Dunkellin River and Aggard Stream Flood Relief Scheme

Response to Iarnród Éireann

Document Control Sheet

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INTRODUCTION

RPS was commissioned by Galway County Council in 2011 to prepare an Environmental Impact Statement (EIS) for the Dunkellin River and Aggard Stream Flood Relief Scheme, hereafter called the "scheme", in south County Galway. The Dunkellin River and the Aggard Stream form part of the Dunkellin Drainage District which was constructed in or around 1857 and Galway County Council has a statutory maintenance responsibility for these works.

The scheme was submitted to An Bord Pleanála (ABP) in October 2014 for planning approval in line with Section 175 of the Planning and Development Act 2000, as amended. In February 2015, the Board, in accordance with Section 175(5)(a) of the Planning and Development Act, 2000, as amended, requested further information in relation to the proposed development.

Item 7 of the Board's letter stated that, "*The applicant is invited to respond in detail to the written submissions made by parties including local residents, prescribed bodies and others.*"

The purpose of this document is to provide a response to the issues raised by the Iarnród Éireann in their submission.

1 ITEM 1 - GENERAL

1.1 The Railway Safety Act 2005 places an obligation on all persons carrying out any works on or near the railway to ensure that there is no increase in risk to the railway as a consequence of these works. All works carried out adjacent to, or under or over the railway, or that may have a direct impact on the railway must be carried out in a safe manner which safeguards the interests of Iarnród Éireann (IÉ). This includes minimising the risk to the railway and minimising the general impact on the railway. Due to the interface of the proposed works to the railway, Galway County Council must take into account this obligation in the design, construction and operation of the scheme.

The 2005 Railway Safety Act will be taken into account during the design, construction and operation of the scheme. Iarnród Éireann's Safety Management Standard (CCE-SMS-05) and their Permit to Work Systems will also be considered.

1.2 Iarnród Éireann is obliged to comply with the requirement of the Railway Safety Act (2005), the Railway Safety Directive (2004/49/EC) and the Interoperability Directive (2008/57/EC) for all new railway infrastructure. In order to satisfy these legislative requirements an application for Authorisation to Place In Service (APIS) shall be made to the Railway Safety Commission (RSC) for each stage of the project in accordance with the RSC Guidelines for the approval of new infrastructure works, in particular RSC-G-009 "Guidelines for the Process of Authorisation for Placing in Service of Railway Sub Systems".

An application for Authorisation to Place in Service (APIS) shall be made following planning approval.

1.3 An application for safety validation shall be prepared by Iarnród Éireann for each stage of the project, to be submitted to the Safety Validation Panel (SVP), SVP approval will be required before an application can be made to the Railway Safety Commission.

Galway County Council shall facilitate IÉ in their duties to prepare a safety validation application for each stage of the project.

2 ITEM 2 - ZONE 1 – CRAUGHWELL RIVER

2.1 The proposed flood relief works include significant works on Córas Iompair Éireann (CIÉ) lands beneath the Craughwell River bridge (UBE154) and a licence agreement between CIÉ and Galway County Council is required for the design, construction and maintenance of the proposed works. The safety and technical acceptance of the proposed works by IÉ is also required in accordance with Iarnród Éireann Infrastructure Standard I-DEP-0120, Guidance on Third Party Works.

This requirement for a licence agreement and IÉ's technical acceptance is noted.

2.2 The proposed flood relief works involves deepening of the river bed by 1.0-1.5m upstream of Rahasane Turlough for a distance of 950m, from 600m downstream of the railway bridge (UBE154) to 35m upstream of the R446 (Old Dublin Road) bridge. The railway bridge will require engineering works from the Description of Proposed Works' document as to the scale of the proposed works at the railway bridge and further detail will be required to allow IÉ to assess the impact on the structure.

The scale of the proposed works at the railway bridge is discussed in **Section 3.4.2** of the Works Description report (**Appendix A** to the Main EIS). Refer also to Drawing 6408-2210.

2.3 Drg. No. 6408-2210 Rev C: The proposed works to the railway bridge indicate that anchored mini-pile underpinning is to be provided to the base of the existing abutment however no site investigations have been carried out to determine the detail of the existing foundations of UBE154. In addition, the bedrock nature (i.e. depth to bedrock and competency of bedrock, likely to be strongly weathered, solutionised karst limestone bedrock) needs to be assessed in order to design the depth of mini-piles and the anchorage of the proposed piled wall In order to properly review the proposed works It is recommended that site investigations are undertaken to determine the full extents of the existing abutment foundations.

Site investigative works were carried out between August and October 2014 to facilitate the detailed design.

Referring to section 3.4.2 of the Works Description Report (Appendix A to the Main EIS), "it is envisaged that the foundations of the existing railway bridge will require scour protection through the use of a secant or contiguous piled wall along each side of the bridge piers or abutments".

We note that, the size/depth of underpinning shown on d rawing 6408-2210 is indicative only. The nature of the piles required will be determined at detailed design stage.

The following **Figure 2.1** illustrates the extent of site investigation which has been completed to date.

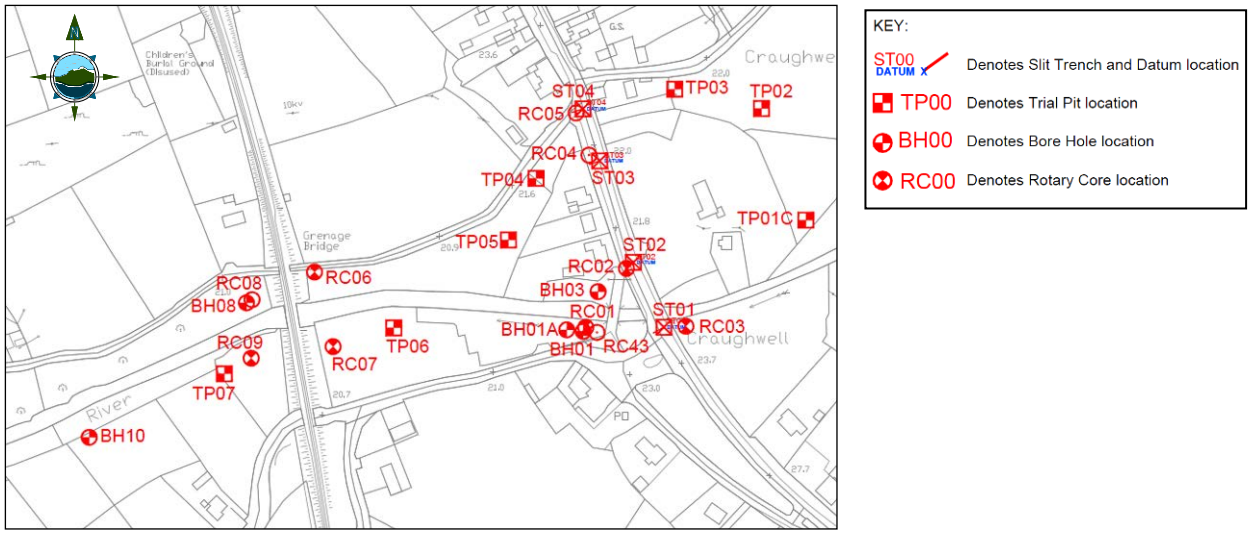


Figure 2.1 – Map of Site Investigation Works

The investigations undertaken at the bridge include:

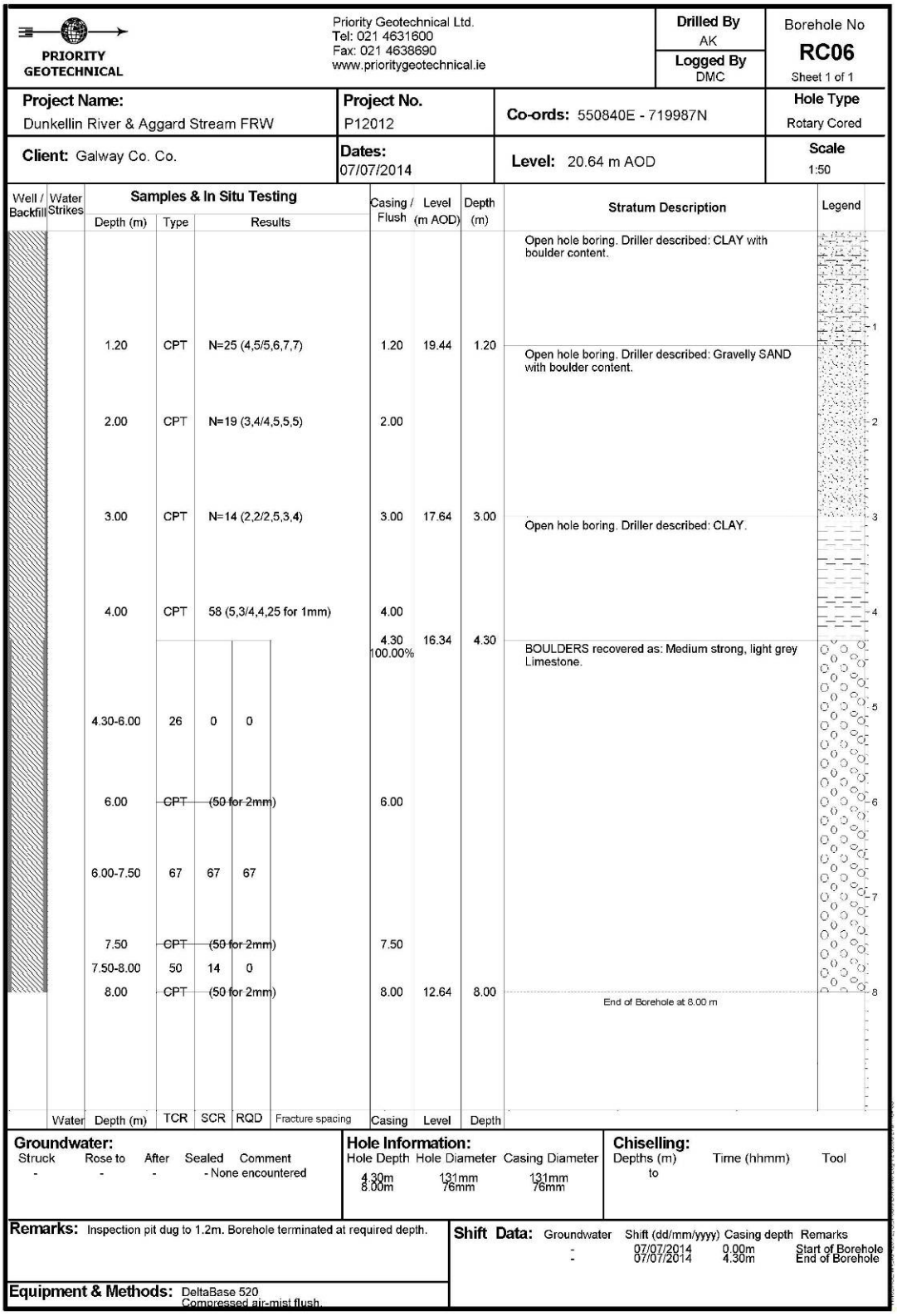
1. Rotary Core 6 (RC06)
   Rotary Core 7 (RC07)
   Rotary Core 8 (RC08)
   Rotary Core 9 (RC09)

2. Trial Pit 06 (TP06)
   Trial Pit 07 (TP07)

   and

3. Borehole 08 (BH08)

These results are presented in the following images, **Image 2.1 to 2.7**



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Drilled By AK
Logged By DMC

Borehole No **RC06** Sheet 1 of 1

Project Name: Dunkellin River & Aggard Stream FRW
Project No. P12012
Co-ords: 550840E - 719987N
Hole Type Rotary Cored
Client: Galway Co. Co.
Dates: 07/07/2014
Level: 20.64 m AOD
Scale 1:50

Well / Backfill	Water Strikes	Depth (m)	Type	Results	Casing / Flush	Level (m AOD)	Depth (m)	Stratum Description	Legend
								Open hole boring. Driller described: CLAY with boulder content.	
		1.20	CPT	N=25 (4,5/5,6,7,7)	1.20	19.44	1.20		
								Open hole boring. Driller described: Gravelly SAND with boulder content.	
		2.00	CPT	N=19 (3,4/4,5,5,5)	2.00				
		3.00	CPT	N=14 (2,2/2,5,3,4)	3.00	17.64	3.00		
								Open hole boring. Driller described: CLAY.	
		4.00	CPT	58 (5,3/4,4,25 for 1mm)	4.00				
					4.30 100.00%	16.34	4.30	BOULDERS recovered as: Medium strong, light grey Limestone.	
		4.30-6.00	26	0 0					
		6.00	CPT	(50 for 2mm)	6.00				
		6.00-7.50	67	67 67					
		7.50	CPT	(50 for 2mm)	7.50				
		7.50-8.00	50	14 0					
		8.00	CPT	(50 for 2mm)	8.00	12.64	8.00	End of Borehole at 8.00 m	

Water	Depth (m)	TCR	SCR	RQD	Fracture spacing	Casing	Level	Depth

Groundwater:

Struck	Rose to	After	Sealed	Comment
-	-	-		- None encountered

Hole Information:

Hole Depth	Hole Diameter	Casing Diameter
4.30m	131mm	131mm
8.00m	76mm	76mm

Chiselling:

Depths (m)	Time (hhmm)	Tool
to		

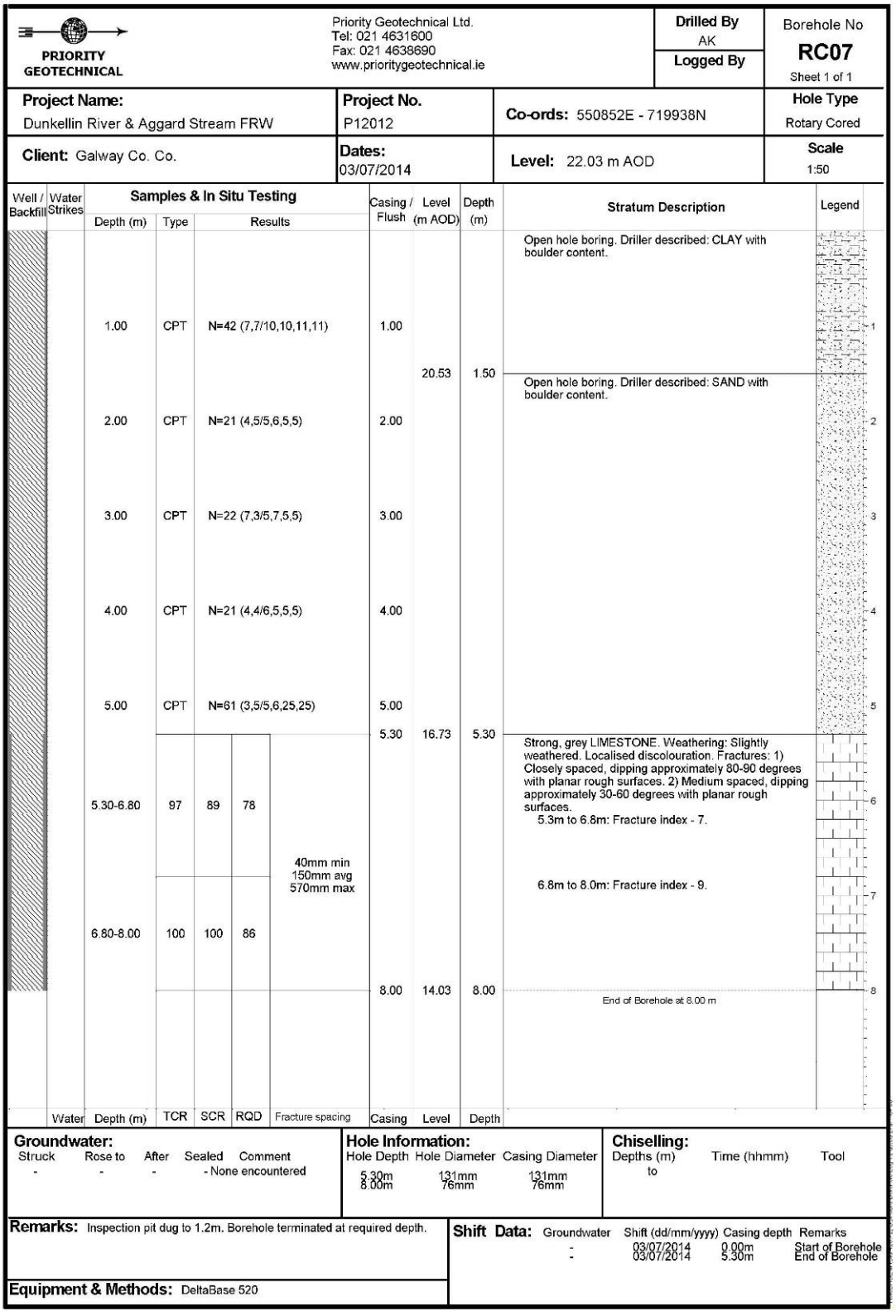
Remarks: Inspection pit dug to 1.2m. Borehole terminated at required depth.

Shift Data:

Groundwater	Shift (dd/mm/yyyy)	Casing depth	Remarks
-	07/07/2014	0.00m	Start of Borehole
-	07/07/2014	4.30m	End of Borehole

Equipment & Methods: DeltaBase 520
Compressed air-mist flush.

Image 2.1 – Rotary Core RC06 Log



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Drilled By: AK
Logged By:

Borehole No: RC07
Sheet 1 of 1

Project Name: Dunkellin River & Aggard Stream FRW
Project No.: P12012
Co-ords: 550852E - 719938N
Hole Type: Rotary Cored
Client: Galway Co. Co.
Dates: 03/07/2014
Level: 22.03 m AOD
Scale: 1:50

Well / Backfill	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	TCR	SCR	RQD	Fracture spacing	Casing / Flush	Level (m AOD)	Depth (m)	Stratum Description	Legend
		1.00	CPT	N=42 (7,7/10,10,11,11)					1.00			Open hole boring. Driller described: CLAY with boulder content.	
										20.53	1.50		
		2.00	CPT	N=21 (4,5/5,6,5,5)					2.00			Open hole boring. Driller described: SAND with boulder content.	
		3.00	CPT	N=22 (7,3/5,7,5,5)					3.00				
		4.00	CPT	N=21 (4,4/6,5,5,5)					4.00				
		5.00	CPT	N=61 (3,5/5,6,25,25)					5.00				
									5.30	16.73	5.30	Strong, grey LIMESTONE. Weathering: Slightly weathered. Localised discolouration. Fractures: 1) Closely spaced, dipping approximately 80-90 degrees with planar rough surfaces. 2) Medium spaced, dipping approximately 30-60 degrees with planar rough surfaces. 5.3m to 6.8m: Fracture index - 7.	
		5.30-6.80			97	89	78	40mm min 150mm avg 570mm max					
		6.80-8.00			100	100	86					6.8m to 8.0m: Fracture index - 9.	
									8.00	14.03	8.00	End of Borehole at 8.00 m	

Groundwater:

Struck	Rose to	After	Sealed	Comment
-	-	-		- None encountered

Hole Information:

Hole Depth	Hole Diameter	Casing Diameter
5.30m	131mm	131mm
8.00m	76mm	76mm

Chiselling:

Depths (m)	Time (hhmm)	Tool
to		

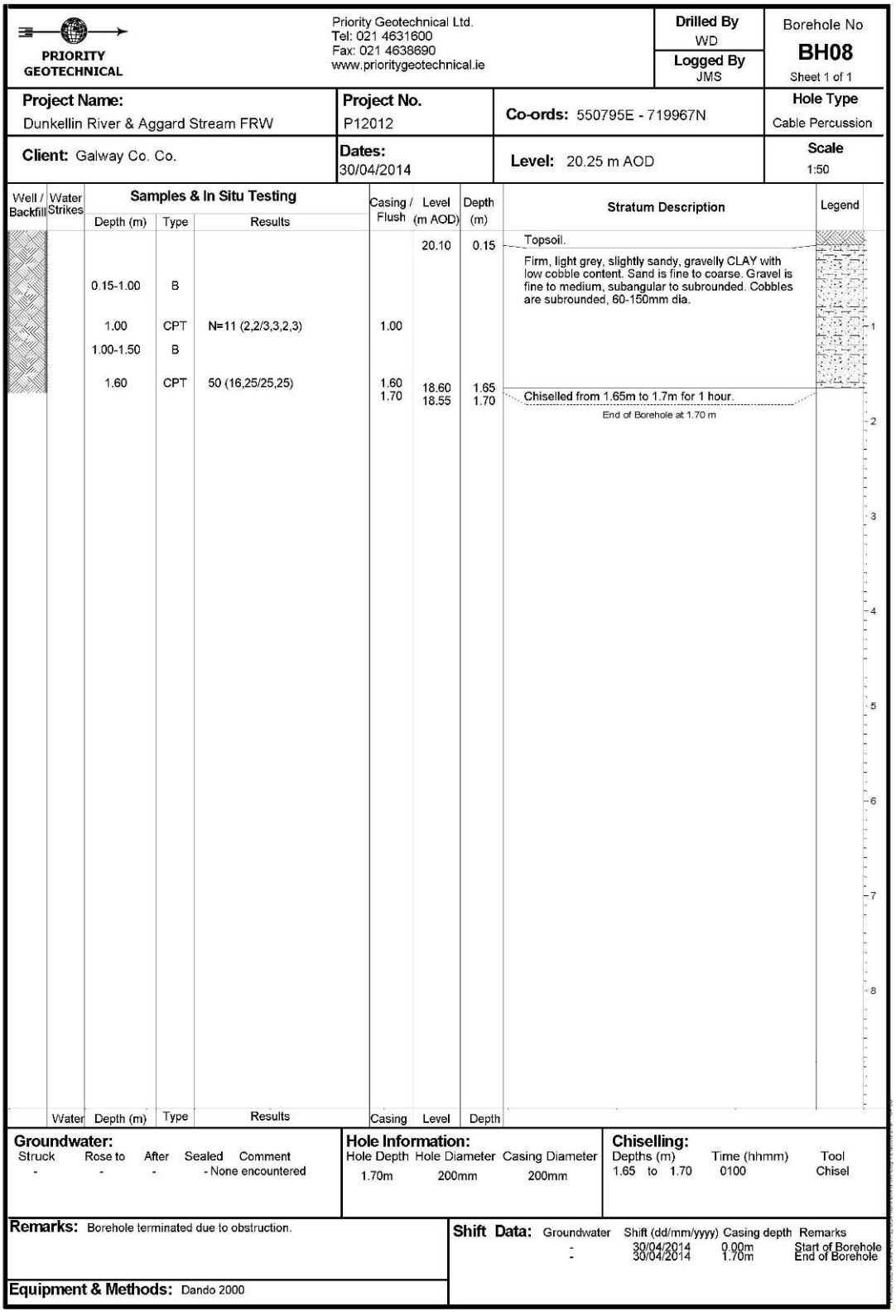
Remarks: Inspection pit dug to 1.2m. Borehole terminated at required depth.

Equipment & Methods: DeltaBase 520

Shift Data:

Groundwater	Shift (dd/mm/yyyy)	Casing depth	Remarks
-	03/07/2014	0.00m	Start of Borehole
-	03/07/2014	5.30m	End of Borehole

Image 2.2 - Rotary Core RC07 Log



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Drilled By: WD
Logged By: JMS

Borehole No: BH08
Sheet 1 of 1

Project Name:	Project No.	Co-ords:	Hole Type
Dunkellin River & Aggard Stream FRW	P12012	550795E - 719967N	Cable Percussion
Client: Galway Co. Co.	**Dates:** 30/04/2014	**Level:** 20.25 m AOD	**Scale** 1:50

Well / Backfill	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Casing / Flush	Level (m AOD)	Depth (m)	Stratum Description	Legend
						20.10	0.15	Topsoil.	
		0.15-1.00	B					Firm, light grey, slightly sandy, gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded. Cobbles are subrounded, 60-150mm dia.	
		1.00	CPT	N=11 (2,2/3,3,2,3)	1.00				
		1.00-1.50	B						
		1.60	CPT	50 (16,25/25,25)	1.60 1.70	18.60 18.55	1.65 1.70	Chiselled from 1.65m to 1.7m for 1 hour. End of Borehole at 1.70 m	

Water	Depth (m)	Type	Results	Casing	Level	Depth

Groundwater:

Struck	Rose to	After	Sealed	Comment
-	-	-		- None encountered

Hole Information:

Hole Depth	Hole Diameter	Casing Diameter
1.70m	200mm	200mm

Chiselling:

Depths (m)	Time (hhmm)	Tool
1.65 to 1.70	0100	Chisel

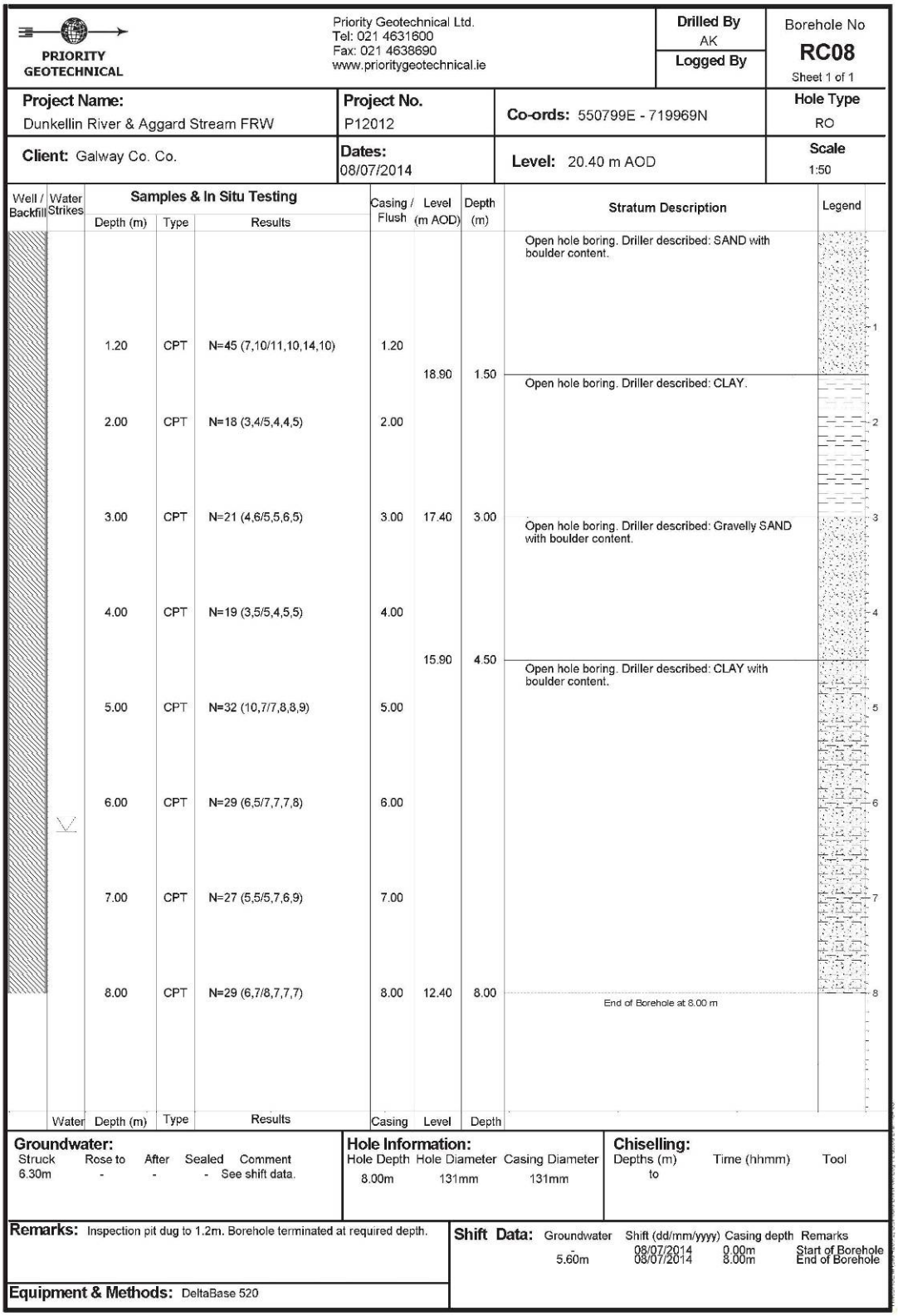
Remarks: Borehole terminated due to obstruction.

Equipment & Methods: Dando 2000

Shift Data:

Groundwater	Shift (dd/mm/yyyy)	Casing depth	Remarks
-	30/04/2014	0.00m	Start of Borehole
-	30/04/2014	1.70m	End of Borehole

Image 2.3 - Borehole BH08 Log



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Drilled By: AK
Logged By:

Borehole No: RC08
Sheet 1 of 1

Project Name: Dunkellin River & Aggard Stream FRW
Project No.: P12012
Co-ords: 550799E - 719969N
Hole Type: RO
Client: Galway Co. Co.
Dates: 08/07/2014
Level: 20.40 m AOD
Scale: 1:50

Well / Backfill	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Casing / Flush	Level (m AOD)	Depth (m)	Stratum Description	Legend
								Open hole boring. Driller described: SAND with boulder content.	
		1.20	CPT	N=45 (7,10/11,10,14,10)	1.20				
						18.90	1.50		
								Open hole boring. Driller described: CLAY.	
		2.00	CPT	N=18 (3,4/5,4,4,5)	2.00				
		3.00	CPT	N=21 (4,6/5,5,6,5)	3.00	17.40	3.00		
								Open hole boring. Driller described: Gravelly SAND with boulder content.	
		4.00	CPT	N=19 (3,5/5,4,5,5)	4.00				
						15.90	4.50		
								Open hole boring. Driller described: CLAY with boulder content.	
		5.00	CPT	N=32 (10,7/7,8,8,9)	5.00				
		6.00	CPT	N=29 (6,5/7,7,7,8)	6.00				
		7.00	CPT	N=27 (5,5/5,7,6,9)	7.00				
		8.00	CPT	N=29 (6,7/8,7,7,7)	8.00	12.40	8.00		
								End of Borehole at 8.00 m	

Water	Depth (m)	Type	Results	Casing	Level	Depth

Groundwater:

Struck	Rose to	After	Sealed	Comment
6.30m	-	-	-	See shift data.

Hole Information:

Hole Depth	Hole Diameter	Casing Diameter
8.00m	131mm	131mm

Chiselling:

Depths (m)	Time (hhmm)	Tool
to		

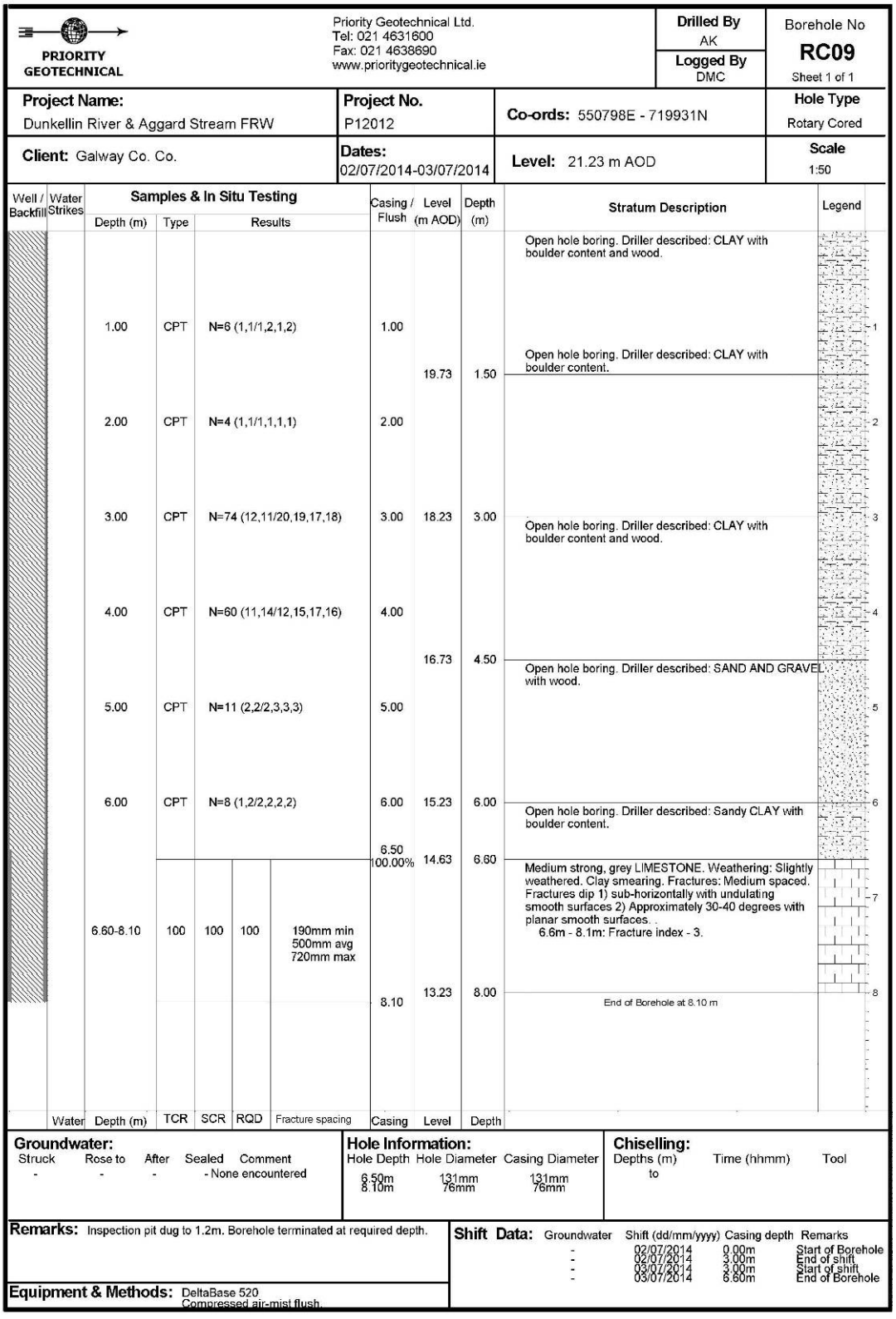
Remarks: Inspection pit dug to 1.2m. Borehole terminated at required depth.

Equipment & Methods: DeltaBase 520

Shift Data:

Groundwater	Shift (dd/mm/yyyy)	Casing depth	Remarks
-	08/07/2014	0.00m	Start of Borehole
5.60m	08/07/2014	8.00m	End of Borehole

Image 2.4 - Rotary Core RC08 Log



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Drilled By: AK
Logged By: DMC

Borehole No: RC09
Sheet 1 of 1

Project Name: Dunkellin River & Aggard Stream FRW
Project No.: P12012
Co-ords: 550798E - 719931N
Hole Type: Rotary Cored
Client: Galway Co. Co.
Dates: 02/07/2014-03/07/2014
Level: 21.23 m AOD
Scale: 1:50

Well / Backfill	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Casing / Flush	Level (m AOD)	Depth (m)	Stratum Description	Legend
		1.00	CPT	N=6 (1,1/1,2,1,2)	1.00			Open hole boring. Driller described: CLAY with boulder content and wood.	
						19.73	1.50	Open hole boring. Driller described: CLAY with boulder content.	
		2.00	CPT	N=4 (1,1/1,1,1,1)	2.00				
		3.00	CPT	N=74 (12,11/20,19,17,18)	3.00	18.23	3.00	Open hole boring. Driller described: CLAY with boulder content and wood.	
		4.00	CPT	N=60 (11,14/12,15,17,16)	4.00				
						16.73	4.50	Open hole boring. Driller described: SAND AND GRAVEL with wood.	
		5.00	CPT	N=11 (2,2/2,3,3,3)	5.00				
		6.00	CPT	N=8 (1,2/2,2,2,2)	6.00	15.23	6.00	Open hole boring. Driller described: Sandy CLAY with boulder content.	
					6.50 100.00%	14.63	6.60	Medium strong, grey LIMESTONE. Weathering: Slightly weathered. Clay smearing. Fractures: Medium spaced. Fractures dip 1) sub-horizontally with undulating smooth surfaces 2) Approximately 30-40 degrees with planar smooth surfaces. . 6.6m - 8.1m: Fracture index - 3.	
		6.60-8.10	100	100	100	190mm min 500mm avg 720mm max			
					8.10	13.23	8.00	End of Borehole at 8.10 m	

Water	Depth (m)	TCR	SCR	RQD	Fracture spacing	Casing	Level	Depth

Groundwater:

Struck	Rose to	After	Sealed	Comment
-	-	-		- None encountered

Hole Information:

Hole Depth	Hole Diameter	Casing Diameter
6.50m	131mm	131mm
8.10m	76mm	76mm

Chiselling:

Depths (m)	Time (hhmm)	Tool
to		

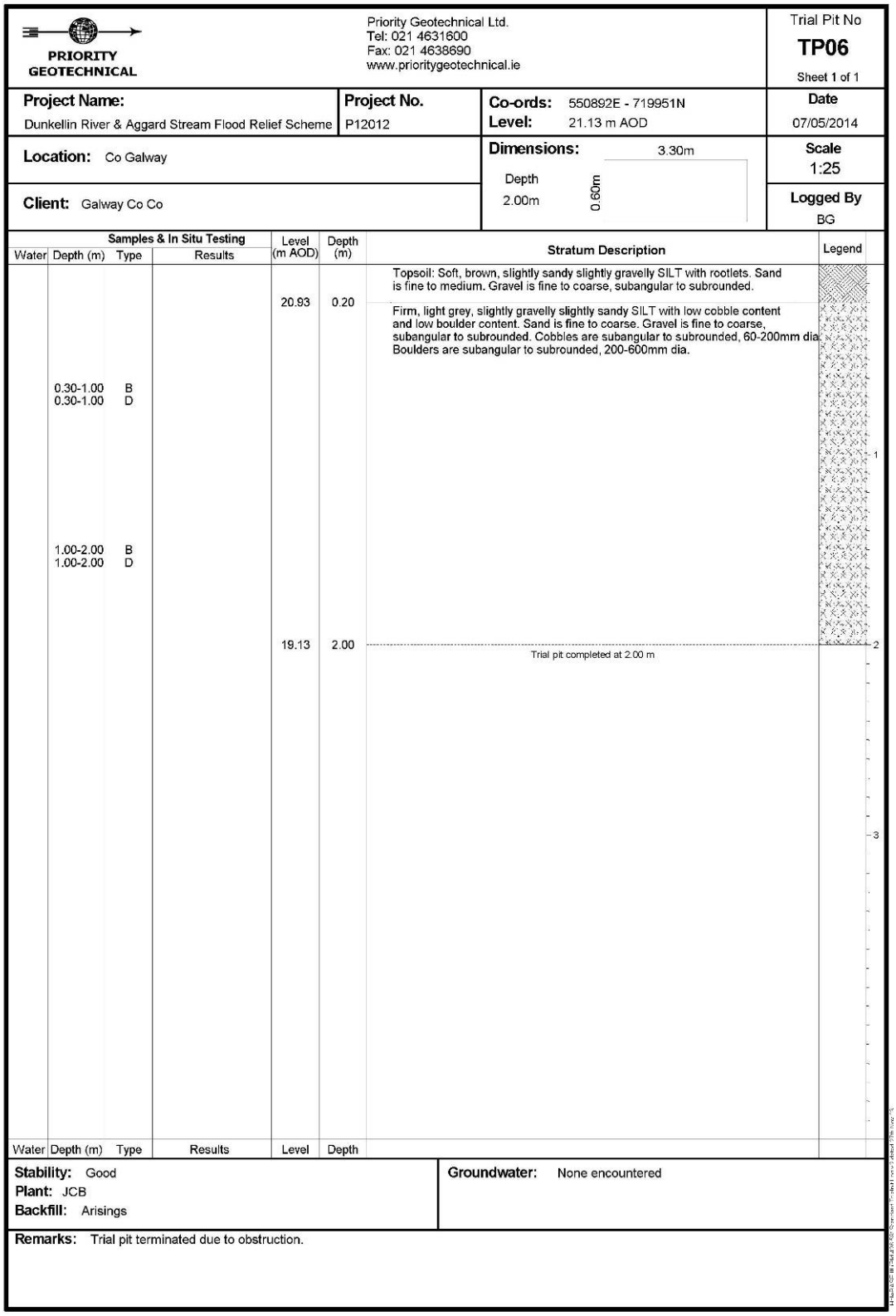
Remarks: Inspection pit dug to 1.2m. Borehole terminated at required depth.

Equipment & Methods: DeltaBase 520
Compressed air-mist flush.

Shift Data:

Groundwater	Shift (dd/mm/yyyy)	Casing depth	Remarks
-	02/07/2014	0.00m	Start of Borehole
-	02/07/2014	3.00m	End of shift
-	03/07/2014	3.00m	Start of shift
-	03/07/2014	6.60m	End of Borehole

Image 2.5 - Rotary Core RC09 Log



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Trial Pit No **TP06** Sheet 1 of 1

Project Name: Dunkellin River & Aggard Stream Flood Relief Scheme	**Project No.** P12012	**Co-ords:** 550892E - 719951N **Level:** 21.13 m AOD	**Date** 07/05/2014
Location: Co Galway		**Dimensions:** 3.30m Depth 2.00m, 0.60m	**Scale** 1:25
Client: Galway Co Co			**Logged By** BG

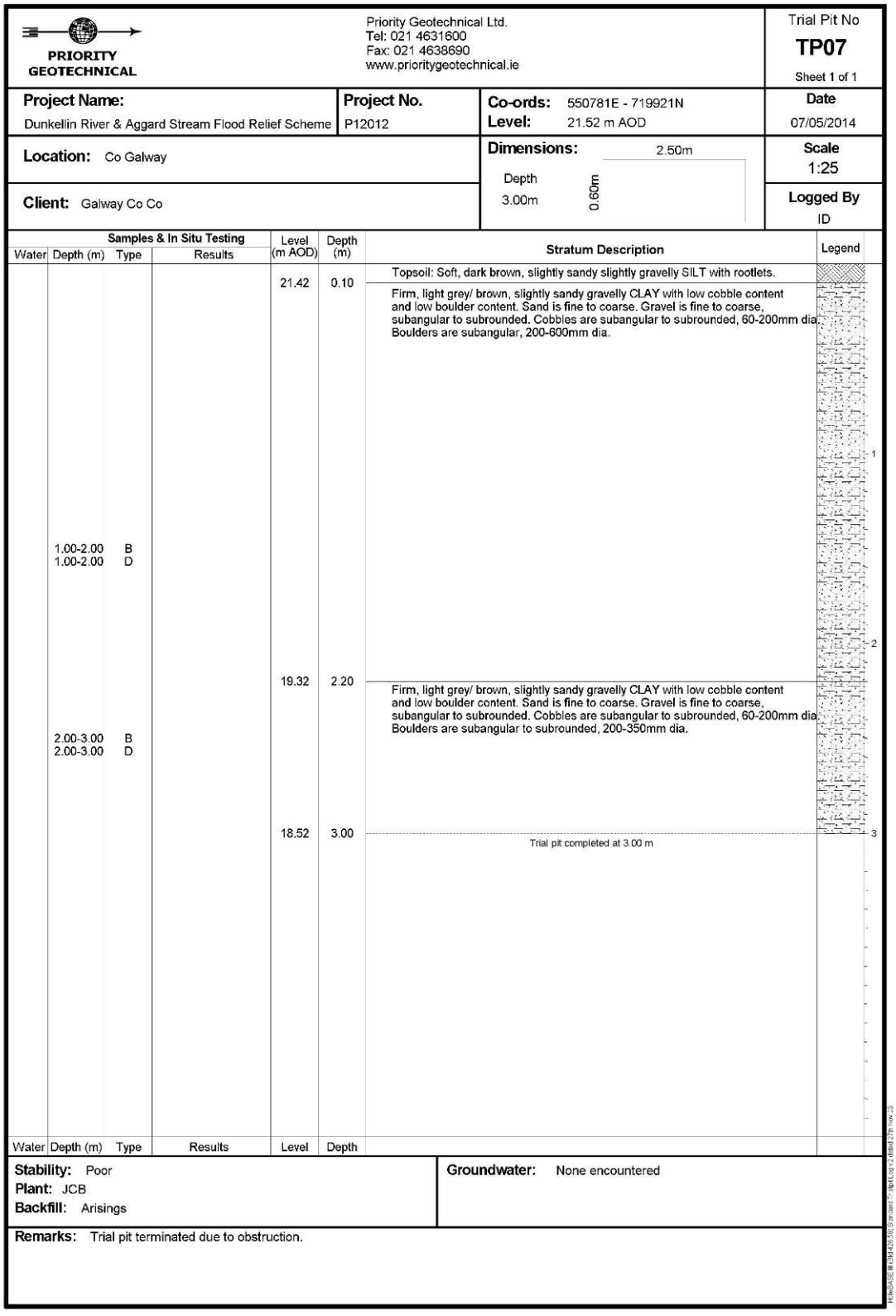
Samples & In Situ Testing				Level (m AOD)	Depth (m)	Stratum Description	Legend
Water	Depth (m)	Type	Results				
				20.93	0.20	Topsoil: Soft, brown, slightly sandy slightly gravelly SILT with rootlets. Sand is fine to medium. Gravel is fine to coarse, subangular to subrounded.	
	0.30-1.00 0.30-1.00	B D				Firm, light grey, slightly gravelly slightly sandy SILT with low cobble content and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular to subrounded, 60-200mm dia. Boulders are subangular to subrounded, 200-600mm dia.	
	1.00-2.00 1.00-2.00	B D					
				19.13	2.00	Trial pit completed at 2.00 m	
Water	Depth (m)	Type	Results	Level	Depth		

Stability: Good
Plant: JCB
Backfill: Arisings

Groundwater: None encountered

Remarks: Trial pit terminated due to obstruction.

Image 2.6 – Trial Pit TP06 Log



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Trial Pit No **TP07** Sheet 1 of 1

Project Name:	Project No.	Co-ords:	Date
Dunkellin River & Aggard Stream Flood Relief Scheme	P12012	Level: 21.52 m AOD	07/05/2014

Location: Co Galway

Dimensions: 2.50m; Depth 3.00m; 0.60m

Scale 1:25

Client: Galway Co Co

Logged By ID

Water	Depth (m)	Type	Results	Level (m AOD)	Depth (m)	Stratum Description	Legend
				21.42	0.10	Topsoil: Soft, dark brown, slightly sandy slightly gravelly SILT with rootlets.	
						Firm, light grey/ brown, slightly sandy gravelly CLAY with low cobble content and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular to subrounded, 60-200mm dia. Boulders are subangular, 200-600mm dia.	1
	1.00-2.00	B					
	1.00-2.00	D					2
				19.32	2.20	Firm, light grey/ brown, slightly sandy gravelly CLAY with low cobble content and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular to subrounded, 60-200mm dia. Boulders are subangular to subrounded, 200-350mm dia.	
	2.00-3.00	B					
	2.00-3.00	D					
				18.52	3.00	Trial pit completed at 3.00 m	3

Water	Depth (m)	Type	Results	Level	Depth

Stability: Poor
Plant: JCB
Backfill: Arisings

Groundwater: None encountered

Remarks: Trial pit terminated due to obstruction.

Image 2.7 - Trial Pit TP07 Log

A summary of the ground investigation survey findings is presented in **Table 2.1** below.

Table 2.1 – Summary of Ground Investigation Findings

Test Hole	Max Depth	Description
RC06	8m	Varied Ground conditions. Generally sand, clays and medium strong limestone found at 4.3m BGL.
RC07	8m	Ditto with strong limestone found at 5.3m BGL
BH08	1.65m	Topsoil overlying boulders or cobbles
RC08	8m	Sands, clay and gravelly sands overlying clays with boulders
RC09	8m	Ditto with medium strong limestone at a depth of 6.4m BGL.

2.4 Drg. No. 6408-2210 Rev C. The size of mini-pile, the spacing of mini-piles and the tie-in details of the piled wall with the upstream, downstream banks and rail embankments are not described. Suitable tie-ins with the railway embankment are crucial to the success of the countermeasure works.

Full details of piles and tie-ins will not be determined until Detailed Design Stage.

2.5 Drg. No. 6409-2210 Rev. C. it is acknowledged that the use of a secant or contiguous mini-piled wall with foundation strengthening works inside represents an effective and proven countermeasure for scour defence provided they are cored to sufficient depth and designed using detailed site specific geotechnical information. It is an ideal measure for confined work areas (such as works under existing operating bridges), variable ground and foundation conditions. Galway County Council needs to demonstrate that this method is suitable for the proposed site and that the proposed piles have adequate durability given the proposed exposure to abrasive river flows.

Full details of piles will not be determined until Detailed Design Stage. All proposed works will be undertaken in liaison with Iarnród Éireann.

2.6 Drg. No. 6409-2210 Rev C. A construction methodology for the proposed works at UBE154 which minimises any potential impact to the existing structure (vibration, etc.) will be required. Structural monitoring of the existing structure to IÉ's specification during the proposed works will also be required.

These requirements are acknowledged. A construction method will be agreed with Iarnród Éireann in advance of the detailed design. Structural monitoring will be included as part of the contract requirements.

2.7 The channel re-grading works will involve underpinning of the various bridges along the main channel including the railway bridge (UBE 154) so as to pass the Design Flood Flow. It is not clear from the EIS reports as to the design standard used for the scheme, whether it is 100year, the November 2009 (estimated at 122yr) or the 100year +20%CC flood. In the EIS the pre and post comparisons use the November 2009 flood peak of 84.8cumec.

The proposed scheme has been designed in accordance with documentation published by the OPW including '*Assessment of Potential Future Scenarios for Flood Risk Management*' OPW, 2009.

The scheme has been designed to cater for flood events with a 100 year return period (81.4 m^3/s) plus a Mid-Range Future Scenario of +20% (16.3 m^3/s).

This means that the scheme has been designed to safely convey flood flows of up to 97.7 m^3/s, at Craughwell village within the new channel.

By comparison the flood event experienced in 2009 has been estimated to have a peak flow of 84.8 m^3/s.

2.8 The modelling results set out in the EIS indicate that the velocity in the channel downstream of the railway bridge will increase from 1.67 to 1.87m / s (pre and post-works) for the 2009 flood event and 1.05 to 1.3m / s upstream. These predicted velocities for the existing and proposed cases appear to be very low in respect to the bridge cross-section. The existing bridge cross-section at the estimated peak November 2009 flood flow of 84.8cumec and a flood level of 20.86m O.D provides a flow area of 30.2m^2. This produces a peak flow velocity of 20.07m O.D Malin. The proposed cross-sectional area at this flood level is 28.1m^2 giving a peak flow velocity of 3.02m / s. These velocities represent significant flow velocities with the potential for scouring and increased scouring post drainage works. Galway County Council must demonstrate how they will mitigate the risk of the increased scour potential created by the scheme to the satisfaction of Iarnród Éireann.

2.9 The EIS states the following in respect to proposed bridge works at UBE154: "It is envisaged that the foundations of the existing railway bridge will require scour protection through the use of secant or contiguous piled wall along each side of the bridge piers or abutments...." Given the high local velocities predicated at the bridge site and the predicted increase in these velocities post works, a definite commitment in respect to the bridge foundation strengthening and scour protection works is required.

The existing railway bridge at Craughwell was surveyed in November 2011 by McDonalds Surveys Ltd. The dimensions of the bridge are as follows:

Width	8.61 m
Soffit	23.50 mOD
Average Bed level	17.73 mOD

The depth of water during the November 2009 event has been estimated to be of the order of 20.86 mOD, as indicated on drawing 6408-2210 Rev C. On this basis the velocity of flow has been estimated to be 3.14 m/s.

Water level at the bridge face	20.86 mOD
Bed level	17.73 mOD
Depth of Water	3.13 m
Width of Bridge	8.61 m
Area of Flow	26.95 m^2

Flow Rate	84.8 m^3/s
Velocity of Flow	3.14 m/s

Referring to drawing 6408-2210 Rev. C the proposed bed level at the railway bridge is 16.75 mOD. The mathematical model has predicted that a flow of 84.8 cumecs (November 2009) will produce a water level of 20.07 mOD at the upstream face of the bridge.

Water level at the bridge face	20.07 mOD
Bed level	16.75 mOD
Depth of Water	3.32 m
Width of Bridge	8.61 m
Area of Flow	28.58 m^2
Flow Rate	84.8 m^3/s
Velocity of Flow	2.96 m/s

When this proposed velocity is compared with the estimated November 2009 velocity it can be seen that there is a predicted decrease of 0.18 m/s. This reduction in flood velocity would not represent an additional risk on the potential for scouring on the bridge structure. However, and despite this change, it is proposed to complete the detailed design of the mini-piles or contiguous piled wall in accordance with UK DMRB BA59/94, UK DMRB97/12 and UK DMRB74/06.

We would propose to engage with Iarnród Éireann during the detailed design stage to demonstrate how scour potential is to be eliminated in the design.

For clarity we would point out that the velocities as presented in Table 4-2 of the works description report (Appendix A to the Main EIS), particularly the locations described as “Between Masonry Arch Pedestrian Bridge and Railway Bridge” and “d/s of Railway Bridge” are located at approximately 130m upstream of the railway crossing and approximately 90m downstream of the railway crossing respectively. These velocities are not representative of the flows across the bridge structure itself.

It is noted that these calculations represent a single point and average estimation and further analysis of local scour at the abutments and contraction across the river bed will be undertaken at detailed design stage.

The bridge scour protection or counter measures will include the channel improvements and pier/abutment protection made up of the proposed contiguous piled wall with guide banks aligned to provide a reduction in the potential for local scour.

Any channel instability upstream and downstream of the bridge will be mitigated through the use of designed rock rip rap.

It is proposed that the contiguous piled wall will extend into the rock profile indicated on the Site Investigation, thus ensuring that the bridge foundations are not at risk from local scouring.

2.10 Provision should be made for maintaining the security of the railway boundary during the course of the works and the boundary treatment should be completed before any major development works begin on site

The contract documents for the proposed works will specify the provision of temporary security fencing throughout the scheme.

2.11 Should the development require the use of a crane that could swing over the railway property, then the developer must enter into an agreement with IÉ / CIÉ regarding this issue.

It would be envisaged that all works can be accessed from each side of the railway without the need to traverse the railway. However, if the works contractor proposes the use of a crane adjacent to the railway he will be contractually required to consult with IÉ/CIÉ before work commences.

3 ITEM 3 - AGGARD STREAM

3.1 The proposed flood relief works include the replacement of 2 no. culverts under the railway line at UBE144 (AG08) and UBE145 (AG07) in addition to a further possible interface at UBE147, Ballynamannin. A licence agreement between CIÉ / IÉ and Galway County Council is required for the design, construction and maintenance of the proposed works on Córas Iompair Éireann Infrastructure Standard I-DEP-0120, Guidance on Third Party Works.

This requirement for a licence agreement and IÉ's technical acceptance is noted.

3.2 Provision should be made for maintaining the security of the railway boundary during the course of the works and the boundary treatment should be completed before any major development works begin on site.

The contract documents for the proposed works will specify the provision of temporary security fencing throughout the scheme.

3.3 Should the development require the use of a crane that could swing over the railway property, then the developer must enter into an agreement with IÉ / CIÉ regarding this issue.

It would be envisaged that all works can be accessed from each side of the railway without the need to traverse the railway. However, if the works contractor proposes the use of a crane adjacent to the railway he will be contractually required to consult with IÉ/CIÉ before work commences.