

## **Appendix A.7.8**

### **BD02 Other Structures (Retaining Structures, Sign Gantries and Environmental Noise Barriers)**

## A.7.8

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Galway County Council

**N6 Galway City Transport Project**

**Retaining Structures, Sign Gantries &  
Environmental Noise Barriers**

GCOB-4.04-020-014

Issue 2 | 14 November 2017

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

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

Job number 233985

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# 1 Introduction

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## 1.1 Design Brief given to the authors, including dates

This report has been produced by Arup, who have been appointed by Galway County Council to provide multi-disciplinary engineering consultancy services for the N6 Galway City Transport Project. Galway County Council, Galway City Council, Transport Infrastructure Ireland (formerly known as the National Roads Authority) and the National Transport Authority are collaborating in developing a solution to the existing transportation issues in Galway City and its environs. The solution will include a smart mobility component, public transport component and a road component. The road component of the solution is known as N6 Galway City Ring Road (GCRR).

## 1.2 Background information covering the origins for the need for the structure

The retaining structures, sign gantries and environmental noise barriers are required as part of the proposed N6 Galway City Ring Road.

## 1.3 Previous studies and their recommendations

Previous studies and documents relevant to this Outline Structures Report are listed below.

- Galway County Council. Project Brief. Phase 1, Scheme Concept and Feasibility Studies (REF/14/11222, 2 May 2015).
- Galway County Council. Project Brief. Phase 2, Route Selection (REF/14/11222, 6 November 2015).
- GCOB-4.04-009 Route Selection Report, Issue 1, 16/03/2016
- Galway Transport Strategy, An Integrated Transport Management Programme for Galway City and environs, Technical Report, September 2016

## 2 Site and function

### 2.1 Site location

The location of the proposed retaining structures and sign gantries are indicated on the scheme layout drawings, GCOB-1500-D-000 to 015. Refer to the N6 GCRR design report. The location of the environmental noise barriers are indicated on the noise monitoring and mitigation location drawings, Figures 17.1.01 to 17.1.14. Refer to Volume 4 of the Environmental Impact Assessment of the N6 GCRR.

The proposed retaining structures are located at chainages stated in **Table 1** below, along the mainline of the proposed road development.

**Table 1 Retaining structures location<sup>[1]</sup>**

Name of Structure	Chainage
R04/01	04+450
R08/01	08+325
R08/02	08+390
R08/03a	08+475
R08/07	08+550
R08/08 (N59 Link Road North)	N59 LRN* Ch. 0+100
R08/09 (N59)	00+075
R09/01	09+510
R09/02	09+510
R09/03	09+825
R12/01	12+300
R14/03	14+550
R14/05	14+890
R15/01	15+630
R15/02	15+750

Note: \*N59 LRN = N59 Link Road North

[1] It should be noted that there are other retaining structures proposed elsewhere on the N6 Galway City Ring Road, for example at the western approach to Lackagh Tunnel, at Structure C10/01, at abutments to overbridges and underbridges, etc. These structures are addressed within other preliminary design reports relevant to the associated bridge or tunnel structures.

The proposed sign gantries are located at chainages stated in **Table 2** below, along the mainline of the proposed road development.

**Table 2 Sign Gantries location**

Name of Structure	Gantry Type	Approx. Chainage	Lateral Siting / Span	Comment
G06/01	Cantilever	06+260	Eastbound verge	Variable Message Sign
G06/02	Cantilever	06+950	Eastbound verge	Advance Directional Sign
G08/01	Cantilever	08+340	Westbound verge	Advance Directional Sign
G10/01	Cantilever	10+075	Eastbound verge	Variable Message Sign
G10/02	Portal	10+470	Across Eastbound lanes	Advance Directional Sign Intelligent Transport Sign
G10/03	Portal	10+600	Across Eastbound lanes	Intelligent Transport Sign
G10/04	Portal	10+840	Across Eastbound lanes	Advance Directional Sign Intelligent Transport Sign
G11/01	Portal	11+030	Across entire carriageway	Intelligent Transport Sign
G11/02	Portal	11+525	Across Westbound lanes	Intelligent Transport Sign
G11/03	Portal	11+600	Across Eastbound lanes +diverge	Directional Sign Intelligent Transport Sign
G11/04	Portal	11+775	Across Westbound lanes + merge	Intelligent Transport Sign
G12/01	Portal	12+060	Across Westbound lanes	Intelligent Transport Sign
G12/02	Portal	12+450	Across Westbound merge only	Advance Directional Sign
G12/03	Portal	12+725	Across all Westbound lanes	Directional Sign
G12/04	Portal	12+950	Across all Eastbound lanes	Advance Directional Sign Variable Message Sign
G13/01	Portal	13+190	Across all Westbound lanes	Advance Directional Sign Variable Message Sign
G13/02	Portal	13+450	Across Eastbound lanes +diverge	Directional Sign

Name of Structure	Gantry Type	Approx. Chainage	Lateral Siting / Span	Comment
G13/03	Portal	13+610	Across Westbound merge only	Advance Directional Sign
G14/01	Portal	14+250	Across Westbound lanes	Intelligent Transport Sign
G14/02	Portal	14+650	Across entire carriageway	Directional Sign Intelligent Transport Sign
G14/03	Portal	14+810	Across entire carriageway	Advance Directional Sign Intelligent Transport Sign
G15/01	Portal	15+290	Across entire carriageway	Advance Directional Sign Intelligent Transport Sign
G15/02	Portal	15+510	Across Westbound lanes	Intelligent Transport Sign
G15/03	Portal	15+690	Across Westbound lanes	Advance Directional Sign Intelligent Transport Sign Variable Message Sign
G15/04	Cantilever	15+820	Eastbound verge	Directional Sign
G15/05	Cantilever	15+925	Westbound verge	Variable Message Sign
G16/01	Portal	16+900	Across Westbound diverge only	Directional Sign
G17/01	Cantilever	17+320	Westbound verge	Directional Sign
G18/01	Cantilever	18+090	Westbound verge	Variable Message Sign

The proposed environmental noise barriers are located at chainages stated in Table 3 below, along the mainline of the proposed road development.

**Table 3 Environmental Noise Barriers location**

Structure Name	Start Chainage	End Chainage	Height	Location	Lateral Siting
NB00/01	0+015	0+120	2.0	R336 West of Bearn West Roundabout	Westbound side
NB00/02	0+000	0+100	2.0	R336 East of Bearn West Roundabout	Eastbound side
NB01/01	1+030	1+145	2.0	Proposed Road Development Mainline	Eastbound side
NB01/02	1+520	1+735	2.0	Proposed Road Development Mainline	Westbound side
NB04/01	4+370	4+450	2.5	Proposed Road Development Mainline	Eastbound side
NB04/02	0+095	0+130	2.0	Cappagh Road North of Cappagh Road Junction	Northbound side
NB04/03	0+080	0+090	2.0	Cappagh Road North of Cappagh Road Junction	Northbound side
NB04/04	4+460	4+535	1.5	Proposed Road Development Mainline	Westbound side
NB04/05	0+185	0+225	2.5	Cappagh Road South of Cappagh Road Junction	Southbound side
NB04/06	0+140	0+185	2.5	Cappagh Road South of Cappagh Road Junction	Southbound side
NB05/01	5+525	5+615	3.5	Proposed Road Development Mainline	Westbound side
NB05/02	0+080	0+110	3.0	Ballymoneen Road south of Ballymoneen Road Junction	Northbound side
NB05/03	0+000	0+060	2.5	Ballymoneen Road south of Ballymoneen Road Junction	Northbound side
NB05/04	5+660	5+750	2.5	Proposed Road Development Mainline	Eastbound side
NB05/05	0+145	0+160	2.0	Ballymoneen Road north of Ballymoneen Road Junction	Southbound side
NB05/06	0+170	0+225	2.0	Ballymoneen Road north of Ballymoneen Road Junction	Southbound side
NB05/07	5+910	6+110	2.0	Proposed Road Development Mainline	Westbound side
NB06/01	6+400	6+555	2.0	Proposed Road Development Mainline	Eastbound side
NB06/02	6+870	7+100	2.0	Proposed Road Development Mainline	Westbound side
NB07/01	7+165	7+210	2.5	Proposed Road Development Mainline	Eastbound side
NB07/02	0+000 7+210	0+250 7+260	2.5	N59 Letteragh Junction EB diverge	Eastbound side
NB07/03	7+180	7+440	2.0	Proposed Road Development Mainline	Westbound side
NB07/04	1+415	1+470	2.0	N59 Link Road South	Southbound side
NB07/05	0+105	0+175	2.0	Letteragh Road L1323	Eastbound side
NB07/06	0+030	0+065	2.0	Letteragh Road L1323	Eastbound side
NB07/07	0+000	0+025	2.0	Letteragh Road L1323	Eastbound side

Structure Name	Start Chainage	End Chainage	Height	Location	Lateral Siting
NB08/01	0+060 8+010	0+000 8+070	2.5	N59 Letteragh Junction WB diverge	Westbound side
NB08/02	8+070	8+280	2.5	Proposed Road Development Mainline	Westbound side
NB08/03	8+280	8+540	3.0	Proposed Road Development Mainline	Westbound side
NB08/04	8+100	8+230	3.5	Proposed Road Development Mainline	Eastbound side
NB08/05	8+230	8+375	4.0	Proposed Road Development Mainline	Eastbound side
NB08/06	8+375	8+405	3.5	Proposed Road Development Mainline	Eastbound side
NB08/07	8+545	8+850	2.5	Proposed Road Development Mainline	Eastbound side
NB08/08	8+850	9+500	2.0	Proposed Road Development Mainline	Eastbound side
NB08/09	8+540	8+760	2.5	Proposed Road Development Mainline	Westbound side
NB08/10	8+760	8+790	2.0	Proposed Road Development Mainline	Westbound side
NB08/11	8+850	9+500	2.0	Proposed Road Development Mainline	Westbound side
NB08/12	8+405	8+525	3.0	Proposed Road Development Mainline	Eastbound side
NB08/13	8+525	8+545	2.5	Proposed Road Development Mainline	Eastbound side
NB08/14	8+800	8+850	2.0	Proposed Road Development Mainline	Westbound side
NB09/01	9+990	10+100	1.5	Proposed Road Development Mainline	Eastbound side
NB10/01	10+420	10+780	3.0	Proposed Road Development Mainline	Westbound side
NB11/01	11+910	12+120	3.5	Proposed Road Development Mainline	Eastbound side
NB11/02	11+980	12+120	2.5	Proposed Road Development Mainline	Westbound side
NB12/01	12+140	12+350	3.0	Proposed Road Development Mainline	Eastbound side
NB12/02	0+180	0+350	2.0	N84 Headford Road Junction WB diverge	Westbound side
NB12/03	0+050	0+080	2.0	N84 Headford Road	Northbound side
NB12/04	0+090	0+150	2.0	N84 Headford Road	Northbound side
NB12/05	12+910	13+020	2.5	Proposed Road Development Mainline	Westbound side
NB12/06	12+870	13+050	3.5	Proposed Road Development Mainline	Eastbound side
NB12/07	12+140	12+350	2.5	Proposed Road Development Mainline	Westbound side
NB13/01	13+020	13+165	3.0	Proposed Road Development Mainline	Westbound side
NB13/02	13+050	13+120	3.0	Proposed Road Development Mainline	Eastbound side
NB13/03	13+160	13+370	2.0	Proposed Road Development Mainline	Eastbound side

Structure Name	Start Chainage	End Chainage	Height	Location	Lateral Siting
NB13/04	13+360	13+640	3.0	Proposed Road Development Mainline	Westbound side
NB13/05	13+590	13+935	3.5	Proposed Road Development Mainline	Westbound side
NB13/06	0+240 13+640	0+000 13+840	3.0	N17 Tuam Road Road Junction WB merge	Westbound side
NB13/07	13+620	13+960	3.5	Proposed Road Development Mainline	Eastbound side
NB15/01	15+200	15+720	2.5	Proposed Road Development Mainline	Eastbound side

## 2.2 Function of the structure and obstacles crossed

The retaining structures and strengthened slopes will facilitate the construction and operation of the proposed N6 Galway City Ring Road within the proposed development lands whilst reducing impacts on the receiving environment.

The sign gantries will support the directional signage, advanced directional signage, variable message signage and intelligent transport signage for the proposed road development.

The environmental noise barriers will mitigate potential noise impacts due to noise from traffic on the receiving environment at several locations along the proposed road development.

## 2.3 Choice of location

The retaining structures are located in positions where the use of non-strengthened embankment slopes is not considered feasible or desirable due to site specific constraints. Retaining structures are proposed at several locations along the proposed road development.

The sign gantry locations were chosen based on the signage strategy for the proposed road development.

Environmental barriers are provided at several locations along the proposed road development to mitigate the potential impacts due to noise from traffic on the receiving environment.

## 2.4 Site description and topography

Table 4 Site description and topography for Retaining Walls and Gantries.

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
R04/01	Proposed road development in cutting (Approximately 2m).	None	Fosset Code Residential. Local Importance (lower value).  Fossett Code WS1, Local Importance (higher value).
R08/01	Proposed road development on embankment (Approximately 6 - 7m).	None	Fosset Code Residential. Local Importance (lower value).  Fosset Code GS1, Local Importance (lower value).  Fosset Code BL3, Local Importance (lower value).
R08/02	Proposed road development on embankment (Approximately 7 - 8m).	None	Fosset Code Residential. Local Importance (lower value).  Fossett Code WS1/GS2, Local Importance (higher value).
R08/03a	Proposed road development on embankment (Approximately 6 - 9m).	None	Fossett Code GS2/ED3, Local Importance (lower value).  Fosset Code GA1, Local Importance (lower value).  Fossett Code WL2/WS1, Local Importance (higher value).
R08/07	Proposed road development on embankment (Approximately 5 - 9m).	None	Fosset Code Residential. Local Importance (lower value).  Fosset Code BL3, Local Importance (lower value).  Fosset Code WL2, Local Importance (higher value).
R08/08	Proposed road development in cutting (Approximately 10m).	Previously Unrecorded Sites/ Structures of Cultural Heritage Merit listed in Chapter 13 of the EIS as CH38 – Possible square enclosure. Not marked on the OS maps.	Fossett Code GA1, Local Importance (lower value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
		Built Heritage (BH) sites located within the receiving environment listed in Chapter 13 of the EIS as BH7 - Church/Chapel	
R08/09	Proposed road development in cutting (Approximately 3m).	Built Heritage (BH) sites located within the receiving environment listed in Chapter 13 of the EIS as BH5 - Bushypark House	Fosset Code Residential. Local Importance (lower value).
R09/01	Proposed road development on embankment (Approximately 6 - 7m).	Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP9 - River Corrib (TB22) A designated landscape listed in Chapter 13 as DL 8 - Menlo Castle demesne.	An Ecological Constraint of Local (High) Importance within the Lough Corrib cSAC listed in Chapter 8 of the EIS is impacted by the structure R09/03. The habitat is (Mixed) broadleaved woodland under Fossit Code WD1.
R09/02	Proposed road development on embankment (Approximately 7 - 8m).	Cultural Heritage site as listed in Chapter 13 of the Environmental Impact Assessment as CH 46 - Possible circular enclosure identified during AP analysis and marked as a possible feature of the 1895-1900 mapping.  Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP9 - River Corrib (TB 22)  A designated landscape listed in Chapter 13 as DL 8 - Menlo Castle demesne.	An Ecological Constraint of Local (High) Importance within the Lough Corrib cSAC listed in Chapter 8 of the EIS is impacted by the structure R09/03. The habitat is (Mixed) broadleaved woodland under Fossit Code WD1.
R09/03	Proposed road development on embankment (Approximately 7 - 17m).	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH49 - Possible prehistoric tomb  A designated landscape listed in Chapter 13 as DL 8 - Menlo Castle demesne.	An Ecological Constraint of Local (High) Importance listed in Chapter 8 of the EIS as ECXX is impacted by the structure R09/03. The habitat is (Mixed) broadleaved woodland under Fossit Code WD1.
R12/01	Proposed road development on embankment (Approximately 2 - 9m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB25 – Boundary between	An Ecological Constraint of Local (High) Importance listed in Chapter 8 of the EIS as EC39 is impacted by the structure R12/01. The

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
		Ballindooley/An Caisleán Gearr	habitat is scrub and grassy verges under Fossit Codes WS1 and GS1.
R14/03	Proposed road development in cutting (Approximately 8 - 9m).	A townland boundary listed in Chapter 13 of the EIS as TB 30 – Boundary between Parkmore/Ballybrit	Fossett Code GA1, Local Importance (lower value).  Fossett Code BL3, Local Importance (lower value).
R14/05	Proposed road development on embankment (Approximately 5m).	None	Fossett Code BL3, Local Importance (lower value).
R15/01	Proposed road development on embankment (Approximately 5 - 6m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB31 - Boundary between Ballybrit/ Doughiska – Removed	Fossett Code GS2, Local Importance (higher value).
R15/02	Proposed road development on embankment (Approximately 7m).	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH58 - Site of vernacular buildings	Fossett Code GS2/WS1, Local Importance (higher value).
G06/01	Proposed road development on embankment (Approximately 9m).	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH29 - Site of vernacular structures marked on 1841 first edition map. No longer extant	Fossett Code GA1, Local Importance (lower value).
G06/02	Proposed road development in cutting (Approximately 6m).	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH33 - Very well built stone walled laneway, marked on the 1841 first edition map.	Fossett Code GA1, Local Importance (lower value).
G08/01	Proposed road development on embankment (Approximately 5m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB19 - Boundary between Barnacranny/Dangan Upper	Fossett Code GS1, Local Importance (lower value).
G10/01	Proposed road development on embankment (Approximately 8m).	None	Fossett Code WN2, Local Importance (higher value).  Fosset Code Residential. Local Importance (lower value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
G10/02	Proposed road development on embankment – (Approximately 9m).	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH51 - Possible boulder of archaeological potential (2006 EIS)	Ecological constraint Annex Code 8240  Fossett Code WN2, International Importance.  Fossett Code GA1, Local Importance (lower value).
G10/03	Proposed road development on embankment (Approximately 2m).	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH52 - Site of vernacular structures marked on the 1841 first edition map. No longer appear to be extant.	Fossett Code GA1, Local Importance (lower value).
G10/04	Proposed road development on embankment (Approximately 7m).	None	Fossett Code GA1, Local Importance (lower value).
G11/01	Proposed road development in cutting (Approximately 11m).	None	Fossett Code GS1, Local Importance (higher value).
G11/02	Proposed road development on embankment – (Approximately 2m).	Archaeological Heritage site listed in Chapter 13 of the Environmental Impact Assessment as AH19 - Ringfort	Fossett Code ED4, Local Importance (lower value).
G11/03	Proposed road development on embankment – (Approximately 11m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB24 - Boundary between Coolagh/Ballindooley/An Caisleán Gearr - Quarried away.	Fossett Code ED4, Local Importance (lower value).
G11/04	Proposed road development in cutting – (Approximately 8m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB25 - Boundary between Ballindooley/An Caisleán Gearr - Stone wall and hedgerow	Fossett Code ED2/ED3, Local Importance (lower value).
G12/01	Proposed road development on embankment – (Approximately 2m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB25 - Boundary between Ballindooley/An Caisleán Gearr - Stone wall and hedgerow	Fossett Code WS1/GS1, Local Importance (higher value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
G12/02	Proposed road development on embankment – (Approximately 10m).	Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP10 - margins of Lough an Dúlaigh	Fossett Code GA1, Local Importance (lower value).
G12/03	Proposed road development in cutting (Approximately 7m).	None	Fossett Code GA1, Local Importance (lower value).
G12/04	Proposed road development on embankment (Approximately 2m).	Built Heritage (BH) sites located within the receiving environment listed in Chapter 13 of the EIS as BH12 - Thatched cottage	Fossett Code GA1/GS1, Local Importance (lower value).
G13/01	Proposed road development in cutting (Approximately 12m).	None	Fossett Code GA1, Local Importance (lower value).
G13/02	Proposed road development in cutting (Approximately 8m).	None	Fossett Code GA1, Local Importance (lower value).
G13/03	Proposed road development in cutting (Approximately 3m).	None	Fossett Code WS1/GS2, Local Importance (higher value).  Fossett Code GA1, Local Importance (lower value).
G14/01	Proposed road development in cutting (Approximately 12m).	None	Fossett Code GA1, Local Importance (lower value).
G14/02	Proposed road development in cutting (Approximately 9m).	None	Fossett Code GA1, Local Importance (lower value).
G14/03	Proposed road development in cutting (Approximately 9m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB30 – Boundary between Parkmore/Ballybrit	Fossett Code BL3, Local Importance (lower value).
G15/01	Proposed road development in cutting (Approximately 5m).	None	Fossett Code GA1, Local Importance (lower value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
G15/02	Proposed road development on embankment (Approximately 1m).	None	Fossett Code GA1, Local Importance (lower value).
G15/03	Proposed road development on embankment (Approximately 6m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB31 - Boundary between Ballybrit/Doughiska	Fossett Code GS2, Local Importance (higher value).
G15/04	Proposed road development on embankment (Approximately 8m).	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB32 - Boundary between Doughiska/Coolagh/Breanloughaun	Fossett Code BL3, Local Importance (lower value).
G15/05	Proposed road development on embankment (Approximately 7m).	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH58 - Site of vernacular structures, including a school, marked on the 1841 and 1895-1900 mapping. No longer extant.  A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS - Boundary between Doughiska/Coolagh/Breanloughaun	Fosset Code Residential. Local Importance (lower value).
G16/01	Proposed road development in cutting (Approximately 6m).	None	Fossett Code GS2/ER2, Local Importance (higher value).
G17/01	Proposed road development in cutting (Approximately 0m).	None	Fossett Code GS2, Local Importance (higher value).
G18/01	Existing N6 on embankment (Approximately 4m).	Existing road.	Existing road.

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
NB00/01	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB1 - Boundary between An Baile Nua/ Na Foráí Maola Thiar.	Fossitt Code BL3, Local Importance (lower value).  Fossitt Code GA1, Local Importance (lower value).  Fossitt Code HD1/GS4, Local Importance (lower value).
NB00/02	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB1 - Boundary between An Baile Nua/ Na Foráí Maola Thiar.	Fossitt Code BL3, Local Importance (lower value).  Fossitt Code HD1, Local Importance (lower value).  Fossitt Code WS1, Local Importance (lower value).  Fossitt Code Residential, Local Importance (lower value).
NB01/01	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB3 - Boundary between Na Foráí Maola Thiar/ Na Foráí Maola Thoir.	Fossitt Code HD1/GS4/WS1, Local Importance (lower value).  Fossitt Code GS4/GS2/HD1/WS1/ER1, Local Importance (higher value).  Fossitt Code Residential, Local Importance (lower value).  Fossitt Code GM1, Local Importance (higher value).
NB01/02	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB4 - Boundary between Na Foráí Maola Thoir/ Troiscaigh Thiar.	Fossitt Code GA1, Local Importance (lower value).  Fossitt Code BL3, Local Importance (lower value).  Fossitt Code GA2/WS3/WS1/ER1/BL1, Local Importance (lower value).  Fossitt Code GS2/ER1/WS1, Local Importance (higher value).  Fossitt Code WS1/HD1, Local Importance (higher value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
			Fossitt Code WS1/HD1, Local Importance (lower value).
NB04/01	Proposed road development on embankment, barrier located in verge.	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH20 - Vernacular cottage and outbuildings. Marked on the 1895-1900 mapping.	Fossitt Code GA1, Local Importance (lower value). Fossitt Code WL2, Local Importance (higher value).
NB04/02	Proposed road development on embankment, barrier located in verge.	None.	Fossitt Code GA1, Local Importance (lower value). Fossitt Code WL2, Local Importance (higher value). Fossitt Code Residential, Local Importance (lower value).
NB04/03	Proposed road development on embankment, barrier located in verge.	None.	Fossitt Code Residential, Local Importance (lower value).
NB04/04	Proposed road development on embankment, barrier located in verge.	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH21 - Site of vernacular structures marked on the 1841 first edition map. No longer appear to be extant.	Fossitt Code HD1, Local Importance (lower value).
NB04/05	Proposed road development on embankment, barrier located in verge.	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH22 - Group of ruined vernacular structures marked on the 1841 first edition map.	Fossitt Code HD1, Local Importance (lower value). Fossitt Code WS1, Local Importance (higher value).
NB04/06	Proposed road development in cutting, barrier located in verge.	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH22 - Group of ruined vernacular structures marked on the 1841 first edition map.	Fossitt Code WS1, Local Importance (higher value). Fossitt Code BL3/GA2/WS3, Local Importance (lower value).
NB05/01	Proposed road development on embankment, barrier located in verge.	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH25 - Vernacular farm yard marked on the 1841 and 1895-1900 mapping.	Fossitt Code GS4/GS2, Local Importance (higher value). Fossitt Code WL2, Local Importance (higher value). Fossitt Code GA1, Local Importance (lower value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
NB05/02	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB13 - Keeraun/Ballyburke.	Fossitt Code WL2, Local Importance (higher value). Fossitt Code BL3, Local Importance (higher value). Fossitt Code GS4/GS2, Local Importance (higher value).
NB05/03	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB13 - Keeraun/Ballyburke.	Fossitt Code BL3, Local Importance (higher value). Fossitt Code BL3/GA2, Local Importance (higher value). Fossitt Code WL2, Local Importance (higher value). Fossitt Code GA1, Local Importance (lower value).
NB05/04	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB13 – Boundary between Keeraun/Ballyburke  Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH26 - Vernacular cottage marked on the 1895-1900 mapping. Extended but now derelict.	Fossitt Code GS4, Local Importance (higher value). Fossitt Code GA1/GS4/ED3, Local Importance (lower value). Fossitt Code GA1/ ED2, Local Importance (lower value). Fossitt Code GA1, Local Importance (lower value).
NB05/05	Proposed road development on embankment, barrier located in verge.	Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH26 - Vernacular cottage marked on the 1895-1900 mapping. Extended but now derelict.	Fossitt Code WL2/WL1GS2/WS3, Local Importance (higher value).
NB05/06	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB13 - Keeraun/Ballyburke  Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH26 - Vernacular cottage marked on the 1895-1900 mapping. Extended but now derelict.	Fossitt Code WL2/WL1GS2/WS3, Local Importance (higher value). Fossitt Code GA1, Local Importance (lower value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
NB05/07	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB14 – Boundary between Ballyburke/Minclon.	<p>Fossitt Code GS3/GS4/GA1, Local Importance (higher value).</p> <p>Fossitt Code GS1, Local Importance (higher value).</p> <p>Fossitt Code WS1, Local Importance (higher value).</p> <p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code ED1, Local Importance (lower value).</p>
NB06/01	Proposed road development on embankment, barrier located in verge.	<p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH30 - Vernacular house and farmstead, marked on the 1895-1900 mapping.</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH32 - A stone outbuilding marked on the third edition OS map (1915-20).</p>	Fossitt Code GA1, Local Importance (lower value).
NB06/02	Proposed road development on embankment and in cutting, barrier located in verge.	<p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH33 - Very well built stone walled laneway, marked on the 1841 first edition map.</p> <p>Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP5 - Stream and boggy hollow.</p> <p>Archaeological Heritage site listed in Chapter 13 of the Environmental Impact Assessment as AH2 - Bullaun Stone.</p>	<p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code WS1, Local Importance (higher value).</p> <p>Fossitt Code GS1, Local Importance (higher value).</p>
NB07/01	Proposed road development on embankment, barrier located in verge.	None.	<p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code GS1, Local Importance (lower value).</p>

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
NB07/02	Proposed road development on embankment, barrier located in verge.	<p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH34 – Site of vernacular structures marked on 1841 first edition map. No longer extant</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH36 - A very well built stone walled laneway, marked on the 1841 first edition map.</p> <p>A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB16 – Boundary between Ragoon/Letteragh</p> <p>Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP 9 - River Corrib (TB 22).</p>	<p>Fossitt Code GS1, Local Importance (lower value).</p> <p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code GS4, Local Importance (lower value).</p> <p>Fossitt Code BL3, Local Importance (lower value).</p> <p>Fossitt Code GS4/WS1, Local Importance (lower value).</p> <p>Fossitt Code WL1/ED2, Local Importance (higher value).</p>
NB07/03	Proposed road development on embankment, barrier located in verge.	<p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH35 - Leitriff House. Two storey farm house with four bays. Named and extend on 1895-1900 mapping.</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH34 – Site of vernacular structures marked on 1841 first edition map. No longer extant</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH36 - A very well built stone walled laneway, marked on the 1841 first edition map.</p> <p>A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB16</p>	<p>Fossitt Code GS1, Local Importance (lower value).</p> <p>Fossitt Code GS4, Local Importance (lower value).</p> <p>Fossitt Code BL3, Local Importance (lower value).</p> <p>Fossitt Code GS4/WS1, Local Importance (lower value).</p> <p>Fossitt Code GA1, Local Importance (lower value).</p>

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
		<p>– Boundary between Rahoon/Letteragh</p> <p>Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP 6 - Small stream.</p>	
NB07/04	Proposed road development on embankment, barrier located in verge.	None.	Fossitt Code GA1, Local Importance (lower value).
NB07/05	Proposed road development in cutting, barrier located in verge and at top of cutting.	None.	<p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code Residential, Local Importance (lower value).</p>
NB07/06	Proposed road development in cutting, barrier located at top of cutting.	None.	<p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code Residential, Local Importance (lower value).</p>
NB07/07	Proposed road development in cutting, barrier located at top of cutting.	None.	<p>Fossitt Code Residential, Local Importance (lower value).</p> <p>Fossitt Code BL3, Local Importance (lower value).</p>
NB08/01	Proposed road development in cutting, barrier located at top of cutting.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB19 – Boundary between Barnacranny/Dangan Upper.	Fossitt Code GS3/ED2/ED3, Local Importance (higher value).
NB08/02	Proposed road development in cutting, barrier located at top of cutting.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB19 – Boundary between Barnacranny/Dangan Upper.	<p>Fossitt Code GS3/ED2/ED3, Local Importance (higher value).</p> <p>Fossitt Code BL3/ED2, Local Importance (lower value).</p> <p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code GS1, Local Importance (lower value).</p>
NB08/03	Proposed road development on embankment,	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB20	Fossitt Code GS1, Local Importance (lower value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
	barrier located in verge.	– Boundary between Dangan Upper/Dangan Lower/Kentfield/Ballagh/Bushy park.	Fossitt Code Residential, Local Importance (lower value).  Fossitt Code BL3, Local Importance (lower value).  Fossitt Code GS2/ED3, Local Importance (lower value).  Fossitt Code WL2/WS1, Local Importance (higher value).
NB08/04	Proposed road development in cutting, barrier located at top of cutting.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB19 – Boundary between Barnacranny/Dangan Upper.	Fossitt Code GS3, Local Importance (higher value).  Fossitt Code BL3, Local Importance (lower value).  Fossitt Code GA1, Local Importance (lower value).
NB08/05	Proposed road development in cutting and on embankment, barrier located at top of cutting and in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB19 – Boundary between Barnacranny/Dangan Upper.	Fossitt Code WS1, Local Importance (higher value).  Fossitt Code GS1, Local Importance (lower value).  Fossitt Code WS1/GS2, Local Importance (higher value).
NB08/06	Proposed road development on embankment, barrier located in verge.	None.	Fossitt Code WS1/GS2, Local Importance (higher value).
NB08/07	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB20 – Boundary between Dangan Upper/Dangan Lower/Kentfield/Ballagh/Bushy park  Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH42 – Ruined stone outbuilding that is marked on the 1895-1900 mapping.  Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH43 - Site of	Fossitt Code BL3, Local Importance (lower value).  Fossitt Code Residential, Local Importance (lower value).  Fossitt Code WD1, Local Importance (higher value).  Fossitt Code GA2, Local Importance (lower value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
		<p>Dangan Cottage. Marked on the 1841 first edition map, ruined by 1895-1900.</p> <p>A designated landscape listed in Chapter 13 as DL 7 - Dangan Lower demesnes.</p>	
NB08/08	Proposed road development on bridge, barrier integral with bridge.	<p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH43 - Site of Dangan Cottage. Marked on the 1841 first edition map, ruined by 1895-1900.</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH44 - Site of walled garden and outbuildings associated with Dangan House (Nunnery). Shown the 1841 first edition mapping.</p> <p>A designated landscape listed in Chapter 13 as DL 7 - Dangan Lower demesnes</p> <p>Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP9 - River Corrib (TB22).</p>	<p>Fossitt Code WD1, Local Importance (higher value).</p> <p>Fossitt Code GA2, Local Importance (lower value).</p> <p>Fossitt Code WN2, Local Importance (higher value).</p> <p>Fossitt Code WS3, Local Importance (lower value).</p> <p>Fossitt Code BL3, Local Importance (lower value).</p> <p>Fossitt Code GA2, Local Importance (lower value).</p> <p>Fossitt Code GA2/GS4, Local Importance (lower value).</p> <p>Fossitt Code GS1, Local Importance (higher value).</p> <p>Fossitt Code GS2, Local Importance (higher value).</p> <p>Fossitt Code WS1, Local Importance (higher value).</p> <p>Fossitt Code FW2, international importance.</p>
NB08/09	Proposed road development on embankment, barrier located in verge.	<p>A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB20 – Boundary between Dangan Upper/Dangan Lower/Kentfield/Ballagh/Bushy park</p> <p>A designated landscape listed in Chapter 13 as DL 7 - Dangan Lower demesnes</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact</p>	<p>Fossitt Code BL3, Local Importance (lower value).</p> <p>Fossitt Code Residential, Local Importance (lower value).</p> <p>Fossitt Code WL2, Local Importance (higher value).</p> <p>Fossitt Code WD1, Local Importance (higher value).</p>

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
		Assessment as CH42 – Ruined stone outbuilding that is marked on the 1895-1900 mapping.	
NB08/10	Proposed road development in cutting, barrier located in verge.	<p>A designated landscape listed in Chapter 13 as DL 7 - Dangan Lower demesnes</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH42 – Ruined stone outbuilding that is marked on the 1895-1900 mapping.</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH43 - Site of Dangan Cottage. Marked on the 1841 first edition map, ruined by 1895-1900.</p>	Fossitt Code WD1, Local Importance (higher value).
NB08/11	Proposed road development on bridge, barrier integral with bridge.	<p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH43 - Site of Dangan Cottage. Marked on the 1841 first edition map, ruined by 1895-1900.</p> <p>Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP9 - River Corrib (TB22)</p> <p>A designated landscape listed in Chapter 13 as DL 7 - Dangan Lower demesnes.</p>	<p>Fossitt Code WD1, Local Importance (higher value).</p> <p>Fossitt Code GA2, Local Importance (lower value).</p> <p>Fossitt Code WN2, Local Importance (higher value).</p> <p>Fossitt Code BL3, Local Importance (lower value).</p> <p>Fossitt Code GA2, Local Importance (lower value).</p> <p>Fossitt Code GS1, Local Importance (higher value).</p> <p>Fossitt Code GS2, Local Importance (higher value).</p> <p>Fossitt Code WS1, Local Importance (higher value).</p> <p>Fossitt Code FW2, international importance.</p>
NB08/12	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB20 – Boundary between Dangan Upper/Dangan Lower/Kentfield/Ballagh/Bushy park.	<p>Fossitt Code WS1/GS2, Local Importance (higher value).</p> <p>Fossitt Code BL3, Local Importance (lower value).</p> <p>Fossitt Code Residential, Local Importance (lower value).</p>

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
			Fossitt Code GS2/ED3, Local Importance (lower value).
NB08/13	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB20 – Boundary between Dangan Upper/Dangan Lower/Kentfield/Ballagh/Bushy park.	Fossitt Code BL3, Local Importance (lower value).
NB08/14	Proposed road development on embankment, barrier located in verge.	<p>A designated landscape listed in Chapter 13 as DL 7 - Dangan Lower demesnes</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH42 – Ruined stone outbuilding that is marked on the 1895-1900 mapping.</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH43 - Site of Dangan Cottage. Marked on the 1841 first edition map, ruined by 1895-1900.</p>	<p>Fossitt Code WD1, Local Importance (higher value).</p> <p>Fossitt Code GA2, Local Importance (lower value).</p>
NB09/01	Proposed road development on embankment, barrier located in verge.	None.	<p>Fossitt Code WN2, Local Importance (higher value).</p> <p>Fossitt Code ER2, International importance.</p> <p>Fossitt Code Residential, Local Importance (lower value).</p>
NB10/01	Proposed road development on embankment, barrier located in verge.	<p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH51 - Possible boulder of archaeological potential (2006 EIS)</p> <p>Structure of Cultural Heritage Merit as listed in Chapter 13 of the Environmental Impact Assessment as CH52 - Site of vernacular structures marked on the 1841 first edition map. No longer appear to be extant.</p>	<p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code WL1, Local Importance (higher value).</p> <p>Fossitt Code WS1, Local Importance (higher value).</p> <p>Fossitt Code WS1, Local Importance (lower value).</p> <p>Fossitt Code GS1, Local Importance (higher value).</p>

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
		A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB23.	
NB11/01	Proposed road development on embankment and in cutting, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB25 – Boundary between Ballindooley/An Caisleán Gearr.	Fossitt Code GA1, Local Importance (lower value). Fossitt Code WN2, Local Importance (higher value). Fossitt Code WS1/GS1, Local Importance (higher value). Fossitt Code Residential, Local Importance (lower value).
NB11/02	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB25 – Boundary between Ballindooley/An Caisleán Gearr.	Fossitt Code GA1, Local Importance (lower value). Fossitt Code WN2, Local Importance (higher value). Fossitt Code WS1/GS1, Local Importance (higher value). Fossitt Code S1, National importance.
NB12/01	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB25 – Boundary between Ballindooley/An Caisleán Gearr  Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP10 - Boggy pasture – margins of Lough an Dúlaigh.	Fossitt Code Residential, Local Importance (lower value). Fossitt Code GS2, Local Importance (higher value). Fossitt Code WL2, Local Importance (higher value). Fossitt Code GA1, Local Importance (lower value).
NB12/02	Proposed road development on embankment, barrier located in verge.	A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB25 – Boundary between Ballindooley/An Caisleán Gearr.	Fossitt Code GS1/ED3/WS1, Local Importance (higher value). Fossitt Code WL2, Local Importance (higher value). Fossitt Code Residential, Local Importance (lower value). Fossitt Code GS2, Local Importance (higher value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
			Fossitt Code WL2, Local Importance (higher value).  Fossitt Code BL3, Local Importance (lower value).
NB12/03	Proposed road development in cutting, barrier located at top of cutting.	None.	Fossitt Code GA1, Local Importance (lower value).
NB12/04	Proposed road development in cutting, barrier located at top of cutting.	None.	Fossitt Code GA1, Local Importance (lower value).  Fossitt Code ED2, Local Importance (lower value).  Fossitt Code Residential, Local Importance (lower value).
NB12/05	Proposed road development on embankment, barrier located in verge.	Built Heritage (BH) sites located within the receiving environment listed in Chapter 13 of the EIS as BH12 - Thatched cottage  Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP11 - Boggy hollow (AH 24)  Archaeological Heritage site listed in Chapter 13 of the Environmental Impact Assessment as AH24 - Redundant record: non-antiquity.	Fossitt Code ED2, Local Importance (lower value).  Fossitt Code Residential, Local Importance (lower value).  Fossitt Code GA1/GS1, Local Importance (lower value).  Fossitt Code GS2, Local Importance (lower value).
NB12/06	Proposed road development on embankment and in cutting, barrier located in verge and at top of cutting.	Built Heritage (BH) sites located within the receiving environment listed in Chapter 13 of the EIS as BH12 - Thatched cottage  Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP11 - Boggy hollow (AH 24)  Archaeological Heritage site listed in Chapter 13 of the Environmental Impact Assessment as AH24 - Redundant record: non-antiquity.	Fossitt Code GA1, Local Importance (lower value).  Fossitt Code ED2, Local Importance (lower value).  Fossitt Code GS1/ED3/WS1, Local Importance (higher value).  Fossitt Code GA1/GS1, Local Importance (lower value).  Fossitt Code GS1/ED3/WS1, Local Importance (higher value).

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
NB12/07	Proposed road development on embankment, barrier located in verge.	<p>A townland boundary listed in Chapter 13 of the Environmental Impact Assessment of the EIS as TB25 – Boundary between Ballindooley/An Caisleán Gearr</p> <p>Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP10 - Boggy pasture – margins of Lough an Dúlaigh.</p>	<p>Fossitt Code Residential, Local Importance (lower value).</p> <p>Fossitt Code GS1/ED3/WS1, Local Importance (higher value).</p> <p>Fossitt Code GS2, Local Importance (higher value).</p> <p>Fossitt Code WL2, Local Importance (higher value).</p> <p>Fossitt Code GA1, Local Importance (lower value).</p>
NB13/01	Proposed road development in cutting, barrier located at top of cutting.	<p>Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP11 - Boggy hollow (AH 24)</p> <p>Archaeological Heritage site listed in Chapter 13 of the Environmental Impact Assessment as AH24 - Redundant record: non-antiquity.</p>	<p>Fossitt Code GS2, Local Importance (lower value).</p> <p>Fossitt Code GA1/GS2, Local Importance (lower value).</p>
NB13/02	Proposed road development in cutting, barrier located at top of cutting.	<p>Area of Archaeological Potential as listed in Chapter 13 of the Environmental Impact Assessment as AAP11 - Boggy hollow (AH 24)</p> <p>Archaeological Heritage site listed in Chapter 13 of the Environmental Impact Assessment as AH24 - Redundant record: non-antiquity.</p>	<p>Fossitt Code GA1/GS2, Local Importance (lower value).</p> <p>Fossitt Code Residential, Local Importance (lower value).</p> <p>Fossitt Code Residential, Local Importance (lower value).</p>
NB13/03	Proposed road development in cutting, barrier located at top of cutting.	None.	Fossitt Code GA1, Local Importance (lower value).
NB13/04	Proposed road development in cutting, barrier located at top of cutting.	None.	<p>Fossitt Code GA1, Local Importance (lower value).</p> <p>Fossitt Code GS1, Local Importance (lower value).</p> <p>Fossitt Code WS1, Local Importance (higher value).</p>

Name of Structure	Site description	Archaeology at Structure	Ecology at Structure
NB13/05	Proposed road development on embankment, barrier located in verge.	Assessment of the EIS as TB26 – Boundary between An Caisleán Gearr/ Parkmore  Assessment of the EIS as TB27 – Boundary between An Caisleán Gearr/ Cappanabornia.	Fossitt Code WS1, Local Importance (higher value).  Fossitt Code GA1, Local Importance (lower value).  Fossitt Code BL3, Local Importance (lower value).  Fossitt Code Residential, Local Importance (lower value).
NB13/06	Proposed road development on embankment, barrier located in verge.	Assessment of the EIS as TB26 – Boundary between An Caisleán Gearr/ Parkmore.	Fossitt Code GA1, Local Importance (lower value).
NB13/07	Proposed road development on embankment, barrier located in verge.	Assessment of the EIS as TB26 – Boundary between An Caisleán Gearr/ Parkmore  Assessment of the EIS as TB27 – Boundary between An Caisleán Gearr/ Cappanabornia.	Fossitt Code GA1, Local Importance (lower value).  Fossitt Code GS4, Local Importance (lower value).  Fossitt Code BL3, Local Importance (lower value).  Fossitt Code Residential, Local Importance (lower value).  Fossitt Code GS1, Local Importance (lower value).
NB15/01	Proposed road development on embankment and in cutting, barrier located in verge and at top of cutting.	None.	Fossitt Code GA1, Local Importance (lower value).  Fossitt Code Residential, Local Importance (lower value).  Fossitt Code BL3, Local Importance (lower value).  Fossitt Code GS2, Local Importance (higher value).

## 2.5 Vertical and horizontal alignments

The details of the proposed road development's horizontal and vertical alignments adjacent to retaining walls, gantries and environmental barriers are included in **Chapter 3, Alignment Geometry**, of the Design Report for the N6 Galway City Ring Road.

## 2.6 Cross sectional dimensions on the alignments

The details of the proposed road development's cross section dimensions adjacent to retaining walls, gantries and environmental barriers are included in **Chapter 3, Alignment Geometry** of the Design Report for the N6 Galway City Ring Road.

## 2.7 Existing underground and overground services

All the utility providers have been consulted during the preliminary design process. The existing services in the vicinity of the proposed structures are outlined in **Table 5** below.

**Table 5 Existing Services**

Name of Structure	Existing Services
R04/01	No services
R08/01	ESB 38kV overhead/underground, ESB MV/LV Underground,
R08/02	100mm Watermains, ESB MV/LV Underground , ESB 38kV Underground
R08/03a	ESB MV/LV Underground, ESB 38kV Underground
R08/07	ESB MV/LV Underground
R08/08	ESB10kV Overhead Line ESB MV/LV Overhead
R08/09	No services
R09/01	No Services
R09/02	No Services
R09/03	No Services
R12/01	No services
R14/03	ESB LV/MV Underground
R14/05	No services
R15/01	No services
R15/02	ESB LV/MV Underground Underground Eir Line, E-Net service
G06/01	No services
G06/02	No services
G08/01	ESB 38kV Overhead
G10/01	ESB MV/LV Overhead
G10/02	No services
G10/03	No services
G10/04	No services
G11/01	No services
G11/02	No services
G11/03	No services
G11/04	No services
G12/01	No services

Name of Structure	Existing Services
G12/02	No services
G12/03	No services
G12/04	No services
G13/01	No services
G13/02	No services
G13/03	No services
G14/01	No services
G14/02	No services
G14/03	No services
G15/01	No services
G15/02	No services
G15/03	No services
G15/04	No services
G15/05	No services
G16/01	110kV Overhead ESB Lines
G17/01	No services
G18/01	No services
NB00/01	ESB LV/MV Overhead, Overhead Eir Line Underground Eir Line
NB00/02	150mm Watermain
NB01/01	ESB LV/MV Overhead, 200mm Watermain
NB01/02	ESB LV/MV Overhead, Overhead Eir Line 80mm Watermain
NB04/01	No services
NB04/02	No services
NB04/03	No services
NB04/04	No services
NB04/05	No services
NB04/06	ESB LV/MV Overhead
NB05/01	Underground Eir diversion Overhead Eir Line
NB05/02	No services
NB05/03	No services
NB05/04	No services
NB05/05	ESB LV/MV Overhead
NB05/06	No services.
NB05/07	Surface water sewer Foul water sewer ESB MV Overhead
NB06/01	Overhead Eir Line

Name of Structure	Existing Services
	250mm Watermain
NB06/02	No services
NB07/01	No services
NB07/02	ESB LV/MV Overhead Overhead Eir Line 250mm Watermain 300mm Watermain
NB07/03	ESB LV/MV Overhead Overhead Eir Line 250mm Watermain 300mm Watermain
NB07/04	Overhead Eir Line
NB07/05	No services
NB07/06	No services
NB07/07	ESB LV/MV Overhead
NB08/01	No services ESB LV/MV Overhead
NB08/02	ESB LV/MV Overhead
NB08/03	ESB LV/MV Overhead
NB08/04	ESB LV/MV Overhead
NB08/05	ESB LV/MV Overhead
NB08/06	No services
NB08/07	ESB LV/MV Overhead
NB08/08	No services
NB08/09	100mm Watermain Underground Eir Line
NB08/10	No services
NB08/11	No services
NB08/12	ESB LV/MV Overhead ESB LV/MV Underground
NB08/13	100mm Watermain Underground Eir Line
NB08/14	No services
NB09/01	No services
NB10/01	No services
NB11/01	ESB LV/MV Overhead Underground Eir Line
NB11/02	ESB LV/MV Overhead Underground Eir Line
NB12/01	No services
NB12/02	ESB LV/MV Overhead
NB12/03	No services
NB12/04	No services
NB12/05	No services
NB12/06	No services
NB12/07	No services
NB13/01	ESB LV/MV Overhead
NB13/02	ESB LV/MV Overhead
NB13/03	ESB LV/MV Overhead

Name of Structure	Existing Services
NB13/04	ESBI 110kV Overhead
NB13/05	ESB LV/MV Overhead Underground Eir Line
NB13/06	ESB LV/MV Overhead
NB13/07	ESB LV/MV Overhead Underground Eir Line
NB15/01	No services

## 2.8 Geotechnical summary

The geotechnical information is available in the scheme factual reports<sup>1</sup>.

Due to the potential for karst features at some structure locations additional ground investigation is recommended at these locations to further assess this risk.

N6 Galway City Outer By-Pass Contract 1 GI Menlough to Garraun North 2003  
 N6 Galway City Outer By-Pass Contract 2 GI Gortaleva to Menlough 2003  
 N6 Galway City Outer By-Pass Contract 3 GI Forramoyle West to Gort 2004  
 N6 Galway City Outer By-Pass Detailed Design Ground Investigation 2006  
 N6 Galway City Transport Project – Phase 2 Ground Investigation Contract 1 2015  
 N6 Galway City Transport Project – Phase 3 Ground Investigation Contract 1 2016  
 N6 Galway City Transport Project – Phase 3 Ground Investigation Contract 2 2016

## 2.9 Hydrology and Hydraulic summary

Refer to **Chapter 8, Drainage, Hydrology and Flood Risk**, of the Design Report for the N6 Galway City Ring Road.

Refer to **Chapter 11, Hydrology**, of the Environmental Impact Assessment Report for the N6 Galway City Ring Road.

## 2.10 Archaeology summary

The archaeology summary is provided in **Table 4** above.

## 2.11 Environmental summary

The environmental (ecology) summary is provided in **Table 4** above.

## 2.12 Sustainability

### *Retaining Structures and Strengthened Slopes*

Typically reinforced concrete panels and coping beams are proposed as the facing system to the mechanically stabilized earth (MSE) structures. Other retaining walls will be of cantilever L-wall construction, using reinforced concrete as the primary structural material. Concrete has a high durability performance and requires little maintenance during the design life (120yrs), where the product is appropriately specified and executed. Portland cement replacements such as ground granulated blast-furnace slag (GGBS) will be used where appropriate.

The straps using in the MSE and strengthened slope systems will have the relevant BBA/IBA certification to demonstrate that the system can achieve a design life of 120 years.

The strengthened slopes are proposed as “green” slopes are will provided with appropriate vegetation to the finished reinforced slope.

All retaining structures can be readily demolished at the end of the service life of the bridge, and much of the structural materials (concrete, steel etc.) can be recycled and reused.

### *Sign Gantries*

Steel is the most suitable material for the proposed gantry structures and its surface is to be adequately treated so as to minimise the maintenance requirements for the structures throughout its 60 year design life. The material of the gantries can be recycled or reused as required once it has reached its design life. Concrete is chosen as the most suitable material for the pad foundations as it is a highly durable material and this structure is expected to require minimal maintenance during its design life.

### *Noise Barriers*

Timber environmental barriers are the most sustainable option on the market for preventing noise pollution and have a desired service life of 30 years. Timber is the most cost effective and flexible solution that can be adapted to suit most ground conditions and contours.

## 3 Structure and aesthetics

### 3.1 General description of recommended structures

#### *Retaining Structures*

The structural options considered depends on the configuration at each retaining wall location. Typically, where the structure is required to retain the proposed N6 roadway constructed on an embankment, the use of mechanically stabilized earth (MSE) systems are preferred. Elsewhere, reinforced concrete L-walls are adopted. Where there is more room available, strengthened slopes (reinforced earth embankments) are proposed. These slopes have angle up to 70 degrees to the horizontal.

A summary of the recommended retaining structures are provided in **Table 6** below.

**Table 6 Retaining wall structure type**

Name of Structure	Structure Type
R04/01	Reinforced concrete L-wall
R08/01	MSE Wall
R08/02	MSE wall
R08/03a	Strengthened Slope.
R08/07	Strengthened Slope
R08/08	Reinforced concrete L-wall
R08/09	Reinforced concrete L-wall
R09/01	Strengthened Slope
R09/02	Strengthened Slope
R09/03	Strengthened Slope
R12/01	MSE Wall
R14/03	Reinforced concrete L-wall
R14/05	Reinforced concrete L-wall
R15/01	MSE Wall
R15/02	MSE Wall

#### *Sign Gantries*

With the exception of the VMS Cantilever gantries (type MS3), the proposed sign gantries in accordance with the TII Publication Portal and Cantilever Sign/Signal Gantries (DN-STR-03010). The VMS Cantilever gantries (type MS3) are to be in accordance with the UK Manual of Contract Document for Highway Works (Construction Details MCX 069, 0582 and 0583).

The proposed advanced directional sign gantries for the N6 Galway City Ring Road will adopt standardised configurations given in DN-STR-03010. A summary is provided in **Table 2** and **Table 7**.

**Table 7 Sign Gantries Structure Type**

Name of Structure	Structure Type	Typical Span	Group <sup>1</sup>	Reference
G06/01	Cantilever gantry VMS	8	MS3	HCD/MCX/0582 and 0583
G06/02	Cantilever gantry ADS	8.9	4	RCD/1800/10
G08/01	Cantilever gantry ADS	8.9	4	RCD/1800/10
G10/01	Cantilever gantry VMS	9.1	MS3	HCD/MCX/0582 and 0583
G10/02	Portal gantry ADS	14	6	RCD/1800/14
G10/03	Portal gantry ADS	19	6	RCD/1800/14
G10/04	Portal gantry ITS	15	6	RCD/1800/14
G11/01	Portal gantry ITS	38	7	RCD/1800/18
G11/02	Portal gantry ITS	22	6	RCD/1800/14
G11/03	Portal gantry ITS	24	6	RCD/1800/14
G11/04	Portal gantry ITS	30	7	RCD/1800/18
G12/01	Portal gantry ITS	15	6	RCD/1800/14
G12/02	Portal gantry ADS	14	6	RCD/1800/14
G12/03	Portal gantry ADS	18	6	RCD/1800/14
G12/04	Portal gantry +VMS	17	6	RCD/1800/14
G13/01	Portal gantry +VMS	17	6	RCD/1800/14
G13/02	Portal gantry ADS	19	6	RCD/1800/14
G13/03	Portal gantry ADS	16	6	RCD/1800/14
G14/01	Portal gantry ITS	18	6	RCD/1800/14
G14/02	Portal gantry ITS	33	7	RCD/1800/18
G14/03	Portal gantry ITS	32	7	RCD/1800/18
G15/01	Portal gantry ITS	28	7	RCD/1800/18
G15/02	Portal gantry ITS	16	6	RCD/1800/14
G15/03	Portal gantry ITS + VMS+ADS	14	6	RCD/1800/14
G15/04	Cantilever gantry ADS	9.4	4	RCD/1800/10
G15/05	Cantilever gantry VMS	9.1	MS3	HCD/MCX/0582 and 0583
G16/01	Portal gantry ADS	16	6	RCD/1800/14
G17/01	Cantilever gantry ADS	9	4	RCD/1800/10
G18/01	Cantilever gantry VMS	6.3	MS3	HCD/MCX/0582 and 0583

<sup>1</sup> Group refers to TII RCD standard gantry group types, with the exception of MS3 which refers to UK HE SHW standard gantry type for VMS cantilever gantry.

The location and the type of gantry is based on the current design of the signage on the proposed road development.

### *Environmental Noise Barriers*

Information on the proposed environmental noise barriers is provided **Table 3** above and in **Section 3.3.5** below.

## **3.2 Aesthetic considerations**

### *Retaining Structures*

A consistent approach is used where possible for the structural form and finishes for retaining structures along the length of the scheme to provide “a family of structures”.

The concrete panels of the MSE structures will be typically provided with a raised relief and F4 smooth concrete finish to the precast coping beam. Drip checks are provided at the top of the wall.

The reinforced concrete L-wall will be typically provided with a featured finish and F4 smooth concrete finish to the coping beam. Drip checks are provided at the top of the wall.

The proposed reinforced earth embankments will be constructed with a modular wrap around system to form a vegetated (green) face.

### *Sign Gantries*

The form and aesthetics of the sign gantries will be in accordance with the guidance given in DN-STR-03010-02 (BD 51) and the Standard Construction Details (RCD Series 1800).

### *Environmental Noise Barriers*

Where environmental barriers are not located on bridge structures, the barriers are to be of timber panel construction supported by steel posts. All timber panels and steel posts are to comply with Series 300 of the TII Specification for Road Works.

At the River Corrib Bridge, S08/04, a 2m high transparent (glass) noise barrier with an appropriate level of aesthetic quality is to be provided. Refer to the River Corrib Bridge Preliminary Design Report (document GCOB-4.04-020-012) for further details.

At structure, S08/02 a 2.5m high noise barrier is to be provided on both sides of the bridge structure.

### 3.3 Proposals for the recommended structure of family of structures

#### 3.3.1 Proposed Category

All sign gantries have a Category 1 classification.

All noise barriers are less than or equal to 3.0m in height, and have a Category 0 classification; noise barriers with a height greater than 3.0m have a Category 1 classification.

Retaining walls with a retained height of less than 7.0m is assigned as Category 1; structures with retained heights greater or equal to 7.0m are classified as Category 2. Refer to **Table 8** for classification of each proposed retaining structure.

#### 3.3.2 Approaches including run-on arrangements

Not applicable.

### 3.3.3 Retaining Structures

#### Structural arrangement

The dimensions of the retaining structures are given **Table 8** below.

**Table 8: Dimensions of Retaining Structures**

Name of Structure	Length (m)	Retained Height (m)	Category
R04/01	6	Varies. 2.5 max	1
R08/01	77	Varies. 7.0 max	2
R08/02	64	Varies. 6.5 max	2
R08/03a	42	Varies. 5.5 max	2
R08/07	128	Varies. 9.0 max	2
R08/08	36	Varies. 3.5 max	1
R08/09	69	Varies. 3.5 max	1
R09/01	69	Varies. 7.5 max	2
R09/02	73	Varies. 9.5 max	2
R09/03	202	Varies. 6.5 max	2
R12/01	110	Varies. 8.0 max	2
R14/03	288	Varies. 2.5 max	1
R14/05	33	Varies. 3.0 max	1
R15/01	66	Varies. 4.5 max	1
R15/02	128	Varies. 7.0 max	2

A summary of the recommended retaining structures is provided in **Section 3.1** above.

#### Approaches including Run-on Arrangements

Not applicable

#### Substructure

Not applicable

#### Foundation type

All foundations to MSE structure, Cantilever L-Walls and Strengthened Slopes are to be founded on competent identified natural strata or appropriately compacted 6N upfill which will achieve the required bearing capacity. The required bearing capacity is to be calculated during the detailed design, and site testing should be carried out to ensure this bearing capacity is achieved.

Where applicable, parapet support slabs will be founded directly on the reinforced earth material. The foundations for the reinforced earth panels will be founded directly on a strip footing.

## Superstructure

### MSE Walls

The structure consists of reinforced earth retaining wall, formed using proprietary reinforced earth straps or grids, with precast concrete facing panels. The reinforced earth walls will be filled with Class 6I/6J granular fill material, see Figure 1.

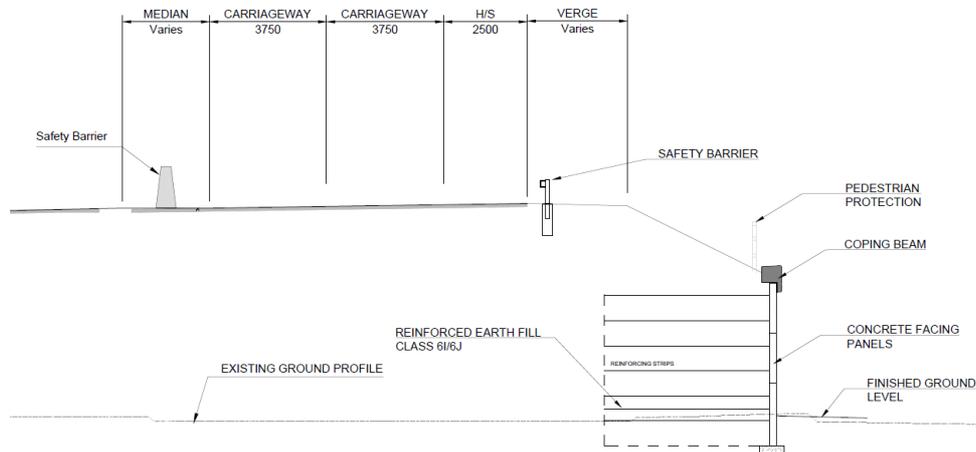


Figure 1 - MSE wall.

The reinforced earth walls are to be BBA certified for a design life of 120 years.

### Strengthened Slopes

The reinforced earth embankments shall consist of proprietary granular mesh and/or geogrid reinforced sloping embankments with a modular wrap around system to form a vegetated (green) face, see Figure 2.

The reinforced earth embankments are to be BBA certified for a design life of 120 years.

The reinforced earth embankments will be filled with Class 6I/6J granular fill material as detailed in Table 6.1 in Specification Appendix 6/1.

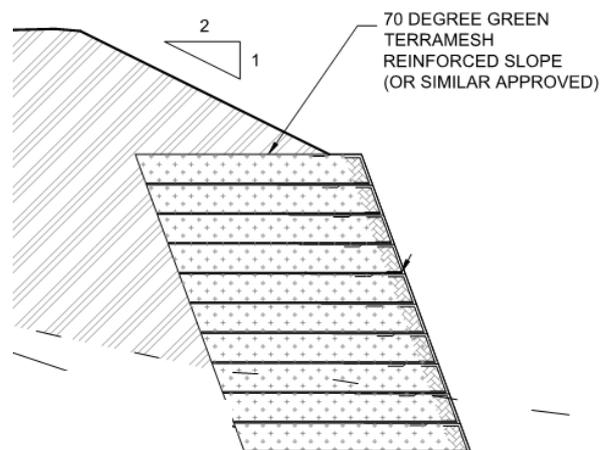


Figure 2 - Strengthened Slope.

### Reinforced concrete L-wall

The reinforced concrete walls are to be freestanding in-situ reinforced concrete cantilever retaining walls. The wall will have a base that will act as a spread footing, see Figure 3.

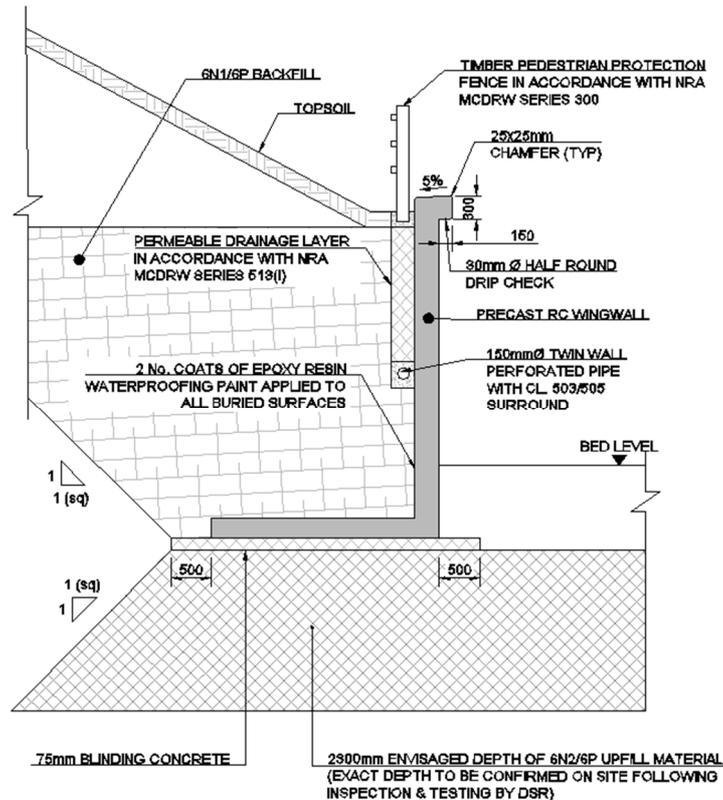


Figure 3 – reinforced concrete L-wall.

### Articulation arrangements, joints and bearings

There are no expansion joints or bearings at the retaining structures.

### Parapet

Where parapets are required in accordance with TII DN-STR-03011 (NRA BD 52), a 1250mm high, H2-W4 parapet with mesh infill will be provided.

At locations of retaining walls where the road is in embankment a H2 vehicle restraint system will be provided in accordance with DN-STR-03011 with appropriate approach and departure length VRS systems in accordance with DN-REQ-03034. At locations of retaining walls where the road is in cut, standard N2 safety barriers with appropriate working width will be provided if the wall is located within the clear zone. As per Table 5/5 DN-REQ-03034. Note that retaining walls may incorporate a concrete barrier in accordance with Series 400 of the Specification for Road Works rather than require a separate barrier, provided the surface of the wall presents a smooth traffic face for at least 1.5m above the carriageway level.



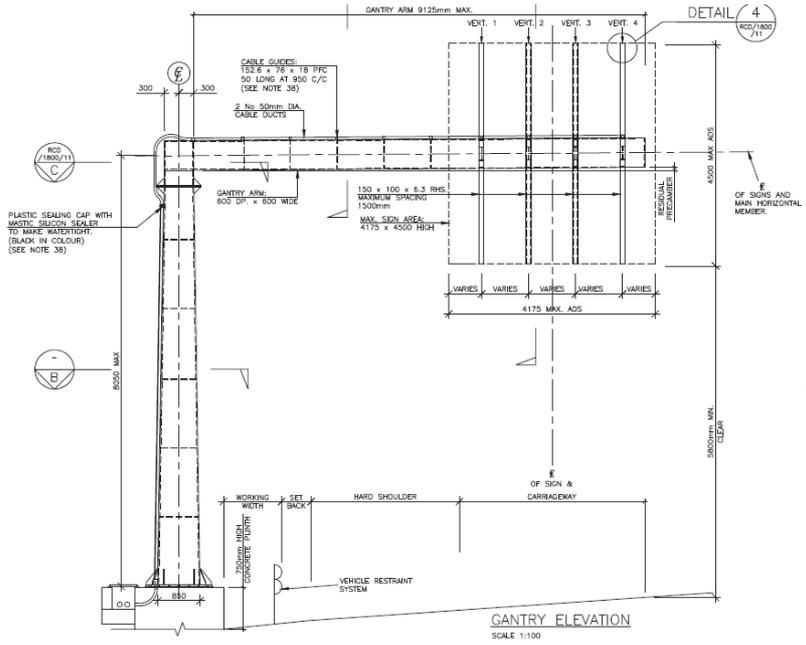


Figure 5 - Gantry elevation, Group 4.

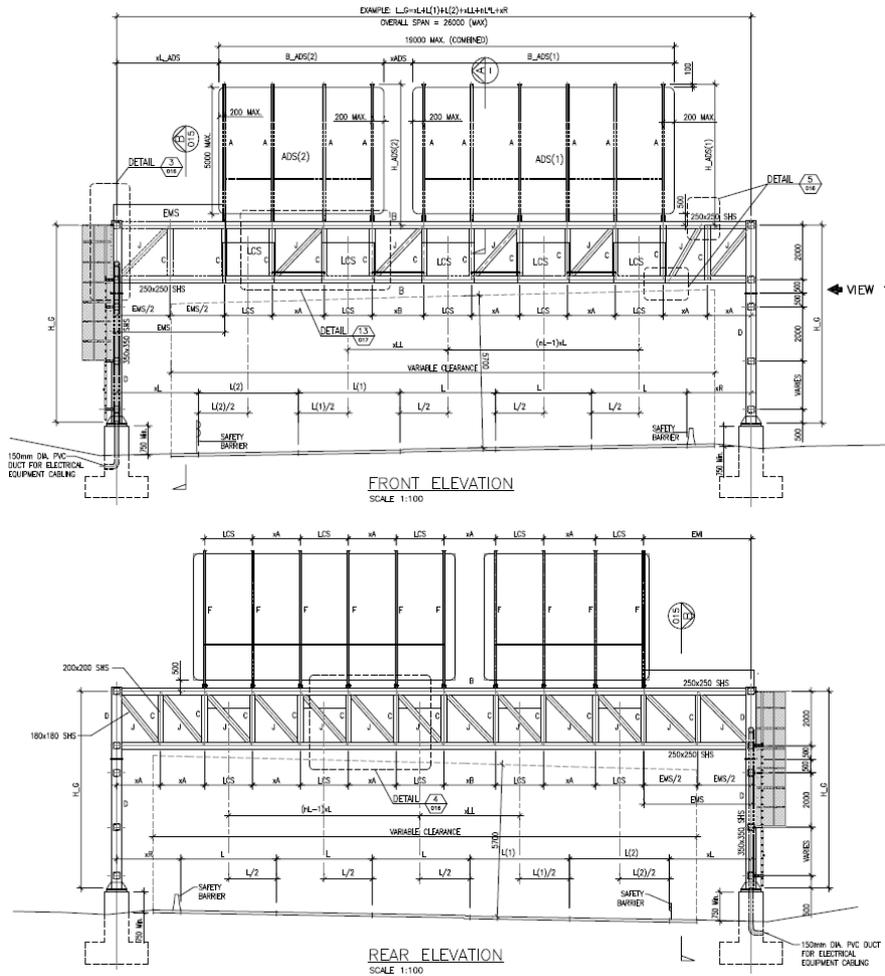


Figure 6 - Gantry elevation, Group 6.

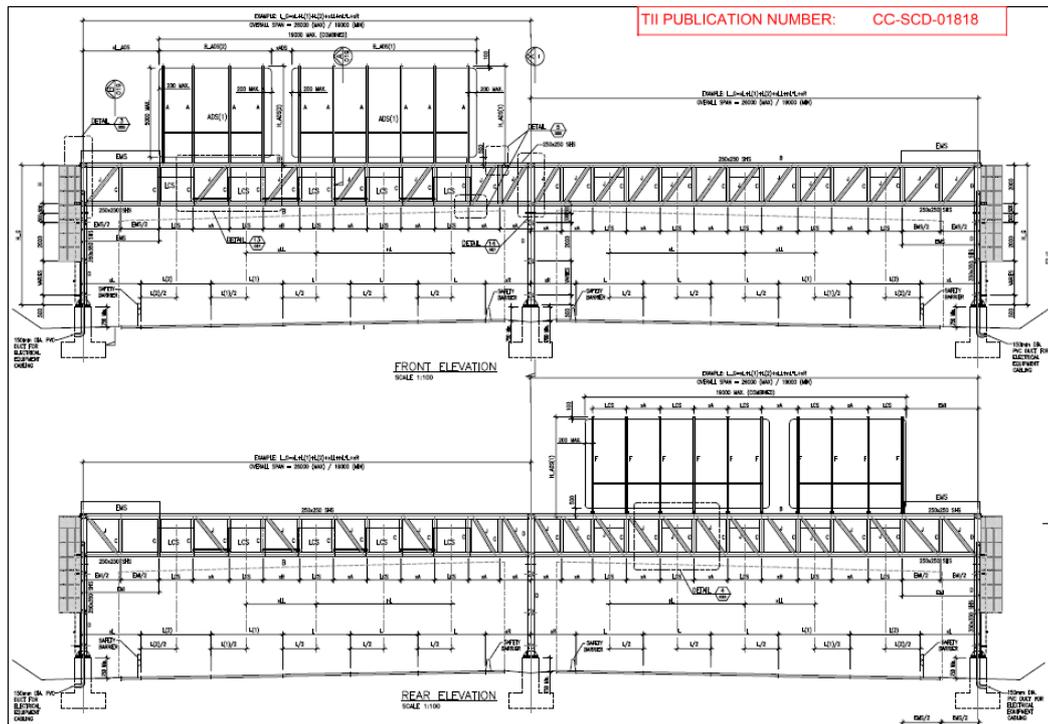


Figure 7 - Gantry elevation, Group 7.

## Approaches including Run-on Arrangements

N/A.

## Substructure

The substructure shall comprise of an insitu reinforced concrete plinth with cast-in holding down bolts to support the gantry elements.

## Foundation type

The gantries are to be supported on spread foundations. All foundations to be founded on competent identified natural strata or appropriately compacted 6N upfill which will achieve the required bearing capacity. The required bearing capacity will be calculated during the detailed design, and site testing will be carried out to ensure this bearing capacity is achieved.

## Superstructure

The superstructure shall comprise of a non-passively safe gantry of steel construction. Gantry elements are to be connected to the foundations by means of cast in holding down bolts.

## Articulation arrangements, joints and bearings

There are no expansion joints or bearings for the sign gantries

## Vehicle Restraint Systems

Where applicable a vehicle restraint system will be provided on the approach to and departure from the sign gantries. A minimum containment level of N2 will be provided and an appropriate working width will be chosen depending site specific requirements.

## Inspection and maintenance

Inspections and maintenance of the gantries will ideally be carried out during lane closures put in place for routine maintenance or, if necessary, specially arranged lane closures.

Access can be achieved using lane closures and mobile hydraulic lifts. Vehicular access can be achieved using lane or carriageway closures. The gantry foundations are located behind the vehicle restraint system and can therefore be inspected without the need for traffic management, other than as noted above.

The gantry structure is defined as Working Life Category 4, in accordance with IS EN 1990, and will be designed for a 60 year design working life.

### 3.3.5 Environmental Noise Barriers

#### Structural arrangement

The dimensions of the environmental noise barriers are given **Table 9** below.

**Table 9: Dimensions of Environmental Noise Barriers**

Structure name	Barrier Height (m)	Length (m)	Structure name	Barrier Height (m)	Length (m)
NB00/01	2	105	NB08/11	2.0	650
NB00/02	2	100	NB08/12	3.0	120
			NB08/13	2.5	20
			NB08/14	2.0	50
NB01/01	2	115			
NB01/02	2	215			
NB04/01	2.5	80			
NB04/02	2.0	35	NB09/01	1.5	110
NB04/03	2	10			
NB04/04	1.5	75	NB10/01	3.0	360
NB04/05	2.5	40			
NB04/06	2.5	45	NB11/01	3.5	210
			NB11/02	2.5	140
NB05/01	3.5	90	NB12/01	3.0	210
NB05/02	3.0	30	NB12/02	2	170

Structure name	Barrier Height (m)	Length (m)	Structure name	Barrier Height (m)	Length (m)
NB05/03	2.5	60	NB12/03	2.0	30
NB05/04	2.5	90	NB12/04	2.0	60
NB05/05	2.0	15	NB12/05	2.5	110
NB05/06	2	55	NB12/06	3.5	180
NB05/07	2	200			
NB06/01	2	155	NB12/07	2.5	210
NB06/02	2	230			
NB07/01	2.5	45	NB13/01	3	145
NB07/02	2.5	300	NB13/02	3	70
NB07/03	2.0	260	NB13/03	2	210
NB07/04	2	55	NB13/04	3	280
NB07/05	2	70	NB13/05	3.5	345
NB07/06	2	35			
NB07/07	2	25			
NB08/01	2.5	120	NB13/06	3	440
NB08/02	2.5	210	NB13/07	3.5	340
NB08/03	3.0	260			
NB08/04	3.5	130			
NB08/05	4.0	145			
NB08/06	3.5	30	NB15/01	2.5	520
NB08/07	2.5	305			
NB08/08	2	650			
NB08/09	2.5	220			
NB08/10	2	30			

## Approaches including Run-on Arrangements

N/A.

## Substructure

Not applicable.

## Foundation type

Barriers are to be supported from mass concrete foundation. The size and shape of the foundations are to be confirmed in the detailed design stage. Wind loading applied to the barriers in the sizing of the foundations to be in accordance with EN 1991-1-4:2005 & the Irish NA.

## Superstructure

Typically the barriers will be constructed using timber panels supported by steel posts.

At the River Corrib Bridge, glass panels will be used and supported with steel or aluminium posts.

## Articulation arrangements, joints and bearings

Not applicable

## Parapet

Not applicable

## Inspection and maintenance

The timber environmental noise barriers have no expansion joints or bearings and hence minimal maintenance requirements are expected.

Regular inspections should be carried out to ensure the timber panels and the steel posts are in good condition and that the service life of the structure is attained.

Access to the environmental barriers will be generally from the ground level in front of the structure, and where necessary a mobile elevated work platform may be required for access/inspection purposes.

The environmental noise barriers should have an indicative working life of 30 years, in accordance with Clause 310 of the Specification for Road Works.

## 4 Safety

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### 4.1 Traffic management during construction including land for temporary diversions

Detailed traffic management proposals will be developed at detail design stage by the appointed Contractor in consultation with their Designers and the consent for the diversions and or road closures will be sought from the appropriate local authority.

### 4.2 Safety during construction

The Designer will take account of the General Principles of Prevention, as specified in the Schedule 3 of the Safety, Health and Welfare at Work Act 2005, liaise with the Project Supervisor appointed by the Client for the Design Process and the Project Supervisor appointed for the Construction Stage and carry out all other duties as required by Clause 15 of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013).

The Project Supervisor for the Design Process will comply with all the requirements outlined in Clauses 11, 12, 13 & 14 of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013).

### 4.3 Safety in use

Where applicable, parapets and vehicle restraint systems will be provided at the retaining structures, sign gantries and environmental noise barriers. The parapets and vehicle restraint systems are to be provided for the required approach to and departure from the structure.

Where applicable, pedestrian protection will be provided at the top of the retaining wall structures in accordance with TII DN-STR-03011 (NRA BD 52).

### 4.4 Lighting

Not applicable.

## 5 Cost

### 5.1 Budget Estimate in current year, including whole life cost

**Table 10 Budget estimate**

Name of structure	Structure Cost Excl. VAT (euro)
R04/01	4500
R08/01	161700
R08/02	124800
R08/03a	46200
R08/07	230400
R08/08	37800
R08/09	72450
R09/01	103500
R09/02	138700
R09/03	262600
R12/01	264000
R14/03	216000
R14/05	29700
R15/01	89100
R15/02	268800
G06/01	50000
G06/02	50000
G08/01	50000
G10/01	50000
G10/02	110000
G10/03	110000
G10/04	110000
G11/01	110000
G11/02	110000
G11/03	110000
G11/04	110000
G12/01	110000
G12/02	110000
G12/03	110000

Name of structure	Structure Cost Excl. VAT (euro)
G12/04	110000
G13/01	110000
G13/02	110000
G13/03	110000
G14/01	110000
G14/02	110000
G14/03	110000
G15/01	110000
G15/02	110000
G15/03	110000
G15/04	50000
G15/05	50000
G16/01	110000
G17/01	50000
G18/01	50000
NB00/01 to NB15/04	216500

The cost estimate values given in **Table 10** are based on the rates adopted in **Table 11** below. A range of -10% to +15% is considered to be applicable to the budget cost for this stage of the design.

**Table 11 Basis of cost estimate**

Structure Type	Rate
MSE wall	300 euro / m <sup>2</sup>
Reinforced Concrete L-Wall	300 euro / m <sup>2</sup>
Sign Gantry – Cantilever	50,000 euro / per gantry
Sign Gantry – Portal	110,000 euro / per gantry
Environmental Noise Barrier	225 euro / m
Strengthened Slope	200 euro / m <sup>2</sup>

## 6 Design Assessment Criteria

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### 6.1 Normal Loading

The retaining structures, sign gantries and environmental noise barriers will be design for loading in accordance with the Eurocode and the associated nation annexes.

### 6.2 Abnormal Loading

Where applicable, Load Model 3 up to and including SV196 (where applicable) will be considered in accordance with IS EN 1991-2:2003 and the associated National Annex.

### 6.3 Footway live loading

Where applicable, a footway loading shall be in accordance with Clause 5.3.2.1 of IS EN 1991-2:2003. A nominal  $q_{fk} = 5\text{kN/m}^2$  will be adopted.

### 6.4 Provision for exceptional abnormal loads

No exceptional abnormal loads are proposed.

### 6.5 Any special loading not covered above

Not applicable.

### 6.6 Heavy or high load route requirements and arrangements being made to preserve route

Not applicable.

### 6.7 Minimum headroom provided

The minimum headroom clearance under the sign gantries and any sign attachments will be 5.8m in accordance with TII DN-STR-03010 (NRA BD51).

### 6.8 Authorities consulted and any special conditions required

Consultation with relevant authorities is on-going. The following groups have been contacted as part of the scheme:

Transport Infrastructure Ireland (TII)

Galway County Council (GCoC)

Galway City Council (GCiC)

Land and home owners

## 7 Ground Conditions

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### 7.1 Description of the ground conditions and compatibility with proposed foundations

Pad or strip foundations are typically envisaged for the reinforced concrete retaining walls, sign gantries and noise barriers.

Reinforced earth walls and strengthened slopes will be founded on competent strata. Underlying soft/loose material to be excavated and replaced where necessary.

Due to the potential for karst features there may be a need for piled foundations at some locations. This aspect should be considered in further detail at the next stages for the design development.

## **8 Drawings and Documents**

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### **8.1 List of all documents accompanying the submission**

None