Impact of the flood wall on architectural heritage (Mill ruin)
- Constructability of the new culvert crossing the existing culvert
- Traffic impacts during construction of the culvert
- Works in the downstream channel connected into a SAC (River Suir)

Option 2

Maintaining existing Weir and add diversion culvert on Pond Road



Morning Glory spillway at Vartry Reservoir

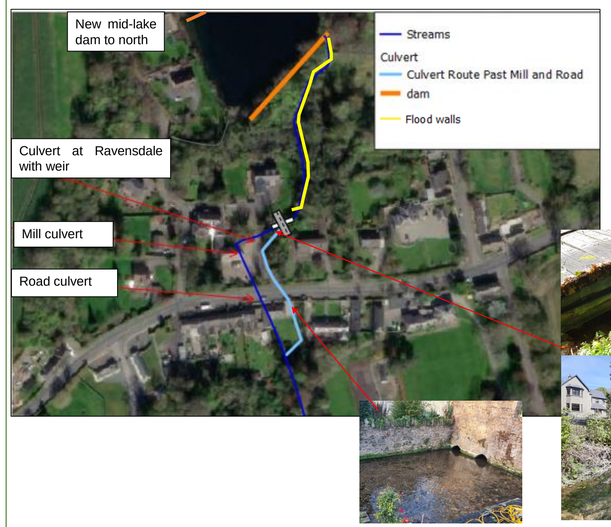
- Maintaining existing lake outlet weir
- Construct a new morning glory type spillway approx. 15m diameter in the lake
- Construct a flow diversion culvert down Pond Road approx. 525m long, discharging into an open channel approx. 190m long

Potential constraints

- Disruption to local community during culvert construction
- Space required for a new weir
- Construction works within the lake
- Works in the downstream channel connected into a SAC (River Suir)

Option 3

Lower Weir and divert 1% AEP flow via new culvert at Mill Apartments downstream of existing road culvert



- Lower the existing lake outlet weir
- Construct a new mid-lake dam to retain water level in northern part of lake
- Flood walls for 90m ca along the spillway
- New weir wall across the river with an opening in the base to allow low flows to follow the existing stream course.
- Diversion culvert approx. 90m long

Potential constraints

- Site access during weir works
- Impact of the flood wall on architectural heritage (Mill ruin)
- Culvert construction in the grounds of residential properties
- Construction of the new dam across the middle of the lake
- Works on a stream connected into a SAC (River Suir)

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6. Options 4, 5

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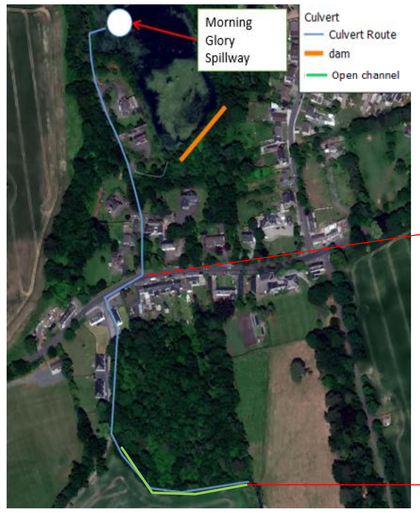
Option 4

Lower part of the weir and add new Overflow with diversion culvert on Pond Road



Morning Glory spillway at Vartry Reservoir

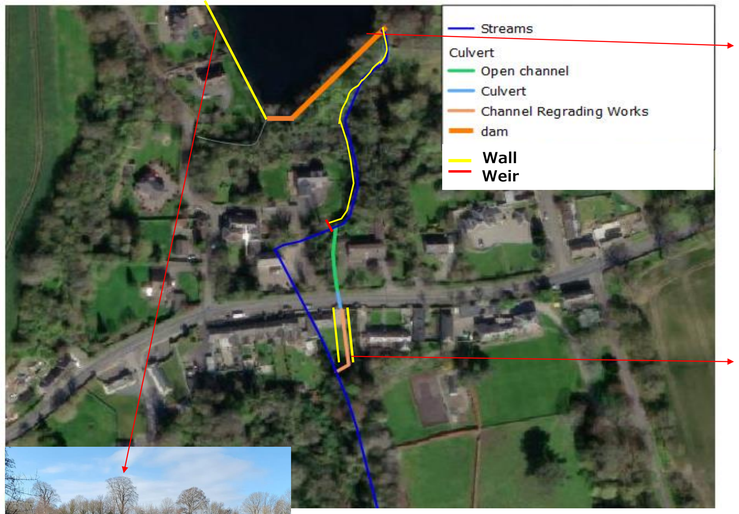
- Lower half of the existing weir
- Construct new morning glory type spillway 5m diameter
- Construct a new dam (approx. 100m long) across the centre of the lake to maintain water level on top half of the lake at current levels
- Construct a flow diversion culvert down Pond Road approx. 525m long, discharging into an open channel approx. 190m long

Potential constraints

- Site access during weir works
- Constructability of the new dam (sheet-pile or embankment)
- Disruption to local community during dam and culvert construction
- Works in the lake required for a new weir
- Works in the downstream channel connected into a SAC (River Suir)

Option 5

Raise dam embankment and divert 1% AEP flow via open channel and culvert



- Raise the existing dam embankment and embankment along the lakeside properties
- Flood wall along the spillway and on the west shore of the lake to protect the properties
- Open diversion channel approx. 40m long
- Diversion culvert approx. 10m long
- Regrading works to deepen the existing 40m long channel and provide retaining walls to increase conveyance

Potential constraints

- Site access during construction of dam and flood walls
- Requires stability assessment of the dam with increased embankment
- Impact of the flood wall on architectural heritage (Mill ruin)
- Permanent constructions at residential properties on both side of the road
- Works in the stream connected into a SAC (River Suir)

Marlfield Lake
Flood Relief Scheme

7. Non-viable Options Considered

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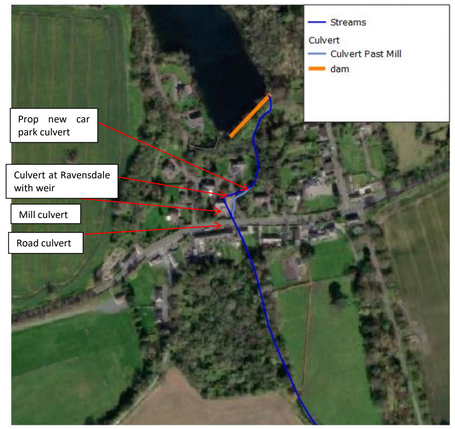
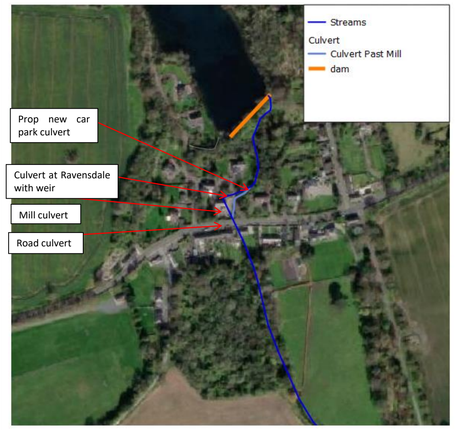
In addition to these 5 viable Options, other options were initially considered. They were rejected because of the constraints or because they were not able to meet the two objective targets of increasing dam safety and protecting the village from the flood.

Option 6. Do Minimum. Divert 1% AEP flow via new culvert at Mill Apartments to existing road culvert



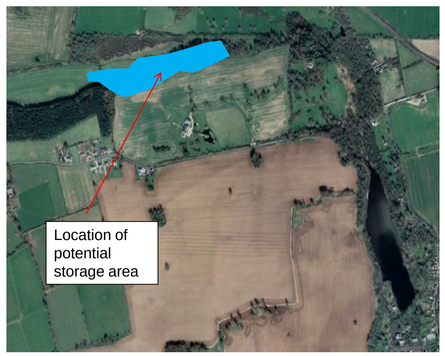
The existing road culvert does not have capacity for the 1% AEP flow, so this option does not provide flood protection. Without works at the dam this does not increase dam safety.

Option 7. Lower the Weir and divert 1% AEP flow via new culvert at Mill Apartments to existing road culvert



This option consists in adding the lowering of the weir to Option 6.
It was rejected because the existing road culvert does not have capacity for the 1% AEP flow, so this option does not provide flood protection.

Option 8. Restrict inflow into Marlfield Lake upstream of the road bridge



This option would have created a temporary lake similar in size to Marlfield Lake during storm events.
Even with this storage, modelling found that the peak flow at Marlfield is not reduced sufficiently to prevent flooding.

Option 9. Add a new overflow weir and divert 0.1% AEP flow to east of stream

This option while meeting both the target objectives was rejected because of constructability issues due to the steep slopes across the route and the difficulty of access for heavy machinery near the new weir location and the dangers associated with deep construction close to the existing dam.

Option 10. Structural improvement works to dam to allow overtopping safely

This option can provide the dam safety but fails to protect the village from the flood.

Option 11. Do Nothing

The option of do nothing is the baseline option against which potential improvements are measured. Doing nothing does not improve the safety of the dam and does not provide increased flood protection to the village.

Option 12. Relocate affected residents

This option proposes the relocation of the residents of affected properties. From the hydraulic modelling it is shown that 14 properties could be affected by the 1% AEP flood. This option is rejected due to the high social impact of relocating residents.

Option 13. Additional maintenance

This option consists in additional maintenance of the embankment. However, additional maintenance cannot on its own meet the target objectives. Maintenance will be included with any selected measures.

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8. Next steps

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MCA

A Multi-Criteria Assessment (MCA) will be carried out to provide an objective scoring for each option. The OPW provides a MCA framework which covers a range of criteria defined under four categories:

-Social

-Economic

-Environmental

-Technical

Emerging Preferred Option

The emerging preferred option will be the option which best meets the criteria above to deliver a sustainable solution for Marlfield.

2nd PCD

The second Public Consultation Day will be held to present this Preferred Option.

Design & Planning

The preferred option will be developed and brought forward for statutory consultation and submitted for planning.

Contact details

Please have your say – speak to the project representatives today and fill a consultation questionnaire to ensure your views are known.

Further questions can be directed to:
Tipperary County Council or to Nicholas O'Dwyer Limited

By post:
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