

# South Western CFRAM Study

Preliminary Options Report UoM 19

July 2016

The Office of Public Works



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Preliminary Options Report UoM 19

July 2016

The Office of Public Works

Jonathan Swift Street  
Trim  
Co. Meath

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# Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	February 2016	TD / RM / JD	B. O'Connor	F. McGivern	Draft Issue
B	May 2016	T. Donovan	B. O'Connor	F. McGivern	Draft Final
C	June 2016	T. Donovan	B. O'Connor	F. McGivern	Final
D	July 2016	J Desmond	T. Donovan	F. McGivern	Final

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## Appendix A. Estimate of Costs

## Summary

<b>UoM</b>	19	Optimism Bias	38.59%
<b>AFA</b>	Ballingeary	Site Investigation Estimate	€ 50,000.00
<b>Option</b>	1 - Flood Defences	Preliminaries	17%
<b>Description</b>	Flood Defences	Design Fees	13%
		Compensation and Land Acquisition	10%
		Archaeology and Environmental	10%
		Art Allowance	€ 25,500.00

Element Reference	Element	Capital Costs	PV O&M Costs	Total Costs
1	Walls	€ 884,429.86	€ 3,321.76	€ 887,751.62
2	Embankments	€ 201,448.66	€ 55,473.57	€ 256,922.23
3	Demountable Walls and Gates	€ 0.00	€ 0.00	€ 0.00
4	In-Channel Excavation	€ 0.00	€ 0.00	€ 0.00
5	Excavation on Land	€ 0.00	€ 0.00	€ 0.00
6	Weirs	€ 0.00	€ 0.00	€ 0.00
7	Weir Removal	€ 0.00	€ 0.00	€ 0.00
8	Bridges	€ 0.00	€ 0.00	€ 0.00
9	Bridge Underpinning	€ 0.00	€ 0.00	€ 0.00
10	Culverts	€ 0.00	€ 0.00	€ 0.00
11	Sluice Gates	€ 0.00	€ 0.00	€ 0.00
12	Road Raising	€ 0.00	€ 0.00	€ 0.00
13	Individual Property Protection	€ 0.00	€ 0.00	€ 0.00
14	Hydrometric Gauging Stations	€ 0.00	€ 0.00	€ 0.00
15	Flood Forecasting	€ 0.00	€ 0.00	€ 0.00
16	Pumping Stations	€ 130,200.00	€ 208,972.48	€ 339,172.48
17	Channel Maintenance	€ 0.00	€ 0.00	€ 0.00
18	Bank Protection	€ 0.00	€ 0.00	€ 0.00
19	Manhole Sealing	€ 0.00	€ 0.00	€ 0.00

€ 1,216,078.53	€ 267,767.80	€ 1,483,846.33
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Basic Construction Costs	€ 1,216,078.53
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Preliminaries	€ 206,733.35
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Optimism Bias	€ 549,037.99
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<b>Construction Costs (Excl VAT)</b>	<b>€ 1,971,849.87</b>
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Design Fees	€ 256,340.48
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<b>Σ Construction Costs and Fees</b>	<b>€ 2,228,190.35</b>
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### Other Items

Allowance for Archaeology and Environmental Mitigation Measures	€ 197,184.99
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Allowance for Compensation and Land Acquisition	€ 197,184.99
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Site Investigation	€ 50,000.00
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Art Allowance	€ 25,500.00
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PV O&M	€ 267,767.80
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PV O&M Optimism Bias	€ 103,326.87
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<b>Σ Other Items</b>	<b>€ 840,964.64</b>
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<b>Option Cost for Cost Benefit Analysis</b>	<b>€ 3,069,155.00</b>
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## CFRAM Unit Cost Development Project

## Optimism Bias Calculator

Prepared by: AEP Date: December 2013  
 Site Reference: Site Name: Ballingearry 1 - Flood Defences

Project risk components that influence total project cost	Weight 1-3 (3 being a higher weight)	Risk value (0-100%) 0% = no risk 100% = risk expected and not mitigated		Key:	Default weighting defined by OPW for all CFRAM projects
					Default risk value defined for all CFRAM projects
					Automated function cell (no input required)
					User defined - risk value, comments, justification
Procurement	Weight	Select from Dropdown Risk score		Comment/justification	
Complexity of Contract Structure	1	Medium	50%	Default risk value	
Late Contractor Involvement in Design	2	Medium	50%	Default risk value	
Poor Contractor Capabilities	1	Medium	50%	Default risk value	
Government Guidelines	1	Medium	50%	Default risk value	
Dispute & Claims Occurred	3	Medium	50%	Default risk value	
Information Management	1	Medium	50%	Default risk value	
Budgeting	2	Medium	50%	Default risk value	
Other	1	Medium	50%	Default risk value	
Project Specific					
Design Complexity	2	Medium	50%	Scheme with low complexity - embankments, walls and pump station	
Degree of Innovation	2	Low	30%	Standard and proven methods	
Technology	2	Medium	50%	Pump station and associated equipment required	
Services	3	Medium	50%	Unknown - large amount of services not expected in rural area	
Ground conditions	3	Medium	50%	Unknown	
Health and Safety	3	Low	30%	Scheme with no unusual risks associated with works	
Other	1	Medium	50%	Surface water drainage and pump stations	
Client Specification					
Inadequacy of the Business Case	3	Medium	50%	Default risk value	
Large No. of Stakeholders	2	High	70%	Large number of stakeholders	
Funding Availability	2	Medium	50%	Default risk value	
Project Management Team	1	Medium	50%	Unforeseeable	
Poor Project Intelligence	2	Medium	50%	Potential risk - same for all AFAs	
Other	1	Very Low	10%	None	
Environment					
Public Relations	2	High	70%	Large number of stakeholders and interferences	
Site Characteristics	2	Medium	50%	Presence of invasive non-native species unknown	
Environmental Impact	3	Medium	50%	No significant environmental impacts	
Permits / Consents / Approvals	2	Medium	50%	No anticipated delays associated with permits, consents or approvals	
Amenity and art	1	Low	30%	Rural scheme with large number of stakeholders	
Contaminated land	3	Medium	50%	Unknown	
Archaeology	3	Low	30%	Unknown - small scheme which can be adequately scoped	
Other	1	Very Low	10%	None	
External Influences					
Political	3	Medium	50%	Default risk value	
Economic	2	Medium	50%	Default risk value	
Legislation / Regulations	1	Medium	50%	Default risk value	
Multiple river users / stakeholders	2	Medium	50%	Large number of stakeholders and interferences	
Flood events during construction	3	High	70%	History of frequent flooding	
Other	1	Very Low	10%	None	
	68	46%			
Weighting to apply: 0.476				Minimum Optimism Bias: 10%	
				Maximum Optimism Bias: 70%	
				Calculated Optimism bias: 39%	

## 1. Walls

[illegible]

## 2. Embankments

[illegible]

### 3. Demountable Barrier

3. Demountable Barrier							Length of Wall	With Ground Beam Installation	Height	Additional Costs	Wall Length for Maintenance	Rate	Cost of Wall	PV Maintenance Rate
No.	Select Demountable Barrier Span from Dropdown	Comments	(m)	Select Yes/No	Select (mm)	Select	Select	(€/m)	(€)	(€/m)				
								Capital Cost	€ 0.00					

### **3a. Flood Gate**

[illegible]

#### 4. In-Channel Excavation

4. In-Channel Excavation		Urban or Rural	Volume of Excavation	Rate	Cost of Excavation
		Select	Min 100m <sup>3</sup> Max 1,000m <sup>3</sup> (m <sup>3</sup> )	(€/m <sup>3</sup> )	(€)
No. Select Excavation Type from Dropdown	Comments				
				Total Cost	€ 0.00

5. Dredging		Rate	Cost of Dredging
Volume of Dredging		Select a Rate from Dropdown (€/m <sup>3</sup> )	(€)
No. Dredging	(m <sup>3</sup> )		
		Total Cost	€ 0.00

5. Excavation on Land		Volume of Excavation	Rate	Cost of Excavation
No. Select Excavation Type from Dropdown	Comments	(m³)	(€/m³)	(€)
		Total Cost		€ 0.00

6. Weir Construction		Width of Weir	Rate	Capital Cost of Weir	Maintenance Costs Estimate	PV Cost/Weir
No. Select Weir Height from Dropdown	Comments	Min 10m Max 20m	(€/m)	(€)	Select	(€/weir)
		(m)			H/L	
					Average	
		Capital Cost		€ 0.00	Total PV Cost	€ 0.00
					Total Cost	€ 0.00

7. Weir Removal		Length of Weir	Rate	Cost of Construction
No. Description of Weir	(m)	(€/m)	(€)	
		Total Cost		€ 0.00

8. Bridges		Remove or Replace	Area of Bridge	Rate	Cost of Construction	PV Costs
No. Description of Bridge		Select Yes/No	(m²)	(€/m²)	(€)	(€/bridge)
		Capital Cost		€ 0.00		€ 0.00
				Total Cost		€ 0.00

9. Bridge Underpinning		Length of Bridge	Rate	Cost of Construction
No. Choose a suitable bridge from dropdown	Comments	(m)	(€/m)	(€)
		Total Cost		€ 0.00

10a. Culverts (Rural)		Disposal of Spoil	Ground Type	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select	Select Soil/Rock	Select (m)	Select (m)	(m)	(€/m)	(€)	Select	(€/m)	(€)
			Soil	2.5	(m)				H/L		
									High		
									Average		
									Low		
									Average		
									Average		
									Average		
									Average		
									Average		
									Average		
		Capital Cost						€ 0.00		Total PV Cost	€ 0.00
										Total Cost	€ 0.00

10b. Culverts (Urban)		Culvert	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select New/Replacement	Select (m)	Select (m)	(m)	(€/m)	(€)	Select	(€/m)	(€)
								H/L		
								High		
								Average		
								Low		
								Average		
								Average		
								Average		
								Average		
								Average		
								Average		
		Capital Cost					€ 0.00		Total PV Cost	€ 0.00
									Total Cost	€ 0.00

10c. Culverts (Headwall)		Length of Culvert	Culvert Size	Rate	Cost of Construction
No. Description of Culvert	(m)	Select (m)	(€/m)	(€)	
		Capital Cost		€ 0.00	
		Overall Capital Cost	€ 0.00	Overall PV Cost	€ 0.00
				Overall Cost	€ 0.00

11. Sluice Gates		Size Select	Maintenance Select	Operation Select	Maintenance Costs Estimate Select H/L	Capital Cost	PV Cost	Total Cost
No. Select Gate Type	Comments					(€)	(€)	(€)
						Capital Cost	€ 0.00	€ 0.00
						PV Cost		€ 0.00
						Total Cost		€ 0.00

12. Road Raising		Length of Road	Cost of Construction	Cost of Construction
Note cost is to raise road by 600mm				
No. Road Details		(m)	(€)	(€)
		Total Cost	€ 0.00	€ 0.00

13. Individual Property Protection		Factor Select	Number of Units	Rate	Cost of Works	PV Rate	PV Cost
No. Property Type	Comments			(€)	(€)	(€)	(€)
1 Detached							
2 Semi-Detached							
3 Terraced							
4 Flat							
5 Residential average							
6 Shop							
7 Office							
					Capital Cost	€ 0.00	€ 0.00
					PV Cost		€ 0.00
					Total Cost		€ 0.00

14. Hydrometric Gauging Stations		Number of Units	Maintenance Select H/L	Rate	Capital Cost of Units	PV Rate	PV Costs
No. Hydrometric Gauging Station	Comments			(€)	(€)	(€)	(€)
					Capital Cost	€ 0.00	€ 0.00
					PV Cost		€ 0.00
					Total Cost		€ 0.00

15. Flood Forecasting		Signage Select Yes/No	Maintenance Select	Number of Units	Rate	Cost of Construction	PV Cost	PV Cost
No. Category	Comments				(€)	(€)	(€)	(€)
						Capital Cost	€ 0.00	€ 0.00
						PV Cost		€ 0.00
						Total Cost		€ 0.00

16. Pumping Stations		Number of Units	Rate	Capital Cost	Operation Cost	Running Cost	PV Cost
No. Pumpstation Capacity	Comments		(€)	(€)	(€)	(€)	(€)
1 0.02 m3/s							
2 0.05 m3/s							
3 0.1 m3/s		1	€ 130,200.00	€ 130,200.00	€ 80,429.30	€ 17,873.18	€ 98,302.48
4 0.5 m3/s							
5 1.0 m3/s							
6 2.0 m3/s							
7 3.0 m3/s							
				Capital Cost	€ 130,200.00		€ 208,972.48
				Total Cost			€ 339,172.48

110670

17. Channel Maintenance		Length of Channel	Rate	Maintenance Costs
No. Channel Type	Comments	(m)	(€)	(€)
			Total Cost	€ 0.00

18. Bank Protection		Fluvial/Coastal Select	Maintenance Select	Length	Rate	Cost of Construction	PV Rate	PV Cost
No. Description of Bank Protection				(m)	(€/m)	(€)	(€)	(€)
	Fluvial	High						
						Capital Cost	€ 0.00	€ 0.00
						PV Cost		€ 0.00
						Total Cost		€ 0.00

19. Manhole Sealing		No. of Manholes	Rate	Cost of Construction
No. Manhole Type	Comments		(€)	(€)
			Total Cost	€ 0.00

## Summary

<b>UoM</b>	19	Optimism Bias	43.88%
<b>AFA</b>	Ballingeary	Site Investigation Estimate	€ 150,000.00
<b>Option</b>	2 - Storage	Preliminaries	7%
<b>Description</b>	Storage	Design Fees	13%
		Compensation and Land Acquisition	15%
		Archaeology and Environmental	15%
		Art Allowance	€ 51,000.00

Element Reference	Element	Capital Costs	PV O&M Costs	Total Costs
1	Walls	€ 0.00	€ 0.00	€ 0.00
2	Embankments	€ 8,174,745.76	€ 238,340.63	€ 8,413,086.39
3	Demountable Walls and Gates	€ 0.00	€ 0.00	€ 0.00
4	In-Channel Excavation	€ 0.00	€ 0.00	€ 0.00
5	Excavation on Land	€ 0.00	€ 0.00	€ 0.00
6	Weirs	€ 0.00	€ 0.00	€ 0.00
7	Weir Removal	€ 0.00	€ 0.00	€ 0.00
8	Bridges	€ 0.00	€ 0.00	€ 0.00
9	Bridge Underpinning	€ 0.00	€ 0.00	€ 0.00
10	Culverts	€ 0.00	€ 0.00	€ 0.00
11	Sluice Gates	€ 50,270.82	€ 92,730.07	€ 143,000.89
12	Road Raising	€ 0.00	€ 0.00	€ 0.00
13	Individual Property Protection	€ 0.00	€ 0.00	€ 0.00
14	Hydrometric Gauging Stations	€ 0.00	€ 0.00	€ 0.00
15	Flood Forecasting	€ 0.00	€ 0.00	€ 0.00
16	Pumping Stations	€ 0.00	€ 0.00	€ 0.00
17	Channel Maintenance	€ 0.00	€ 0.00	€ 0.00
18	Bank Protection	€ 0.00	€ 0.00	€ 0.00
19	Manhole Sealing	€ 0.00	€ 0.00	€ 0.00

€ 8,225,016.58	€ 331,070.70	€ 8,556,087.28
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Basic Construction Costs	€ 8,225,016.58
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Preliminaries	€ 575,751.16
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Optimism Bias	€ 3,861,983.96
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<b>Construction Costs (Excl VAT)</b>	<b>€ 12,662,751.70</b>
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Design Fees	€ 1,646,157.72
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<b>Σ Construction Costs and Fees</b>	<b>€ 14,308,909.42</b>
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### Other Items

Allowance for Archaeology and	€ 1,899,412.75
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Allowance for Compensation and	€ 1,899,412.75
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Site Investigation	€ 150,000.00
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Art Allowance	€ 51,000.00
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PV O&M	€ 331,070.70
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PV O&M Optimism Bias	€ 145,281.61
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<b>Σ Other Items</b>	<b>€ 4,476,177.82</b>
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<b>Option Cost for Cost Benefit Analysis</b>	<b>€ 18,785,087.24</b>
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## CFRAM Unit Cost Development Project

## Optimism Bias Calculator

Prepared by: AEP Date: December 2013  
 Site Reference: Site Name: Ballingeary 2 - Storage

Project risk components that influence total project cost	Weight 1-3 (3 being a higher weight)	Risk value (0-100%) 0% = no risk 100% = risk expected and not mitigated		Key:	Default weighting defined by OPW for all CFRAM projects
					Default risk value defined for all CFRAM projects
					Automated function cell (no input required)
					User defined - risk value, comments, justification
Procurement	Weight	Select from Dropdown Risk score		Comment/justification	
Complexity of Contract Structure	1	Medium	50%	Default risk value	
Late Contractor Involvement in Design	2	Medium	50%	Default risk value	
Poor Contractor Capabilities	1	Medium	50%	Default risk value	
Government Guidelines	1	Medium	50%	Default risk value	
Dispute & Claims Occurred	3	Medium	50%	Default risk value	
Information Management	1	Medium	50%	Default risk value	
Budgeting	2	Medium	50%	Default risk value	
Other	1	Medium	50%	Default risk value	
Project Specific					
Design Complexity	2	High	70%	Scheme based on two storage areas	
Degree of Innovation	2	Medium	50%	Standard and proven methods	
Technology	2	High	70%	Storage area controls, pump station and associated equipment required	
Services	3	Medium	50%	Unknown - large amount of services not expected in rural area	
Ground conditions	3	High	70%	Unknown - critical as there are two storage areas	
Health and Safety	3	Medium	50%	Two storage areas but no unusual risks associated with works	
Other	1	Medium	50%	Risks associated with two storage areas	
Client Specification					
Inadequacy of the Business Case	3	Medium	50%	Default risk value	
Large No. of Stakeholders	2	Very High	90%	Low number of stakeholders - critical stakeholders associated with storage area	
Funding Availability	2	Medium	50%	Default risk value	
Project Management Team	1	Medium	50%	Unforeseeable	
Poor Project Intelligence	2	Medium	50%	Potential risk - same for all AFAs	
Other	1	Very Low	10%	None	
Environment					
Public Relations	2	Very High	90%	Low number of stakeholders - critical stakeholders associated with storage area	
Site Characteristics	2	Medium	50%	Presence of invasive non-native species unknown	
Environmental Impact	3	Medium	50%	No significant environmental impacts	
Permits / Consents / Approvals	2	High	70%	Number of species of conservation importance present - Salmon	
Amenity and art	1	Low	30%	Rural scheme with remote storage area	
Contaminated land	3	High	70%	Unknown - risk associated with storage area	
Archaeology	3	Medium	50%	Unknown - extent of storage areas can be adequately scoped	
Other	1	Medium	50%	Risks associated with two storage areas	
External Influences					
Political	3	Medium	50%	Default risk value	
Economic	2	Medium	50%	Default risk value	
Legislation / Regulations	1	Medium	50%	Default risk value	
Multiple river users / stakeholders	2	Very High	90%	Low number of stakeholders - critical stakeholders associated with storage area	
Flood events during construction	3	High	70%	History of frequent flooding	
Other	1	Very Low	10%	None	
	68		54%		
Weighting to apply: 0.565				Minimum Optimism Bias:	10%
				Maximum Optimism Bias:	70%
				Calculated Optimism bias:	44%

## 1. Walls

[illegible]

## 2. Embankments

[illegible]

### 3. Demountable Barrier

3. Demountable Barrier				Length of Wall	With Ground Beam Installation	Height	Additional Costs	Wall Length for Maintenance	Rate	Cost of Wall	PV Maintenance Rate
No.	Select Demountable Barrier Span from Dropdown	Comments	(m)	Select Yes/No	Select (mm)	Select	Select	Select	(€/m)	(€)	(€/m)
									Capital Cost	€ 0.00	

### 3a. Flood Gate

[illegible]

#### 4. In-Channel Excavation

4. In-Channel Excavation		Urban or Rural	Volume of Excavation	Rate	Cost of Excavation
		Select	Min 100m³ Max 1,000m³ (m³)	(€/m³)	(€)
No. Select Excavation Type from Dropdown	Comments				
				Total Cost	€ 0.00

No. Dredging	Volume of Dredging (m³)	Rate Select a Rate from Dropdown (€/m³)	Cost of Dredging (€)
<b>Total Cost</b>			<b>€ 0.00</b>

**Total Excavation Costs € 0.00**

5. Excavation on Land		Volume of Excavation	Rate	Cost of Excavation
No. Select Excavation Type from Dropdown	Comments	(m³)	(€/m³)	(€)
		Total Cost	€ 0.00	

6. Weir Construction		Width of Weir	Rate	Capital Cost of Weir	Maintenance Costs Estimate	PV Cost/Weir
No. Select Weir Height from Dropdown	Comments	Min 10m Max 20m	(€/m)	(€)	Select H/L	(€/weir)
		(m)			Average	
		Capital Cost	€ 0.00		Total PV Cost	€ 0.00
				Total Cost	€ 0.00	

7. Weir Removal		Length of Weir	Rate	Cost of Construction
No. Description of Weir	(m)	(€/m)	(€)	
		Total Cost	€ 0.00	

8. Bridges		Remove or Replace	Area of Bridge	Rate	Cost of Construction	PV Costs
No. Description of Bridge		Select Yes/No	(m²)	(€/m²)	(€)	(€/bridge)
		Capital Cost	€ 0.00		€ 0.00	
				Total Cost	€ 0.00	

9. Bridge Underpinning		Length of Bridge	Rate	Cost of Construction
No. Choose a suitable bridge from dropdown	Comments	(m)	(€/m)	(€)
		Total Cost	€ 0.00	

10a. Culverts (Rural)		Disposal of Spoil	Ground Type	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select	Select Soil/Rock	Select (m)	Select (m)	(m)	(€/m)	(€)	Select H/L	(€/m)	(€)
			Soil	2.5					High		
									Average		
									Low		
									Average		
									Average		
									Average		
									Average		
									Average		
									Average		
		Capital Cost	€ 0.00						Total PV Cost	€ 0.00	
										Total Cost	€ 0.00

10b. Culverts (Urban)		Culvert	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert	Select	Select	Select					H/L		
	New/Replacement	(m)	(m)	(m)	(€/m)	(€)		(€/m)	(€)	
								High		
								Average		
								Low		
								Average		
								Average		
								Average		
								Average		
								Average		
Capital Cost						€ 0.00	Total PV Cost		€ 0.00	
							Total Cost		€ 0.00	

10c. Culverts (Headwall)		Length of Culvert	Culvert Size	Rate	Cost of Construction
No. Description of Culvert	(m)	Select (m)	(€/m)	(€)	
		Capital Cost	€ 0.00		
		Overall Capital Cost	€ 0.00	Overall PV Cost	€ 0.00
				Overall Cost	€ 0.00

11. Sluice Gates		Size Select	Maintenance Select	Operation Select	Maintenance Costs Estimate Select H/L	Capital Cost	PV Cost	Total Cost
No. Select Gate Type	Comments					(€)	(€)	(€)
1	Sluice Gates	1800	Woodland/open public or open non public locations with lower debris loads	Electric Operation	Average	€ 25,135.41	€ 46,365.04	€ 71,500.44
2	Sluice Gates	1800	Woodland/open public or open non public locations with lower debris loads	Electric Operation	Average	€ 25,135.41	€ 46,365.04	€ 71,500.44
Capital Cost						€ 50,270.82	PV Cost	€ 92,730.07
							Total Cost	€ 143,000.89

12. Road Raising		Length of Road	Cost of Construction	Cost of Construction
No. Road Details		(m)	(€)	(€)
Total Cost			€ 0.00	€ 0.00

13. Individual Property Protection		Factor Select	Number of Units	Rate	Cost of Works	PV Rate	PV Cost
No. Property Type	Comments			(€)	(€)	(€)	(€)
1	Detached						
2	Semi-Detached						
3	Terraced						
4	Flat						
5	Residential average						
6	Shop						
7	Office						
Capital Cost					€ 0.00	PV Cost	€ 0.00
						Total Cost	€ 0.00

14. Hydrometric Gauging Stations		Number of Units	Maintenance Select H/L	Rate	Capital Cost of Units	PV Rate	PV Costs
No. Hydrometric Gauging Station	Comments			(€)	(€)	(€)	(€)
Capital Cost					€ 0.00	PV Cost	€ 0.00
						Total Cost	€ 0.00

15. Flood Forecasting		Signage Select Yes/No	Maintenance Select	Number of Units	Rate	Cost of Construction	PV Cost	PV Cost
No. Category	Comments				(€)	(€)	(€)	(€)
Capital Cost						€ 0.00	PV Cost	€ 0.00
							Total Cost	€ 0.00

16. Pumping Stations		Number of Units	Rate	Capital Cost	Operation Cost	Running Cost	PV Cost
No. Pumpstation Capacity	Comments		(€)	(€)	(€)	(€)	(€)
1	0.02 m3/s						
2	0.05 m3/s						
3	0.1 m3/s						
4	0.5 m3/s						
5	1.0 m3/s						
6	2.0 m3/s						
7	3.0 m3/s						
Capital Cost				€ 0.00		PV Cost	€ 0.00
				Total Cost		Total Cost	€ 0.00

17. Channel Maintenance		Length of Channel	Rate	Maintenance Costs
No. Channel Type	Comments	(m)	(€)	(€)
Total Cost			€ 0.00	

18. Bank Protection		Fluvial/Coastal Select	Maintenance Select	Length	Rate	Cost of Construction	PV Rate	PV Cost
No. Description of Bank Protection				(m)	(€/m)	(€)	(€)	(€)
		Fluvial	High					
Capital Cost						€ 0.00	PV Cost	€ 0.00
							Total Cost	€ 0.00

19. Manhole Sealing		No. of Manholes	Rate	Cost of Construction
No. Manhole Type	Comments		(€)	(€)
Total Cost			€ 0.00	

## Summary

<b>UoM</b>	19	Optimism Bias	36.47%
<b>AFA</b>	Castlemartyr	Site Investigation Estimate	€ 50,000.00
<b>Option</b>	1 - Flood defences and flow diversion	Preliminaries	17%
<b>Description</b>	Flood defences and flow diversion	Design Fees	13%
		Compensation and Land Acquisition	10%
		Archaeology and Environmental	10%
		Art Allowance	€ 25,500.00

Element Reference	Element	Capital Costs	PV O&M Costs	Total Costs
1	Walls	€ 596,163.69	€ 2,056.06	€ 598,219.75
2	Embankments	€ 0.00	€ 0.00	€ 0.00
3	Demountable Walls and Gates	€ 0.00	€ 0.00	€ 0.00
4	In-Channel Excavation	€ 0.00	€ 0.00	€ 0.00
5	Excavation on Land	€ 0.00	€ 0.00	€ 0.00
6	Weirs	€ 0.00	€ 0.00	€ 0.00
7	Weir Removal	€ 0.00	€ 0.00	€ 0.00
8	Bridges	€ 0.00	€ 0.00	€ 0.00
9	Bridge Underpinning	€ 0.00	€ 0.00	€ 0.00
10	Culverts	€ 0.00	€ 0.00	€ 0.00
11	Sluice Gates	€ 17,037.99	€ 46,365.04	€ 63,403.03
12	Road Raising	€ 0.00	€ 0.00	€ 0.00
13	Individual Property Protection	€ 0.00	€ 0.00	€ 0.00
14	Hydrometric Gauging Stations	€ 0.00	€ 0.00	€ 0.00
15	Flood Forecasting	€ 0.00	€ 0.00	€ 0.00
16	Pumping Stations	€ 0.00	€ 0.00	€ 0.00
17	Channel Maintenance	€ 0.00	€ 0.00	€ 0.00
18	Bank Protection	€ 0.00	€ 0.00	€ 0.00
19	Manhole Sealing	€ 0.00	€ 0.00	€ 0.00
		€ 613,201.68	€ 48,421.09	€ 661,622.78
		Basic Construction Costs		€ 613,201.68
		Preliminaries		€ 104,244.29
		Optimism Bias		€ 261,656.76
		<b>Construction Costs (Excl VAT)</b>		<b>€ 979,102.73</b>
		Design Fees		€ 127,283.36
		<b>Σ Construction Costs and Fees</b>		<b>€ 1,106,386.09</b>

### Other Items

Allowance for Archaeology and Environmental Mitigation Measures	€ 97,910.27
Allowance for Compensation and Land Acquisition	€ 97,910.27
Site Investigation	€ 50,000.00
Art Allowance	€ 25,500.00
PV O&M	€ 48,421.09
PV O&M Optimism Bias	€ 17,659.46
<b>Σ Other Items</b>	<b>€ 337,401.10</b>

**Option Cost for Cost Benefit Analysis € 1,443,787.19**

## CFRAM Unit Cost Development Project

## Optimism Bias Calculator

Prepared by: AEP Date: December 2013  
 Site Reference: Site Name: Castlemartyr 1 - Flood defences and flow diversion

Project risk components that influence total project cost	Weight 1-3 (3 being a higher weight)	Risk value (0-100%) 0% = no risk 100% = risk expected and not mitigated		Key:	Default weighting defined by OPW for all CFRAM projects
					Default risk value defined for all CFRAM projects
					Automated function cell (no input required)
					User defined - risk value, comments, justification
		Select from Dropdown			
Procurement	Weight	Risk score		Comment/justification	
Complexity of Contract Structure	1	Medium	50%	Default risk value	
Late Contractor Involvement in Design	2	Medium	50%	Default risk value	
Poor Contractor Capabilities	1	Medium	50%	Default risk value	
Government Guidelines	1	Medium	50%	Default risk value	
Dispute & Claims Occurred	3	Medium	50%	Default risk value	
Information Management	1	Medium	50%	Default risk value	
Budgeting	2	Medium	50%	Default risk value	
Other	1	Medium	50%	Default risk value	
Project Specific					
Design Complexity	2	Medium	50%	Small scheme with low complexity - flow diversion	
Degree of Innovation	2	Low	30%	Standard and proven methods	
Technology	2	Medium	50%	Flow control structure	
Services	3	Low	30%	Unknown - services not expected	
Ground conditions	3	Medium	50%	Unknown	
Health and Safety	3	Low	30%	Small scheme with no unusual risks associated with works	
Other	1	Very Low	10%	None	
Client Specification					
Inadequacy of the Business Case	3	Medium	50%	Default risk value	
Large No. of Stakeholders	2	Medium	50%	Low number of stakeholders but increasing flood risk	
Funding Availability	2	Medium	50%	Default risk value	
Project Management Team	1	Medium	50%	Unforeseeable	
Poor Project Intelligence	2	Medium	50%	Potential risk - same for all AFAs	
Other	1	Very Low	10%	None	
Environment					
Public Relations	2	Medium	50%	Low number of stakeholders but increasing flood risk	
Site Characteristics	2	Medium	50%	Presence of invasive non-native species unknown	
Environmental Impact	3	Medium	50%	No significant environmental impacts	
Permits / Consents / Approvals	2	Medium	50%	No anticipated delays associated with permits, consents or approvals	
Amenity and art	1	Low	30%	Small scheme with majority of works out of public sight	
Contaminated land	3	Medium	50%	Unknown	
Archaeology	3	Low	30%	Unknown - small scheme which can be adequately scoped	
Other	1	Very Low	10%	None	
External Influences					
Political	3	Medium	50%	Default risk value	
Economic	2	Medium	50%	Default risk value	
Legislation / Regulations	1	Medium	50%	Default risk value	
Multiple river users / stakeholders	2	Medium	50%	Low number of stakeholders but increasing flood risk	
Flood events during construction	3	Medium	50%	History of flooding	
Other	1	Very Low	10%	None	
	68	43%			
Weighting to apply: 0.441				Minimum Optimism Bias: 10%	
				Maximum Optimism Bias: 70%	
				Calculated Optimism bias: 36%	

## 1. Walls

1. Walls									
No.	Select Wall Type from Dropdown	Comments	Length of Wall (m)	Height of Wall Min 0.6m Max 3.0m (m)	Rate (€/m)	Capital Cost of Wall (€)	Maintenance Costs Estimate Select H/L	PV Rate (€/m)	PV Cost PVC * Length (€)
1	Retaining Wall, Urban with sheet piling, <100m in length (€/m)		73.159	1.10	€ 2,060.26	€ 150,726.48	Average	€ 8.43	€ 616.73
2	Retaining Wall, Urban with sheet piling, >100m in length (€/m)		170.739	1.40	€ 2,608.88	€ 445,437.20	Average	€ 8.43	€ 1,439.33
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## 2. Embankments

[illegible]

### 3. Demountable Barrier

[illegible]

### 3a. Flood Gate

[illegible]

#### 4. In-Channel Excavation

4. In-Channel Excavation		Urban or Rural	Volume of Excavation	Rate	Cost of Excavation
		Select	Min 100m³ Max 1,000m³ (m³)	(€/m³)	(€)
No.	Select Excavation Type from Dropdown	Comments			
				Total Cost	€ 0.00

No.	Dredging	Volume of Dredging (m³)	Rate Select a Rate from Dropdown (€/m³)	Cost of Dredging (€)
			Total Cost	€ 0.00

**Total Excavation Costs € 0.00**

5. Excavation on Land		Volume of Excavation	Rate	Cost of Excavation
No. Select Excavation Type from Dropdown	Comments	(m³)	(€/m³)	(€)
		Total Cost		€ 0.00

6. Weir Construction		Width of Weir	Rate	Capital Cost of Weir	Maintenance Costs Estimate	PV Cost/Weir
No. Select Weir Height from Dropdown	Comments	Min 10m Max 20m	(€/m)	(€)	Select H/L	(€/weir)
		(m)			Average	
		Capital Cost		€ 0.00	Total PV Cost	€ 0.00
				Total Cost	€ 0.00	

7. Weir Removal		Length of Weir	Rate	Cost of Construction
No. Description of Weir	(m)	(€/m)	(€)	
		Total Cost	€ 0.00	

8. Bridges		Remove or Replace	Area of Bridge	Rate	Cost of Construction	PV Costs
No. Description of Bridge		Select Yes/No	(m²)	(€/m²)	(€)	(€/bridge)
		Capital Cost		€ 0.00	€ 0.00	
				Total Cost	€ 0.00	

9. Bridge Underpinning		Length of Bridge	Rate	Cost of Construction
No. Choose a suitable bridge from dropdown	Comments	(m)	(€/m)	(€)
		Total Cost	€ 0.00	

10a. Culverts (Rural)		Disposal of Spoil	Ground Type	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select	Select Soil/Rock	Select (m)	Select (m)	(m)	(€/m)	(€)	Select H/L	(€/m)	(€)
			Soil	2.5	(m)				High		
									Average		
									Low		
									Average		
									Average		
									Average		
									Average		
									Average		
									Average		
		Capital Cost						€ 0.00		Total PV Cost	€ 0.00
								Total Cost	€ 0.00		

10b. Culverts (Urban)		Culvert	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select New/Replacement	Select (m)	Select (m)	(m)	(€/m)	(€)	Select H/L	(€/m)	(€)
								High		
								Average		
								Low		
								Average		
								Average		
								Average		
								Average		
								Average		
								Average		
		Capital Cost					€ 0.00		Total PV Cost	€ 0.00
								Total Cost	€ 0.00	

10c. Culverts (Headwall)		Length of Culvert	Culvert Size	Rate	Cost of Construction
No. Description of Culvert	(m)	Select (m)	(€/m)	(€)	
		Capital Cost	€ 0.00		
Overall Capital Cost		€ 0.00	Overall PV Cost	€ 0.00	
				Overall Cost	€ 0.00



11. Sluice Gates		Size Select	Maintenance Select	Operation Select	Maintenance Costs Estimate Select H/L	Capital Cost	PV Cost	Total Cost
No. Select Gate Type	Comments					(€)	(€)	(€)
1	Sluice Gates	1500	Woodland/open public or open non public locations with lower debris loads	Electric Operation	Average	€ 17,037.99	€ 46,365.04	€ 63,403.03
Capital Cost						€ 17,037.99	PV Cost	€ 46,365.04
						Total Cost		€ 63,403.03

12. Road Raising		Length of Road	Cost of Construction	Cost of Construction
No. Road Details		(m)	(€)	(€)
Total Cost			€ 0.00	€ 0.00

13. Individual Property Protection		Factor Select	Number of Units	Rate	Cost of Works	PV Rate	PV Cost
No. Property Type	Comments			(€)	(€)	(€)	(€)
1	Detached						
2	Semi-Detached						
3	Terraced						
4	Flat						
5	Residential average						
6	Shop						
7	Office						
Capital Cost					€ 0.00	PV Cost	€ 0.00
					Total Cost		€ 0.00

14. Hydrometric Gauging Stations		Number of Units	Maintenance Select H/L	Rate	Capital Cost of Units	PV Rate	PV Costs
No. Hydrometric Gauging Station	Comments			(€)	(€)	(€)	(€)
Capital Cost					€ 0.00	PV Cost	€ 0.00
					Total Cost		€ 0.00

15. Flood Forecasting		Signage Select Yes/No	Maintenance Select	Number of Units	Rate	Cost of Construction	PV Cost	PV Cost
No. Category	Comments				(€)	(€)	(€)	(€)
Capital Cost						€ 0.00	PV Cost	€ 0.00
						Total Cost		€ 0.00

16. Pumping Stations		Number of Units	Rate	Capital Cost	Operation Cost	Running Cost	PV Cost
No. Pumpstation Capacity	Comments		(€)	(€)	(€)	(€)	(€)
1	0.02 m3/s						
2	0.05 m3/s						
3	0.1 m3/s						
4	0.5 m3/s						
5	1.0 m3/s						
6	2.0 m3/s						
7	3.0 m3/s						
Capital Cost				€ 0.00		PV Cost	€ 0.00
				Total Cost		€ 0.00	

17. Channel Maintenance		Length of Channel	Rate	Maintenance Costs
No. Channel Type	Comments	(m)	(€)	(€)
Total Cost			€ 0.00	

18. Bank Protection		Fluvial/Coastal Select	Maintenance Select	Length	Rate	Cost of Construction	PV Rate	PV Cost
No. Description of Bank Protection				(m)	(€/m)	(€)	(€)	(€)
		Fluvial	High					
Capital Cost						€ 0.00	PV Cost	€ 0.00
						Total Cost		€ 0.00

19. Manhole Sealing		No. of Manholes	Rate	Cost of Construction
No. Manhole Type	Comments		(€)	(€)
Total Cost			€ 0.00	

## Summary

<b>UoM</b>	19	Optimism Bias	37.18%
<b>AFA</b>	Castlemartyr	Site Investigation Estimate	€ 50,000.00
<b>Option</b>	2 - Flood defences	Preliminaries	16%
<b>Description</b>	Flood defences	Design Fees	13%
		Compensation and Land Acquisition	10%
		Archaeology and Environmental	10%
		Art Allowance	€ 25,943.36

Element Reference	Element	Capital Costs	PV O&M Costs	Total Costs
1	Walls	€ 1,621,014.51	€ 5,329.75	€ 1,626,344.26
2	Embankments	€ 9,364.37	€ 4,272.88	€ 13,637.25
3	Demountable Walls and Gates	€ 0.00	€ 0.00	€ 0.00
4	In-Channel Excavation	€ 0.00	€ 0.00	€ 0.00
5	Excavation on Land	€ 0.00	€ 0.00	€ 0.00
6	Weirs	€ 0.00	€ 0.00	€ 0.00
7	Weir Removal	€ 0.00	€ 0.00	€ 0.00
8	Bridges	€ 0.00	€ 0.00	€ 0.00
9	Bridge Underpinning	€ 0.00	€ 0.00	€ 0.00
10	Culverts	€ 0.00	€ 0.00	€ 0.00
11	Sluice Gates	€ 0.00	€ 0.00	€ 0.00
12	Road Raising	€ 0.00	€ 0.00	€ 0.00
13	Individual Property Protection	€ 0.00	€ 0.00	€ 0.00
14	Hydrometric Gauging Stations	€ 0.00	€ 0.00	€ 0.00
15	Flood Forecasting	€ 0.00	€ 0.00	€ 0.00
16	Pumping Stations	€ 0.00	€ 0.00	€ 0.00
17	Channel Maintenance	€ 0.00	€ 0.00	€ 0.00
18	Bank Protection	€ 0.00	€ 0.00	€ 0.00
19	Manhole Sealing	€ 0.00	€ 0.00	€ 0.00

€ 1,630,378.88	€ 9,602.63	€ 1,639,981.51
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Basic Construction Costs	€ 1,630,378.88
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Preliminaries	€ 260,860.62
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Optimism Bias	€ 703,096.10
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<b>Construction Costs (Excl VAT)</b>	<b>€ 2,594,335.59</b>
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Design Fees	€ 337,263.63
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<b>Σ Construction Costs and Fees</b>	<b>€ 2,931,599.22</b>
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### Other Items

Allowance for Archaeology and Environmental Mitigation Measures	€ 259,433.56
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Allowance for Compensation and Land Acquisition	€ 259,433.56
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Site Investigation	€ 50,000.00
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Art Allowance	€ 25,943.36
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PV O&M	€ 9,602.63
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PV O&M Optimism Bias	€ 3,569.92
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<b>Σ Other Items</b>	<b>€ 607,983.03</b>
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<b>Option Cost for Cost Benefit Analysis</b>	<b>€ 3,539,582.25</b>
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## CFRAM Unit Cost Development Project

## Optimism Bias Calculator

Prepared by: AEP Date: December 2013  
 Site Reference: Site Name: Castlemartyr 2 - Flood defences

Project risk components that influence total project cost	Weight 1-3 (3 being a higher weight)	Risk value (0-100%) 0% = no risk 100% = risk expected and not mitigated		Key:	<div><div></div>Default weighting defined by OPW for all CFRAM projects</div> <div><div></div>Default risk value defined for all CFRAM projects</div> <div><div></div>Automated function cell (no input required)</div> <div><div></div>User defined - risk value, comments, justification</div>
		Select from Dropdown			
Procurement	Weight	Risk score		Comment/justification	
Complexity of Contract Structure	1	Medium	50%	Default risk value	
Late Contractor Involvement in Design	2	Medium	50%	Default risk value	
Poor Contractor Capabilities	1	Medium	50%	Default risk value	
Government Guidelines	1	Medium	50%	Default risk value	
Dispute & Claims Occurred	3	Medium	50%	Default risk value	
Information Management	1	Medium	50%	Default risk value	
Budgeting	2	Medium	50%	Default risk value	
Other	1	Medium	50%	Default risk value	
Project Specific					
Design Complexity	2	Medium	50%	Small scheme with low complexity - walls and a short section of embankment	
Degree of Innovation	2	Low	30%	Standard and proven methods	
Technology	2	Low	30%	No assets sensitive to technology	
Services	3	Medium	50%	Unknown - large amount of services not expected adjacent to watercourse except drainage outfalls	
Ground conditions	3	Medium	50%	Unknown	
Health and Safety	3	Low	30%	Small scheme with no unusual risks associated with works	
Other	1	Very Low	10%	None	
Client Specification					
Inadequacy of the Business Case	3	Medium	50%	Default risk value	
Large No. of Stakeholders	2	Medium	50%	Large number of stakeholders	
Funding Availability	2	Medium	50%	Default risk value	
Project Management Team	1	Medium	50%	Unforeseeable	
Poor Project Intelligence	2	Medium	50%	Potential risk - same for all AFAs	
Other	1	Very Low	10%	None	
Environment					
Public Relations	2	Medium	50%	Large number of stakeholders and interferences	
Site Characteristics	2	Medium	50%	Presence of invasive non-native species unknown	
Environmental Impact	3	Medium	50%	No significant environmental impacts	
Permits / Consents / Approvals	2	Medium	50%	No anticipated delays associated with permits, consents or approvals	
Amenity and art	1	Low	30%	Small scheme with majority of works out of public sight	
Contaminated land	3	Medium	50%	Unknown	
Archaeology	3	Medium	50%	Unknown - small scheme which can be adequately scoped	
Other	1	Very Low	10%	None	
External Influences					
Political	3	Medium	50%	Default risk value	
Economic	2	Medium	50%	Default risk value	
Legislation / Regulations	1	Medium	50%	Default risk value	
Multiple river users / stakeholders	2	Medium	50%	Large number of stakeholders and interferences	
Flood events during construction	3	Medium	50%	History of flooding	
Other	1	Very Low	10%	None	
	68	43%			
Weighting to apply:				Minimum Optimism Bias: 10%	
				Maximum Optimism Bias: 70%	
		0.453	Calculated Optimism bias: 37%		

## 1. Walls

1. Walls		Length of Wall	Height of Wall	Rate	Capital Cost of Wall	Maintenance Costs Estimate	PV Rate	PV Cost	
No.	Select Wall Type from Dropdown	Comments	(m)	(m)	(€/m)	(€)	Select H/L	PVC * Length	
1	Retaining Wall, Urban with sheet piling, <100m in length (€/m)		73.159	1.10	€ 2,060.26	€ 150,726.48	Average	€ 8.43	€ 616.73
2	Retaining Wall, Urban with sheet piling, >100m in length (€/m)		170.739	1.40	€ 2,608.88	€ 445,437.20	Average	€ 8.43	€ 1,439.33
3	Retaining Wall, Urban with sheet piling, >100m in length (€/m)		173.474	1.30	€ 2,364.71	€ 410,215.30	Average	€ 8.43	€ 1,462.39
4	Retaining Wall, Urban with sheet piling, <100m in length (€/m)		155.872	1.50	€ 3,003.90	€ 468,223.95	Average	€ 8.43	€ 1,314.00
5	Retaining Wall, Urban with sheet piling, <100m in length (€/m)		58.992	1.30	€ 2,481.89	€ 146,411.57	Average	€ 8.43	€ 497.30
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## 2. Embankments

[illegible]

### 3. Demountable Barrier

[illegible]

### 3a. Flood Gate

[illegible]

#### 4. In-Channel Excavation

4. In-Channel Excavation		Urban or Rural	Volume of Excavation	Rate	Cost of Excavation
		Select	Min 100m <sup>3</sup> Max 1,000m <sup>3</sup> (m <sup>3</sup> )	(€/m <sup>3</sup> )	(€)
No. Select Excavation Type from Dropdown	Comments				
				Total Cost	€ 0.00

Volume of Dredging		Rate	Cost of Dredging
No. Dredging	(m <sup>3</sup> )	Select a Rate from Dropdown (€/m <sup>3</sup> )	(€)
		Total Cost	€ 0.00

Total Excavation Costs € 0.00

5. Excavation on Land		Volume of Excavation	Rate	Cost of Excavation
No. Select Excavation Type from Dropdown	Comments	(m³)	(€/m³)	(€)
		Total Cost		€ 0.00

6. Weir Construction		Width of Weir	Rate	Capital Cost of Weir	Maintenance Costs Estimate	PV Cost/Weir
No. Select Weir Height from Dropdown	Comments	Min 10m Max 20m	(€/m)	(€)	Select H/L	(€/weir)
		(m)			Average	
		Capital Cost		€ 0.00	Total PV Cost	€ 0.00
				Total Cost	€ 0.00	

7. Weir Removal		Length of Weir	Rate	Cost of Construction
No. Description of Weir	(m)	(€/m)	(€)	
		Total Cost	€ 0.00	

8. Bridges		Remove or Replace	Area of Bridge	Rate	Cost of Construction	PV Costs
No. Description of Bridge		Select Yes/No	(m²)	(€/m²)	(€)	(€/bridge)
		Capital Cost		€ 0.00	€ 0.00	
				Total Cost	€ 0.00	

9. Bridge Underpinning		Length of Bridge	Rate	Cost of Construction
No. Choose a suitable bridge from dropdown	Comments	(m)	(€/m)	(€)
		Total Cost		€ 0.00

10a. Culverts (Rural)		Disposal of Spoil	Ground Type	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select	Select Soil/Rock	Select (m)	Select (m)	(m)	(€/m)	(€)	Select H/L	(€/m)	(€)
			Soil	2.5					High		
									Average		
									Low		
									Average		
									Average		
									Average		
									Average		
									Average		
									Average		
		Capital Cost						€ 0.00		Total PV Cost	€ 0.00
								Total Cost	€ 0.00		

10b. Culverts (Urban)		Culvert	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select New/Replacement	Select (m)	Select (m)	(m)	(€/m)	(€)	Select H/L	(€/m)	(€)
								High		
								Average		
								Low		
								Average		
								Average		
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								Average		
								Average		
								Average		
		Capital Cost					€ 0.00		Total PV Cost	€ 0.00
								Total Cost	€ 0.00	

10c. Culverts (Headwall)		Length of Culvert	Culvert Size	Rate	Cost of Construction
No. Description of Culvert	(m)	Select (m)	(€/m)	(€)	
		Capital Cost		€ 0.00	
Overall Capital Cost		€ 0.00	Overall PV Cost	€ 0.00	
				Overall Cost	€ 0.00

11. Sluice Gates		Size Select	Maintenance Select	Operation Select	Maintenance Costs Estimate Select H/L	Capital Cost	PV Cost	Total Cost
No. Select Gate Type	Comments					(€)	(€)	(€)
						Capital Cost	€ 0.00	€ 0.00
						PV Cost		€ 0.00
						Total Cost		€ 0.00

12. Road Raising		Length of Road	Cost of Construction	Cost of Construction
Note cost is to raise road by 600mm				
No. Road Details	(m)	(€)	(€)	
Total Cost		€ 0.00	€ 0.00	

13. Individual Property Protection		Factor Select	Number of Units	Rate	Cost of Works	PV Rate	PV Cost
No. Property Type	Comments			(€)	(€)	(€)	(€)
1 Detached							
2 Semi-Detached							
3 Terraced							
4 Flat							
5 Residential average							
6 Shop							
7 Office							
Capital Cost					€ 0.00	PV Cost	€ 0.00
					Total Cost		€ 0.00

14. Hydrometric Gauging Stations		Number of Units	Maintenance Select H/L	Rate	Capital Cost of Units	PV Rate	PV Costs
No. Hydrometric Gauging Station	Comments			(€)	(€)	(€)	(€)
Capital Cost					€ 0.00	PV Cost	€ 0.00
					Total Cost		€ 0.00

15. Flood Forecasting		Signage Select Yes/No	Maintenance Select	Number of Units	Rate	Cost of Construction	PV Cost	PV Cost
No. Category	Comments				(€)	(€)	(€)	(€)
Capital Cost						€ 0.00	PV Cost	€ 0.00
						Total Cost		€ 0.00

16. Pumping Stations		Number of Units	Rate	Capital Cost	Operation Cost	Running Cost	PV Cost
No. Pumpstation Capacity	Comments		(€)	(€)	(€)	(€)	(€)
1 0.02 m3/s							
2 0.05 m3/s							
3 0.1 m3/s							
4 0.5 m3/s							
5 1.0 m3/s							
6 2.0 m3/s							
7 3.0 m3/s							
Capital Cost				€ 0.00		PV Cost	€ 0.00
				Total Cost		Total Cost	€ 0.00

17. Channel Maintenance		Length of Channel	Rate	Maintenance Costs
No. Channel Type	Comments	(m)	(€)	(€)
Total Cost			€ 0.00	

18. Bank Protection		Fluvial/Coastal Select	Maintenance Select	Length	Rate	Cost of Construction	PV Rate	PV Cost
No. Description of Bank Protection				(m)	(€/m)	(€)	(€)	(€)
	Fluvial	High						
Capital Cost						€ 0.00	PV Cost	€ 0.00
						Total Cost		€ 0.00

19. Manhole Sealing		No. of Manholes	Rate	Cost of Construction
No. Manhole Type	Comments		(€)	(€)
Total Cost			€ 0.00	

## Summary

<b>UoM</b>	19	Optimism Bias	38.06%
<b>AFA</b>	Inchigeelagh	Site Investigation Estimate	€ 50,000.00
<b>Option</b>	1 - Flood defences	Preliminaries	20%
<b>Description</b>	Flood defences	Design Fees	13%
		Compensation and Land Acquisition	10%
		Archaeology and Environmental	10%
		Art Allowance	€ 25,500.00

Element Reference	Element	Capital Costs	PV O&M Costs	Total Costs
1	Walls	€ 690,797.73	€ 52,865.22	€ 743,662.95
2	Embankments	€ 116,701.56	€ 43,577.95	€ 160,279.51
3	Demountable Walls and Gates	€ 0.00	€ 0.00	€ 0.00
4	In-Channel Excavation	€ 0.00	€ 0.00	€ 0.00
5	Excavation on Land	€ 0.00	€ 0.00	€ 0.00
6	Weirs	€ 0.00	€ 0.00	€ 0.00
7	Weir Removal	€ 0.00	€ 0.00	€ 0.00
8	Bridges	€ 0.00	€ 0.00	€ 0.00
9	Bridge Underpinning	€ 0.00	€ 0.00	€ 0.00
10	Culverts	€ 0.00	€ 0.00	€ 0.00
11	Sluice Gates	€ 0.00	€ 0.00	€ 0.00
12	Road Raising	€ 0.00	€ 0.00	€ 0.00
13	Individual Property Protection	€ 0.00	€ 0.00	€ 0.00
14	Hydrometric Gauging Stations	€ 0.00	€ 0.00	€ 0.00
15	Flood Forecasting	€ 0.00	€ 0.00	€ 0.00
16	Pumping Stations	€ 130,200.00	€ 208,972.48	€ 339,172.48
17	Channel Maintenance	€ 0.00	€ 0.00	€ 0.00
18	Bank Protection	€ 0.00	€ 0.00	€ 0.00
19	Manhole Sealing	€ 0.00	€ 0.00	€ 0.00
		€ 937,699.29	€ 305,415.65	€ 1,243,114.94

Basic Construction Costs € 937,699.29

Preliminaries € 187,539.86

Optimism Bias € 428,252.78

**Construction Costs (Excl VAT) € 1,553,491.92**

Design Fees € 201,953.95

**Σ Construction Costs and Fees € 1,755,445.87**

### Other Items

Allowance for Archaeology and € 155,349.19

Allowance for Compensation and € 155,349.19

Site Investigation € 50,000.00

Art Allowance € 25,500.00

PV O&M € 305,415.65

PV O&M Optimism Bias € 116,237.60

**Σ Other Items € 807,851.64**

**Option Cost for Cost Benefit Analysis € 2,563,297.51**

## CFRAM Unit Cost Development Project

## Optimism Bias Calculator

Prepared by: AEP Date: December 2013  
 Site Reference: Site Name: Inchigeelagh 1 - Flood defences

Project risk components that influence total project cost	Weight 1-3 (3 being a higher weight)	Risk value (0-100%) 0% = no risk 100% = risk expected and not mitigated		Key:
				Default weighting defined by OPW for all CFRAM projects Default risk value defined for all CFRAM projects Automated function cell (no input required) User defined - risk value, comments, justification
<b>Procurement</b>	<b>Weight</b>	<b>Select from Dropdown</b>		<b>Comment/justification</b>
Complexity of Contract Structure	1	Medium	50%	Default risk value
Late Contractor Involvement in Design	2	Medium	50%	Default risk value
Poor Contractor Capabilities	1	Medium	50%	Default risk value
Government Guidelines	1	Medium	50%	Default risk value
Dispute & Claims Occurred	3	Medium	50%	Default risk value
Information Management	1	Medium	50%	Default risk value
Budgeting	2	Medium	50%	Default risk value
Other	1	Medium	50%	Default risk value
<b>Project Specific</b>				
Design Complexity	2	Medium	50%	Scheme with low complexity - embankments, walls and pump station
Degree of Innovation	2	Low	30%	Standard and proven methods
Technology	2	Medium	50%	Pump station and associated equipment required
Services	3	Medium	50%	Unknown - large amount of services not expected in rural area
Ground conditions	3	Medium	50%	Unknown
Health and Safety	3	Low	30%	Scheme with no unusual risks associated with works
Other	1	Medium	50%	Surface water drainage and pump stations
<b>Client Specification</b>				
Inadequacy of the Business Case	3	Medium	50%	Default risk value
Large No. of Stakeholders	2	High	70%	Large number of stakeholders
Funding Availability	2	Medium	50%	Default risk value
Project Management Team	1	Medium	50%	Unforeseeable
Poor Project Intelligence	2	Medium	50%	Potential risk - same for all AFAs
Other	1	Very Low	10%	None
<b>Environment</b>				
Public Relations	2	High	70%	Large number of stakeholders and interferences
Site Characteristics	2	Medium	50%	Presence of invasive non-native species unknown
Environmental Impact	3	Medium	50%	No significant environmental impacts
Permits / Consents / Approvals	2	Medium	50%	No anticipated delays associated with permits, consents or approvals
Amenity and art	1	Low	30%	Rural scheme with large number of stakeholders
Contaminated land	3	Medium	50%	Unknown
Archaeology	3	Low	30%	Unknown - small scheme which can be adequately scoped
Other	1	Very Low	10%	None
<b>External Influences</b>				
Political	3	Medium	50%	Default risk value
Economic	2	Medium	50%	Default risk value
Legislation / Regulations	1	Medium	50%	Default risk value
Multiple river users / stakeholders	2	Medium	50%	Large number of stakeholders and interferences
Flood events during construction	3	Medium	50%	History of flooding
Other	1	Very Low	10%	None
	68		45%	
Weighting to apply:		Minimum Optimism Bias:		10%
		Maximum Optimism Bias:		70%
		Calculated Optimism bias:		38%



## 1. Walls

[illegible]

## 2. Embankments

[illegible]

### 3. Demountable Barrier

3. Demountable Barrier		Length of Wall	With Ground Beam Installation	Height	Additional Costs	Wall Length for Maintenance	Rate	Cost of Wall	PV Maintenance Rate	
No.	Select Demountable Barrier Span from Dropdown	Comments	(m)	Select Yes/No	Select (mm)	Select	Select	(€/m)	(€)	(€/m)
Capital Cost								€ 0.00		

### 3a. Flood Gate

[illegible]

#### 4. In-Channel Excavation

4. In-Channel Excavation		Urban or Rural	Volume of Excavation	Rate	Cost of Excavation
No.	Select Excavation Type from Dropdown	Comments	Select Min 100m³ Max 1,000m³ (m³)	(€/m³)	(€)
Total Cost					€ 0.00

No.	Dredging	Volume of Dredging (m³)	Rate Select a Rate from Dropdown (€/m³)	Cost of Dredging (€)
Total Cost				€ 0.00

Total Excavation Costs € 0.00

5. Excavation on Land		Volume of Excavation	Rate	Cost of Excavation
No. Select Excavation Type from Dropdown	Comments	(m³)	(€/m³)	(€)
		Total Cost		€ 0.00

6. Weir Construction		Width of Weir	Rate	Capital Cost of Weir	Maintenance Costs Estimate	PV Cost/Weir
No. Select Weir Height from Dropdown	Comments	Min 10m Max 20m	(€/m)	(€)	Select H/L	(€/weir)
		(m)			Average	
		Capital Cost		€ 0.00	Total PV Cost	€ 0.00
				Total Cost	€ 0.00	

7. Weir Removal		Length of Weir	Rate	Cost of Construction
No. Description of Weir	(m)	(€/m)	(€)	
		Total Cost	€ 0.00	

8. Bridges		Remove or Replace	Area of Bridge	Rate	Cost of Construction	PV Costs
No. Description of Bridge		Select Yes/No	(m²)	(€/m²)	(€)	(€/bridge)
		Capital Cost		€ 0.00	€ 0.00	
				Total Cost	€ 0.00	

9. Bridge Underpinning		Length of Bridge	Rate	Cost of Construction
No. Choose a suitable bridge from dropdown	Comments	(m)	(€/m)	(€)
		Total Cost	€ 0.00	

10a. Culverts (Rural)		Disposal of Spoil	Ground Type	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select	Select Soil/Rock	Select (m)	Select (m)	(m)	(€/m)	(€)	Select H/L	(€/m)	(€)
			Soil	2.5					High		
									Average		
									Low		
									Average		
									Average		
									Average		
									Average		
									Average		
									Average		
		Capital Cost						€ 0.00		Total PV Cost	€ 0.00
								Total Cost	€ 0.00		

10b. Culverts (Urban)		Culvert	Invert	Culvert Size	Length of Culvert	Rate	Cost of Construction	Maintenance Costs Estimate	PV Rate	PV Cost
No. Description of Culvert		Select New/Replacement	Select (m)	Select (m)	(m)	(€/m)	(€)	Select H/L	(€/m)	(€)
								High		
								Average		
								Low		
								Average		
								Average		
								Average		
								Average		
								Average		
								Average		
		Capital Cost					€ 0.00		Total PV Cost	€ 0.00
								Total Cost	€ 0.00	

10c. Culverts (Headwall)		Length of Culvert	Culvert Size	Rate	Cost of Construction
No. Description of Culvert	(m)	Select (m)	(€/m)	(€)	
		Capital Cost	€ 0.00		
Overall Capital Cost		€ 0.00	Overall PV Cost	€ 0.00	
				Overall Cost	€ 0.00

11. Sluice Gates		Size Select	Maintenance Select	Operation Select	Maintenance Costs Estimate Select H/L	Capital Cost	PV Cost	Total Cost
No. Select Gate Type	Comments					(€)	(€)	(€)
Capital Cost						€ 0.00	PV Cost	€ 0.00
						Total Cost		€ 0.00

12. Road Raising		Length of Road	Cost of Construction	Cost of Construction
Note cost is to raise road by 600mm				
No. Road Details		(m)	(€)	(€)
Total Cost			€ 0.00	€ 0.00

13. Individual Property Protection		Factor Select	Number of Units	Rate	Cost of Works	PV Rate	PV Cost
No. Property Type	Comments			(€)	(€)	(€)	(€)
1 Detached							
2 Semi-Detached							
3 Terraced							
4 Flat							
5 Residential average							
6 Shop							
7 Office							
Capital Cost					€ 0.00	PV Cost	€ 0.00
					Total Cost		€ 0.00

14. Hydrometric Gauging Stations		Number of Units	Maintenance Select H/L	Rate	Capital Cost of Units	PV Rate	PV Costs
No. Hydrometric Gauging Station	Comments			(€)	(€)	(€)	(€)
Capital Cost					€ 0.00	PV Cost	€ 0.00
					Total Cost		€ 0.00

15. Flood Forecasting		Signage Select Yes/No	Maintenance Select	Number of Units	Rate	Cost of Construction	PV Cost	PV Cost
No. Category	Comments				(€)	(€)	(€)	(€)
Capital Cost						€ 0.00	PV Cost	€ 0.00
						Total Cost		€ 0.00

16. Pumping Stations		Number of Units	Rate	Capital Cost	Operation Cost	Running Cost	PV Cost
No. Pumpstation Capacity	Comments		(€)	(€)	(€)	(€)	(€)
1 0.02 m3/s							
2 0.05 m3/s							
3 0.1 m3/s		1	€ 130,200.00	€ 130,200.00	€ 80,429.30	€ 17,873.18	€ 98,302.48
4 0.5 m3/s							
5 1.0 m3/s							
6 2.0 m3/s							
7 3.0 m3/s							
Capital Cost				€ 130,200.00		PV Cost	€ 208,972.48
				Total Cost		Total Cost	€ 339,172.48

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17. Channel Maintenance		Length of Channel	Rate	Maintenance Costs
No. Channel Type	Comments	(m)	(€)	(€)
Total Cost			€ 0.00	

18. Bank Protection		Fluvial/Coastal Select	Maintenance Select	Length	Rate	Cost of Construction	PV Rate	PV Cost
No. Description of Bank Protection				(m)	(€/m)	(€)	(€)	(€)
	Fluvial	High						
Capital Cost						€ 0.00	PV Cost	€ 0.00
						Total Cost		€ 0.00

19. Manhole Sealing		No. of Manholes	Rate	Cost of Construction
No. Manhole Type	Comments		(€)	(€)
Total Cost			€ 0.00	

## CFRAM Unit Cost Development Project

Method	Complex Forecast for Catchment		
Prepared by:	T. Donovan	Date:	23/02/2016
Checked by:	B. O'Connor	Date:	23/02/2016

Project reference	SWCFRAM	Project name:	Ballingeary / Inchigeelagh AFA
Base date for estimates (year 0)	Feb-2016	Construction Price Index (CPI)	1.000
Scaling factor (e.g. €m, €k, €)	€	Method Factor - to take into account particular site issues /constraints	1.00

This sheet should only be used when assessing single method options as double counting may occur when method costs are added. Costing of complex forecasting over a catchment will depend on the number of gauges, type of forecast model and degree of existing forecast systems (hardware/software). Indicative costs for each element of a forecast model are provided. Appraisers must enter the units required to generate a total cost.

### Single Method Capital Cost Tool for complex forecast

Specification, site survey and administration	Typical Rate (€)		Quantity	Unit	Rate (€)	Total cost (€)	Comment/justification
	Lower	Upper					
Specification and procurement of system	€2,000	€4,000	No.	1	€2,000	€2,000	
Site visit to determine gauge locations	€2,000	€4,000	No.	1	€2,000	€2,000	
Warning area survey			No.			€0	
<b>Gauging and telemetry</b>							
Raingauges	€3,000	€4,000	No.	0	€3,000	€0	
River gauges	€4,000	€5,000	No.	4	€4,000	€16,000	
<b>Forecast model set-up, calibration, configuration and testing</b>							
Hydrological model build and calibration (PDM/routing)	€10,000	€35,000	No.	1	€15,000	€15,000	
Testing and configuration of system	€2,000	€5,000	No.	1	€2,000	€2,000	
Reporting	€3,000	€5,000	No.	1	€3,000	€3,000	
<b>Forecasting system development</b>							
Purchase of development of forecasting platform and licence costs	€40,000	€120,000	No.	1	€40,000	€40,000	
Computer hardware and backup systems	€5,000	€15,000	No.	1	€5,000	€5,000	
Web viewable forecast system (web server, licence, set up costs)	€60,000	€130,000	No.	1	€60,000	€60,000	
<b>Design and plan of training package</b>							
Design, preparation and documentation	€3,000	€8,000	No.	1	€3,000	€3,000	
Delivery and facilitation of training	€2,000	€4,000	No.	1	€2,000	€2,000	
<b>Public awareness campaign</b>							
% of full time equivalent at €30,000/year for year 1	N/A	N/A	%			€0	
<b>Total costs</b>						€150,000	
Apply update to unit rate (CPI) if appropriate (cell N15)						€150,000	
Enter appropriate preliminaries estimate (%) if applicable						0%	
Enter other applicable costs (€)						0	
<b>Total capital cost (€)</b>						€150,000	
Consider amendments based on site issues/constraints (cell N16)						€150,000	
<b>Total capital cost (€)</b>						€150,000	

### Operation and Maintenance Cost Tool

	Typical Rate (€)		Quantity	Unit	Rate (€)	Total cost (€)
	Lower	Upper				
Raingauge maintenance and telemetry	€1,000	€2,000	No.	0	1000	€0
River gauge maintenance and telemetry	€1,000	€5,000	No.	4	1000	€4,000
Data (GPRS/GSM) costs	€200	€1,500	No.	1	200	€200
Forecasting management software shell maintenance	€5,000	€20,000	No.	1	5000	€5,000
Forecast model updates and re-calibration	€1,000	€2,000	No.	1	1000	€1,000
Hardware and backup system maintenance	€1,000		No.	1	1000	€1,000
<b>Total O&amp;M cost (€)</b>						€11,200

### Other costs

Other costs (user defined - consider the need for additional longer term or intermittent costs)	€0
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### Total PV Cost

<b>Total PVC costs (see PVC calculator below)</b>	€389,024
Optimism bias rate (from external sheet)	44%
<b>Total Cost including Optimism Bias</b>	€560,195

# Whole life cost and PVc analysis - for Complex Forecast for Catchment

Enter applicable costs (enabling, capital and O&M)

Enter year of capital works (all other costs start after this year)

Enter 'other' costs and frequency (e.g. replacement costs) if applicable

Enabling costs assume to start in year 0 (amend manually if required)

Enabling cost (€) (if applicable, may be sunk cost)	
Year of capital works (year)	0
Capital cost (€)	€150,000.0
Annual maintenance cost (€)	€11,200.0
Other cost (€)	€0.0
Other works frequency (years)	

## Key

	Information
	Calculation
	Cost input

Discount rate:		4.0%	Present Value Factor: 22.341		Total PVc (€k): 389024	
Cash sum		0	150000	548800	0	698800 389024
		Cost Elements				TOTALS:
year	Discount Factor	Enabling	Capital	Maint.	Other	Cash PV
0	1.000	0	150000			150000.0 150000.0
1	0.962			11200		11200.0 10769.2
2	0.925			11200		11200.0 10355.0
3	0.889			11200		11200.0 9956.8
4	0.855			11200		11200.0 9573.8
5	0.822			11200		11200.0 9205.6
6	0.790			11200		11200.0 8851.5
7	0.760			11200		11200.0 8511.1
8	0.731			11200		11200.0 8183.7
9	0.703			11200		11200.0 7869.0
10	0.676			11200		11200.0 7566.3
11	0.650			11200		11200.0 7275.3
12	0.625			11200		11200.0 6995.5
13	0.601			11200		11200.0 6726.4
14	0.577			11200		11200.0 6467.7
15	0.555			11200		11200.0 6219.0
16	0.534			11200		11200.0 5979.8
17	0.513			11200		11200.0 5749.8
18	0.494			11200		11200.0 5528.6
19	0.475			11200		11200.0 5316.0
20	0.456			11200		11200.0 5111.5
21	0.439			11200		11200.0 4914.9
22	0.422			11200		11200.0 4725.9
23	0.406			11200		11200.0 4544.1
24	0.390			11200		11200.0 4369.4
25	0.375			11200		11200.0 4201.3
26	0.361			11200		11200.0 4039.7
27	0.347			11200		11200.0 3884.3
28	0.333			11200		11200.0 3734.9
29	0.321			11200		11200.0 3591.3
30	0.308			11200		11200.0 3453.2
31	0.296			11200		11200.0 3320.4
32	0.285			11200		11200.0 3192.6
33	0.274			11200		11200.0 3069.9
34	0.264			11200		11200.0 2951.8
35	0.253			11200		11200.0 2838.3
36	0.244			11200		11200.0 2729.1
37	0.234			11200		11200.0 2624.1
38	0.225			11200		11200.0 2523.2
39	0.217			11200		11200.0 2426.2
40	0.208			11200		11200.0 2332.8
41	0.200			11200		11200.0 2243.1
42	0.193			11200		11200.0 2156.8
43	0.185			11200		11200.0 2073.9
44	0.178			11200		11200.0 1994.1
45	0.171			11200		11200.0 1917.4
46	0.165			11200		11200.0 1843.7
47	0.158			11200		11200.0 1772.8
48	0.152			11200		11200.0 1704.6
49	0.146			11200		11200.0 1639.0

## CFRAM Unit Cost Development Project

Method	Complex Forecast for Catchment		
Prepared by:	T. Donovan	Date:	23/02/2016
Checked by:	B. O'Connor	Date:	23/02/2016

Project reference	SWCFRAM	Project name:	Castlemartyr AFA
Base date for estimates (year 0)	Feb-2016	Construction Price Index (CPI)	1.000
Scaling factor (e.g. €m, €k, €)	€	Method Factor - to take into account particular site issues /constraints	1.00

This sheet should only be used when assessing single method options as double counting may occur when method costs are added. Costing of complex forecasting over a catchment will depend on the number of gauges, type of forecast model and degree of existing forecast systems (hardware/software). Indicative costs for each element of a forecast model are provided. Appraisers must enter the units required to generate a total cost.

### Single Method Capital Cost Tool for complex forecast

Specification, site survey and administration	Typical Rate (€)		Quantity	Unit	Rate (€)	Total cost		Comment/justification
	Lower	Upper				(€)	(€)	
Specification and procurement of system	€2,000	€4,000	No.	1	€2,000	€2,000		
Site visit to determine gauge locations	€2,000	€4,000	No.	1	€2,000	€2,000		
Warning area survey			No.			€0		
<b>Gauging and telemetry</b>								
Raingauges	€3,000	€4,000	No.	3	€3,000	€9,000		
River gauges	€4,000	€5,000	No.	3	€4,000	€12,000		
<b>Forecast model set-up, calibration, configuration and testing</b>								
Hydrological model build and calibration (PDM/routing)	€10,000	€35,000	No.	1	€10,000	€10,000		
Testing and configuration of system	€2,000	€5,000	No.	1	€2,000	€2,000		
Reporting	€3,000	€5,000	No.	1	€3,000	€3,000		
<b>Forecasting system development</b>								
Purchase of development of forecasting platform and licence costs	€40,000	€120,000	No.	1	€40,000	€40,000		
Computer hardware and backup systems	€5,000	€15,000	No.	1	€5,000	€5,000		
Web viewable forecast system (web server, licence, set up costs)	€60,000	€130,000	No.	1	€60,000	€60,000		
<b>Design and plan of training package</b>								
Design, preparation and documentation	€3,000	€8,000	No.	1	€3,000	€3,000		
Delivery and facilitation of training	€2,000	€4,000	No.	1	€2,000	€2,000		
<b>Public awareness campaign</b>								
% of full time equivalent at €30,000/year for year 1	N/A	N/A	%			€0		
<b>Total costs</b>						€150,000		
Apply update to unit rate (CPI) if appropriate (cell N15)						€150,000		
Enter appropriate preliminaries estimate (%) if applicable						0%		
Enter other applicable costs (€)						0		
<b>Total capital cost (€)</b>						€150,000		
Consider amendments based on site issues/constraints (cell N16)						€150,000		
<b>Total capital cost (€)</b>						€150,000		

### Operation and Maintenance Cost Tool

Specification, site survey and administration	Typical Rate (€)		Quantity	Unit	Rate (€)	Total cost		Comment/justification
	Lower	Upper				(€)	(€)	
Raingauge maintenance and telemetry	€1,000	€2,000	No.	3	1000	€3,000		
River gauge maintenance and telemetry	€1,000	€5,000	No.	3	1000	€3,000		
Data (GPRS/GSM) costs	€200	€1,500	No.	1	200	€200		
Forecasting management software shell maintenance	€5,000	€20,000	No.	1	5000	€5,000		
Forecast model updates and re-calibration	€1,000	€2,000	No.	1	1000	€1,000		
Hardware and backup system maintenance	€1,000		No.	1	1000	€1,000		
<b>Total O&amp;M cost (€)</b>						€13,200		

### Other costs

Other costs (user defined - consider the need for additional longer term or intermittent costs)	€0	
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### Total PV Cost

<b>Total PVC costs (see PVC calculator below)</b>	€431,707	
Optimism bias rate (from external sheet)	44%	
<b>Total Cost including Optimism Bias</b>	€621,659	

# Whole life cost and Pvc analysis - for Complex Forecast for Catchment

Enter applicable costs (enabling, capital and O&M)

Enter year of capital works (all other costs start after this year)

Enter 'other' costs and frequency (e.g. replacement costs) if applicable

Enabling costs assume to start in year 0 (amend manually if required)

Enabling cost (€) (if applicable, may be sunk cost)	
Year of capital works (year)	0
Capital cost (€)	€150,000.0
Annual maintenance cost (€)	€13,200.0
Other cost (€)	€0.0
Other works frequency (years)	

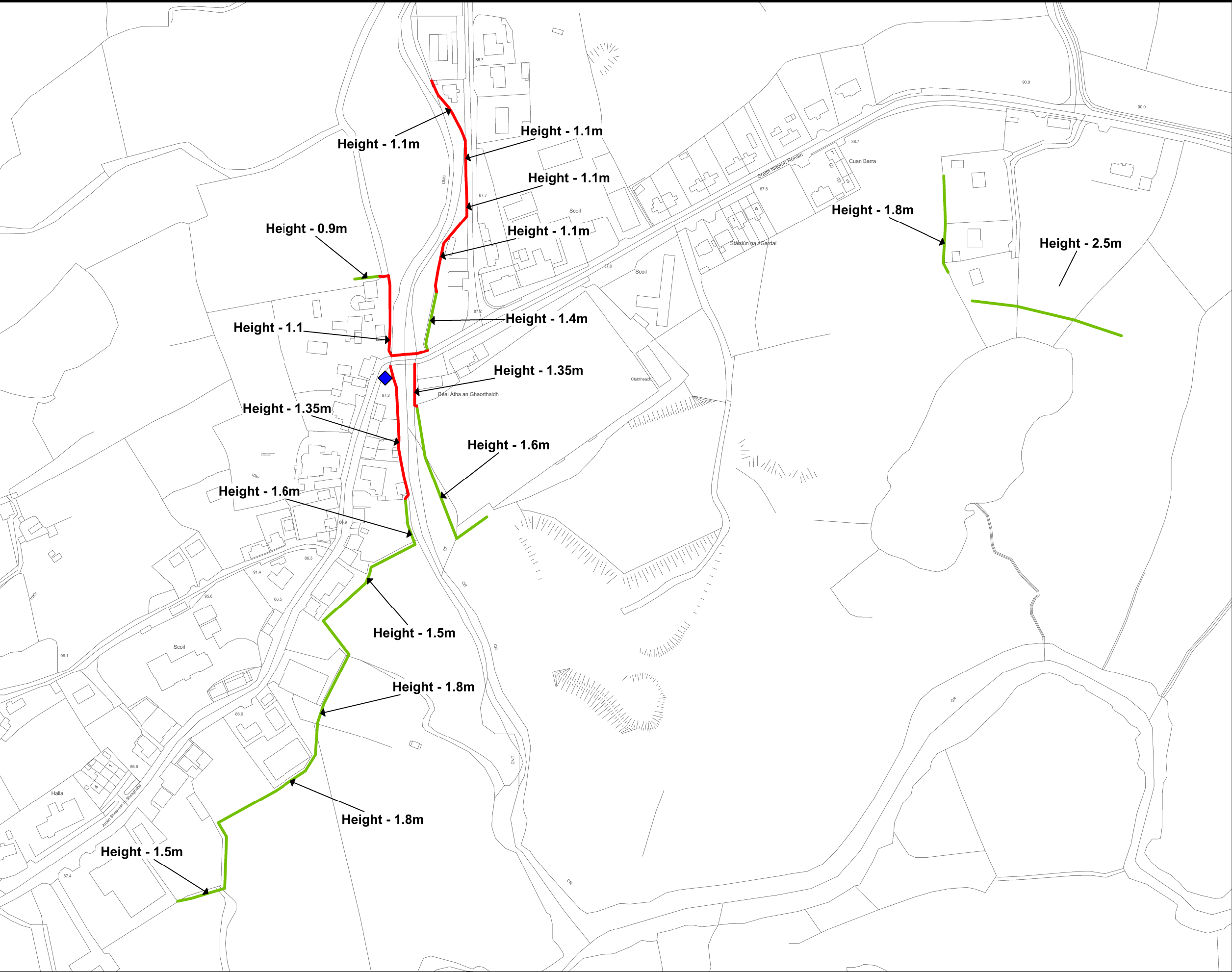
Key

	Information
	Calculation
	Cost Input

Discount rate:		4.0%	Present Value Factor: 22.341		Total Pvc (€k): 431707	
Cash sum		0	150000	646800	0	796800 431707
		Cost Elements				TOTALS:
year	Discount Factor	Enabling	Capital	Maint.	Other	Cash PV
0	1.000	0	150000			150000.0 150000.0
1	0.962			13200		13200.0 12692.3
2	0.925			13200		13200.0 12204.1
3	0.889			13200		13200.0 11734.8
4	0.855			13200		13200.0 11283.4
5	0.822			13200		13200.0 10849.4
6	0.790			13200		13200.0 10432.2
7	0.760			13200		13200.0 10030.9
8	0.731			13200		13200.0 9645.1
9	0.703			13200		13200.0 9274.1
10	0.676			13200		13200.0 8917.4
11	0.650			13200		13200.0 8574.5
12	0.625			13200		13200.0 8244.7
13	0.601			13200		13200.0 7927.6
14	0.577			13200		13200.0 7622.7
15	0.555			13200		13200.0 7329.5
16	0.534			13200		13200.0 7047.6
17	0.513			13200		13200.0 6776.5
18	0.494			13200		13200.0 6515.9
19	0.475			13200		13200.0 6265.3
20	0.456			13200		13200.0 6024.3
21	0.439			13200		13200.0 5792.6
22	0.422			13200		13200.0 5569.8
23	0.406			13200		13200.0 5355.6
24	0.390			13200		13200.0 5149.6
25	0.375			13200		13200.0 4951.5
26	0.361			13200		13200.0 4761.1
27	0.347			13200		13200.0 4578.0
28	0.333			13200		13200.0 4401.9
29	0.321			13200		13200.0 4232.6
30	0.308			13200		13200.0 4069.8
31	0.296			13200		13200.0 3913.3
32	0.285			13200		13200.0 3762.8
33	0.274			13200		13200.0 3618.0
34	0.264			13200		13200.0 3478.9
35	0.253			13200		13200.0 3345.1
36	0.244			13200		13200.0 3216.4
37	0.234			13200		13200.0 3092.7
38	0.225			13200		13200.0 2973.8
39	0.217			13200		13200.0 2859.4
40	0.208			13200		13200.0 2749.4
41	0.200			13200		13200.0 2643.7
42	0.193			13200		13200.0 2542.0
43	0.185			13200		13200.0 2444.2
44	0.178			13200		13200.0 2350.2
45	0.171			13200		13200.0 2259.8
46	0.165			13200		13200.0 2172.9
47	0.158			13200		13200.0 2089.3
48	0.152			13200		13200.0 2009.0
49	0.146			13200		13200.0 1931.7

## Appendix B. Drawings of Potential FRM Options



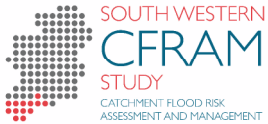


Storm Water Pump Station



Flood Defence Walls

Flood Defence Embankments



Office of Public Works  
Jonathan Swift Street  
Trim, Co. Meath



Mott MacDonald Ireland  
5 Eastgate Avenue  
Little Island, Cork

Project :  
South Western CFRAM Study

Map : Ballingeary  
Flood Defences

Map Type: Preliminary Options

Source: Fluvial Flooding

Map Area: Urban Area

Scenario: Current

Drawn by: Tony Donovan

Checked by: Barry O'Connor

Approved by: Fintan McGivern

Map No.: MMD-296235-E-DR-19-BY-201-P1

Sheet: 1 of 1 Revision: P1

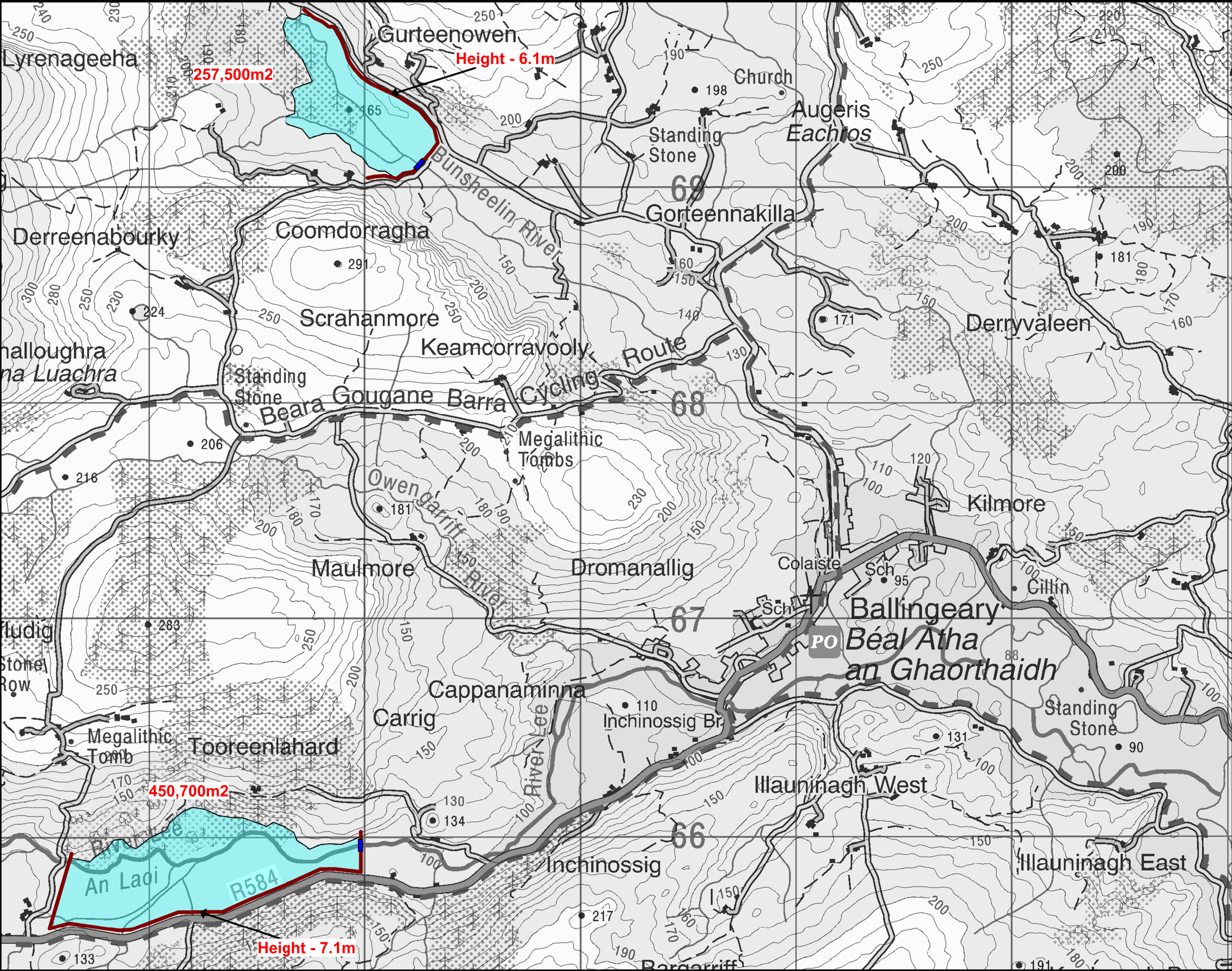
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Storage Area

Embankment

Sluice Gate



Office of Public Works  
Jonathan Swift Street  
Trim, Co. Meath



Mott MacDonald Ireland  
5 Eastgate Avenue  
Little Island, Cork

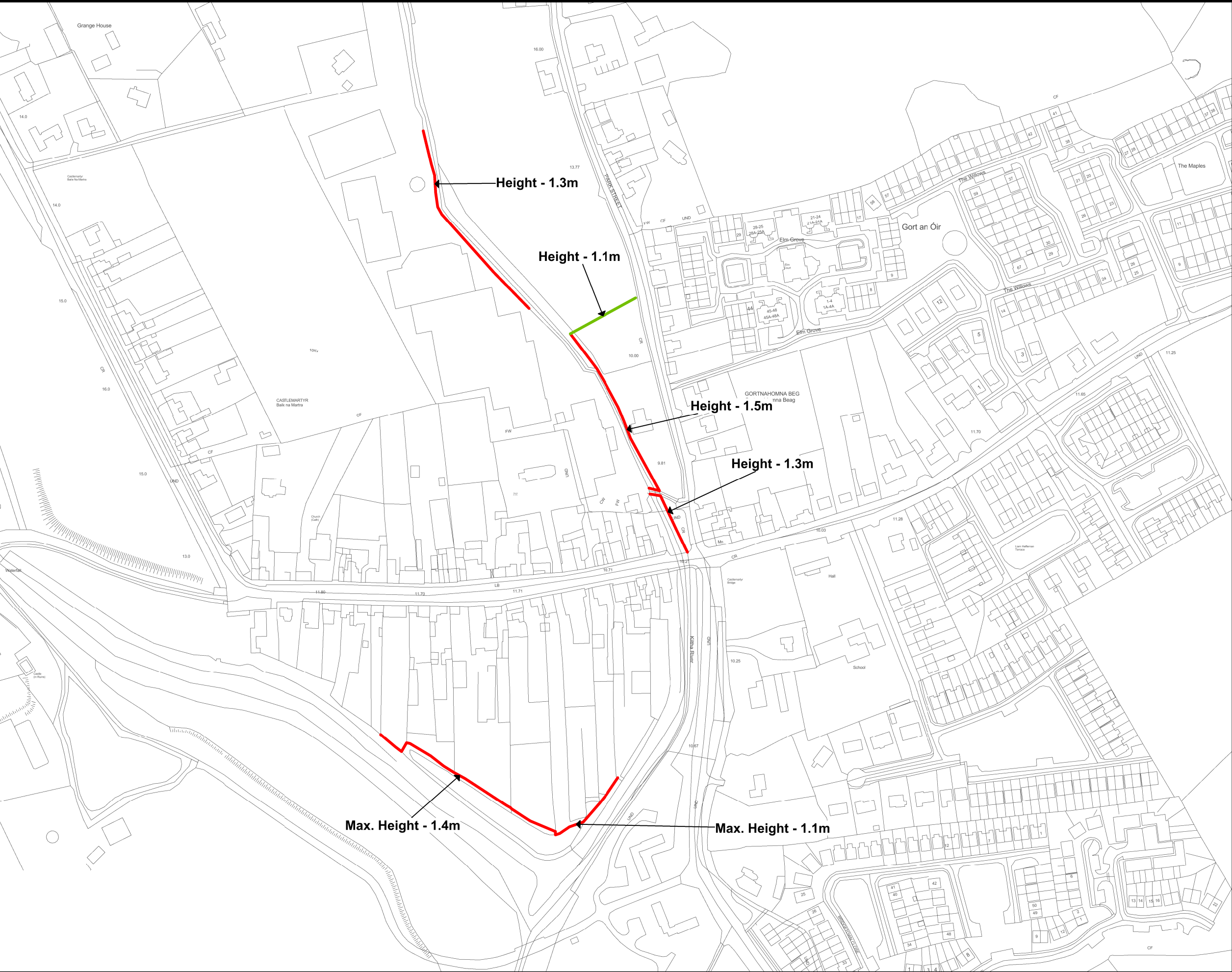
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Map : Ballingeary Storage	
Map Type:	Preliminary Options
Source:	Fluvial Flooding
Map Area:	Urban Area
Scenario:	Current
Drawn by:	Tony Donovan
Checked by:	Barry O'Connor
Approved by:	Fintan McGivern
Map No.:	MMD-296235-E-DR-19-BY-202-P1
Sheet:	1 of 1
Drawing Scale:	NTS
Revision:	P1
Plot Scale:	1:1 @ A3



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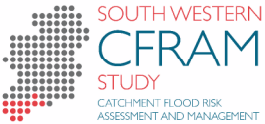
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Flood Defence Walls

Flood Defence Embankments



Office of Public Works  
Jonathan Swift Street  
Trim, Co. Meath

Mott MacDonald Ireland  
5 Eastgate Avenue  
Little Island, Cork

Project :

**South Western CFRAM Study**

Map : **Castlemaryr  
Flood Defences**

Map Type: Preliminary Options

Source: Fluvial Flooding

Map Area: Urban Area

Scenario: Current

Drawn by: Tony Donovan

Checked by: Barry O'Connor

Approved by: Fintan McGivern

Map No.: MMD-296235-E-DR-19-CR-201-P1

Sheet:

1 of 1

Revision: P1

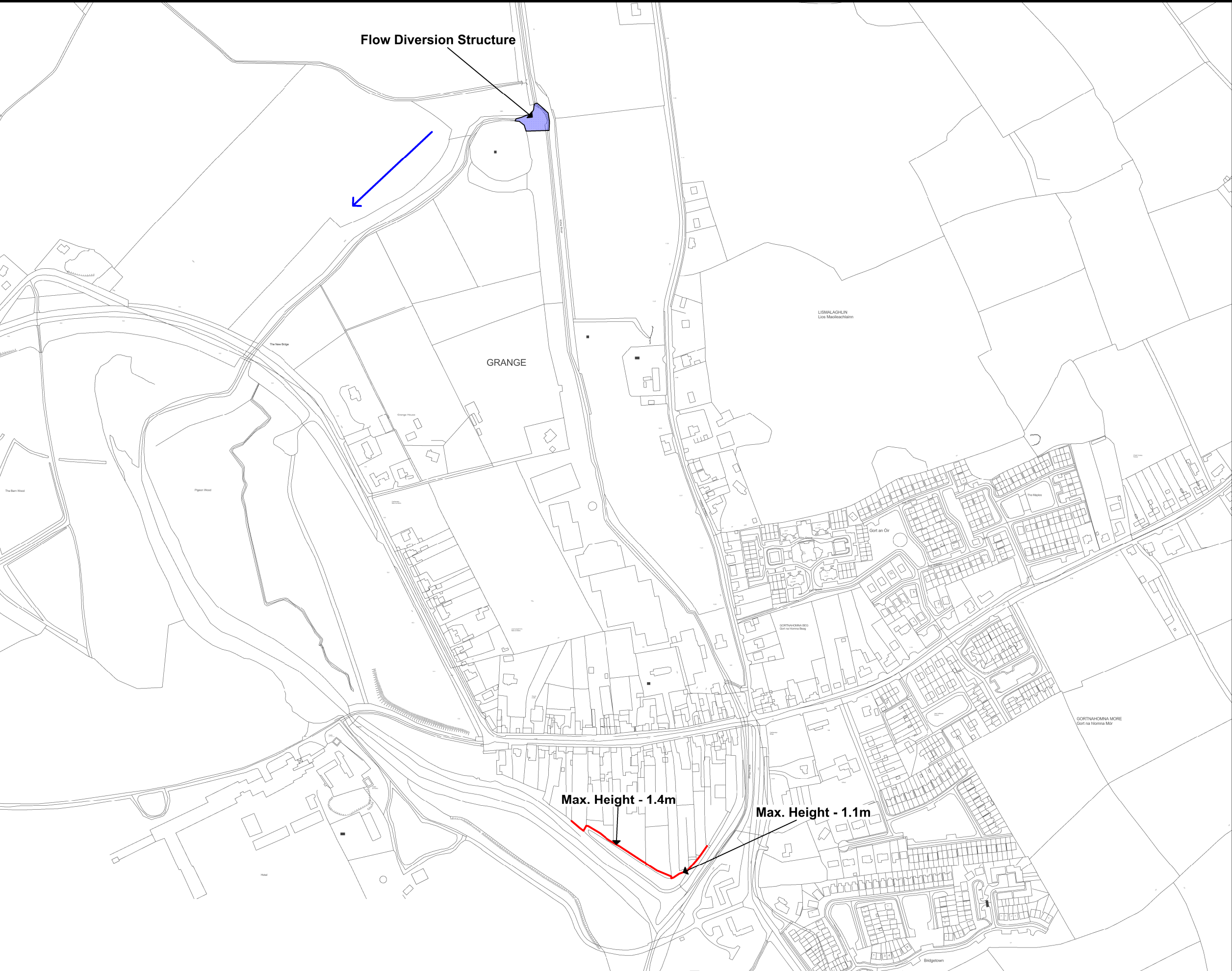
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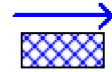


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Flow Diversion Structure



Flood Defence Walls



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Jonathan Swift Street  
Trim, Co. Meath



Mott MacDonald Ireland  
5 Eastgate Avenue  
Little Island, Cork

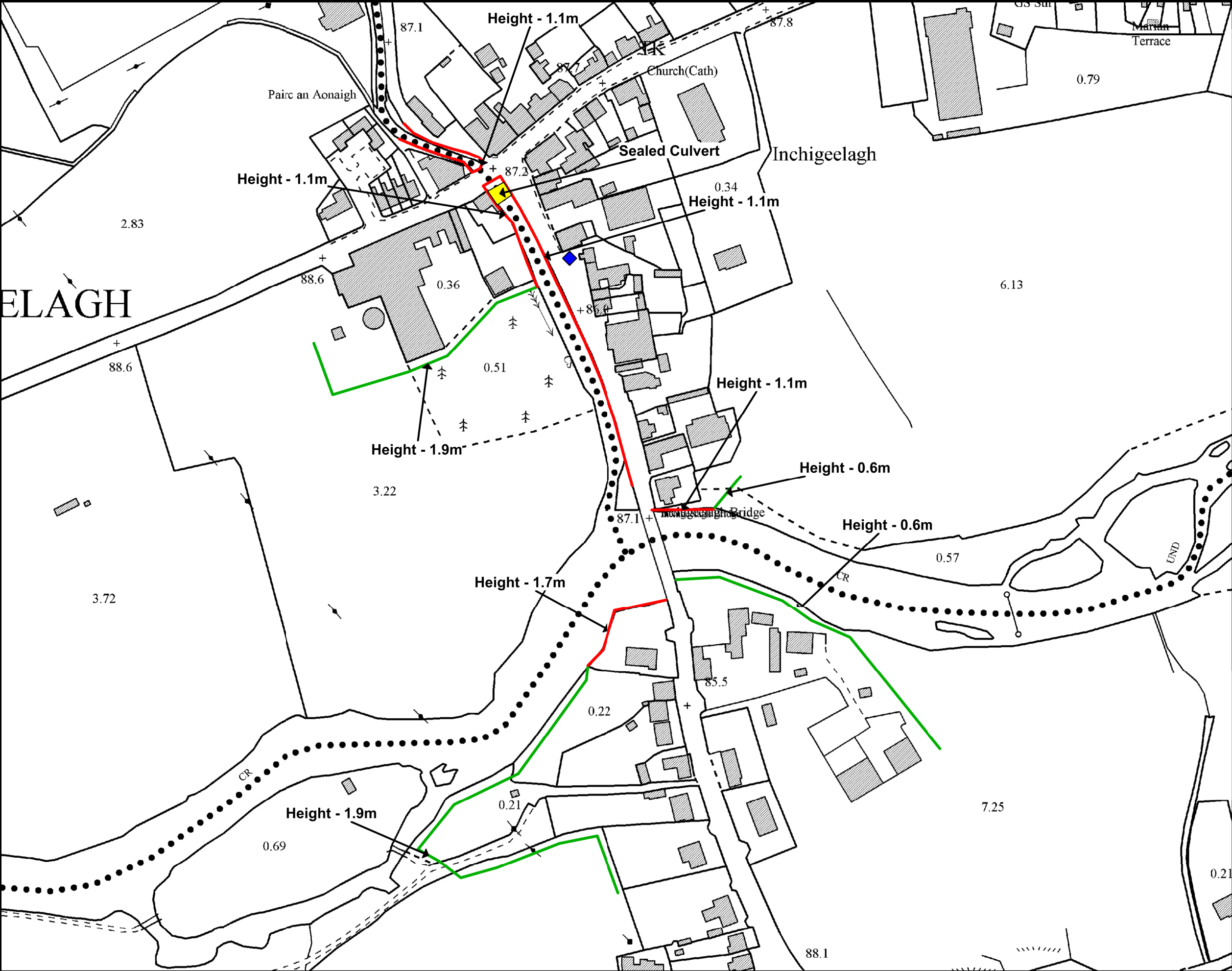
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Map : <b>Castlemartyr Flow Diversion &amp; Flood Defences</b>	
Map Type:	Preliminary Options
Source:	Fluvial Flooding
Map Area:	Urban Area
Scenario:	Current
Drawn by:	Tony Donovan
Checked by:	Barry O'Connor
Approved by:	Fintan McGivern
Map No.:	MMD-296235-E-DR-19-CR-202-P1
Sheet:	1 of 1
Drawing Scale:	NTS
Revision:	P1
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Flood Defence Walls  
Flood Defence Embankments  
Sealed Culvert  
Storm Water Pump Station



Office of Public Works  
Jonathan Swift Street  
Trim, Co. Meath



Mott MacDonald Ireland  
5 Eastgate Avenue  
Little Island, Cork

Project : South Western CFRAM Study	
Map : Inchigeelagh Flood Defences	
Map Type:	Preliminary Options
Source:	Fluvial Flooding
Map Area:	Urban Area
Scenario:	Current
Drawn by:	Tony Donovan
Checked by:	Barry O'Connor
Approved by:	Fintan McGivern
Map No.:	MMD-296235-E-DR-19-IH-201-P1
Sheet:	1 of 1
Drawing Scale:	NTS
Revision:	P1
Plot Scale:	1:1 @ A3



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