MACKA'S SAND & SOIL SUPPLIES

Williamtown - Site 218
Screened Sand for
Utility Assets
2025

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

HUNTER CIVILAB

Macka's Sand - Screened Sand Williamtown Site 218 - Annual Testing Results Summary for 2025
Aggregate for Utility Assets Specification Compliance

Property	Units	Test Method	Result	Specification				
				R11	AS3725	WSA PS - 350	WSA PS - 360	Hunter Water Corporation STS 101
				Stormwater Drainage	Design for Installation of Buried Concrete Pipes	Compaction Sand for Pipe Embedment	Embedment / Concrete Sand	Construction & Pipe Bedding Materials
				Bed & Haunch	*Bed & Haunch*	*Grade B*		*Sand*
Uncompacted Bulk Density	t/m3	AS1141.4	**1.48**					
Compacted Bulk Density	t/m3	AS1141.4	**1.59**					
Particle Density (SSD)	t/m3	AS1141.5	**2.64**				>= 2.1	
Particle Density (Dry)	t/m3	AS1141.5	**2.64**				>= 2.1	
Water Absorption	%	AS1141.5	**0.2**				<= 3	
Particle Size Distribution:								
% Finer Than 2.36 mm	%	AS1141.11.1 / T201 / AS1289.3.6.1	**100**	50 to 100	50 to 100	90-100	60-100	100
% Finer Than 1.18 mm	%	AS1141.11.1 / T201 / AS1289.3.6.1	**100**	-		85-100	30-100	
% Finer Than 0.600 mm	%	AS1141.11.1 / T201 / AS1289.3.6.1	**100**	20 to 90	20 to 90	70-100	15-100	90-100
% Finer Than 0.425 mm	%	AS1141.11.1 / T201 / AS1289.3.6.1	**95**	-				
% Finer Than 0.300mm	%	AS1141.11.1 / T201 / AS1289.3.6.1	**49**	10 to 60	10 to 60	50-100	5-50	
% Finer Than 0.150mm	%	AS1141.11.1 / T201 / AS1289.3.6.1	**1**	0 to 25	0 to 25	0-40	0-15	0-20
% Finer Than 0.075mm	%	AS1141.11.1 / T201 / AS1289.3.6.1	**1**	0 to 10	0 to 10	0-5	0-5	0-5
% Finer Than 0.075mm	%	AS1141.12 / T203 / AS1289.3.6.1	**0**			0-5	<= 10	0-5
% Finer Than 0.002mm	%	AS1141.13	**N/A**				<= 1	
Sodium Sulphate Soundness	%	AS1141.24	**0.2**					
Light Particles	%	AS1141.31	**0**				< = 1	
Organic Impurities		AS1141.34	**Lighter (Pass)**					
Organic Matter Content	%	AS1289.4.1.1	**<0.1**					
Sugar		AS1141.35	**Absent**					
Methylene Blue Adsorption Value (MBV)	g/mg	T659	**1.0**					
MBV75 Value	-	Calculated	**1**					
Acid Insoluble Residue	%	Tex-612-J	**100**					
Micro-Deval Loss	%	ASTM D7428	**3.7**					
Flow Cone Time	s	T279	**18.9**					
Chlorides	%	AS1012.20	**0.003**					
Sulfates	%	AS1012.20	**0.005**					
Mortar Bar test		AS1141.60.1	**Slowly Reactive**					
Concrete Prism Test		AS1141.60.2	**Non-Reactive**					
Petrographic Analysis		ASTM C295	**Report**					< 3% Mica
Secondary Mineral Count		AS1141.26	**Report**					
Moisture	%	T120	**2.9**					
Linear Shrinkage	%	AS1289.3.4.1	**NP**		max 10			
Plasticity Index	%	T109, AS1289.3.3.1	**NP**	max 6				
Salinity	mS/cm	APHA 2510B	**0.045**					< 0.4 mS / cm
pH Value	pH	AS1289.4.3.1	**7.4**			Range 5 - 9	Range 5 - 9	> 5.5

Material Test Report

Report Number: **P20023-9F**
Issue Number: 1
Date Issued: 12/03/2025
Client: Macka's Sand Pty Ltd
2684 Nelson Bay Road, Salt Ash NSW 2318
Contact: Brett
Project Number: P20023
Project Name: Materials Testing - Screened Sand
Project Location: Williamtown Quarry - Site 218
Work Request: 17728
Sample Number: 24-17728A
Date Sampled: 16/12/2024
Dates Tested: 17/12/2024 - 17/01/2025
Sampling Method: AS 1141.3.1 9.4 - Sampling aided by power equipment - other than backblading method
Preparation Method: In accordance with the test method
Material: Screened Dune Sand
Material Source: Macka's Sand - Williamtown Site 218

Hunter Geotechnical Services
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: results@huntergeo.au

Accredited for compliance with ISO/IEC 17025 - Testing

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

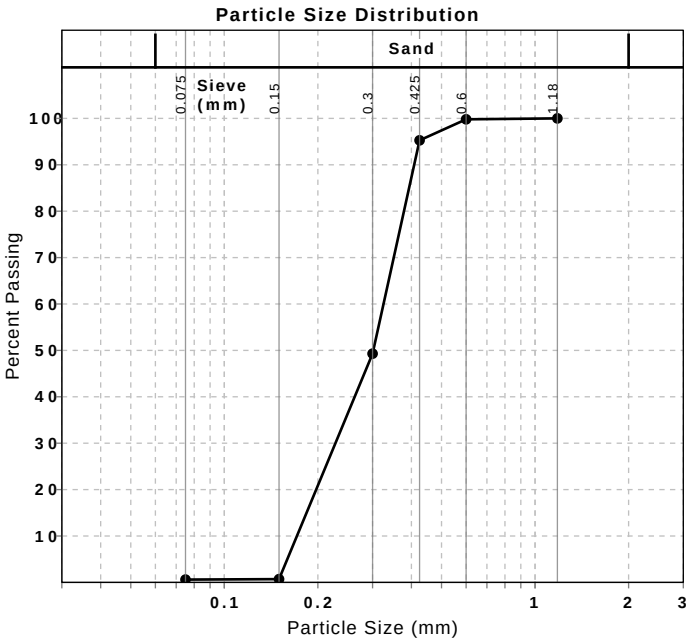
Particle Size Distribution (AS1141.11.1)			
Sample Washing	Sample was Washed		
Sieve	Passed %	Passing Limits	
1.18 mm	**100**		
0.6 mm	**100**		
0.425 mm	**95**		
0.3 mm	**49**		
0.15 mm	**1**		
0.075 mm	**1**		

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

Bulk Density of Aggregate (AS 1141.4)		Min	Max
Uncompacted (t/m^3)	**1.48**		
Compacted (t/m^3)	**1.59**		
Moisture Condition	Dry		
Nominal Size	Under 5 mm		

Density and Water Absorption of Fine Aggregate (AS 1141.5)		Min	Max
Apparent Particle Density (t/m^3)	2.65		
Particle Density Dry (t/m^3)	2.64		
Particle Density SSD (t/m^3)	2.64		
Water Absorption (%)	**0.2**		

Sodium Sulphate Soundness (AS 1141.24)		Min	Max
Sieve Aperture	% Loss		
0.600 - 0.300mm	0.2		
Total Weighted Loss (%)	**0.2**		



Material Test Report

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Client: Macka's Sand Pty Ltd
2684 Nelson Bay Road, Salt Ash NSW 2318
Contact: Brett
Project Number: P20023
Project Name: Materials Testing - Screened Sand
Project Location: Williamtown Quarry - Site 218
Work Request: 17728
Sample Number: 24-17728A
Date Sampled: 16/12/2024
Dates Tested: 17/12/2024 - 09/01/2025
Sampling Method: AS 1141.3.1 9.4 - Sampling aided by power equipment - other than backblading method
Preparation Method: In accordance with the test method
Material: Screened Dune Sand
Material Source: Macka's Sand - Williamtown Site 218

Hunter Geotechnical Services
62 Sandringham Avenue Thornton NSW 2322
Phone: (02) 4966 1844
Email: results@huntergeo.au

Accredited for compliance with ISO/IEC 17025 - Testing

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

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

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)			Min	Max
	Test 1	Test2		
Methylene Blue Adsorption Value (mg/g)	1	1		
Mean Methylene Blue Value (mg/g)	1			

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	2.9		

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 could not be determined as the liquid limit could not be obtained and the material is non-plastic.			

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)			
Cracking Crumbling Curling			
Linear shrinkage could not be determined as the liquid limit could not be obtained and the material is non-plastic.			

Material Test Report

Report Number: **P20023-9F**
Issue Number: 1
Date Issued: 12/03/2025
Client: Macka's Sand Pty Ltd
2684 Nelson Bay Road, Salt Ash NSW 2318
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Dates Tested: 17/12/2024 - 17/12/2024

Hunter Geotechnical Services
62 Sandringham Avenue Thornton NSW 2322
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Accredited for compliance with ISO/IEC 17025 - Testing

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

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content (%)	Min	Max	Material
24-17728A	**	2.9 %	**	**	Screened Dune Sand

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TEST REPORT

CLIENT: HUNTER CIVILAB FILE NO: 629/25

PROJECT: Testing of Screened Dune Sand ex Williamtown Quarry – Site 218. REQUEST NO: 116528

TEST PROCEDURE: ASTM 7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus DATE TESTED: 14.1.25

Sample Description:		Screened Dune Sand
Project No:		P20023
Work Request No:		17728
Client Sample No:		24-17728A
Date Sampled:		16.12.24
Date Received:		8.1.25
Laboratory Sample No:		315712
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	3.7

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

J. Wyatt, Q C File, File

Kamal Ali

Approved signatory _____

Date 4.2.25 Serial no. AGG116528.KA.1

NATA Accredited Laboratory
Number: 547

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TEST REPORT

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

FILE No.: 629 / 25

PROJECT: Testing of Screened Dune Sand from Williamtown Quarry - Site 218

REQUEST No.: 116528

TEST PROCEDURE:
AS 1141.12 – Material Finer than 75 micron *
AS 1141.13 – Material Finer than 2 micron

Laboratory Sample No.:	315712
Date Sampled:	16.12.24
Date Received:	8.1.25
Date Tested:	13.1.25
Project No.:	P20023
Work Request No.:	17728
Sample Description:	Screened Dune Sand Client Sample No. 24-17728A
Field No.:	1

TEST RESULTS:

Material Finer than 75 micron (μm) (%) *	Nil
Material Finer than 2 micron (μm) (%)	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 13.1.25 Serial no. CHEM116528.SK.1

NATA Accredited Laboratory
Number: 547

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TEST REPORT

CLIENT:	Hunter Civilab P.O Box 3127, Thornton, NSW 2322	FILE No.: 629 / 25
PROJECT:	Project No.: P20023 / Work Request:17728	REQUEST No.:116528

TEST PROCEDURE:
Tex-612 - J – Acid Insoluble Residue for Fine Aggregate

Laboratory Sample Number:	315712
Date Sampled:	16.12.24
Date Received:	08.01.25
Date Tested:	14.01.25
Sample Description:	Screened Dune Sand CSN: 24-17728A Williamtown Quarry Site 218
Field No.:	1

TEST RESULTS:

Acid Insoluble Residue (%)	100

Sample was provided by the Client.

Test results in this Test Report relate only to the samples tested.

Otilia Costache
15th January 2025

James Wyatt, Mat. File, File.

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Test Report

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Winston Hills NSW 2153

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Client: HUNTER CIVILAB
Address: P. O. BOX 3127, THORNTON, NSW 2322
Date Received: 08/01/2025
Project: Testing of Screened Dune Sand – Project No. P20023 – Work Request No. 17728.
Test Method: Potential Alkali-silica Reactivity – Accelerated Mortar Bar Method (AS 1141.60.1)

File No: 629/25
Req. No: 116528
Date Sampled: 16/12/2024

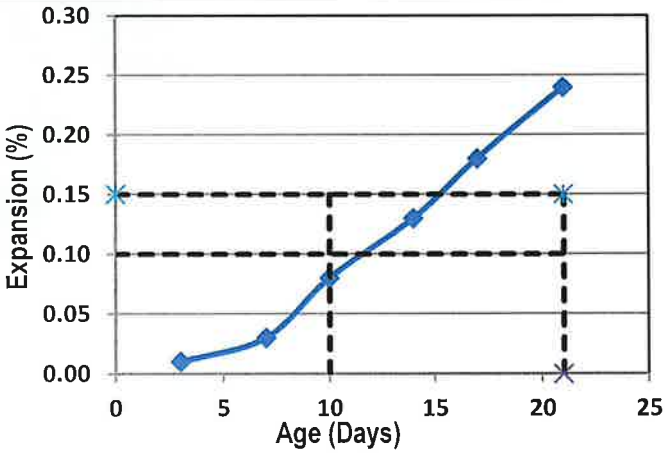
Lab Sample No	Sample Description	Location
315712	Screened Dune Sand – Sample No. 24-17728A	Williamtown Quarry – Site 218
N/A	Boral GP/SL Cement	Berrima

Results:

Flow (%): 60 **W/C Ratio:** 0.47 **Date Mixed:** 15/01/2025

Age (Days)	Expansion (%)			
	Specimen 1	Specimen 2	Specimen 3	Average
3	0.005	0.005	0.010	0.01
7	0.030	0.030	0.030	0.03
10	0.085	0.080	0.080	0.08
14	0.125	0.125	0.125	0.13
17	0.180	0.175	0.175	0.18
21	0.240	0.235	0.235	0.24

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%		



Note:

- Sample supplied by the client.

James Wyatt, Mat. File, File

Approved signatory S. Somasundaram

Date 10/02/2025 Serial no. CEM116528.SHA.1

NATA Accredited Laboratory Number: 547

SYDNEY ANALYTICAL LABORATORIES

Office:
PO BOX 48
ERMINGTON NSW 2115

Laboratory:
1/4 ABBOTT ROAD
SEVEN HILLS NSW 2147
Telephone: (02) 9838 8903
Fax: (02) 9838 8919
A.C.N. 003 614 695
A.B.N. 81 829 182 852
NATA No: 1884

ANALYTICAL REPORT for:

HUNTER GEOTECHNICAL SERVICES

UNIT 3/62 SANDRINGHAM AVE
THORNTON 2322

ATTN: JAMES WYATT

JOB NO: SAL29055E

CLIENT ORDER: P20023

DATE RECEIVED: 07/01/25

DATE COMPLETED: 22/01/25

TYPE OF SAMPLES: SOIL

NO OF SAMPLES: 1

NATA Accredited for compliance with ISO/IEC 17025 Testing

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Issued on 22/01/25
Lance Smith
(Chief Chemist)

ANALYTICAL REPORT

JOB NO: SAL29055E
CLIENT ORDER: P20023

	SAMPLES	pH 1:5	Cl %	O.M. %	SO4 % as SO3	COND. uS/cm
1	24-17728A	7.4	0.003	<0.1	0.005	45
MDL		0.1	0.001	0.1	0.001	0.1
Method Code		C1	C32	C4	C33	WA2
Preparation		P4	P5	P4	P5	P4

RESULTS ON DRY BASIS
MATERIAL: SCREENED SAND, WILLIAMTOWN QUARRY - SITE 218
DATE OF COLLECTION: 16/12/24
WRN: 17728

SYDNEY ANALYTICAL LABORATORIES

ANALYTICAL REPORT

JOB NO: SAL29055E
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
C1	pH - AS1289.4.3.1
C32	Acid Soluble Chloride - AS1012.20.1
C4	Organic Matter - AS1289.4.1.1
C33	Acid Soluble Sulphate - AS1012.20.1
WA2	Conductivity-In House Method A8.25 (1:5 soil/water extract) Determined by APHA 2510B

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TEST REPORT

CLIENT: HUNTER CIVILAB FILE NO: 629/25

PROJECT: Testing of Screened Dune Sand ex Williamtown Quarry – Site 218. REQUEST NO: 116528

TEST PROCEDURE: ASTM 7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus DATE TESTED: 14.1.25

Sample Description:		Screened Dune Sand
Project No:		P20023
Work Request No:		17728
Client Sample No:		24-17728A
Date Sampled:		16.12.24
Date Received:		8.1.25
Laboratory Sample No:		315712
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	3.7

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

J. Wyatt, Q C File, File

Kamal Ali

Approved signatory _____

Date 4.2.25 Serial no. AGG116528.KA.1

NATA Accredited Laboratory
Number: 547

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TEST REPORT

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

FILE No.: 629 / 25

PROJECT: Testing of Screened Dune Sand from Williamtown Quarry - Site 218

REQUEST No.: 116528

TEST PROCEDURE:
AS 1141.12 – Material Finer than 75 micron *
AS 1141.13 – Material Finer than 2 micron

Laboratory Sample No.:	315712
Date Sampled:	16.12.24
Date Received:	8.1.25
Date Tested:	13.1.25
Project No.:	P20023
Work Request No.:	17728
Sample Description:	Screened Dune Sand Client Sample No. 24-17728A
Field No.:	1

TEST RESULTS:

Material Finer than 75 micron (μm) (%) *	Nil
Material Finer than 2 micron (μm) (%)	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 13.1.25 Serial no. CHEM116528.SK.1

NATA Accredited Laboratory
Number: 547

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TEST REPORT

CLIENT:	Hunter Civilab P.O Box 3127, Thornton, NSW 2322	FILE No.: 629 / 25
PROJECT:	Project No.: P20023 / Work Request:17728	REQUEST No.:116528

TEST PROCEDURE:
Tex-612 - J – Acid Insoluble Residue for Fine Aggregate

Laboratory Sample Number:	315712
Date Sampled:	16.12.24
Date Received:	08.01.25
Date Tested:	14.01.25
Sample Description:	Screened Dune Sand CSN: 24-17728A Williamtown Quarry Site 218
Field No.:	1

TEST RESULTS:

Acid Insoluble Residue (%)	100

Sample was provided by the Client.

Test results in this Test Report relate only to the samples tested.

Otilia Costache
15th January 2025

James Wyatt, Mat. File, File.

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Test Report

Boral Construction Materials
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Client: HUNTER CIVILAB
Address: P. O. BOX 3127, THORNTON, NSW 2322
Date Received: 08/01/2025
Project: Testing of Screened Dune Sand – Project No. P20023 – Work Request No. 17728.
Test Method: Potential Alkali-silica Reactivity – Accelerated Mortar Bar Method (AS 1141.60.1)

File No: 629/25
Req. No: 116528
Date Sampled: 16/12/2024

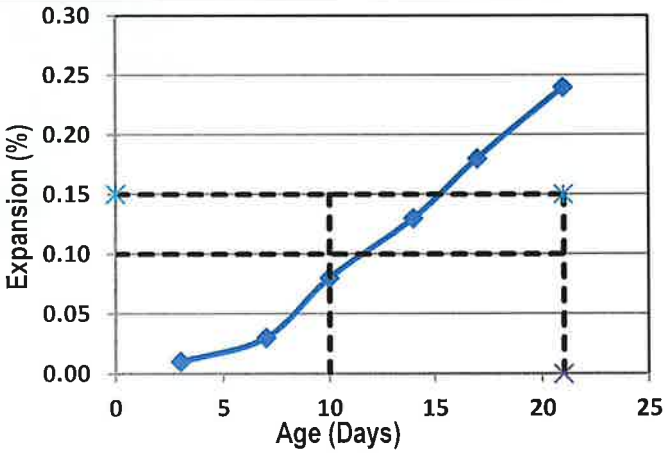
Lab Sample No	Sample Description	Location
315712	Screened Dune Sand – Sample No. 24-17728A	Williamtown Quarry – Site 218
N/A	Boral GP/SL Cement	Berrima

Results:

Flow (%): 60 **W/C Ratio:** 0.47 **Date Mixed:** 15/01/2025

Age (Days)	Expansion (%)			
	Specimen 1	Specimen 2	Specimen 3	Average
3	0.005	0.005	0.010	0.01
7	0.030	0.030	0.030	0.03
10	0.085	0.080	0.080	0.08
14	0.125	0.125	0.125	0.13
17	0.180	0.175	0.175	0.18
21	0.240	0.235	0.235	0.24

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%		



Note:

- Sample supplied by the client.

James Wyatt, Mat. File, File

Approved signatory S. Somasundaram

Date 10/02/2025 Serial no. CEM116528.SHA.1

NATA Accredited Laboratory Number: 547

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LABORATORY SERVICES

PETROGRAPHIC ANALYSIS REPORT

Address: 8 Hyne Road, South Guildford, WA 6055
Email: sales@arctesting.com.au
Web: arctesting.com.au
Mobile: 0477 440 083
ABN: 656 442 723

ARC reference: ARC25_PAR_0412

Date: 17 January 2025

Petrographic Analysis for Sand Sample

Client:	Hunter Geotechnical Services
Client contact:	James Wyatt
Project name:	P20023 – Material Testing – Screened Sand
Location:	Williamtown Quarry – Site 218
Sample reference:	24-17728A
Sample description:	Screened Dune Sand
Date sampled:	16 December 2024
Date received:	14 January 2025
Report issued:	17 January 2025

Author:
Rahul Pillai

Petrologist
BSc. MSc Geology
rahul@arctesting.com.au

Reviewer:
Matthew van Herk

General Manager
NATA Level 5 Signatory
matt@wgls.com.au

Address: 8 Hyne Road, South Guildford, WA 6055
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Web: arctesting.com.au
Mobile: 0477 440 083
ABN: 656 442 723

Introduction

A screened dune sand sample was sampled by the client and sent to the ARC laboratory Services Pty Ltd petrographic facility. The thin section was analyzed by ARC laboratory Services Pty Ltd with instructions from the client to conduct petrographic analysis to ASTM C295, AS 2758.1 proposed use of aggregate, AS 1141.26 – 2019 Standard Guide for the Method for Sampling and Testing Aggregates – Secondary Minerals Content in Igneous Rocks and rock for concrete and recommend further testing if significant deleterious characteristics are identified.

Methodology

Petrographic analysis was completed on a Leica DM2700P polarizing microscope utilizing transmitted light with a range of objective lenses. Photographs of the hand specimen and thin section photomicrographs showing grain sizes and any aspects of the minerals are included as part of the report (Fig 1 to 5). The composition of mineral in the sample was calculated using a Pelcon Automatic Point Counter on 1800 points (Table 2 – Composition of mineral in the sample). The test was performed in accordance with the following standard:

- ASTM C 295 – 2019 Standard Guide for Petrographic Examination of Aggregates for Concrete.
- AS 2758.1 – 2014 Aggregates and Rock for Engineering Purposes Part 1: Concrete Aggregates.
- AS 1141.26 – 2019 Standard Guide for the Method for Sampling and Testing Aggregates – Secondary Minerals Content in Igneous Rocks.

The following standard also referenced:

- SA HB 79-2015 Alkali-Aggregate Reaction - Guidelines on Minimizing the Risk of Damage to Concrete Structure in Australia - Cement and Concrete Association of Australia and Standards Australia.
- AS 2758.2 – 2014 Aggregates and Rock for Engineering Purposes Part 2: Aggregate for sprayed bituminous surfacing.
- AS 2758.5 – 2014 Aggregates and Rock for Engineering Purposes Part 5: Asphalt Aggregates.
- AS 1726-2017 Geotechnical Site Investigations.

Macro-Examination Results

The hand specimen indicates the supplied sample as **sand** and is composed of mostly fine to medium grains. The coarse (>1.18mm) and very fine grains (<0.075mm) were trace in abundance. The sand is moderately to well sorted, and the grains are observed to be subrounded in shape, and of varying sphericity. The majority of the particles in the sample are hard, dense and physically sound. The sand is light brown in color overall perhaps of the presence of clay/silt associated with dark colored particles. The light grey particles are observed to be quartzose in composition which includes quartz crystals, dark grey grains probably of lithic clasts, dark colored grains are supposed to be of magnetite and/or muscovite. Minor feldspar grains are also observed. Traces of plant/coal fragments were observed.

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Table 1 shows the grain size distribution from dry sieve test.

Table 1 – Grain size distribution from dry sieve test

Grain Size (mm)	Abundance (%)
>1.18	0.1
1.18-0.3	71.4
0.3-0.075	28.4
<0.075	0.1

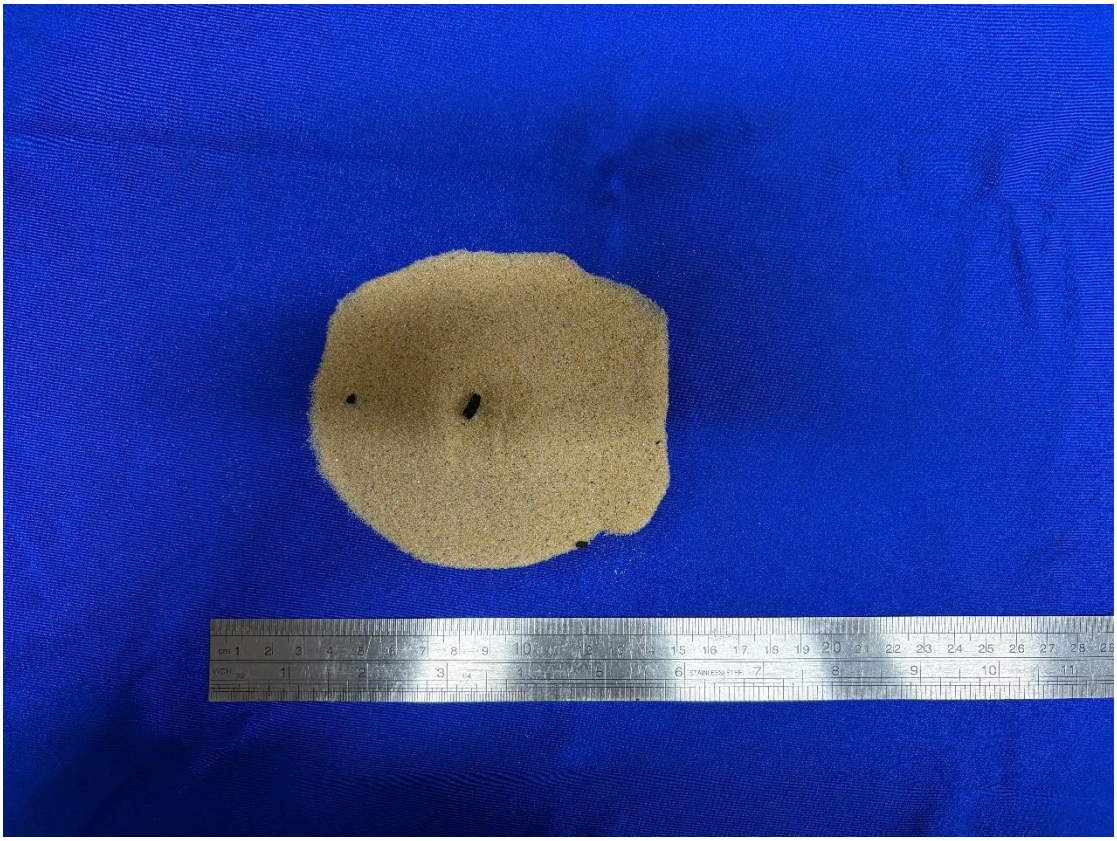

Fig 1: Photograph of the sample as received.

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Fig 2: Photograph of the sample showing abundant quartz with plant/coal fragment.

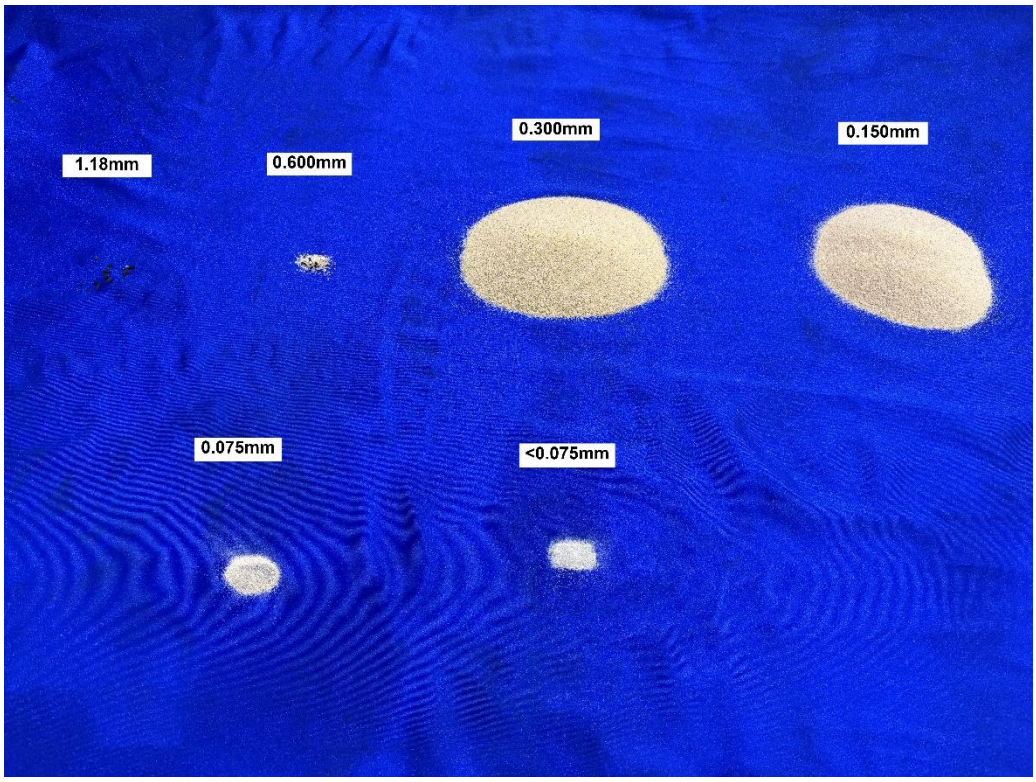

Fig 3: Photograph showing portions of the dry sieved sample

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Micro-Examination Results

AS 1141.26 is intended for use with basic igneous rock. Therefore, the method is not directly applicable to the supplied manufactured sand sample with dominant acid igneous rock. The term 'non-durable mineral' is used instead 'secondary mineral' but basically is to determine the soft or weak phases.

From thin section analysis the sample is observed to contain more quartz particles. Table 2 – composition of mineral in the sample based on a point count of 1800 widely spaced points shows the durable minerals make up **97.6%** of the mineral count and non-durable/weak of **2.4%**. Durable minerals include **quartz (93%), lithic clasts (2.1%), feldspar (1.7%)** and **opaque minerals (0.8%)**. **Iron oxide matrix/clay cement/humic substances (2.2%), sericite (0.1%) and muscovite (0.1%)** are mostly found as weak phases.

Durable minerals: The most abundant mineral in this phase is quartz. Quartz grains are mostly occurring as monocrystalline with variable degrees of strain either with undulatory or non-undulatory and straight to sweeping extinction. 79% quartz as free, unstrained to mildly strained grains, 11% quartz as moderately strained simple or crystalline composite grains, 2% as moderately to highly strained quartzite, 1% as vein quartz and traces of finely microcrystalline chert. Most quartz grains are inclusion free and some are observed with few darker brownish turbid color probably iron oxide stains or clay cement. Some are with embayed and sutured boundaries probably due to result of magmatic corrosion in parent rock. Minor polycrystalline quartz grains are observed with varying granoblastic quartzite texture. Mineral composition is characterized by practically monomineralic quartz composition and coarsely irregular porphyry like structure.

2% of lithic clasts includes sedimentary rock types that exhibit some degree of deformation or foliation. Feldspar grains are rare in this sample which consist of fine to medium alkali feldspar and subordinate plagioclase. Most of them are seen as subrounded and cloudy appearance. Some grains shows traces of argillitic alteration and some with microcline twinning. Opaque minerals occurs as fine subangular to subrounded crystals usually seen as opaque in the thin sections.

Non-durable/Weak minerals: Non-durable minerals most probably of Iron oxide staining and/or clay phases occurs very rare on the grains surface and/or along weathering cracks with light yellowish to turbid color, commonly form due to ferruginous alterations or clay cement. The slight brownish stain on the grain surfaces are perhaps due to humic substances. The main iron oxide mineral present in these features was goethite with minor amounts of hematite. Sericite forming as alteration or weathering within lithic clasts and plagioclase grains. Minor muscovite occurs colorless, laminated platy grains of low relief. Traces of plant/coal fragments are also present.

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Table 2: Composition of mineral in the sample

Durable Minerals	Overall, %
Monocrystalline quartz	79
Strained quartz (R)*	11
Microcrystalline quartz (R)*	Trace
Polycrystalline quartzite (R)*	2
Vein quartz	1
Lithic clasts	2.1
Feldspar	1.7
Opaque minerals	0.8
Weak Minerals	**Overall, %**
Secondary iron oxides/clay cement/humic substances	2.2
Sericite	0.1
Muscovite	0.1
Plant/coal fragments	Trace
Total	**100**

** (R) = Reactive mineral*

Summary

From the petrographic analysis the submitted sample is identified as fine to medium grained **sand**. From the point counting, the sample consists of durable minerals predominantly quartz (93%), lithic clasts (2.1%), feldspar (1.7%) and opaque minerals (0.8%).

Secondary iron oxides/clay cement/humic substances (2.2%), sericite (0.1%) and muscovite (0.1%) are mostly found as non-durable/weak mineral.

Free Silica Content

The total free quartz is estimated at around 93%, constitute both the free quartz grains and those present within the quartzite and other lithic clasts.

The Engineering properties are influenced by the primary mineralogy, the grain size and structure, secondary and adverse mineralogy, and the degree of weathering. Some of them are classified below:

The submitted sample is:

- A fine to medium grained **sand**.

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- Moderately to well sorted, sub-rounded, and of varying sphericity.
- Containing **97.6% durable** and **2.4% non-durable/weak phases**.
- Containing 93% free silica with 79% unstrained or mildly strained, 11% moderately strained quartz, 2% moderately to highly strained quartzite, 1% vein quartz and traces of finely microcrystalline chert.
- Regarded collectively as **hard, strong**, and **durable**.

From the point counting, the sample was found to contain **11% moderately strained quartz** and **2% moderately to highly strained quartzite**. In Accordance with Standards Australia HB 79-2015, the sample tested may have **potential for mild AAR (Alkali Aggregate Reaction) in concrete**. The degree of the alkali silica reactivity and whether the amount of reactive minerals found will produce a deleterious degree of expansion in concrete will be further studied with mortar-bar method, based on **AS 1141.60.1** and the impact and appropriate precautions be taken in mix and engineering design if required.

Based on the petrographic assessment conducted on the sand sample provided it is concluded that aggregates produced from this source predicted to be suitable for construction and engineering purposes including:

Aggregates – Concrete.

This recommendation is made on the basis that additional testing will be required to verify the aggregates produced from the sand source assessed meet suitability of application in specific engineering projects.

The test required and recommended to verify this sand source include but are not limited to:

AS 1141.60.1 - Methods for sampling and testing aggregates Potential alkali-silica reactivity - Accelerated mortar bar method.

AS 1141.34 - Methods for sampling and testing aggregates – Organic impurities other than sugar.

AS 1141.31 - Methods for sampling and testing aggregates light particles.

AS 1141.5 - Particle density and water absorption of fine aggregate.

NB Refer: Durability assessment as per Aggregates and Rock for Engineering Purposes - AS 2758.1.*

Limitations: *The Analysis reported include composition is based on a small sample provided by the client, it may not be representative of the entire source. Further analysis may be required if the source is of variable geology and or visually different to the sample provided. Comments are made specifically to the sample examined.*

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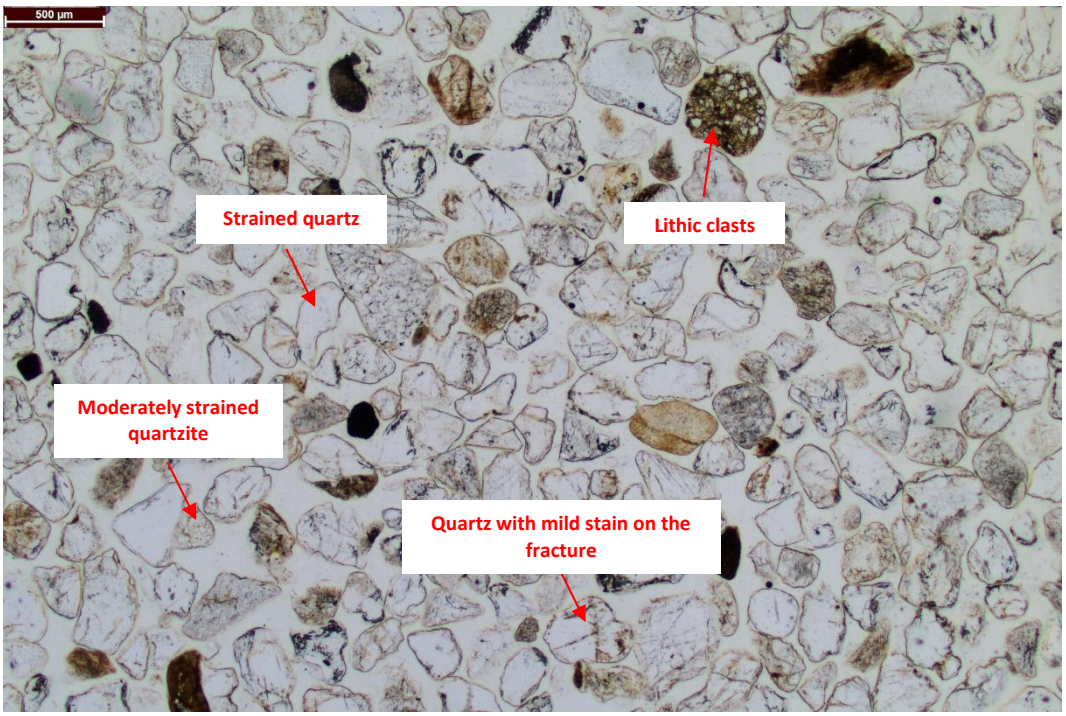

Figure 4: Photomicrograph showing sand dominated by quartz grains. Majority particles are seen with minor ferruginous and opaque stains around the surface. Note the strained quartz, lithic clasts with ferruginous alteration and moderately strained polycrystalline quartzite seen within the range.

Plane Polarized Light, **25X.**

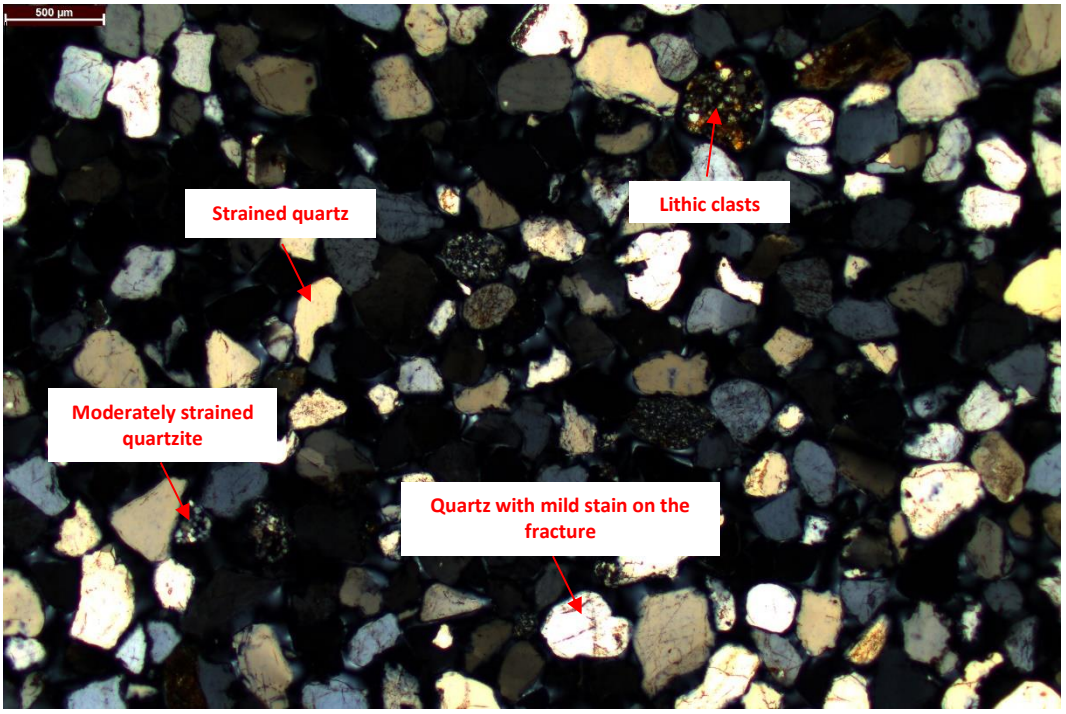

Figure 5: Photomicrograph showing sand dominated by quartz grains. Majority particles are seen with minor ferruginous and opaque stains around the surface. Note the strained quartz, lithic clasts with ferruginous alteration and moderately strained polycrystalline quartzite seen within the range.

Cross Polarized Light, **25X.**

Material Test Report

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

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Grant Burgess
Geologist

NATA Accredited Laboratory Number: 14975

Report Number: **P20023-9A**
Issue Number: 1
Date Issued: 15/01/2025
Client: Macka's Sand Pty Ltd
2684 Nelson Bay Road, Salt Ash NSW 2318
Contact: Brett
Project Number: P20023
Project Name: Materials Testing - Screened Sand
Project Location: Williamtown Quarry - Site 218
Work Request: 17728
Sample Number: 24-17728A
Date Sampled: 16/12/2024
Dates Tested: 17/12/2024 - 07/01/2025
Sampling Method: AS 1141.3.1 9.4 - Sampling aided by power equipment - other than backblading method
Preparation Method: In accordance with the test method
Material: Screened Dune Sand
Material Source: Macka's Sand - Williamtown Site 218

Flow Time and Voids Content (RMS T279)				Min	Max
Proportion of Oversize (%)		0			
Measurement	1	2	3		
Flow Time (s)	18.9	18.9	19.0		
Average Flow Time (s)		**18.9**			
Dry Density (kg/m^3)		2638			
Air Voids (%)	44.5	44.5	44.5		
Average Air Voids (%)		**44.5**			