




Williamtown - Site 218  
Screened Sand for  
Utility Assets  
2 0 2 2



*Specification Compliance with:*  
*R11, AS3725, WSA PS-350, WSA PS-360,*  
*STS101*



		Macka's Sand - Screened Sand Williamtown Site 218 - Annual Testing Results Summary for 2022 Aggregate for Utility Assets Specification Compliance								
Property	Units	Test Method	Result	Specification						
				R11	AS3725	WSA PS - 350	WSA PS - 360	(Project Specified)	Hunter Water Corporation STS 101	
				Stormwater Drainage	Design for Installation of Buried Concrete Pipes	Compaction Sand for Pipe Embedment	Embedment / Concrete Sand	Electrical Trench Sand	Construction & Pipe Bedding Materials	
				Bed & Haunch	Bed & Haunch	Grade B				Sand
Uncompacted Bulk Density	t/m3	AS1141.4	1.49							
Compacted Bulk Density	t/m3	AS1141.4	1.6							
Particle Density (SSD)	t/m3	AS1141.5	2.66				>= 2.1			
Particle Density (Dry)	t/m3	AS1141.5	2.66				>= 2.1			
Water Absorption	%	AS1141.5	0.3				<= 3			
Particle Size Distribution:										
% Finer Than 2.36 mm	%	AS1289.3.6.1	100		50 to 100					
% Finer Than 1.18 mm	%	AS1289.3.6.1	100							
% Finer Than 0.600 mm	%	AS1289.3.6.1	94		20 to 90					
% Finer Than 0.425 mm	%	AS1289.3.6.1	45							
% Finer Than 0.300mm	%	AS1289.3.6.1	1		10 to 60					
% Finer Than 0.150mm	%	AS1289.3.6.1	1		0 to 25					
% Finer Than 0.075mm	%	AS1289.3.6.1	0		0 to 10					
% Finer Than 2.36 mm	%	AS1141.11.1 / T201	100	50 to 100		90-100	60-100			100
% Finer Than 1.18 mm	%	AS1141.11.1 / T201	100	-		85-100	30-100			
% Finer Than 0.600 mm	%	AS1141.11.1 / T201	94	20 to 90		70-100	15-100			90-100
% Finer Than 0.425 mm	%	AS1141.11.1 / T201	45	-						
% Finer Than 0.300mm	%	AS1141.11.1 / T201	1	10 to 60		50-100	5-50			
% Finer Than 0.150mm	%	AS1141.11.1 / T201	1	0 to 25		0-40	0-15			0-20
% Finer Than 0.075mm	%	AS1141.11.1 / T201	0	0 to 10		0-5	0-5			0-5
% Finer Than 0.075mm	%	AS1141.12 / T201	0			0-5	<= 10			0-5
% Finer Than 0.002mm	%	AS1141.13	N/A				<= 1			
Sodium Sulphate Soundness	%	AS1141.24	0.1							
Light Particles	%	AS1141.31	0				< = 1			
Clay & Fine Silt	%	AS1141.33	1							
Organic Impurities		AS1141.34	Lighter Than Standard							
Organic Matter Content	%	AS1289.4.1.1	<0.1							
Sugar		AS1141.35	Absent							
Methylene Blue Adsorption Value (MBV)	g/mg	T659	2.0							
MBV75 Value	-	Calculated	0							
Acid Insoluble Residue	%	Tex-612-J	100							
Micro-Deval Loss	%	ASTM D7428	3.8							
Flow Cone Time	s	T279	19.11							
Acid Soluble Salts:										
Chlorides	%	AS1012.20	0.002							
Sulfates	%	AS1012.20	0.004							
Alkali Aggregate Reactivity		AS1141.60.1	Slowly Reactive							
Petrographic Analysis		ASTM C295	Refer to Report							< 3% Mica
Moisture	%	T120	3							
Linear Shrinkage	%	AS1289.3.4.1	0	max 10						
Plasticity Index	%	T109, AS1289.3.3.1	Non - Plastic	max 6				<6		
Salinity	mS/cm	APHA 2510B	0.0429							< 0.4 mS / cm
pH Value	pH	AS1289.4.3.1	7.8			Range 5 - 9	Range 5 - 9			> 5.5
Note: In accordance with RTA R11 and AS/NZS 3725 Section 9.2.3.2, the grading result indicates aggregate is just outside the limits for the 0.60mm sieve. This will need to be confirmed with the superintendent before approval for use. AS3725 clause 9.2.2.2 provides, " Select fill with the fraction passing the 0.6mm sieve not conforming to the above limits may be used in the bed & haunch zones provided that - a) it can be demonstrated that the required degree of compaction can be attained in the field and the reduction to the bedding factor given in Clause 9.3.2 is applied; or b) it is cement stabilized." The sand is slightly out on the 0.300mm sieve in the WSA – 350 & likewise would need acknowledgement & approval by the projects superintendent before use.										

# Material Test Report

**Report Number:** P20023-4B  
**Issue Number:** 1  
**Date Issued:** 01/03/2022  
**Client:** Macka's Sand Pty Ltd  
 2684 Nelson Bay Road, Salt Ash NSW 2318  
**Contact:** Andrew Pickard  
**Project Number:** P20023  
**Project Name:** Materials Testing - Screened Sand  
**Project Location:** Williamtown Quarry - Site 218  
**Work Request:** 6287  
**Sample Number:** 21-6287A  
**Date Sampled:** 23/12/2021  
**Dates Tested:** 23/12/2021 - 21/02/2022  
**Sampling Method:** AS 1141.3.1 8.4.2 - Hand Sampling with shovel or a scoop  
**Preparation Method:** In accordance with the test method  
**Lot No:** 549  
**Material:** Screened Fine Dune Sand  
**Material Source:** Site 218 Williamtown



Hunter Civilab  
 62 Sandringham Avenue Thornton NSW 2322  
 Phone: (02) 4966 1844  
 Email: office@huntercivilab.com.au



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: James Wyatt  
 Laboratory Manager  
 NATA Accredited Laboratory Number: 14975

Particle Size Distribution (AS1141.11.1)			
Sample Washing	Sample was Washed		
Sieve	Passed %	Passing Limits	
1.18 mm	100		
0.6 mm	100		
0.425 mm	94		
0.3 mm	45		
0.15 mm	1		
0.075 mm	1		

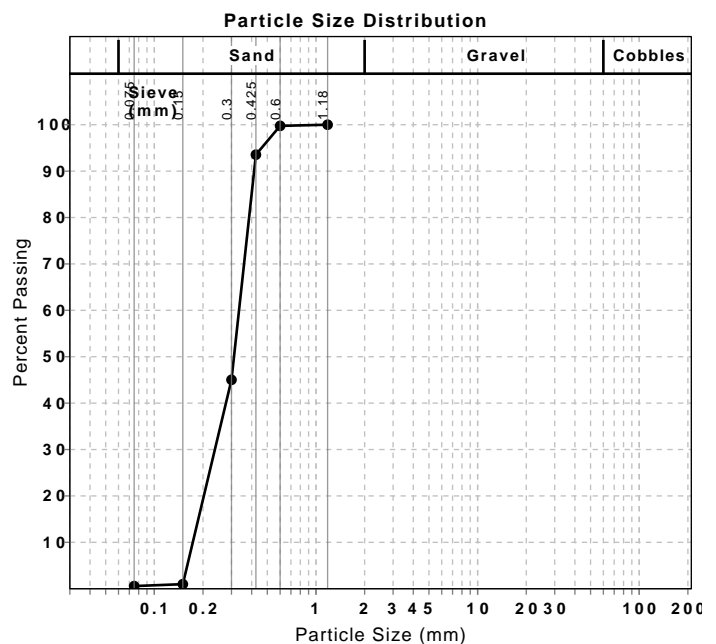
Bulk Density of Aggregate (AS 1141.4)			
	Min	Max	
Uncompacted (t/m <sup>3</sup> )	1.49		
Compacted (t/m <sup>3</sup> )	1.60		
Moisture Condition	Dry		
Nominal Size	Under 5mm		

Density and Water Absorption of Fine Aggregate (AS 1141.5)			
	Min	Max	
Apparent Particle Density (t/m <sup>3</sup> )	2.67		
Particle Density Dry (t/m <sup>3</sup> )	2.66		
Particle Density SSD (t/m <sup>3</sup> )	2.66		
Water Absorption (%)	0.3		

Particle Distribution (AS 1141.12)			
	Min	Max	
Material Finer than 75µm (%)	0		

Sodium Sulphate Soundness (AS 1141.24)			
	Min	Max	
Sieve Aperture	% Loss		
75 - 53mm			
53 - 37.5mm			
37.5 - 26.5mm			
26.5 - 19mm			
19 - 13.2mm			
13.2 - 9.5mm			
9.5 - 4.75mm			
4.75 - 2.36mm			
2.36 - 1.18mm			
1.18 - 0.600mm			
0.600 - 0.300mm	0.1		
<b>Total Weighted Loss (%)</b>	<b>0.1</b>		

Light Particles (AS 1141.31)			
	Min	Max	
Nominal Size of Aggregate (mm)	Less than 7		
Light Particles (%)	0		



Clay and Fine Silt (AS 1141.33)			
	Min	Max	
Volume of Clay and Silt (%)	1		

Organic Impurities other than Sugar (AS 1141.34)			
Organic Impurities	Lighter than standard		
Method of Colour Assessment	Visual using a reference solution		

Sugar (AS 1141.35)			
Sugar	Absent		

Methylene Blue (RMS T659)		
	Test 1	Test2
Methylene Blue Adsorption Value (mg/g)	2	2
Mean Methylene Blue Adsorption Value (mg/g)	2	

Moisture Content (RMS T262)			
Moisture Content (%)	3.0		

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A handwritten signature in black ink, likely belonging to James Wyatt.

Approved Signatory: James Wyatt  
Laboratory Manager  
NATA Accredited Laboratory Number: 14975

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	Not Obtainable		
Plastic Limit (%)	Not Obtainable		
Plasticity Index (%)	Non Plastic		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	0.0		
Cracking Crumbling Curling	None		

pH Value of Soil (AS 1289 4.3.1)		Min	Max
Air Temp (°C)	23.2		
Distilled Water pH	6.8		
Depth			
Moisture Condition	In situ		
pH	7.8		



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## TEST REPORT

CLIENT: HUNTER CIVILAB

FILE NO: 629/22

PROJECT: Testing of Screened Fine Dune Sand ex Williamtown Quarry – Site 218. REQUEST NO: 97719

TEST PROCEDURE: ASTM 7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by  
Abrasion in the Micro-Deval Apparatus DATE TESTED: 3.2.21

Sample Description:		Screened Fine Dune Sand –Lot No: 549
Project No:		P20023
Work Request No:		6287
Client Sample No:		21-6287A
Date Sampled:		23.12.21
Date Received:		20.1.22
Laboratory Sample No:		262402
Test Method:	Test:	Results
ASTM D7428*1	Micro-Deval Abrasion Test % Loss The % loss of the control Agg. tested closest to the time at which the sample was tested = 19.5	3.8

Sample with Particle Density figures provided by client

NOTE: \*1Sample tested without preparing standard grading as per ASTM D7428 Clause 8 Note 2

J. Wyatt, Q C File, File



Approved Signatory

Kamal Ali

Date 8.2.21 Serial No. AGG97719.KA.1

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Number: 547



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**TEST REPORT**

CLIENT: Hunter Civilab  
P.O. Box 3127 Thornton NSW 2322

FILE No.: 629 / 22

PROJECT: Testing of Screened Fine Dune Sand from Williamtown Quarry - Site 218 REQUEST No.: 97719

**TEST PROCEDURE:**

AS 1141.12 – Material Finer than 75 micron \*

AS 1141.13 – Material Finer than 2 micron

Laboratory Sample No.: 262402  
Date Sampled: 23.12.21  
Date Received: 20.1.22  
Date Tested: 31.1.22  
Project Number: P20023  
Work Request Number: 6287  
Sample Description: Screened Fine Dune Sand  
Lot No. 549  
Client Sample No. 21-6287A  
Field No.: 1

**TEST RESULTS:**

Material Finer than 75 micron ( $\mu\text{m}$ ) (%) \* Nil  
Material Finer than 2 micron ( $\mu\text{m}$ ) (%) Not Applicable

Sample was provided by the Client.

\* The authorised signatory for AS 1141.12 is A.Liu.

James Wyatt, Mat.File, File.



Approved Signatory

A.Liu

S.Krishnamoorthy

Date 31.1.22 Serial No. CHEM97719.SK.1

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**TEST REPORT**

CLIENT: Hunter Civilab  
P.O. Box 3127 Thornton NSW 2322

FILE No.: 629 / 22

PROJECT: Testing of Screened Fine Dune Sand from Williamtown Quarry - Site 218 REQUEST No.: 97719

**TEST PROCEDURE:**

Tex-612 - J – Acid Insoluble Residue for Fine Aggregate

Laboratory Sample Number:	262402
Date Sampled:	23.12.21
Date Received:	20.1.22
Date Tested:	1.2.22
Project Number:	P20023
Work Request Number:	6287
Sample Description:	Screened Fine Dune Sand Lot No. 549 Client Sample No. 21-6287A
Field No.:	1

**TEST RESULTS:**

Acid Insoluble Residue (%)	100
----------------------------	-----

Sample was provided by the Client.

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S. Krishnamoorthy  
1<sup>st</sup> February 2022

James Wyatt, Mat. File, File.



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Materials Technical Services**

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### Test Report

**Client:** HUNTER CIVILAB  
**Address:** P. O. BOX 3127 THORNTON, NSW 2322  
**Date Received:** January 2022  
**Project:** Testing of Screened Fine Dune Sand from Williamtown Quarry-site 218; Project No: P20023; Work Request No: 6287  
**Test Method:** Potential Alkali-silica Reactivity – Accelerated Mortar Bar Method (AS 1141.60.1)

**File No:** 629/22  
**Req. No:** 97719  
**Date Sampled:** 23/12/2021

Lab Sample No	Sample Description	Location
262402	Screened Fine Dune Sand - Lot No: 549; Sample No: 21-6287A	Williamtown Quarry
N/A	Boral GP/SL Cement	Berrima

**Results:**

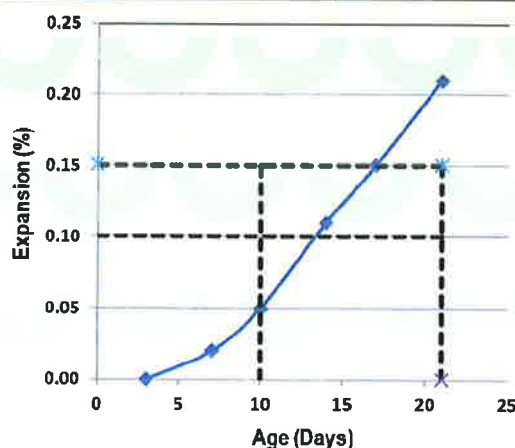
Flow (%): 52

W/C Ratio: 0.47

Date Mixed: 2/02/2022

Age (Days)	Expansion (%)			
	Specimen 1	Specimen 2	Specimen 3	Average
3	0.000	0.000	0.000	0.00
7	0.020	0.025	0.020	0.02
10	0.050	0.060	0.050	0.05
14	0.110	0.115	0.105	0.11
17	0.150	0.160	0.145	0.15
21	0.205	0.215	0.200	0.21

Mortar Bar Expansion (E) %		AS1141.60.1 Aggregate Reactivity Classification	
Duration of Specimens In 1mol/L NaOH at 80°C			
10 Days	21 Days		
—	< 0.1*		Non-Reactive
< 0.1*	0.1*≤ E < 0.3		Slowly Reactive
≥ 0.1*	—	Reactive	
—	0.3 ≤ E	Reactive	
*The value for natural fine aggregates is 0.15%			


**Notes:**

- Sample submitted by the Client.

James Wyatt, Mat. File, File

Approved Signatory



Kasar Humarhan

Date

28.02.2022

Serial No.

CEM97719.KH.1

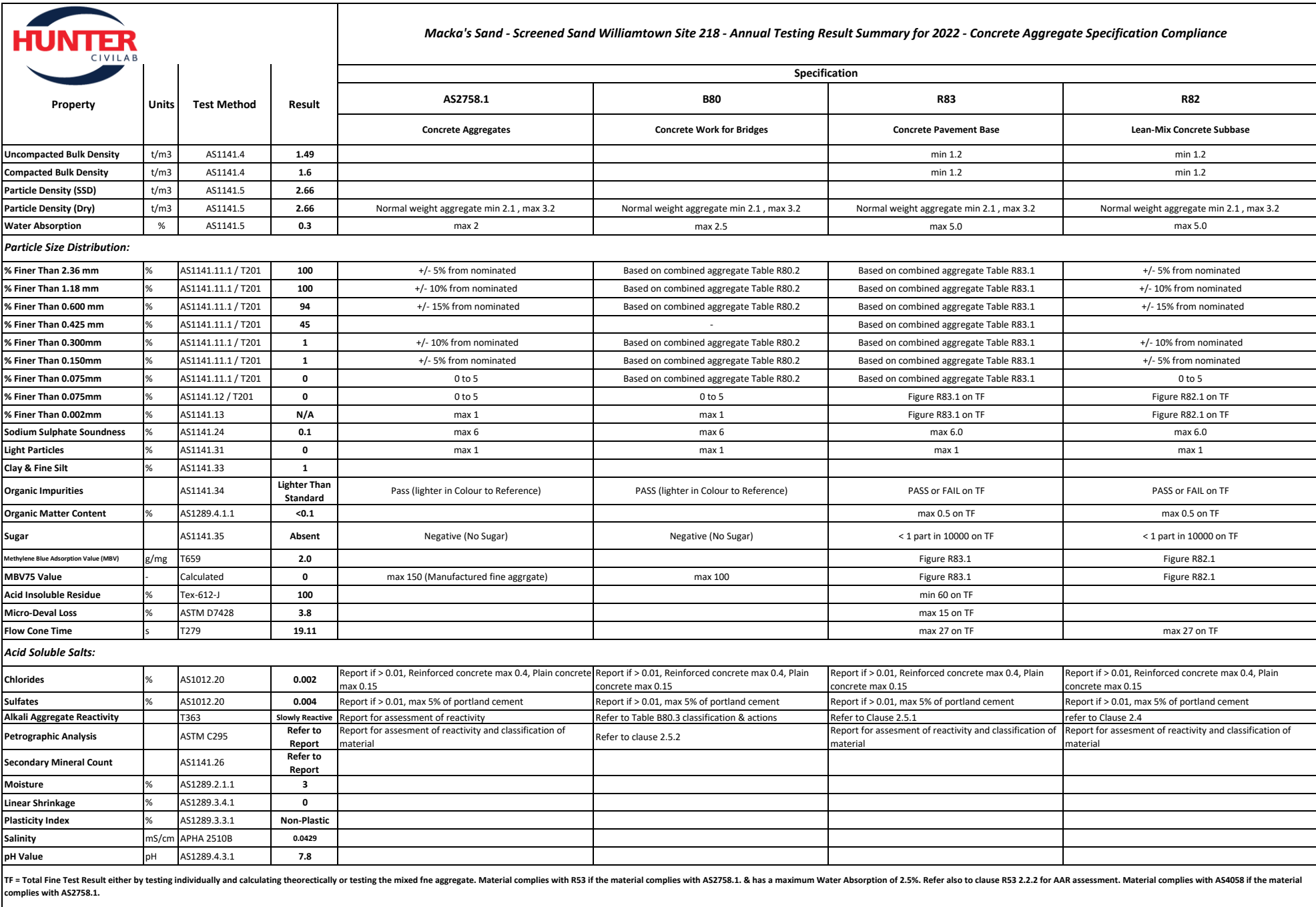
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Thornton NSW 2322  
PH: 02 49661844

## Conductivity

<b>Client:</b>	Macka's Sand Pty Limited	<b>Project No:</b>	P20023
<b>Principle:</b>	-	<b>Report No:</b>	P20023_21-6287A_CON.1
<b>Project:</b>	Materials Testing - Annuals	<b>Sample No:</b>	20-6287A
<b>Location:</b>	Williamtown - Site 218		

### Test Method: APHA 2510B with AS1289.4.3.1 Clause 5 (Preparation)

### Sample Detail

**Date Sampled:** 23/12/2021

**Sampling Method:** AS1141.3.1 (8.4.2) - Hand sampling with shovel or scoop

**Date Tested:** 21/2/2022

**Sample Description:** Screened Fine Dune Sand

**Material Source:** Site 218, Williamtown

**Client reference:** -

**Fraction Tested:** -2.36mm

### Result

<b>Conductivity at 25°C (Temperature Compensated):</b>	42.9 $\mu$ S/cm
<b>Temperature of Sample:</b>	25.1 °C

Remarks:



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**Authorised Signatory:**

**Name:** Natasha O'Neill  
**Position:** Technician  
**Date:** 22/02/2022



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NSW 2322  
PH: 02 49661844

### Flow Time and Voids Content of Fine Aggregate by Flow Cone -RMS T279

<b>Client:</b>	Macka's Sand & Soil Supplies	<b>Project No:</b>	P20023
<b>Principle:</b>	-	<b>Report No:</b>	P20023_21-6287A_FC.1
<b>Project:</b>	Materials Testing	<b>Sample No:</b>	21-6287A
<b>Location:</b>	Williamtown Quarry - Site 218		

**Date Sampled:** 23/12/2021

**Sampling Method:** AS 1141.3.1(8.4.2) - Hand sampling with shovel or a scoop

**Date Tested:** 9/02/2022

**Material Description:** Screened Fine Dune Sand

**Material Source:** Williamtown Quarry - Site 218

**Client Reference:** -

**For use as:** -

### Results

**Dry Density:** 2,656 kg/m<sup>3</sup>

**Oversize Material:** 0 %

#### Flow Time (s):

Test 1	Test 2	Test 3	Average
19.2	19.1	19.1	19.1

**Uncompacted Void Content:** 45.0 %

**Remarks:**



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Accredited Laboratory Number: 14975

**Authorised Signatory:**

**Name:** Natasha O'Neill  
**Position:** Technician  
**Date:** 9/02/2022



**GEOCHEMPET  
SERVICES**

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**PETROGRAPHIC REPORT  
ON A SCREENED SAND SAMPLE (21-6287A)  
FROM WILLIAMTOWN QUARRY**

prepared for

**HUNTER CIVILAB  
THORNTON NSW**

Purchase Order: 0175

Invoice Number: G2202523

Issued by

*H. M. Spring*  
H. M. Spring BSc  
9 February 2022

**FEBRUARY, 2022**

**Hc220201**

**1 of 6**

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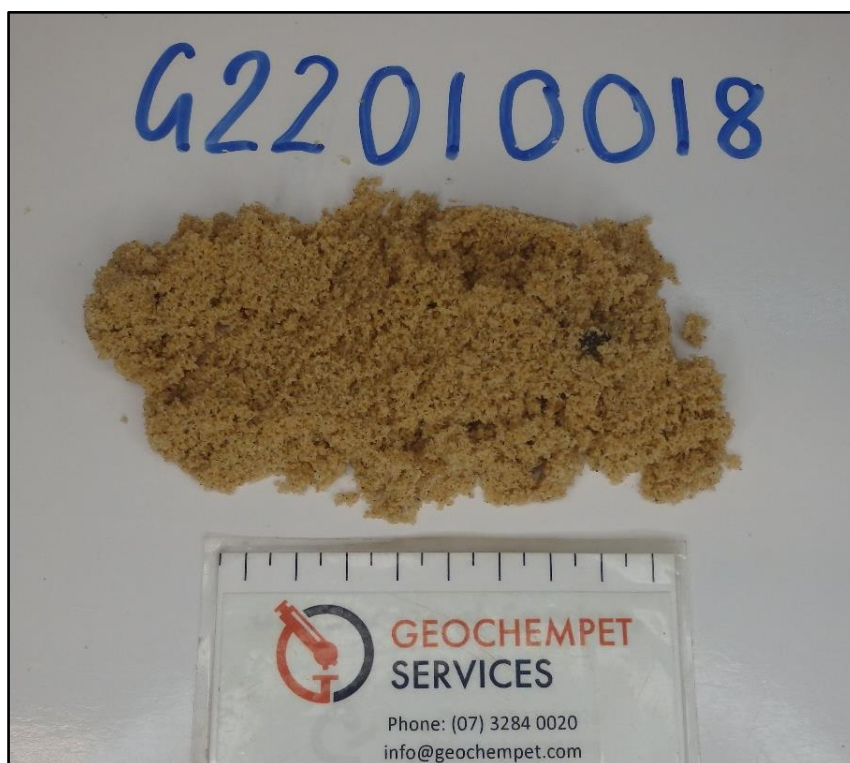
<b><u>Sample Label:</u></b>	21-6287A	<b><u>Date Sampled:</u></b>	23/12/2021
<b><u>Laboratory ID:</u></b>	G22010018	<b><u>Date Received:</u></b>	12/01/2022
<b><u>Material:</u></b>	Screened Fine Dune Sand	<b><u>Project:</u></b>	P20023
<b><u>Location:</u></b>	Williamtown Quarry – Site 218	<b><u>Lot:</u></b>	549
<b><u>Work Request:</u></b>	6287	<b><u>Client:</u></b>	Macka's Sand & Soil
<b><u>Work Requested:</u></b>	Petrographic analysis in relation to use as concrete sand; petrographic assessment of potential for alkali-silica reactivity		

**Methods** Account taken of ASTM C 295 Standard Guide for *Petrographic Assessment of Aggregates for Concrete*, the AS2758.1 – 2014 *Aggregates and rock for engineering purposes part 1; Concrete aggregates (Appendix B)*, the AS1141.65 Standard Guide for the *Method for sampling and testing aggregates*, of the content of the 1996 joint publication of the Cement and Concrete Association of Australia and Standards Australia, entitled (HB 79-2015) *Alkali Aggregate Reaction - Guidelines on Minimising the Risk of Damage to Concrete Structures in Australia*

**Identification** Medium to fine quartz sand

## **Description**

The sample consisted of about 4.5 kg of greyish orange, quartz-rich, free flowing clean sand. Clasts appear to be dominated by quartz and are mainly sub-rounded.



**Figure 1:** A sub sample of the supplied sand from Williamtown Quarry .

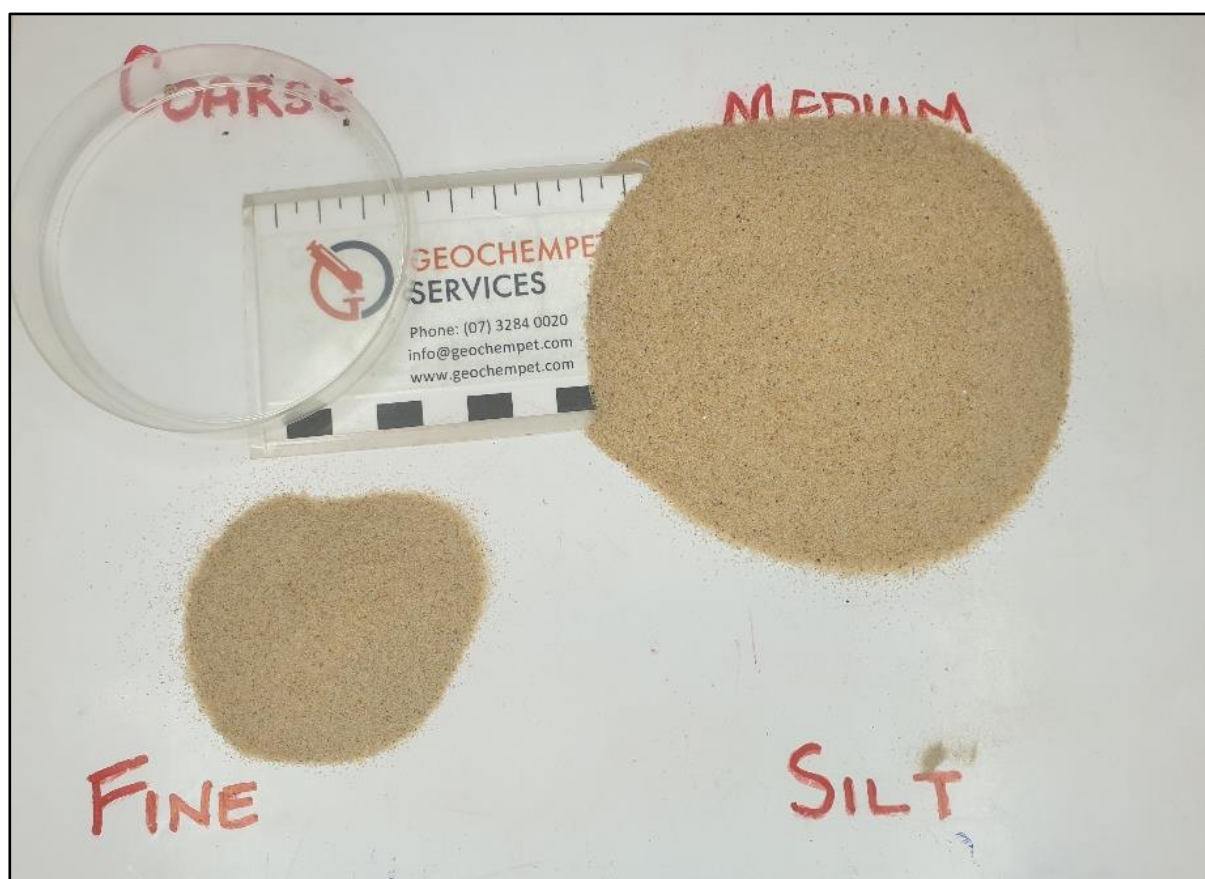
# GEOCHEMPET SERVICES, BRISBANE

In a crude, dry sieving test of a small subsample these results were tabulated:

Sieve Size	Wt % of sample
Coarse (>1.18mm)	<0.1
Medium (>0.3mm)	87.8
Fine (>0.075mm)	12.2
Silt (<0.075mm)	<0.1

Clasts range up to 1 mm. A very minor coarse fraction of clay cemented grains and small shells was recorded. These grains easily crumbled under finger pressure. The sand consists largely of rounded quartz grains. There are no apparent deleterious grain coatings.

A sub-sample was swirled in water, generating a light persistent greyish orange turbidity with some argillized scum at the surface, indicating the presence of some very minor clay and silt.



**Figure 2:** Photograph of sieve fractions recorded above.



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**Figure 3:** Photograph of the medium fraction composed mostly of quartz grains and a few darker lithic grains.

A thin section was prepared for microscopic examination in transmitted, polarized light. A count of 600 widely-spaced points falling within sectioned sand clasts gave the following composition:

73.3%	quartz as single, free, unstrained to mildly strained grains 65.5%) or as simple composite crystalline aggregates of quartz grains (7.8%)
12.3%	quartz as moderately strained simple or crystalline composite grains
4.3%	quartzite (3.9% moderately strained)
0.7%	chert
<1%	vein quartz
2.4%	feldspar (k-feldspar 2.2% and plagioclase 0.2%)
0.4%	other mineral grains (including 0.2% opaque oxides, zircon, rutile (0.2%), biotite and tourmaline)
0.2%	epidote
1.4%	lithic clasts of acid volcanics (0.5% finely microcrystalline quartz)
0.5%	lithic clasts of intermediate volcanics
0.8%	lithic clasts of granite ( 0.3% quartz)
0.2%	lithic clasts of basalt ( weathered)
1.8%	lithic clasts of volcanoclastic siltstone ( 0.6% finely microcrystalline quartz)
1.0%	lithic clasts of sandstone (0.6% quartz)
0.2%	clay cemented grains
0.2%	argillized clasts
0.3%	shell fragments



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## Thin Section Description

A simultaneous count of total free silica content yielded 92.6%, comprising 85.6% as free quartz grains, 5.9% quartz locked within lithic clasts (quartzite, granite, sandstone, and chert), and 1.1% within acid volcanic clasts and siltstone.

In thin section the sand is seen to consist largely of quartz in the form of unstrained to mildly strained free quartz grains (65.5%) and less abundant rounded clasts of simple crystalline composites (7.8%) of two or more unstrained to mildly strained quartz grains. Simple or polycrystalline grains of moderately strained quartz amount to about 12.3%. Other siliceous clasts include 4.3% quartzite and 0.7% chert.

Potassium feldspar grains represent about 2.2% of the rock and 0.2% plagioclase. About 0.6% of the sand consists of other mineral grains (including heavy minerals of tourmaline, rutile and zircon and epidote). Other lithic fragments amount to about 5.7% of the sample and include acid volcanic fragments, intermediate volcanic fragments, granite, basalt, siltstone, and sandstone. Clay cemented grains and argillized fragments together amounted to 0.2% respectively of the sample.

Shell fragments amount to 0.3%.

## Comments and Interpretations

The submitted dune sand sample (labelled 21-6287A) from Williamtown Quarry may be regarded as clean, free flowing, medium to fine quartz sand, and is narrowly graded.

The total **free silica content** (or **total quartz content**) is **92.6%**, comprising 85.6% as free quartz grains, 5.9% quartz locked within lithic clasts (quartzite, granite, sandstone, and chert), and 1.1% within acid volcanic clasts and siltstone.

Being composed almost entirely of hard, strong, durable, rounded siliceous mineral grains and lithic clasts, sand is interpreted to be **physically suitable for use in concrete**.

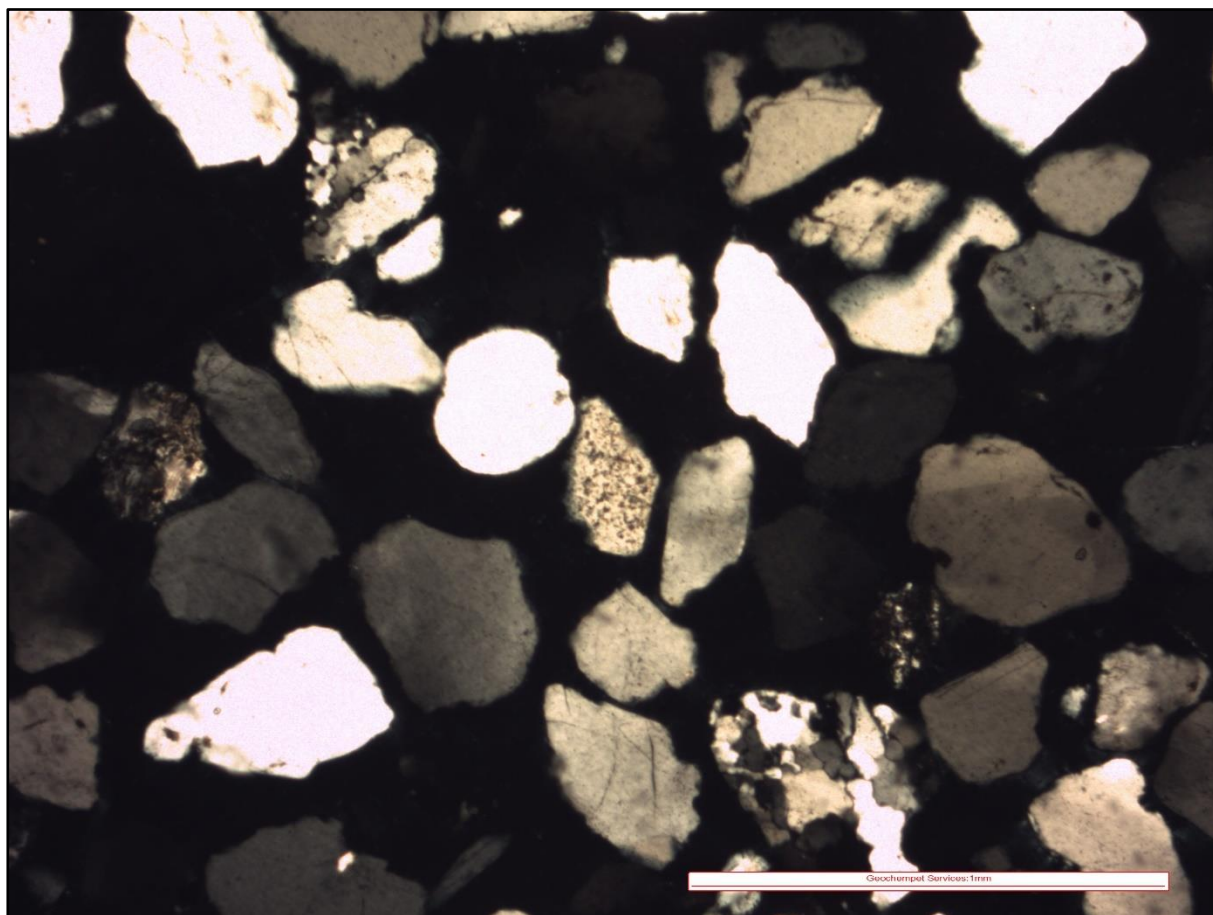
In relation to potential for alkali-silica reactivity in concrete it is noted that the sand carries about 16.2% of moderately strained quartz (as free grains and crystalline composite grains, and in lithic clasts of quartzite and chert) and about 1.8% of finely microcrystalline quartz (within acid volcanic/tuffaceous rock, chert, and siltstone). Thus, the sand is predicted to **have potential for mild and/or slow deleterious alkali-silica reactivity in concrete**.

The supplied sand sample is predicted to be **suitable for use as fine concrete sand** provided that the appropriate precautions are taken in mix and engineering design to deal with its perceived potential for deleterious alkali-silica reactivity when used under conditions which might promote such reaction.

Guidance on appropriate precautions can be obtained from the 2015 joint publication of the Cement and Concrete Association of Australia and Standards Australia, entitled *Alkali Aggregate Reaction - Guidelines on Minimising the Risk of Damage to Concrete Structures in Australia*.

## Free Silica Content

The free silica content is about 92.6%.



**Figure 4:** Photo-micrograph taken at low magnification in transmitted, cross-polarised light. This view is dominated by quartz grains; note the quartzite and different degrees of straining within the quartz grains.

# SYDNEY ANALYTICAL LABORATORIES

Page 1 of 3

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NATA No: 1884

ANALYTICAL REPORT for:

HUNTER CIVILAB

UNIT 3/62 SANDRINGHAM AVE  
THORNTON 2322

ATTN: JAMES WYATT

JOB NO: SAL28135C  
CLIENT ORDER: P20023  
DATE RECEIVED: 10/01/22  
DATE COMPLETED: 19/01/22  
TYPE OF SAMPLES: SOIL  
NO OF SAMPLES: 1



.....  
Issued on 19/01/22  
Lance Smith  
(Chief Chemist)

**ANALYTICAL REPORT**

JOB NO: SAL28135C  
CLIENT ORDER: P20023

SAMPLES	O.M. %	Cl %	SO4 % as SO3
1 21-6287A	<0.1	0.002	0.004
MDL	0.1	0.001	0.001
Method Code	C4	C32	C33
Preparation	P4	P5	P5

**RESULTS ON DRY BASIS**

SAMPLE DESCRIPTION: WILLIAMTOWN QUARRY - SITE 218

DATE OF COLLECTION: 23/12/21

WRN: 6287

**ANALYTICAL REPORT**

JOB NO: SAL28135C  
CLIENT ORDER: P20023

**METHODS OF PREPARATION AND ANALYSIS**

The tests contained in this report have been carried out on the samples as received by the laboratory. In the case where an analyte or group of analytes are received outside of recommended holding times, the analysis will proceed and the report annotated. Analysis is carried out within analyte holding times where possible.

- P4 Sample dried, sieved at 9.5mm, split and crushed to -425um
- P5 Sample dried, split and crushed to -150um
- C4 Organic Matter - AS1289.4.1.1
- C32 Acid Soluble Chloride - AS1012.20.1
- C33 Acid Soluble Sulphate - AS1012.20.1