

7. GENERAL CONDITION SURVEY OF KEY SWALLOW HOLES – BLACKROCK TO KINVARRA AREA

7.1 SCOPE OF THE SURVEY

A general condition survey of key swallow holes in the Kiltartan area, including the Coole and Caherglassaun areas downstream from Kiltartan and the Castletown, Ballylee, Blackrock areas upstream from Kiltartan was carried out on the 13th, 14th of December 2010 and on the 11th of January 2011. The overground survey was aimed to confirm the location of the key swallow holes and to identify rubble / waste / debris likely to lead to blockages.

The key swallow holes were located using mapping available as part of the April 1998 South Galway Flood Study Report as well as 6 inch mapping of the area. This survey was made possible following a period of cold and dry weather at the end of November 2010 and in December 2010. Water levels were unusually low for the season as can be seen in the various photographs available in this Section.

7.2 SURVEY RESULTS

7.2.1 Loughcurra South

The Irish Grid Coordinates of this karstic feature identified at Loughcurra South are as follows :

- Easting : 138530
- Northing : 209070

The following photographs were taken immediately upstream from the swallow hole :



*Figure No.7.1 – Loughcurra South sink hole
Stone wall restricting the flow*



*Figure No.7.2 – Loughcurra South sink hole
Evidence of ground works – right bank of the
channel leading to the swallow hole*

As can be seen above, a stone wall is located within the channel leading to the swallow hole and may be causing restrictions in flows. A significant amount of material is located on the right bank of the channel immediately upstream from the karstic feature which could be washed away by floods and partially block the entrance of the swallow hole.

Fencing of the swallow hole should be discussed with the landowner. Left and right banks of the channel leading to the swallow hole should be cleared from material. The length to be cleared is approximately 250 metres. Overgrown vegetation around the sink should also be cleared.

7.2.2 Ballybuck North

The Irish Grid Coordinates of this karstic feature identified at Ballybuck North are as follows :

- Easting : 139564
- Northing : 206237

The following photographs show the area surveyed :



*Figure No.7.3 – Ballybuck North
Surveyed Area*



*Figure No.7.4 – Ballybuck North
Surveyed Area*

As part of the April 1998 South Galway Flood Study Report, swallow holes were listed and located on maps. Records show that a swallow hole is located at Ballybuck North however, on the day of the survey, the sink could not be found and no evidence of water running was observed. The area is overgrown as can be seen above and the feature could be hidden by

the vegetation. Further investigation is required and the vegetation could be cleared in order to find the sink.

7.2.3 Caherglassaun West

A number of karstic features were identified to the West of Caherglassaun Lough.

7.2.3.1 Pollnamona sink

The Irish Grid Coordinates of this karstic feature are as follows :

- Easting : 140686
- Northing : 206253

The following photographs show Pollnamona sink :



Figure No.7.5 – Pollnamona sink



Figure No.7.6 – Pollnamona sink

This pond is surrounded by dense vegetation. It is recommended that the area including the pond be cleared of debris and that bushes and wood lying on the banks be removed. Fencing off the area should also be discussed with the landowner.

7.2.3.2 Polldalagha sink

The Irish Grid Coordinates of this karstic feature are as follows :

- Easting : 140804
- Northing : 206154

The following photographs show Polldalagha sink :



Figure No.7.7 – Polldalagha sink



Figure No.7.8 – Polldalagha sink

This pond is located 150 metres east of Pollnamona sink. It is also surrounded by dense vegetation which should be cleared in the immediate vicinity of the pond to limit flow restrictions under flooding conditions. Debris and other material obstructing flow should be removed from the pond area. Fencing off the area should be discussed with the landowner.

7.2.3.3 East of Polldalagha

The Irish Grid Coordinates of this karstic feature are as follows :

- Easting : 140865
- Northing : 206181

The following photographs show the area to the east of Polldalagha :



Figure No.7.9 – Area East of Polldalagha Pond



Figure No.7.10 – Area East of Polldalagha Pond

A significant flow of water was observed approximately 80 metres east of Polldalagha pond. Numerous boulders and dense overgrown vegetation made the identification of the outlet difficult however, the northerly direction of the flow suggests the presence of a significant sink hole in the area. It is recommended that boulders be removed to expose the channel path and the outlet. The channel path should also be cleared from the dense vegetation and fencing off the area should be discussed with the landowner.

7.2.4 Caherglassaun North

7.2.4.1 Pollnapasty sink

The Irish Grid Coordinates of the main swallow hole at Caherglassaun are as follows :

- Easting : 141234

○ Northing : 206531

The following photographs show Pollnapasty sink :



*Figure No.7.11 – Pollnapasty sink
Aerial photograph*

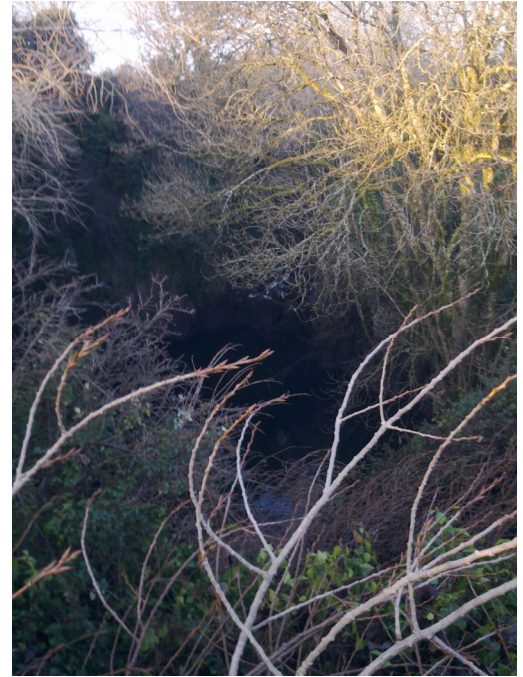


Figure No.7.12 – Pollnapasty sink

This swallow hole is a major outlet in the Caherglassaun area. The bottom of the sink could not be inspected as it is more than 10 metres deep with steep embankments. Dense bushes and trees surround the sink which made the inspection from the top difficult as little light could reach the bottom. Numerous plastic bags were observed on the northern embankments and should be cleared. It is recommended that trees, bushes and pieces of wood be cleared and that fencing of the area be discussed with the landowner.

7.2.4.2 Infilled Cave – North of Pollnapasty

The Irish Grid Coordinates of this cave located north of Pollnapasty are as follows :

- Easting : 141185
- Northing : 206674

The following photographs show the infilled cave :



*Figure No.7.13 – Infilled cave
Aerial photograph*



Figure No.7.14 – Infilled cave

This cave is located 150 metres north of Pollnapasty. It is currently blocked off. Evidence suggest that this cave is active and linked to Pollnapasty sink hole. It is recommended that the entrance be cleared and that fencing be discussed with the landowner.

7.2.5 Garryland North / Coole

The Irish Grid Coordinates of this karstic feature identified at Garryland North are as follows :

- Easting : 142141
- Northing : 205128

The following photograph shows this area at Garryland North adjacent to Coole Lough :



*Figure No.7.15 – Garryland North
Aerial photograph*

Records available as part of the April 1998 South Galway Flood Study Report show that an active karstic feature is located at Garryland North. On the day of the survey, water levels at Coole Lough were unusually low and did not reach the feature. The general condition in the area is considered good. Underwater water surveys to identify siltation levels and general bed conditions should be considered. Discussions should also take place with the landowner in relation to fencing.

Major swallow holes in the Coole area are under water and consideration should be given to carrying out underwater surveys.

7.2.6 Kiltartan

7.2.6.1 Pollomuiro sink

The Irish Grid Coordinates of the main swallow hole at Kiltartan are as follows :

- Easting : 144722
- Northing : 206056

The following photographs show Pollomuiro sink hole :



Figure No.7.16 – Pollomuiro sink



Figure No.7.17 – Pollomuiro sink

Upstream Channel

Pollomuiro sink hole is a major outlet at Kiltartan. The area is overgrown and it is recommended that the dense vegetation be cleared. Discussions should take place with the landowner in relation to fencing around the sink. Debris and other material should be cleared from the entrance to the swallow hole.

The overground river channel upstream from Pollomuiiri should also be cleared from fallen trees and pieces of wood. The length of the channel to be cleared from the spring at Kiltartan (Polldeelin) to Pollomuiiri is approximately 700 metres. Further photographs of the channel are shown below :



*Figure No.7.18 – Polldeelin rise to Pollomuiiri
sink overground channel*



*Figure No.7.19 – Polldeelin rise to Pollomuiiri
sink overground channel*

Further upstream, a collapsed karstic feature receives water from Ballylee. It is surrounded by dense vegetation which should be cleared. Discussions should take place with the landowner in relation to fencing around the feature. It is also recommended that floating debris and pieces of wood that have fallen into the sink be cleared to prevent flow restrictions and blockages.

7.2.6.2 Pollonora sinks (4 No. secondary sinks)

The Irish Grid Coordinates of these karstic features identified at Corker are as follows :

- Pollonora sink No.1
 - Easting : 144850
 - Northing : 206232
- Pollonora sink No.2
 - Easting : 144896

- Northing : 206359
- Pollonora sink No.3
 - Easting : 144897
 - Northing : 206379
- Pollonora sink No.4
 - Easting : 145103
 - Northing : 206716

A number of secondary swallow holes were identified in the Kiltartan area along the route of the Corker overflow. The following aerial photograph shows the location of the sinks :

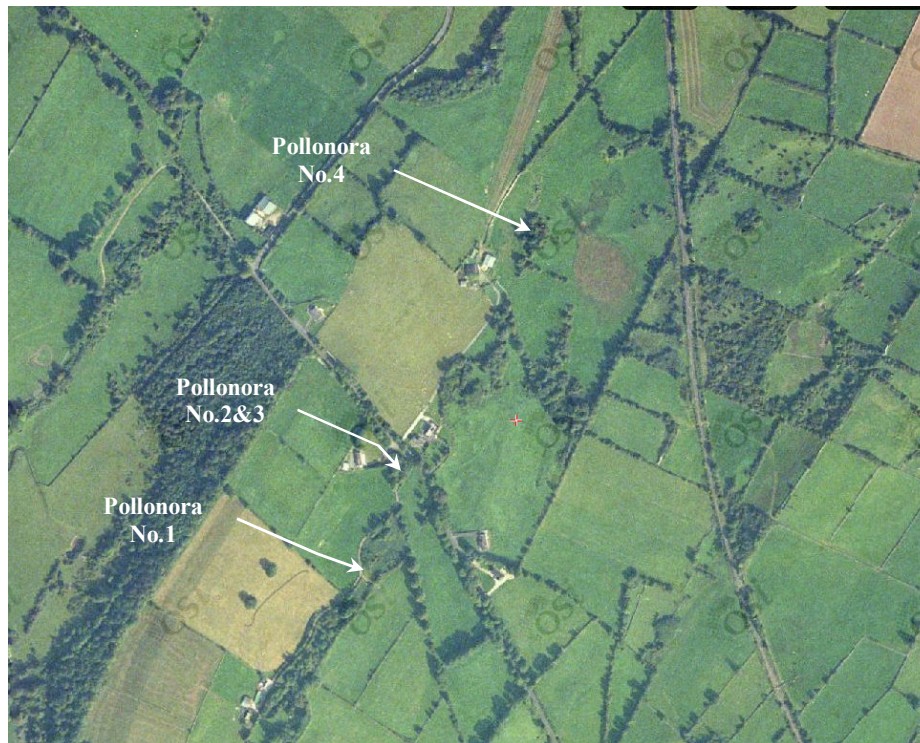


Figure No.7.20 – Pollonora Sinks

Aerial photograph

Pollonora sinks 1 to 3 could not be access and inspected as they are surrounded by dense vegetation. It is recommended that each site be cleared and that discussions take place with landowners in relation to fencing around the feature. Pollonora sink No.4 was inspected

and found to be active although the entrance of the sink was partially blocked by silt. It is also recommended that this sink be cleared.

7.2.7 Castletown sinks

7.2.7.1 Polltoophil North

The Irish Grid Coordinates of the main swallow hole at Castletown are as follows :

- Easting : 145921
- Northing : 204888

The following photographs show Polltoophil North sink hole :



Figure No.7.21 – Polltoophil North



Figure No.7.22 – Polltoophil North

A significant amount of debris and waste can be seen floating in the water. This sink receives water from the Gort River and as a result, it is particularly prone to blockages from material washed away by the river within the Gort city area. It is recommended that

the water be cleared from floating debris and waste. Discussions should take place with the landowner in relation to fencing around the feature. Consideration should be given to carrying out an underwater survey to identify siltation issues / blockages / conditions of the bed.

7.2.7.2 Polltoophil South

The Irish Grid Coordinates of this swallow hole at Castletown are as follows :

- Easting : 145973
- Northing : 204731

The following photographs show Polltoophil South sink hole :



Figure No.7.23 – Polltoophil South



Figure No.7.24 – Polltoophil South

This sink is located 180 metres upstream from Polltoophil North on the Gort River. On the day of the survey, the flow to Polltoophil South sink was very low and most of the water from the Gort river was drained underground via Polltoophil North sink. As can be seen in the photographs above, the channel leading to the southern sink shows significant weed growth. It is recommended that the banks and inlet channel be cleared. Discussions should take place with the landowner in relation to fencing around the feature. Consideration

should be given to carrying out an underwater survey to identify siltation issues / blockages / conditions of the bed.

7.2.8 Ballylee

7.2.8.1 Ballylee South / Pollaleen South

The Irish Grid Coordinates of the main swallow hole at Ballylee are as follows :

- Easting : 147514
- Northing : 206135

The following photographs show Pollaleen South sink hole :



Figure No.7.25 – Pollaleen South



Figure No.7.26 – Pollaleen South

No significant amount of debris was found in the area surrounding Pollaleen South sink hole on the day of the survey. The upstream channel and banks show significant weed growth and it is recommended that weed be cleared. Discussions should take place with the landowner in relation to fencing around the feature. The flow capacity of this sink was

greatly exceeded during last November 2009 floods and excess flood waters overflowed to the sinks at Castletown and Kiltartan. Consideration should be given to carrying out an underwater survey to identify siltation issues / blockages / conditions of the bed.

7.2.8.2 Ballylee North / Pollaleen North

The Irish Grid Coordinates of this karstic feature at Ballylee North are as follows :

- Easting : 148069
- Northing : 206596

The following photographs show Pollaleen North hole :



Figure No.7.27 – Pollaleen North



Figure No.7.28 – Pollaleen North

On the day of the survey carried out on the 11th of January 2011, there was little or no flow at this location. This hole is surrounded by dense vegetation. It is recommended that the area be cleared from bushes and pieces of wood lying on the banks. Discussions should take place with the landowner in relation to fencing around the feature.

7.2.9 Lough Coy

The Irish Grid Coordinates at Lough Coy are as follows :

- Easting : 149005
- Northing : 207455

The following photographs show the Lough Coy area :



Figure No.7.29 – Lough Coy



Figure No.7.30 – Lough Coy

The area surrounding Lough Coy was found to be in good condition. Consideration was given to fencing off the lake to prevent cattle from disturbing the grounds in the immediate vicinity of the lake but was discounted on cost grounds. Consideration should be given to carrying out an underwater survey to identify siltation issues / blockages / conditions of the bed.

7.2.10 Blackrock Turlough

The Irish Grid Coordinates at Blackrock Turlough are as follows :

- Easting : 149946
- Northing : 208044

The following photographs show the Blackrock Turlough area :



Figure No.7.31 – Blackrock turlough



Figure No.7.32 – Blackrock turlough

As can be seen above, water levels were low on the day of the survey carried out on the 11th of January 2011 and the bed of the turlough was partially exposed. Numerous localised holes and depressions could be inspected and small debris such as plastic bottles were found as illustrated overleaf.



Figure No.7.33 – Blackrock turlough



Figure No.7.34 – Blackrock turlough

Most of the water on the 11th of January 2011 was flowing to the eastern pond where it is expected that most of the underground drainage occurs. It is recommended that the numerous holes on the bed of the turlough be cleaned and cleared from debris. Consideration was also given to fencing off the turlough to prevent cattle from disturbing the grounds but was discounted on cost grounds.

8. DISCUSSION ON WATER TRANSFER THROUGH THE FUTURE M18 GORT TO TUAM MOTORWAY

8.1 PROPOSED LAYOUT OF THE FUTURE M18 GORT TO TUAM MOTORWAY

Negotiations for the Contract for the construction of the M18 are understood to be at an advanced stage. It is expected that construction will start late in the first quarter of 2011. The layout is shown on Drawing 4721/K/02 attached as Appendix A. The M18 will link Gort to Tuam and will therefore run perpendicularly to the general direction of the flow of water at Kiltartan. The road is proposed to follow the Coole ridge and then cross under the Kiltartan to Raheen local road before continuing on across the Corker area in a northerly direction.

8.2 POSSIBLE IMPACT ON RIVER DYNAMICS AT KILTARTAN

It is considered absolutely essential that the design of the new motorway take into account the water dynamics at Kiltartan so as to avoid any flow restrictions. In particular, the following elements should be taken into account :

- Protection of the natural underground conduits while constructing the road. Most groundwater flows in an epikarstic layer (1-10 m depth) in the area and in a zone of interconnected fissures and conduits that extend approximately 30m below the epikarstic layer. Any excavation along the route of the M18 and particularly along Coole ridge could affect the underground drainage capacity.
- Design in a manner that no settlement will take place over the years to prevent the collapse of the underground conduits.
- Provide an appropriately sized culvert where the M18 crosses the Corker overflow to avoid any flow restrictions. The culvert across the M18 should be designed with a capacity of 100 m³/s as stated in Section 3.4 of this Report.

The use of permeable material for the embankments is also recommended, particularly north of the Kiltartan to Raheen local road crossing (at Corker). This will further facilitate transfer of waters from East to West of the M18.

A study entitled “Groundwater Conduit Collapse” was carried out in August 2006 by McCarthy Hyder Tobin Consultants. The study sets out the risks of constructing the M18 and considers two main option :

- Eastern Route – East of Kiltartan / West of Castltown
- Western Route – West of Kiltartan along the Coole ridge

The study concludes as follows :

- *“The assessment shows that there is a Low likelihood of collapse under the Western Route. One of the conduits beneath the Eastern Route has a Moderately High likelihood of collapse.*
- *The severity of the consequence of collapse beneath the Western Route would be Moderate. The severity of the consequence of collapse of either of the two conduits beneath the Eastern Route is High.”*

Based on this study, the western route along Coole ridge is the preferred option however, the risk of collapse remains due to underground data uncertainty. It is therefore essential that a specific method of construction be carefully set out, reviewed and approved for the area to prevent any damage to the underground system prior to construction.

9. CONCLUSION & RECOMMENDATIONS / COST ESTIMATE & COST BENEFIT

9.1 COST ESTIMATES & COST BENEFIT

9.1.1 Restoration Works at Kiltartan

The estimated construction cost of the Improvement Works proposed at Kiltartan is €387,177.00 (€341,125.00 nett plus €46,052.00 in respect of VAT at 13.5%). The following Table 9.1.1 provides a detailed breakdown of the cost estimation for the works proposed at Kiltartan under this report.

Ref.	Description:	Quant	Unit	Rate	Total	Total
1.0	Cleaning Works - Kiltartan to Raheen Rd arch bridge					
1.1	Removal of boulders, cleaning & regrading		sum	€7,500.00	€7,500.00	€7,500.00
2.0	Regrading Works to restore natural channel at Corker					
2.1	Regrading through agricultural access to restore channel	150	m ³	€16.00	€2,400.00	€2,400.00
3.0	Construct Culvert on Local Kiltartan Road					
3.1	3.5m wide x 1.5m high culvert	8	m	€3,000.00	€24,000.00	
3.2	3.5m wide x 1.5m high culvert wing walls		sum	€4,000.00	€4,000.00	
3.3	Breaking up, reinstatement of local road & ancillaries	6	m	€2,500.00	€15,000.00	
3.4	Traffic Management		sum	€3,600.00	€3,600.00	
3.5	Crane, Driver & ancillaries		sum	€6,700.00	€6,700.00	€53,300.00
4.0	Construct Culvert Crossing Under the N18					
4.1	3m wide x 2m high culvert	30	m	€2,800.00	€84,000.00	
4.2	3m wide x 2m high culvert wing walls		sum	€4,000.00	€4,000.00	
4.3	Breaking up, reinstatement of national road & ancillaries	26	m	€3,500.00	€91,000.00	
4.4	Traffic Management		sum	€10,700.00	€10,700.00	
4.5	Crane, Driver & ancillaries		sum	€20,000.00	€20,000.00	€209,700.00
5.0	Sub-Total					€272,900.00
6.0	Add Preliminaries at 10%					€27,290.00
7.0	Contingency at 15%					€40,935.00
8.0	Nett Total					€341,125.00
9.0	Add VAT at 13.5%					€46,052.00
10.0	TOTAL					€387,177.00

Table 9.1.1 : Breakdown of Cost Estimate – Works at Kiltartan

A high level cost benefit analysis was carried out and compared with the above cost estimate. The results are detailed in the following table³ :

Ref.	Description:	Quant	Unit	Rate	Total
1.	Building flooded	1	nr	€25,000.00	€25,000.00
2.	Building at risk of flooding	13	nr	€10,000.00	€130,000.00
3.	Commercial / agricultural premises flooded	1	nr	€30,000.00	€30,000.00
4.	Agricultural lands flooded	43	hectare	€400.00	€17,200.00
5.	Road closure - Journeys > 30min due to diversion	> 15,000	nr	€20.00	€300,000.00
6.	Home / other premises cut off by flooding	11	nr	€3,360.00	€36,960.00
7.	TOTAL				€539,160.00
8.	Cost Benefit Ratio				1.39

The overall cost incurred by the local community as a result of flooding is estimated to be €539,160 which is approximately 140% of the cost of the proposed restoration works at Kiltartan. Further benefit would be gained from a Health & Safety point of view by preventing flooding of commercial / agricultural premises and material being washed away by the floods as a result. Further Health & Safety benefits would be gained by preventing flooding of individual wastewater treatment systems such as septic tanks. The above table considered the Kiltartan area only and it should be noted that the communities located upstream from Kiltartan will benefit from the proposed works.

³ The rates used for the purpose of assessing the financial impact of flooding is based on the Minor Works Funding Framework

9.1.2 Possible Overland Flood Overflow Channel between Coole and Kinvarra as originally proposed under the April 1998 South Galway Flood Study Report

9.1.2.1 Possible Overland Flood Overflow Channel between Coole and Caherglassaun

The estimated construction cost of the Possible Flood Overflow Channel between Coole and Caherglassaun is €250,125.00 (€220,375.00 nett plus €29,750.00 in respect of VAT at 13.5%). The following Table 9.1.2 provides a detailed breakdown of the cost estimation for the works proposed at Kiltartan under this report.

Ref.	Description:	Quant	Unit	Rate	Total	Total
1.0	Construct Culvert on Local Road					
1.1	3.5m wide x 1.5m high culvert	8	m	€3,000.00	€24,000.00	
1.2	3.5m wide x 1.5m high culvert wing walls		sum	€4,000.00	€4,000.00	
1.3	Breaking up and reinstatement of local road	6	m	€2,500.00	€15,000.00	
1.4	Traffic Management		sum	€3,600.00	€3,600.00	
1.5	Crane, Driver & ancillaries		sum	€6,700.00	€6,700.00	€53,300.00
2.0	Overflow Channel 600 metres long					
2.1	Excavation to form channel	4200	m ³	€10.00	€42,000.00	
2.2	Extra over item 2.1 for breaking rock	2700.0	m ³	€30.00	€81,000.00	€123,000.00
3.0	Sub-Total					€176,300.00
4.0	Add Preliminaries at 10%					€17,630.00
5.0	Contingency at 15%					€26,445.00
6.0	Nett Total					€220, 375.00
7.0	Add VAT at 13.5%					€29,750.00
8.0	TOTAL					€250,125.00

Table 9.1.2 : Breakdown of Cost Estimate – Coole to Caherglassaun

The above cost is significantly lower than the estimated cost from the original 1998 South Galway Flood Study Report. The construction cost was estimated in April 1998 as being IR£1,419,200 equivalent to €3,028,282 at 2010 prices. This is based on a significant reduction in the scale of excavation works to be carried out as well as a reduction in design

from a multi span bridge to a standard reinforced pre cast concrete box culvert and associated wing walls across the local Tirneevin to Cahermore road.

9.1.2.2 Possible Overland Flood Overflow Channel between Caherglassaun and Kinvarra

The cost for constructing an overland channel from Caherglassaun to Kinvarra was estimated as part of the 1998 South Galway Flood Study. Reviewing the proposed works in the 1998 South Galway Flood Study Report, the construction works for an overland channel between Caherglassaun and Kinvarra cannot be reduced in scale. It is estimated that the construction costs be approximately €48,010,384 excluding VAT.

9.1.2.3 Possible Overland Flood Overflow Channel between Coole and Kinvarra – Cost Benefit

As stated under the April 1998 South Galway Flood Study Report, although the proposal to construct an overland channel from Coole to Kinvarra is technically feasible, it is unlikely to be an acceptable proposal due to environmental and ecological reasons. In any event, it is not possible to justify the estimated construction cost of €48,230,759 excluding VAT in a cost benefit analysis (this amount of €48,230,759 also includes the amount of €220,375 associated with the possible overland flood overflow channel between Coole and Caherglassaun).

9.1.3 Restoration Works between Coole and Kinvarra

The estimated construction cost in relation to the Restoration Works between Coole and Kinvarra is €281,764.00 (€248,250.00 nett plus €33,514.00 in respect of VAT at 13.5%). The following Table 9.1.3 provides a detailed breakdown of the cost estimation for the restoration works proposed between Coole and Kinvarra under this report.

Ref.	Description:	Quant	Unit	Rate	Total	Total
1.0	Construct Culvert on Local Road to Cahermore					
1.1	3.5m wide x 1.5m high culvert	8	m	€3,000.00	€24,000.00	
1.2	3.5m wide x 1.5m high culvert wing walls		sum	€4,000.00	€4,000.00	
1.3	Breaking up and reinstatement of local road	6	m	€2,500.00	€15,000.00	
1.4	Traffic Management		sum	€3,600.00	€3,600.00	
1.5	Crane, Driver & ancillaries		sum	€6,700.00	€6,700.00	€53,300.00
2.0	Construct Culverts on Local Roads between Caherawoneen & Kinvarra					
2.1	Twin 1.75m wide x 1.0m high culvert	12	m	€4,250.00	€51,000.00	
2.2	Twin 1.75m wide x 1.0m high culvert wing walls		sum	€13,000.00	€13,000.00	
2.3	Breaking up and reinstatement of local roads	10	m	€2,500.00	€25,000.00	
2.4	Traffic Management		sum	€7,200.00	€7,200.00	
2.5	Crane, Driver & ancillaries		sum	€13,400.00	€13,400.00	€109,600.00
3.0	Regrading / ground levelling in and out of the culverts					
3.1	Excavation to regrade each side of the culvert	600	m ³	€10.00	€6,000.00	
3.2	Extra over item 2.1 for breaking rock	150.0	m ³	€30.00	€4,500.00	€10,500.00
4.0	Fences / Hedges / Stone walls replacement					
4.1	Clearing existing fence / hedge / stone wall	28	nr	€750.00	€21,000.00	
4.2	Concrete post and wire fencing (at 28 locations)	280	m	€15.00	€4,200.00	€25,200.00
5.0	Sub-Total					€198,600.00
6.0	Add Preliminaries at 10%					€19,860.00
7.0	Contingency at 15%					€29,790.00
8.0	Nett Total					€248,250.00
9.0	Add VAT at 13.5%					€33,514.00
10.0	TOTAL					€281,764.00

Table 9.1.3 : Breakdown of Cost Estimate – Restoration Works between Coole and Caherglassaun

A high level cost benefit analysis was carried out and compared with the above cost estimate. The results are detailed in the following table⁴ :

Ref.	Description:	Quant	Unit	Rate	Total
1.	Building flooded	2	nr	€25,000.00	€50,000.00
2.	Building at risk of flooding	4	nr	€10,000.00	€40,000.00
3.	Commercial / agricultural premises flooded	-	nr		
4.	Agricultural lands flooded	> 50	hectare	€400.00	€20,000.00
5.	Road closure - Journeys > 30min due to diversion	> 12,500	nr	€20.00	€250,000.00
6.	Home / other premises cut off by flooding	-	nr	€160.00	
7.	TOTAL				€360,000.00
8.	Cost Benefit Ratio				1.28

The overall cost incurred by the local community as a result of flooding is estimated to be €360,000 which is approximately 128% of the cost of the proposed restoration works.

⁴ The rates used for the purpose of assessing the financial impact of flooding is based on the Minor Works Funding Framework

9.2 SUMMARY OF FINDINGS & RECOMMENDATIONS

The following is a summary of the works identified :

9.2.1 Proposed Works at Kiltartan

9.2.1.1 Restoration Works at Kiltartan

- Reconstruction of the existing culvert crossing under the N18 : culvert to be 3.0 metres wide by 2.0 metres high (30 metres long approximately) and to include pre cast splayed wing walls at the upstream and downstream ends
- Construction of a culvert to cross under the local Kiltartan to Raheen road (upstream end) : culvert to be 3.5 metres wide by 1.5 metres high (8 metres long approximately) and to include pre cast splayed wing walls at the upstream and downstream ends
- Clearing of the existing arch bridge under the local Kiltartan to Raheen road (downstream end) : boulders and debris were identified and significantly decrease the flow capacity of the bridge
- Regrading of a short section approximately 25m long along the natural Corker overflow channel. Works are minor as they concern an existing agricultural access road which is above the 13.0 metres O.D. mark only. The width of the 25 metres section levelled out at 13.0mO.D. will be 2.0 metres maximum at the base with side slopes at 5/2 so as to tie in smoothly with adjacent lands

9.2.1.2 M18 related works :

It is recommended that a culvert be constructed at Corker on the new M18. The culvert should be designed with a capacity of 100m³/s and to include pre cast splayed wing walls at the upstream and downstream ends.

9.2.1.3 Cleaning works at Kiltartan

It is recommended that cleaning works at Kiltartan be carried out at the entrance of the following karstic features :

- Pollnacapall rise (receives flows from the Ballylee sink),
- Polldeelin rise (receives flows from the Castletown sink),
- Pollmuidir sink (main swallow hole under Coole Ridge to Coole turlough),
- Pollonora sinks which consist of a number of smaller but significant swallow holes under Coole Ridge to Coole turlough. There are at least four Pollonora sinks including one along the route of the Corker overflow.

It is also recommended to carry out cleaning works in relation to the following items :

- River bed and banks (1km approx in length in the Kiltartan area)
- Surrounding lands generally should be cleared from debris

9.2.2 Possible Overland Flood Overflow Channel between Coole and Kinvarra as proposed under the April 1998 South Galway Flood Study Report

The following possible works, which are technically feasible, could not be justified in a cost benefit analysis and are unlikely to meet with approval on ecological examination :

- Coole to Caherglassaun overground flood overflow channel :
 - 3 metres wide (at the base) open channel 0.75m to 1.25m in depth and approximately 580 metres in length – side slopes @ 3/2
- Caherglassaun to Coole overground flood overflow channel
 - 3 metres wide (at the base) open channel up to 7.5 metres in depth and approximately 6,600 metres in length – side slopes @ 3/2 – top width up to 25 metres

9.2.3 Restoration Works between Coole and Kinvarra

While the construction of an overland channel between Caherglassaun Lough and Kinvarra could not be justified, a number of localised drainage improvement works aimed at restoring natural flow paths were identified between Coole and Kinvarra as follows :

- Restoration Works between Coole Lough and Caherglassaun Lough :
 - Replace 6 No. boundary crossings such as stone walls and hedges by concrete post and wire fencing to decrease flow restrictions along the natural channel path
 - Construction of a culvert to cross under the local road to Cahermore : culvert to be 3.5 metres wide by 1.5 metres high and to include pre cast splayed wing walls at the upstream and downstream ends
- Restoration Works between Caherawoneen and Kinvarra :
 - Replace 22 No. boundary crossings such as stone walls and hedges by concrete post and wire fencing to decrease flow restrictions along the natural channel path
 - Construction of two culverts at two separate locations between Caherawoneen and Kinvarra to cross under local roads : culverts to be 3.5 metres wide by 1.5 metres high each and to include pre cast splayed wing walls at the upstream and downstream ends

9.2.4 General condition survey of key Swallow Holes – Blackrock to Kinvarra Area

A general condition survey of the key swallow holes in the South Galway Flood Study Area was carried out to identify potential blockages and to set out maintenance requirements. The following table is a summary of the findings and recommendations proposed for works at the key swallow holes further to completion of the general condition survey :

ID	Coordinates (Irish Grid)	General Condition	Recommendations
Loughcurra South	E138530 N209070	Moderate to good	Evidence of ground works along the upstream water channel. Embankments to be cleared from debris / boulders and levelled. Consideration should be given to replacing the stone wall by post and wire fencing. Overgrown vegetation surrounding the sink at the bottom end to be cleared. Fence to be set around the sink.
Ballybuck North	E139564 N206237	Poor	Swallow hole not found. Overgrown vegetation. No evidence of water movement. Further investigation needed prior to reinstating as feature not found.
Caherglassaun Pollnamona Sink	E140686 N206253	Moderate	Bushes / vegetation surrounding the pond to be cleared. Consideration should be given to carrying out an underwater survey to assess siltation / bed condition. Fencing off the pond should be discussed with the landowner.
Caherglassaun Polldalagha Sink	E140804 N206154	Moderate	Bushes / vegetation surrounding the pond to be cleared. Consideration should be given to carrying out an underwater survey to assess siltation / bed condition. Fencing off the pond should be discussed with the landowner.
Caherglassaun East of Polldalagha Sink	E140865 N206181	Poor	Numerous boulders restricting the flow of water. Boulders to be cleared. Fencing off the feature (when exposed) should be discussed with the landowner.
Caherglassaun Pollnapasty Sink	E141234 N206531	Moderate	Bushes / vegetation surrounding the basin to be cleared. Discussions with the landowner should take place to consider replacing the stone wall by post and wire fencing. Numerous plastic bags at the bottom to be cleared. Consideration should also be given to carrying out an underwater survey to assess siltation / bed condition.

Caherglassaun Infilled cave	E141185 N206674	Blocked	Cave likely to be linked to Pollnapasty only 150m to the southeast. Entrance of the cave located in a field. Entrance is blocked. To be cleared and further assessed. Fencing off the entrance should be discussed with the landowner.
Coole Lough Garryland North	E142141 N205128	Moderate	Surrounding lands are cleared from debris. Fencing off the area should be discussed with the landowner. Consideration should be given to carrying out an underwater survey to assess siltation / bed condition.
Kiltartan Pollomuiir Sink	E144722 N206056	Poor to moderate	Numerous debris / plastic bags / waste / wood on embankments and in the water. To be cleared. Fencing to be considered as well as an underwater survey to assess siltation / bed condition.
Kiltartan Pollonora Sinks	Refer to Section No. 7.2.6.2	Poor	Overgrown vegetation to be cleared. Fencing off each feature should be discussed with the landowners.
Castletown Polltoophil North Sink	E145921 N204888	Poor	Numerous debris / plastic bags / waste / wood on embankments and in the water. To be cleared. Fencing to be considered as well as an underwater survey to assess siltation / bed condition.
Castletown Polltoophil South Sink	E145973 N204731	Partially Blocked	Flow of water very low. Weedy growth / overgrown vegetation. Evidence of siltation. Fencing to be considered as well as an underwater survey to assess siltation / bed condition.
Ballylee South Pollaleen South Sink	E147514 N206135	Poor to moderate	Embankments to be cleared from bushes / wood. Fencing to be considered as well as an underwater survey to assess siltation / bed condition.
Ballylee North Pollaleen North	E148069 N206596	Poor to moderate	Embankments to be cleared from bushes / wood. Fencing to be considered as well as an underwater survey to assess siltation / bed condition.
Lough Coy	E149005 N207455	N/A Lake – consider underwater survey	Consideration should be given to carrying out an underwater survey to assess siltation / bed condition.
Blackrock Turlough	E149946 N208044	N/A Lake – consider underwater survey	Evidence of siltation on part of the bed exposed on the day of the survey. Bed to be cleared from debris. Consideration should be given to carrying out an underwater survey to assess siltation / bed condition.

APPENDIX A:

DRAWINGS