

Appendix 3-5

Ground Investigation Factual Report

Malachy Walsh and Partners **Engineering & Environmental Consultants**

Cork | Tralee | Limerick | London

Carrownagowan Wind Farm **Ground Investigation Factual Report**

Client:

Coillte

Project No:	Revision:	Prepared By:	Approved By:	Date:	Purpose
19107-6014	A	P. Curran	J. O'Leary	26.09.2019	For Information Only

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1 Introduction

The purpose of this report is to present the ground investigation information obtained at the site of the proposed Carrownagowan Wind Farm, Co. Clare

2 Summary of Investigation

The investigation consisted of 20no. Trial Pits at proposed turbine and crane hardstanding locations.

The aims of the investigation were to:

- Identify peat depths at each location
- Identify the subsoil types at each location
- Identify the depth to bedrock
- Comment on stability of the trial pits
- Comment on ground water conditions at each location

The trial pits were excavated using 15t mechanical excavators.

3 Ground Investigation Findings

The ground conditions encountered at each location are described on the trial pit logs in Appendix A. Photographs of the trial pits are given in Appendix B.

4 Conclusions

The trial pits have provided information on the peat depths, subsoil conditions, depth to bedrock, groundwater conditions and stability of the trial pits.

At detailed design stage, further ground investigation consisting of boreholes and further trial pits should be carried out at each turbine location to inform the detailed crane hardstanding and turbine foundation design.




Appendix A

Trial Pit Logs

TRIAL PIT T02

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 562537 678089 COORD SYS ITM LOGGED BY C. MURPHY DATE 01.08.2019
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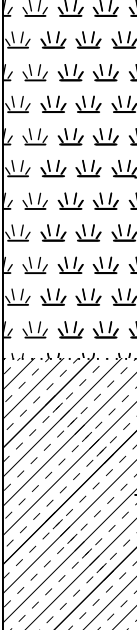
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Hole stable No Groundwater Encountered
1		CLAY: Grey/Brown (Subsoil)	
1.5		CLAY: Firm to stiff, grey/purple gravelly CLAY with frequent cobbles and boulders. Gravel is angular to sub-angular	
2			
2.5			
3			
3.5			
4			
4.5			

TRIAL PIT T03

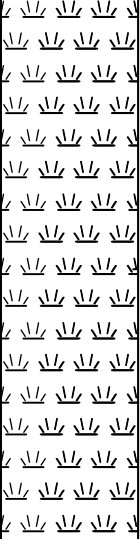
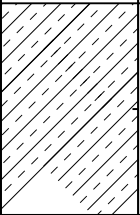
PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 562984 677869 COORD SYS ITM LOGGED BY P. CURRAN DATE 21.08.2019
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COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5 1 1.5 2		PEAT Soft to firm grey/brown silty very sandy gravelly CLAY with cobbles and boulders. Gravel, cobbles and boulders are angular to sub-angular (material very runny when wet)	Hole stable Groundwater boiling at base of trial pit
2.5 3 3.5 4 4.5		Possible Bedrock Terminated on suspected bedrock	

TRIAL PIT T04

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 563344 677586 COORD SYS ITM LOGGED BY P. CURRAN DATE 21.08.2019
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COMMENTS			
Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Poor stability due to land drain No Groundwater Encountered. Rapid water ingress from drain caused instability.
2		Purple/Brown very silty very sandy gravelly CLAY with cobbles and boulders. Cobbles and boulders are angular. Material very runny when wet	
2.5		Terminated as land drain flowing rapidly into trial hole causing instability	
3			
3.5			
4			
4.5			

TRIAL PIT T05

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 563608 677087 COORD SYS ITM LOGGED BY P. CURRAN DATE 07.08.2019
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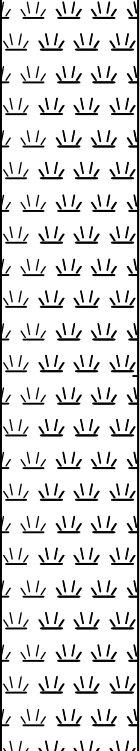
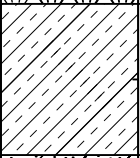
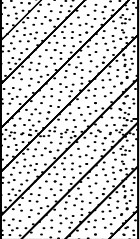
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Very poor stability. Depths approximate as hole collapsed before measurements taken.
1			
1.5			
2			
2.5			Groundwater flowed in quickly at peat interface. This caused instability of hole
3		Blue/grey very silty, very sandy GRAVEL with pockets of clay. Recovered as very runny material.	
3.5			
4		Terminated at maximum reach of excavator	
4.5			

TRIAL PIT T06

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 563140 677146 COORD SYS ITM LOGGED BY P. CURRAN DATE 07.08.2019
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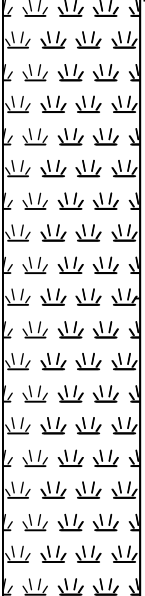
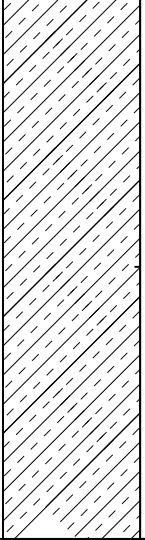
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Hole stable No Groundwater Encountered
2.5		Soft blue/grey silty sandy CLAY	
3.5		Purple very sandy, very gravelly SILT/CLAY with cobbles and boulders. Likely to be very runny when wet.	
4.0		Terminated due to maximum reach of excavator	
4.5			

TRIAL PIT T07

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 562526 677330 COORD SYS ITM LOGGED BY P. CURRAN DATE 07.08.2019
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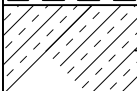
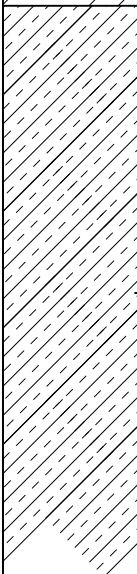
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Hole stable Slow seepage at base of Peat
2		Firm purple/grey very silty, very sandy, very gravelly CLAY with cobbles and boulders. Material appears laminated. Material very runny when wet.	
4		Terminated on possible rock	

TRIAL PIT T08

PROJECT NUMBER 19107	COORDINATES 561932 677704
PROJECT NAME CARROWNAGOWAN WF	COORD SYS ITM
CLIENT COILLTE	LOGGED BY P. CURRAN
	DATE 21.08.2019

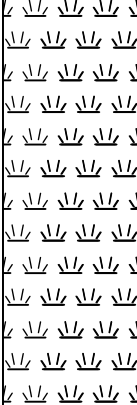

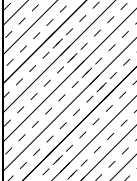
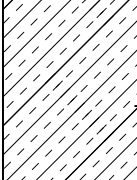
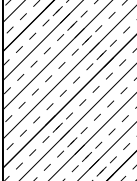
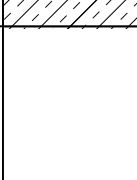
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
		PEAT	Hole stable No Groundwater Encountered. Some overland flow into trial pit.
0.5		Grey soft gravelly CLAY	
1		Purpley firm very silty, very sandy, gravelly CLAY with cobbles and boulders.	
1.5			
2			
2.5			
3		Terminated at engineers request	
3.5			
4			
4.5			

TRIAL PIT T10

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 561445 678031 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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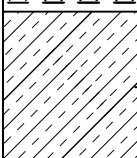
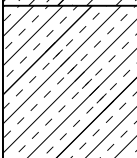
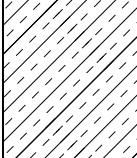
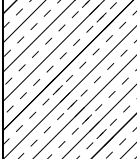
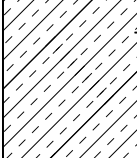
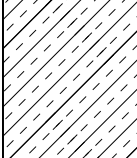
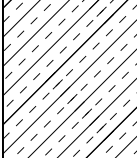
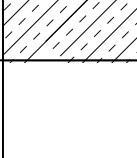
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	<div style="border: 1px solid black; padding: 2px;">Hole stable</div> <div style="border: 1px solid black; padding: 2px;">No Groundwater Encountered</div>
1.5		CLAY: Firm to stiff grey/blue sandy gravelly CLAY with boulders and cobbles. Boulders and cobbles are sub-angular. Material is remouldable on rolling	
2.0		CLAY: Stiff to very stiff brown/grey sandy gravelly CLAY with some large boulders. Material remouldable on rolling and appears to be laminated.	
3.0			
3.5			
4.0		Terminated at maximum reach of excavator	
4.5			

TRIAL PIT T11

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 561207 677501 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
		PEAT	Hole stable No Groundwater Encountered
0.5		CLAY: Grey/Brown (Subsoil)	
1		CLAY: Firm to stiff, grey/brown gravelly CLAY with frequent cobbles and boulders. Gravel is angular to sub-angular	
1.5			
2			
2.5			
3			
3.5			
4		Terminated at maximum reach of excavator	
4.5			



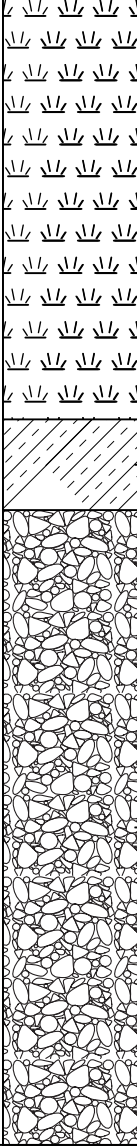
TRIAL PIT T12

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE		COORDINATES 561736 677202 COORD SYS ITM LOGGED BY P. CURRAN DATE 21.08.2019	
COMMENTS			
Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Hole stable No Groundwater Encountered. Flow from surface into trial hole.
2		Firm blue/grey sandy gravelly CLAY. Some large angular boulders.	
3.5		Terminated at engineers request	
4			
4.5			

TRIAL PIT T13

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 562529 676804 COORD SYS ITM LOGGED BY P. CURRAN DATE 08.07.2019
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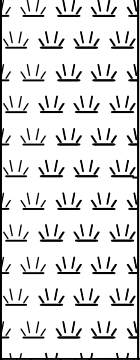
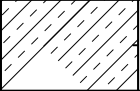
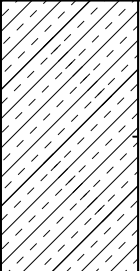
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5 1 1.5 2 2.5 3 3.5 4 4.5		PEAT Possible Bedrock Soft grey sandy CLAY Brown/purple clayey GRAVEL. Gravel is angular (Possibly weathered shale)	Hole stable No Groundwater Encountered
		Terminated on possible bedrock	

TRIAL PIT T15

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 561879 676569 COORD SYS ITM LOGGED BY P. CURRAN DATE 21.08.2019
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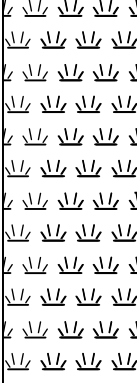
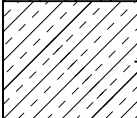

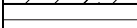

COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Hole stable No Groundwater Encountered
1.5		Grey firm gravelly CLAY	
2.0		Purpley brown firm very silty, very sandy, gravelly CLAY with cobbles and boulders.	
2.5		Terminated at engineers request	
3.0			
3.5			
4.0			
4.5			

TRIAL PIT T16

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 561079 676911 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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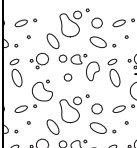
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5 1		PEAT	<div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">Hole stable</div> <div style="border: 1px solid black; padding: 2px;">No Groundwater Encountered</div>
1.5		CLAY: Grey/Blue Soft CLAY	
2		CLAY: Firm purple sandy gravelly CLAY with abundant cobbles and boulders. Cobbles and boulders are angular.	
2.5		Possible Bedrock	
3 3.5 4 4.5		Terminated on possible bedrock	

TRIAL PIT T17

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 560554 677037 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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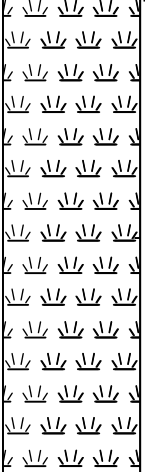
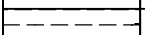
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
		PEAT	Hole stable
0.5		CLAY: Gravelly sandy CLAY	No Groundwater Encountered
1		GRAVEL: Grey very clayey GRAVEL with abundant cobbles and boulders. Cobbles and boulders are angular to sub-angular	
		Possible Bedrock	
1.5		Terminated on possible bedrock	
2			
2.5			
3			
3.5			
4			
4.5			

TRIAL PIT T18

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 560377 676486 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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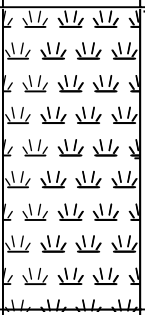
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Hole stable. No Groundwater Encountered
1.5		Possible bedrock	
2.0		Terminated on possible bedrock	
2.5			
3.0			
3.5			
4.0			
4.5			

TRIAL PIT T19

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 561130 676447 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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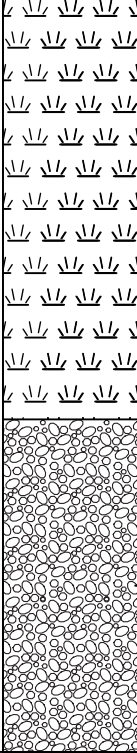
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5 1 1.5 2 2.5 3 3.5 4 4.5		PEAT Terminated as peat became unstable.	Poor stability in Peat Surface water flowing into hole from drain Excavated at edge of existing access track as trees too heavy to get through Approximately 2m depth of peat in cuttings at edge of roadway. Likely 3m+ peat in area.

TRIAL PIT T20

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 561115 675889 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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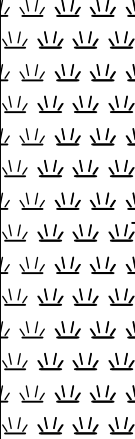
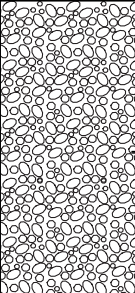
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5 1 1.5 2 2.5 3 3.5 4 4.5		PEAT Red/brown weathered SHALE. Recovered as gravel	Hole Stable No groundwater encountered
		Terminated on possible bedrock	

TRIAL PIT T21

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 560540 675858 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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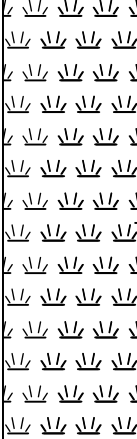
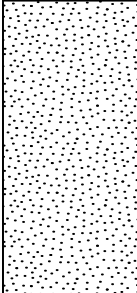
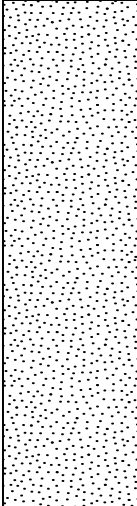
COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Hole Stable No groundwater encountered
2		Red/brown clayey sandy GRAVEL. Gravel is angular of siltstone origin. Possibly weathered shale.	
2.5		Terminated on possible bedrock	
3			
3.5			
4			
4.5			

TRIAL PIT T22

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 559856 676036 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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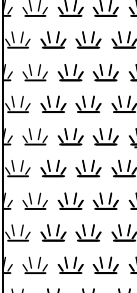
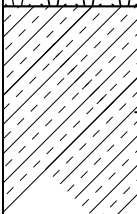
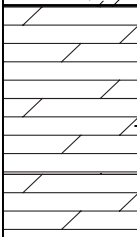


COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5 1 1.5		PEAT	Hole moderately stable. Likely to be running sands when wet No Groundwater Encountered
2 2.5		SAND: Brown silty SAND. Sand is fine	
3 3.5 4		SAND: Grey/purple silty SAND with cobbles and boulders. Cobbles and boulders are sub-angular. Not likely to be stable when wet, likely to run.	
4.5		Terminated at maximum reach of excavator	

TRIAL PIT T23

PROJECT NUMBER 19107 PROJECT NAME CARROWNAGOWAN WF CLIENT COILLTE	COORDINATES 559364 675450 COORD SYS ITM LOGGED BY P. CURRAN DATE 31.07.2019
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COMMENTS

Depth (m)	Graphic Log	Material Description	Additional Observations
0.5		PEAT	Hole stable No Groundwater Encountered
1		CLAY: Red/Brown Sandy CLAY	
1.5		ROCK (Possible weathered rock): SHALE	
2			
2.5			
3		Terminated on possible bedrock	
3.5			
4			
4.5			

Appendix B

Trial Pit Photographs



Trial Pit T2 – Photo 1



Trial Pit T2 – Photo 2



Trial Pit T3 – Photo 1



Trial Pit T3 – Photo 2



Trial Pit T3 – Photo 3



Trial Pit T3 – Photo 4



Trial Pit T4 – Photo 1



Trial Pit T4 – Photo 2



Trial Pit T4 – Photo 3



Trial Pit T4 – Photo 4



Trial Pit T5 – Photo 1



Trial Pit T5 – Photo 2



Trial Pit T5 – Photo 3



Trial Pit T5 – Photo 4



Trial Pit T6 – Photo 1



Trial Pit T6 – Photo 2



Trial Pit T6 – Photo 3



Trial Pit T6 – Photo 4



Trial Pit T7 – Photo 1



Trial Pit T7 – Photo 2



Trial Pit T7 – Photo 3



Trial Pit T7 – Photo 4



Trial Pit T7 – Photo 5



Trial Pit T8 – Photo 1



Trial Pit T8 – Photo 2



Trial Pit T8 – Photo 3



Trial Pit T8 – Photo 4



Trial Pit T10 – Photo 1



Trial Pit T10 – Photo 2



Trial Pit T10 – Photo 3



Trial Pit T10 – Photo 4



Trial Pit T10 – Photo 5



Trial Pit T11 – Photo 1



Trial Pit T11 – Photo 2



Trial Pit T11 – Photo 3



Trial Pit T11 – Photo 4



Trial Pit T12 – Photo 1



Trial Pit T12 – Photo 2



Trial Pit T12 – Photo 3



Trial Pit T12 – Photo 4



Trial Pit T13 – Photo 1



Trial Pit T13 – Photo 2



Trial Pit T13 – Photo 3



Trial Pit T13 – Photo 4



Trial Pit **T15** – Photo 1



Trial Pit **T15** – Photo 2



Trial Pit T15 – Photo 3



Trial Pit T15 – Photo 4



Trial Pit **T16** – Photo 1



Trial Pit **T16** – Photo 2



Trial Pit T16 – Photo 3



Trial Pit T16 – Photo 4



Trial Pit **T17** – Photo 1



Trial Pit **T17** – Photo 2



Trial Pit T17 – Photo 3



Trial Pit T17 – Photo 4



Trial Pit **T18** – Photo 1



Trial Pit **T18** – Photo 2



Trial Pit T18 – Photo 3



Trial Pit T18 – Photo 4



Trial Pit T19 – Photo 1



Trial Pit T19 – Photo 2



Trial Pit T19 – Photo 3



Trial Pit T19 – Photo 4

Trial Pit T20 – No Photographs Available

Trial Pit T21 – No Photographs Available



Trial Pit **T22** – Photo 1



Trial Pit **T22** – Photo 2



Trial Pit T22 – Photo 3



Trial Pit T22 – Photo 4