Kilchreest Quarry Expansion EIAR – Chapter 6 Land/Soil (Geology)

Appendix 6.6 – R. Goodhue Geology Assessment Letter

FASTNET ANALYTICAL LTD

30th July 2023

Visit to quarry at Kilchreest Quarry (Isertkelly North, Co. Galway) for Galway Crushing Services Limited, on 20th February 2020. Arrived 10:30, departed 12:30. Met Robert (site office), Kevin (drilling for blasting) and shown around by Damien Hoade . Weather: dull with drizzle, slowly clearing. Quarry working.

Aim of visit

The aim was to examine quarry for compositional variation and to identify any potentially undesirable minerals with regards to S.R. 21:2014+A1:2016. This report updates and supplement, but does not replicate the information included in the previous on-site visit on 20th February 2020.

Development of quarry since 2020

The quarry has been deepened since 2020, but its footprint is unchanged. Blasts have occurred every 2-2.5 months and yielded up to 20,000 tonnes. A new level has been developed on the W side of the site. The haul road curves around the S, E, and N rim of the quarry and at present ends on the upper level, where stockpiles of finished aggregate products are stored along the S and E edges. A ramp in the SE corner links the upper level to the quarry floor. The next blast will remove some rock from the face in the NE corner and allow the haul road to be straightened and continue to down the quarry floor. Continued development will push the lower face to the E and all processing and stockpile of finished products will be stored on quarry floor. A pump is now in place to remove some surface water from the quarry floor.

Observations from quarry

The active face is partially obscured by dust from crushing. Beds is typically 30 cm to 150 cm thick and laterally continuous in all directions. A slight dip (1-2°) in the bedding to the SSE is apparent in the lower level. The recently blasted rock was examined, and clean broken surfaces reveal a homogenous medium- to coarse-grained Medium Dark Gray (N4) crinoidal wackestone (limestone). Damien noted that the rock is slightly paler with depth in the quarry. This may be related to a slightly coarser grainsize (which petrography might resolve). Rare, thin and discontinuous calcite veins are present.

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Prominent and laterally extensive near-vertical joints cut the rock on 1 – 3 m spacings and define the ENE-WSW faces along the N rim. The joints have thin calcite precipitate on their surfaces giving a paler grey appearance to the beds. The combination of the bedding and the joints yields fragments which are rarely oversized for the Metso impact crusher. However, a few oversized boulders are produced and are put aside for other use / rock breaking prior to processing.

At the time the visit the crusher-run aggregate was being transferred to a temporary stockpile on the upper level where it awaits screening into finished aggregate products. The stockpile was examined and found to be uniform, without contamination and without any apparent concentration of problematic minerals in relation to S.R. 21:2014+A1-2016.

Stockpiles of finished aggregate products of (S.R.21 Annex E) T0 Struc, T2 Perm and T1 Struc, and of Clause 505 (40 mm drainage) were all examined and photographed and found to be without any apparent concentration of problematic minerals (including 'sedimentary mudrock') in relation to S.R. 21:2014+A1-2016. A sample of the T1 Struc finished aggregate product was taken for further geological examination and description.

Geological Survey of Ireland data

According to the online Geological Survey of Ireland Bedrock 100k Solid Geology, the upper units in the quarry are in the Newtown Member of the Tubber Formation, which is described as a 25 m thick 'cherty limestone' of Dinantian (Carboniferous age). The deepening of the quarry and the open anticlinal fold in the area may have brought extraction into the Tubber Formation, which is described as 'crinoidal medium-grey packstone and wackestone, sometimes with shaley partings, cherts and dolomites'. Field evidence from the recently blasted material does not indicate significant chert, dolomite or shaley partings.

Conclusions

The quarry well laid out and being developed in a logical fashion. Better signage and separation of the finished aggregate stockpiles will prevent confusion or mixing of products. The aggregate produced in the quarry is of high quality and without any apparent concentration of problematic minerals in relation to S.R. 21:2014+A1-2016.

Dr Robbie Goodhue

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On-site photographs 27JUL23 Kilchreest (Galway Crushing Services Limited)

Panorama looking WNW to N from SW edge of quarry at IM 52157 13145 showing haul road to middle level (green arrow), active face (dashed yellow box), stockpiles of crusher run (red arrow), T0 Struc (blue arrow), T1 Struc (orange arrow). Small blast along ENE-WSW face (dashed red box) will enable haul road to be extended to quarry floor.

Active face on quarry floor looking SW to NW from IM 52108 13175. Rock in face largely obscured by dust. Brown (dolomitised) material behind excavator will be used to extend haul road.

Active face looking NE from IM 52088 13158. Bedding and joint surfaces are partially obscured by dust.

Photograph looking SE from IM 52035 13165 along active face with recently blasted material being processed.

Photographs of recently blasted irregular and blocky shaped fragments of homogenous limestone. [Hammer 325 mm]

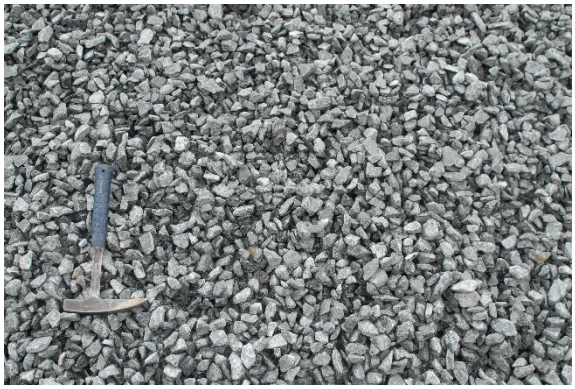
Crusher run obscured by dust (left) and medium grained wackestone with clean fractured face (right).

Panorama looking W-NW from IM 52063 13139 at joint surfaces on ENE-WSW face with drill rig preparing blast holes. Limestone beds are typically 30 cm to 150 cm thick. Pump employed to remove surface water from quarry floor. Oversized boulders on right.

Panorama looking E to S to W from IM 52016 13283 with stockpiles of crusher run (red arrow), T0 Struc (blue arrow), T1 Struc (orange arrow), Cl. 505 (green arrow) and non-specified ¾" down (white arrow). Small stockpile of T2 Perm obscured from view.

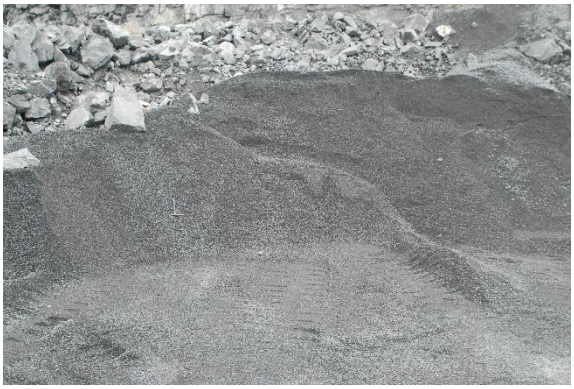
T0 Struc detail (left) and stockpile (right)


T1 Struc detail (left) and stockpile (right)




T2 Perm detail (left) and stockpile (right)


Clause 505 (40 mm drainage) detail (left) and stockpile (right)

Unspecified ¾” down detail (left) and small stockpile (right).

Kilchreest Quarry Expansion EIAR – Chapter 6 Land/Soil (Geology)

Appendix 6.7 – VCL Site Walkover Photographs

Photo 6.7.1: View west along local road (L4219) at access gate to Kilchreest Quarry.

Photo 6.7.2: View east from access gate of old well pump and Roadstone Quarry access gate.

Photo 9.3.3: View north of access road from local road (L2419) to Kilchreest Quarry.

Photo 6.7.4: View of existing weigh bridge, office, canteen and toilet facilities at entrance.

Photo 6.7.5: View SW of entrance to quarry with car, truck parking and fuelling area at access.

Photo 6.7.6: View west of Kilchreest Quarry.

Photo 6.7.7: View South of SW boundary areas of the quarry which is the expansion direction. Phase 1 area is along the west side of the existing quarry and the Phase 2 area is to the south.

Photo 6.7.8: View North from western end of the existing quarry with laydown storage area.

Photo 6.7.9: View NE from west end of the northern boundary with adjacent Roadstn Quarry.

Photo 6.7.10:View south across western side of existing quarry which has been cleared of soil. (This area is part of the proposed Phase 4 & 5 expansion area)

Photo 6.7.11:View north across western side of existing quarry which has been cleared of soil. (This is the Phase 1 area on the right and Phase 4 area in the central part of the picture.)

Photo 6.7.12: View north of exposed rock on western side of existing quarry, (Phases 4 & 5). (This is Phases 4 and 5 for the proposed expansion area.)

Photo 6.7.13:View west from western boundary of the exposed limestone area. (Phase 5).

Photo 6.7.14: View north of field with western berm and area of exposed limestone on right.

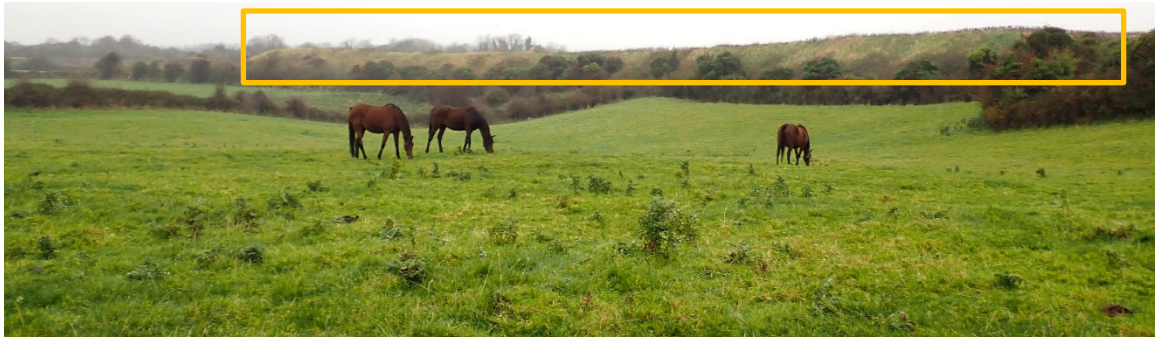


Photo 6.7.15:View north of field to west of proposed expansion area. RdStn boundary behind.

Photo 6.7.16: View enclosed depression karst feature (arrow). This is outside the site area.

Photo 6.7.17: View NW across the western most field, (outside the proposed expansion area.)

Photo 6.7.18: View of over grown scrub area in SW corner of study area, which is identified as a karst enclosed depression feature, (outside the proposed expansion area).

Photo 6.7.19: View NW of western end of the Phase 4 proposed expansion area on west side of the existing site.

Photo 6.7.20: View west of west end of Phase 4 proposed expansion area.

Photo 6.7.21: View SW of western side of proposed Phase 3 expansion area.

Photo 6.7.22: View south of field at western side of the proposed Phase 3 expansion area.

Photo 6.7.23: View of fields south of the Phase 4 area that form the proposed Phase 3 area.

Photo 6.7.24: View east along the southern boundary of the west side of the Phase 4 area. This is the northern end of the Phase 3 expansion area.

6.7.25: View east along the southern boundary of the west side of the site. This is the boundary between the Phase 3 and Phase 2 expansion areas.

Photo 6.7.26: View east along the southern boundary of the existing quarry. This is the northern end of the Phase 2 expansion area.

Photo 6. 7.27: View south from the southern boundary of the existing quarry. This is the main part of the Phase 2 expansion area.

Photo 6. 7.28: View east along the southern boundary of the existing quarry.

Photo 6. 7.29: View north along the western boundary of the existing quarry. This is looking along the main Phase 1 expansion area west of the existing quarry.

Photo 6.7.30: Stockpile of clean limestone aggregate.

Photo 6.7.31: Clean limestone aggregate product form Kilchreest Quarry.

Kilchreest Quarry Expansion EIAR – Chapter 6 Land/Soil (Geology)

Appendix 6.8 – Kilchreest Quarry Limestone Lab Tests 2024

CMTL Ireland Limited
Unit D, Zone 5, Clonminam Business Park
Portlaoise, Co. Laois R32 W30Y
Tel: 057 8664885

LABORATORY TEST REPORT

To determine the pH Value of Soils
in accordance with BS 1377 : Part 3 : 2018 - Clause 12, Electrometric Method

Project:	Kilchreest Quarry	**Job No.:**	PL
Client:	Western Materials Supplies Ltd	**Lab Ref. No.:**	ST 28942
	4 Dolphin Street	**Date Received:**	28/06/2024
	Loughrea	**Date Reported:**	16/07/2024
	Co.Galway	**Material:**	Cl.804
Order No.:	Not Supplied	**Date Tested:**	15/07/2024
Originator:	Robert McManus	**Specification:**	TII

Sample Details **Cl.804**

Supplier:	Western Materials Supplies Ltd	**Date of Sampling:**	Client Info
Source:	Kilchreest Quarry	**Sampled By:**	Client
Sample Location:	Quarry	**Sampling Reason:**	Request

Results

Parameter	RESULT	*95% Confidence limit**
pH Value	**8.3**	*8.08% - 8.52%*

Comments:
** 95% Confidence Limit calculation: - Test Result +/- expanded uncertainty. Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.*

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.
Tested in accordance with the above specifications
Subcontracted to a laboratory accredited for this testing

Jr Ward
Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

CMTL Ireland Limited
Unit D, Zone 5, Clonminam Business Park
Portlaoise, Co. Laois R32 W30Y
Tel: 057 8664885

LABORATORY TEST REPORT
DETERMINATION OF RESISTANCE TO FRAGMENTATION

Site:	Kilchreest Quarry	**Job No.:**	PL
Client:	Galway Crushing Services	**Lab Ref No.:**	ST 27876 SR
	4 Dolphin Street	**Date Received:**	29/03/2024
	Loughrea	**Date Tested:**	02/04/2024
	Co. Galway	**Date Reported:**	11/04/2024
Originator:	**Robert McManus**	**Material:**	T1

Sample Ref:	T1	***Sampled By:***	Client
Size fraction:	14-10mm	***Location:***	Quarry
Date Sampled:	Client Info	**Sample certificate/Plan:**	No
Sampling Method:	Bulk		

Los Angeles Coefficient (LA) = **28**

Los Angeles Coefficient carried out in accordance with BS EN 1097-2:2020

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

JrWard

Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

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Tel: 057 8664885

LABORATORY TEST REPORT

To determine the Acid Soluble Sulfate of an Aggregate Sample in accordance with BS EN 1744-1 : 2009 + A1 : 2012 Clause 12

Project:	Kilchreest Quarry	**Job No.:**	PL
Client:	Galway Crushing Services	**Lab Ref. No.:**	ST 27877 SR
	4 Dolphin Street	**Date Received:**	29/03/2024
	Loughrea	**Date Reported:**	08/05/2024
		Material:	T1
Order No.:	WMSSR21	**Date Tested:**	29/04/2024
Originator:	Robert McManus	**Specification:**	S.R. 21 Annex E

Sample Details	**T1**		
Supplier:	Galway Crushing Services	**Date of Sampling:**	Client Info
Source:	Kilchreest Quarry	**Sampled By:**	Client
Sample Location:	Quarry	**Sampling Reason:**	Request

Results

Parameter	RESULT
Acid Soluble Sulfate Content (SO_3) (%)	**<0.1 (nearest 0.1%)**
*95% Confidence limit**	*<0.09% - <0.11%*
Acid Soluble Sulfate Content (SO_4) (%)	**<0.1 (nearest 0.1%)**
*95% Confidence limit**	*<0.09% - <0.11%*

Comments:

** 95% Confidence Limit calculation: - Test Result +/- expanded uncertainty. Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.*

Tested in accordance with the above specifications
Subcontracted to a laboratory accredited for this testing

JR Ward
Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

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Portlaoise, Co. Laois R32 W30Y
Tel: 057 8664885

LABORATORY TEST REPORT

To determine the Total Sulfur Content of an Aggregate Sample in accordance with BS EN 1744-1 : 2009 + A1 : 2012 : Clause 11.1

Project:	Kilchreest Quarry	**Job No.:**	PL
Client:	Galway Crushing Services	**Lab Ref. No.:**	ST 27877 SR
	4 Dolphin Street	**Date Received:**	29/03/2024
	Loughrea	**Date Reported:**	01/05/2024
		Material:	T1
Order No.:	WMSSR21	**Date Tested:**	29/04/2024
Originator:	Robert McManus	**Specification:**	S.R. 21 Annex E

Sample Details **T1**

Supplier:	Galway Crushing Services	**Date of Sampling:**	Client info
Source:	Kilchreest Quarry	**Sampled By:**	Client
Sample Location:	Quarry	**Sampling Reason:**	Request

Results

Parameter	RESULT	*95% Confidence limit**
Total Sulfur Content as S (%)	**<0.1**	*<0.06% - <0.14%*
Total Sulfur Content as S04 (%)	**<0.3**	*N/A*

Comments:

** 95% Confidence Limit calculation: - Test Result +/- expanded uncertainty. Expanded uncertainty = combined uncertainty multiplied by a factor (k) of 2.*
Departure from specified procedure: Additional reporting as SO4 (S x 3)

Tested in accordance with the above specifications
Subcontracted to a laboratory accredited for this testing

JR Ward
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James Ward, Operations Manager
CMTL Ireland Limited

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Tel: 057 8664885

LABORATORY TEST REPORT

Petrography
in accordance with S.R. 21 : 2014 + A1 : 2016

Project:	Kilchreest Quarry	**Job No.:**	PL
Client:	Galway Crushing Services	**Lab Ref. No.:**	ST 27878 SR
	4 Dolphin Street	**Date Received:**	29/03/2024
	Loughrea	**Date Reported:**	26/04/2024
		Material:	T1
Order No.:	WMSSR21	**Date Tested:**	11/04/2024
Originator:	Robert McManus	**Specification:**	S.R. 21 Annex E

Sample Details	**T1**		
Supplier:	Galway Crushing Services	**Date of Sampling:**	Client Info
Source:	Kilchreest Quarry	**Sampled By:**	Client
Sample Location:	Quarry	**Sampling Reason:**	Request

Results

Report	RESULT
Petrographic	**Please See Petro Report Attached**

Comments:
None

Tested in accordance with the above specifications
Subcontracted to a laboratory competent in this testing
The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

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Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

Information on sample	
Client:	Construction Materials Testing Laboratories
Sample No.:	ST27878
Delivery date:	04-Apr-24
Firm carrying out the geological inspection:	Fastnet Analytical Ltd.
Professional Geologist:	Dr Robbie Goodhue, P.Geo.

Sample details	
Maximum particle size (mm)	48 mm
Sample condition (wet / damp / dry)	Dry

Geological examination	
Lithological detail	*Lithology 1*
Genetic classification[2]	Sedimentary
Rocktype[2]	Limestone
Proportion of total rock types present	100%
Colour (wet or dry)[3]	Medium Light Gray (N6) to Medium Gray (N6), dry
Particles description	Irregular shaped fragments of homogenous limestone with moderately rough surfaces and moderately blunt edges. Limestone appears to be wackestone or packstone in texture, but partially recrystallised. Trace of clean White (N9) calcite veins
Predominant grainsize	? 250 µm
Texture	Wackestone / packstone, partailly recrystallised
Stability[4]	Stable
Stability after 24 h in water[5]	Not assessed
Unconfined compressive strength[6]	Medium strong
Carbonate content tested with 10 % HCl[7]	Highly calcareous (++)
Void content	None apparent
Weathering and alteration effects[8]	Fresh
Minerals identified	Calcite
Presence and nature of laminations	None apparent
Nature and colour of surface coatings	Dusty White (N9) coating of fines easily removed by washing
Nature and colour of staining	None apparent

Key details	
Mudrock content	<10 %
Presence of pyrite	Undetected by visual means
Presence of gypsum	Undetected by visual means

Professional Geologist:	Robbie Goodhue
Date:	11-Apr-24

Footnotes

[1] I.S. EN 932-3:1997, Table 1: Relationship between largest particle size *D* and minimum sample mass *Q*.

[2] ISO 14689-1:2003(E), Table A.1 - Aid to rock identification for engineering purposes.

[3] Munsell Color Geological Rock-Colour Chart

Munsell Color Geological Rock-Colour Chart

[4] ISO 14689-1:2003(E), Table 3 - Stability of a rock material.

[5] ISO 14689-1:2003(E), Table 4 - Rock material stability in water.

[6] ISO 14689-1:2003(E), Table 5 - Field identification of the unconfined compressive strength.

[7] ISO 14689-1:2003(E), Section 4.2.5 Carbonate content.

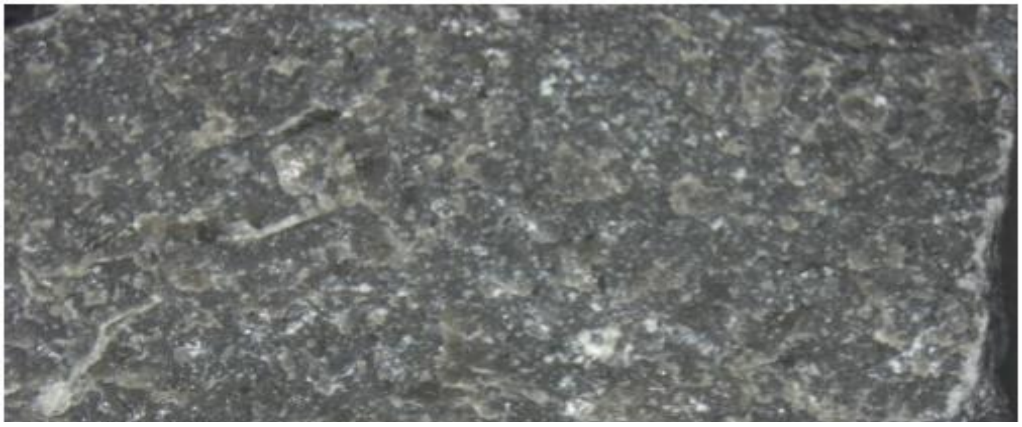
[8] ISO 14689-1:2003(E), Table 2 - Terms to describe weathering / alteration of rock materials.

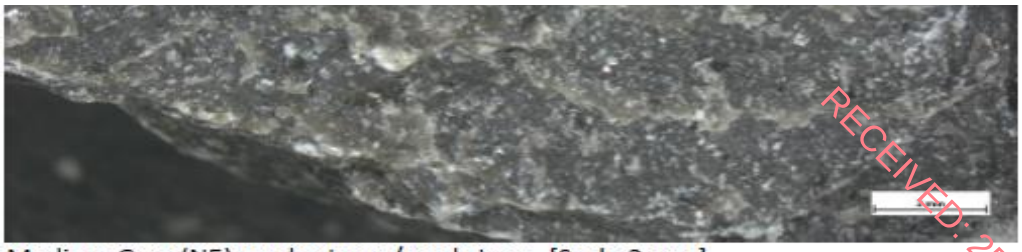
[9] This report is based on the sample as presented and only reflects the part of the source from which the sample(s) were supplied. It is the responsibility of the source operator to visually inspect the source prior to production and to test the material regularly.

ST27878 Photographs

Sample as presented.

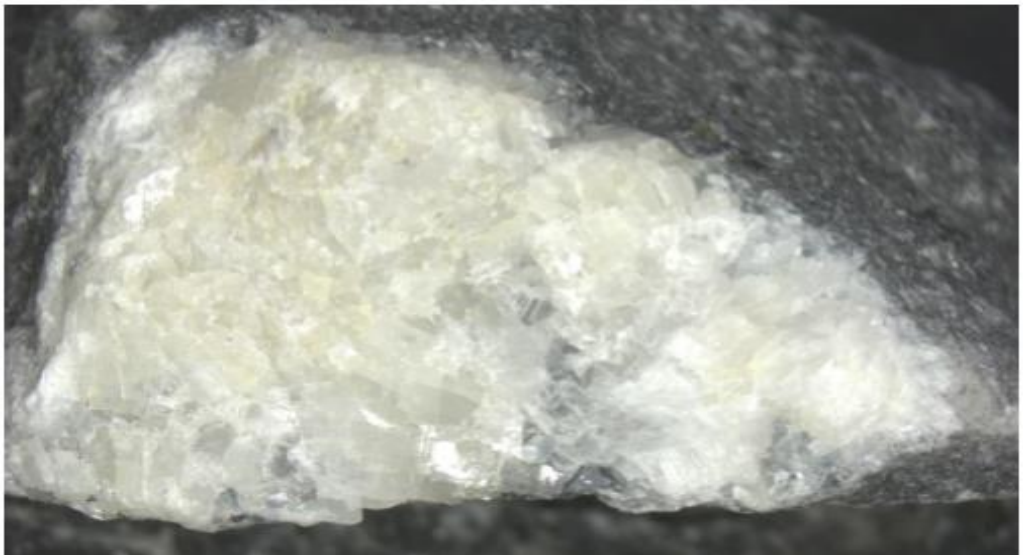
Retained >4 mm subsample on wet sieving. [Pan width 21 cm]

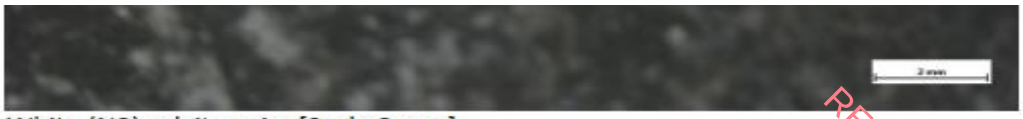




Medium Gray (N5) wackestone / packstone. [Scale 2 mm]

Medium Light Gray (N6) partially recrystallised limestone. [Scale 2 mm]





White (N9) calcite vein. [Scale 2 mm]

Retained 250 µm to 4 mm material from wet sieving. [Scale 2 mm]

S.R. 21:2014+A1-2016

Geological Inspection

Information on sample	
Client:	Construction Materials Testing Laboratories
Sample No.:	ST27878
Delivery date:	04-Apr-24
Firm carrying out the geological inspection:	Fastnet Analytical Ltd.
Professional Geologist:	Dr Robbie Goodhue, P.Geo.

Tests conducted

☑ Geological examination	☑ Site visit from Competent Person (Professional Geologist)
☐ Petrographic assessment (Thin section)	☐ Statement on history of use from supplier
☑ Chemical (Acid soluble sulfate & Total sulfur)	
☐ X-ray diffraction	
☐ SEM	

Statement of compliance:	The material as provided complies with Annex E of S.R.21 "GRANULAR FILL S.R. 21:2014+A1:2016 ANNEX E" and is deemed suitable for use as unbound granular fill (hardcore) for use under concrete floors and footpaths
Recommended further testing:	Regular testing as required by Annex E of S.R. 21:2014+A1:2016
Professional Geologist:	
Date:	14-May-24

This statement is based on the sample as presented and only reflects the part of the source from which the sample was supplied. It is the responsibility of the source operator to visually inspect the source prior to production and to test the material regularly.

CMTL Ireland Limited
Unit D, Zone 5, Clonminam Business Park
Portlaoise, Co. Laois R32 W30Y
Tel: 057 8664885

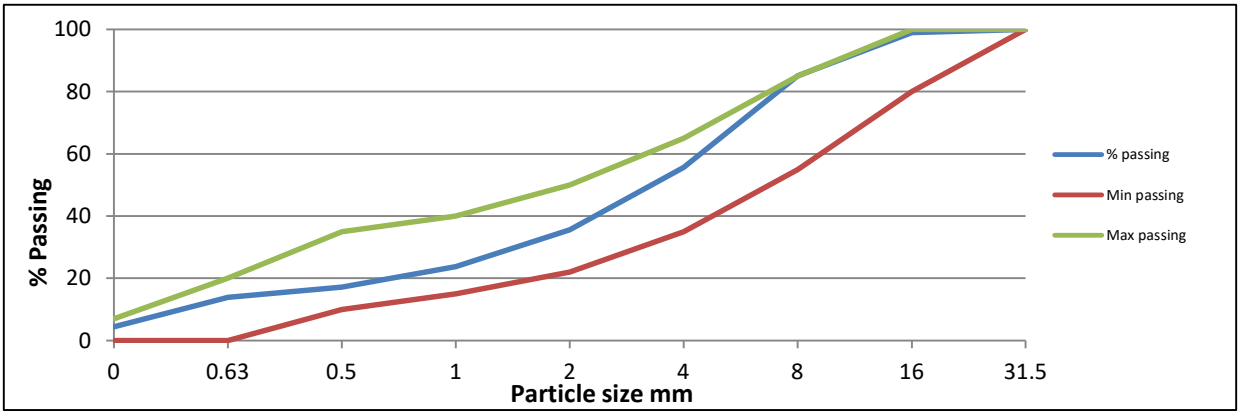
LABORATORY TEST REPORT

Recommendations for the Specification of Unbound Granular Fill Crushed Rock (Hardcore) for use under Concrete Floors and Footpaths
IS EN 13242 : S.R. 21 : 2014 Annex E

Project:	Kilchreest Quarry	**Job No.:**	PL
Client:	Western Materials Supplies Ltd	**Lab Ref No.:**	ST 27878
	4 Dolphin Street	**Date Received:**	29/03/2024
	Loughrea	**Date Reported:**	Various - See below
	Co. Galway	**Material:**	S.R. 21 Rock - T1
Order No.;	WSSR21	**Material Description:**	Rock
Originator:	Robert McManus	**Specification:**	S.R. 21 Annex E

Client Sample Ref :	**SR21 - Rock - T1**
Supplier:	Western Materials Supplies Ltd
Source:	Kilchreest Quarry
Location :	Quarry
Date Sampled :	Client Info
Sample Type:	Bulk
Sampled By:	Client
Sampling Cert.:	No
Specification:	SR 21 : 2014 Annex E Table E.2 $0/31.5DG_{80}$ Crushed Rock

SIEVE ANALYSIS		
Sieve size mm	**% Passing**	**Specification**
125mm		
90mm		
80mm		
75mm		
63mm	100	100-100
40mm		
31.5mm	99	80-100
20mm		
16mm	85	55-85
14mm		
12.5mm		
10mm		
8mm	56	35-65
6.3mm		
4mm	36	22-50
2.8mm		
2.00mm	24	15-40
1.00mm	17	10-35
500µm	14	0-20
250µm		
125µm		
63µm	4.4	0-7



Additional Test Results:

Test	*Method*	*ST Ref*	*Date*	*Result*	*Specification*
Grading Analysis	EN 933-1	ST 27872	02/04/24	**See Above**	SR21 : 2013 Table E.2 0/31.5 DG_{80}
Resistance to Fragmentation	EN 1097-2	ST 27876	02/04/24	**28**	LA_{30}
Water Absorption	EN 1097-6 : Clause 8	ST 27873	02/04/24	**0.8**	$WA_{24}2$
Magnesium Sulfate Soundness	EN 1367-2	ST 27874	23/04/24	**2**	MS_{25}
# Acid Soluble Sulphate Content	EN 1744-1	ST 27877	29/04/24	**<0.1**	$AS_{0.2}$
# Total Sulfur Content	EN 1744-1	ST27877	29/04/24	**<0.1**	See E.2.3 of SR21 EN 13242 **TS 0 - <0.1% acceptable.** TS 0.1 - 1.0% thin section and professional geologist advice required. TS >1.0% material not suitable
# Geological description	EN 932-3 and E2.3	ST27878	11/04/24	**<10%**	Mudrock content less than 10%
# Petrographic Assessment (Thin Section)	SeeE2.3.5	N/A	N/A	See Report	See E2.4.5 where TS less than 0.1% Thin section assessment not required

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

The sample did comply with the specification. See Geologists statement of compliance ref ST 27878 dated 14/05/2024

Tests marked # subcontracted to a laboratory accredited / competent in this testing

Notes/Remarks:

Annex E (of SR 21 guidance document) outlines recommendations for the specification of unbound granular fill (hardcore) for use under concrete floors and footpaths

The reader of this report is strongly reccommended to view this report against all the requirements of SR21 EN 13242

Please see Table E.1 for test requirements and frequencies

Test frequencies may be revised based on the advice of a professional geologist

JR Ward

Approved Signature
CMTL Ireland Ltd
James Ward, Operations Manager