

Lower Lee (Cork City) Drainage Scheme (Flood Relief Scheme)

Addendum to Options Report Assessment of Potential Storage Area at Dromcarra (Upper Lee)



Office of Public Works

Issue to Website

Addendum to Options Report -
Assessment of Potential Storage
Area at Dromcarra (Upper Lee)

Issue | 2 May 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 230436-00

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1 Introduction

As part of the public consultation process, the option of creating a third reservoir on the River Lee was suggested by members of the public. The proposed location was on the Lee upstream of Carrigadrohid reservoir. Following a review of the topography and land use, a potentially suitable site for a reservoir was identified in an area of pastoral land located just upstream of Dromcarra Bridge (7km southwest of Macroom).

This potential storage area was not considered as part of the Lee CFRAMS Study.

As the project brief for the Lower Lee FRS was to build upon the findings of the Lee CFRAMS and focus on revised dam operation, flood forecasting and measures downstream of Inniscarra, this potential solution was not initially considered as part of the options development for the Lower Lee FRS.

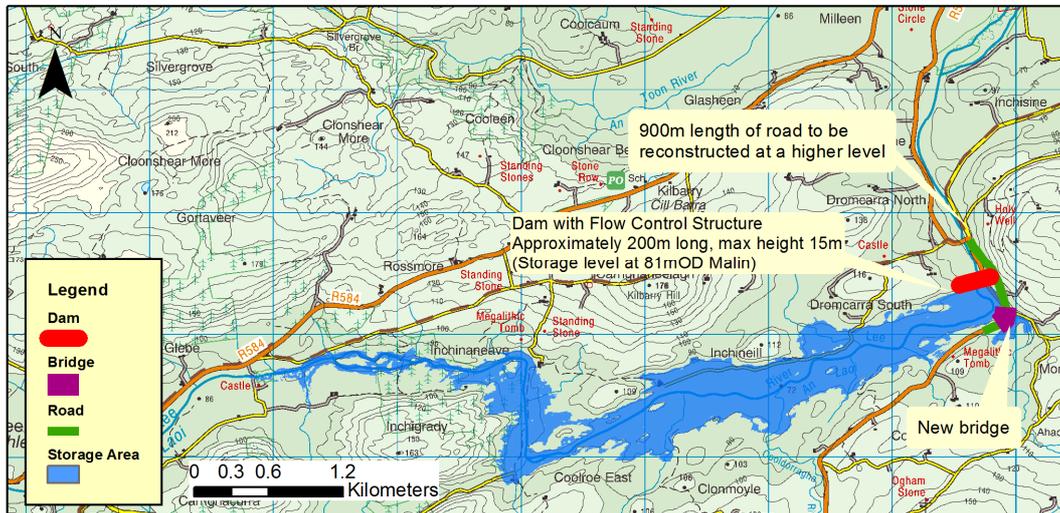
However, as it was highlighted as a potential solution by members of the public, OPW instructed Arup to undertake a preliminary assessment of its potential viability.

This report presents our findings.

2 Description of Possible Dam/Storage Area

The potential storage area and impounding structure (dam) is shown in Figure 1 below.

Figure 1: Potential Storage at Dromcarra on the Upper Lee



The area of the catchment upstream of the potential dam would be 171km² (which is approximately 15% of the Lee catchment to waterworks weir).

The construction works required to deliver the proposed storage area are illustrated on **Figure 1** and can be summarised as follows:

- Construction of a circa 200m long impounding embankment with a maximum height of 15m. The embankment would incorporate a reinforced concrete flow control structure. The flow control structure would need to be actively managed in conjunction with extensive live telemetered gauge data and in an integrated way with both Carrigadrohid and Inniscarra dams.
- A 900m length of the existing R587 road would need to be reconstructed on higher ground.
- A new bridge would be required over a tributary arm of the reservoir at Dromcarra South.

It is estimated that the Net Present Value of the project costs associated with construction and maintenance of the proposed storage area would be in the order of €15m to €20m.

The construction of the storage area would have the following impacts:

- Based on analysis of the LiDAR data, the reservoir would create at maximum footprint, approximately 7km long by maximum 500m wide. The plan area of the reservoir would be approximately 2.2km².
- The storage area would have the capacity to store up to 11 million cubic metres at a maximum depth of 14m. It is envisaged that the reservoir would only be filled during flood conditions to maximise the volume of water which could be stored during a flood event.

- The land within the footprint of the reservoir would need to be compulsorily acquired. Two agricultural farm holdings, (including 2 occupied residential properties) would need to be included in the land acquisition. The buildings in the two farm holdings would need to be either relocated or acquired. A further 3 domestic properties located at the eastern end of the reservoir would also likely need to be acquired and relocated.
- A number of residential properties are located downstream of the dam location. A new residual risk associated with potential dam breach or overtopping, would be introduced for these properties.

3 Hydrological Assessment of Storage Area

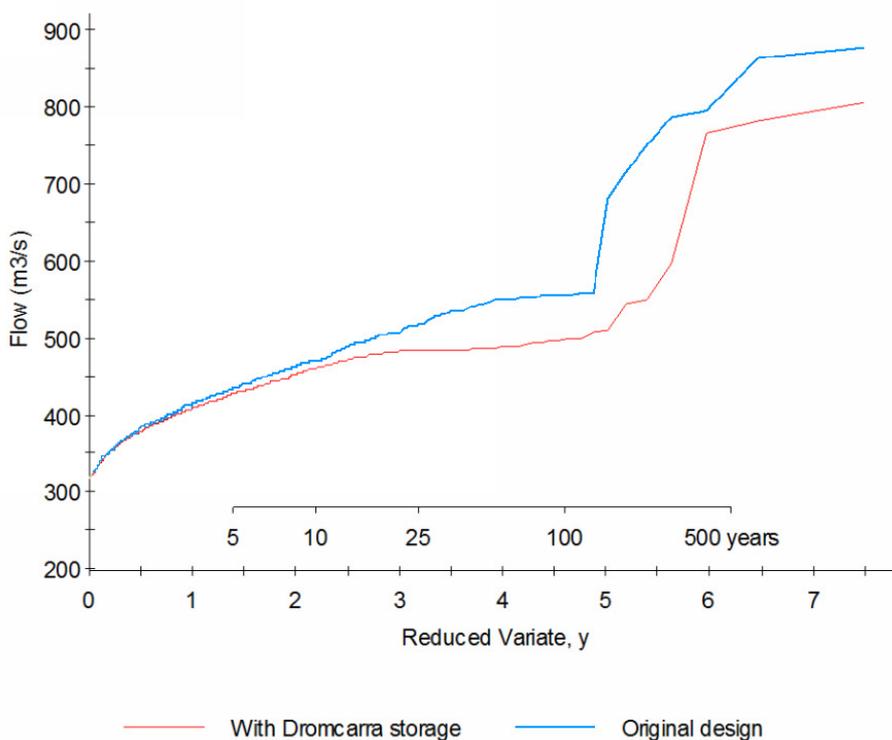
As the proposed area is located relatively far upstream in the catchment and immediately upstream of two larger controlled reservoirs at Inniscarra and Carrigadrohid, it was recognised that whilst there was a potentially significant storage volume available, it's upstream location would likely limit any benefit in terms of flow reduction seen in Cork. To test its viability and effectiveness, it was therefore essential to establish the extent of the potential reduction in peak flow in Cork.

This storage area was tested by adding a new RESERVOIR unit (called DromStor) to the catchment routing model between Dromcarra inflow and Carrigadrohid reservoir. Dromcarra flows all enter the RESERVOIR. An ABSTRACTION unit drains the reservoir, passing forward up to $80\text{m}^3/\text{s}$ until full (after which it passes forward all of the Dromcarra flow).

The pass forward flow, and the target release in Cork, were adjusted by iteration to give the lowest possible simulated flow at Waterworks weir. The model was run with the full continuous simulation. Modelling storage this way assumes 100% efficiency: i.e. no storage is used until the threshold flow is reached. It is noted that this is a non-conservative assumption and may over-estimate the benefit of the storage area.

By addition of this additional storage area, the 100-year design flow at Waterworks Weir could be reduced from $555\text{m}^3/\text{s}$ to $497\text{m}^3/\text{s}$. The frequency curve for a design solution including the Dromcarra Storage area is shown in Figure 2 below and compared to the current design proposal.

Figure 2: Design Flows with Dromcarra Storage and without (Original Design).



4 Hydraulic Modelling

The impact of this reduced design flow of 497m³/s on required direct defences was tested by undertaking hydraulic modelling of the reduced flow using the scheme hydraulic model.

The model results confirmed that flood defence levels in the western reaches of the city (i.e. upstream of the Tyndall Institute) could be reduced by circa 300mm in height but that very few lengths of defences could be omitted.

The addition of the storage area would have a negligible impact on defence heights along the city quays (downstream of Tyndall Institute) as these defence levels are driven by the tidally dominated case with a lesser fluvial element of circa a 1 in 10year flow. As can be seen from the flood frequency curve above, there is very little difference between the 1 in 10 year flows for both scenarios.

Therefore, significant direct defences would still be required.

5 Evaluation of Potential Merits of Dromcarra Storage Option Versus Exhibited Preferred Solution

Construction of the Dromcarra storage area could reduce the design flow in Cork by up to 58m³/s during the 1% AEP event (assuming 100% efficiency).

Whilst this would represent a significant reduction in peak flow into the city, it would not eliminate the need for direct defences and would in fact only reduce defences heights to the west of the city by circa 300mm. As these defences are generally set back from the river walkways and are in the order of 1.8m to 2m high, it is considered that this reduction would not fundamentally alter the scale and nature of the defences.

As illustrated above, the addition of the Dromcarra storage area would not significantly alter defence levels along the city quays.

A preliminary estimate of the net present value of the construction cost, land acquisition, ongoing maintenance etc. of the Dromcarra storage area suggests that its development would be in the order of €15m to €20m.

The reduction in defence heights to the west of city would likely yield an estimated saving of circa €1m to €3m versus the currently proposed solution, meaning that the Dromcarra Storage Option would increase the project costs by circa €12m to €19m. As there are no additional benefitting properties between the proposed Dromcarra storage area and Carrigadrohid Dam, this option would result in a significant reduction in lower Benefit Cost Ratio, which would be much closer to parity in the most onerous sensitivity test.

In terms of the likely outcome of a Multi Criteria Analysis, as the footprint and scale of the required direct defences to the west of the city would not significantly alter, it is considered that the environmental (including Landscape and Visual) scores for the direct defence elements would not significantly alter. However, due to the sterilisation of circa 2.2km² of pastoral land, the requirement to purchase two homesteads, the creation of a new residual risk associated with potential dam breach and the increased complexity of adding a new control structure, it is considered that the Dromcarra Storage Option would score worse than the preferred option in terms of all MCA indicators.

It is therefore concluded that the option statutorily exhibited should be taken forward, and that the potential storage option at Dromcarra be held in reserve as a potential element of a climate change adaptation strategy.