Attachment 11:

Research on finding a suitable material for Otta Sealing works in Narrandera Region

Table 1 presents the specification for gravel to be used for Otta Seal.

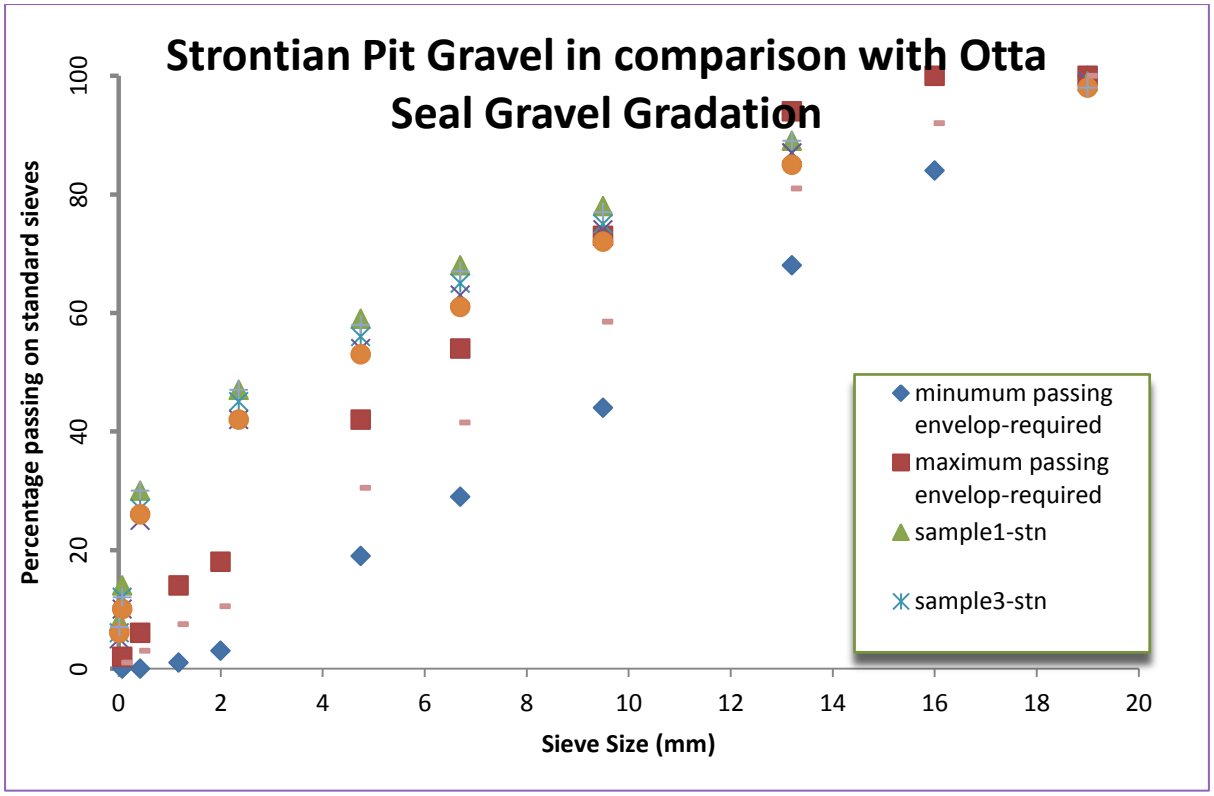
Otta Seal specification from Nepal funded by Asian Development Bank

sieve size	% passing		
mm	min (mm)	max (mm)	average (mm)
19	100	100	100
16	84	100	92
13.2	68	94	81
9.5	44	73	58.5
6.7	29	54	41.5
4.75	19	42	30.5
2	3	18	10.5
1.18	1	14	7.5
0.425	0	6	3
0.075	0	2	1

Various gravel sources were compared to the specification to identify suitability for Otta Seal works.

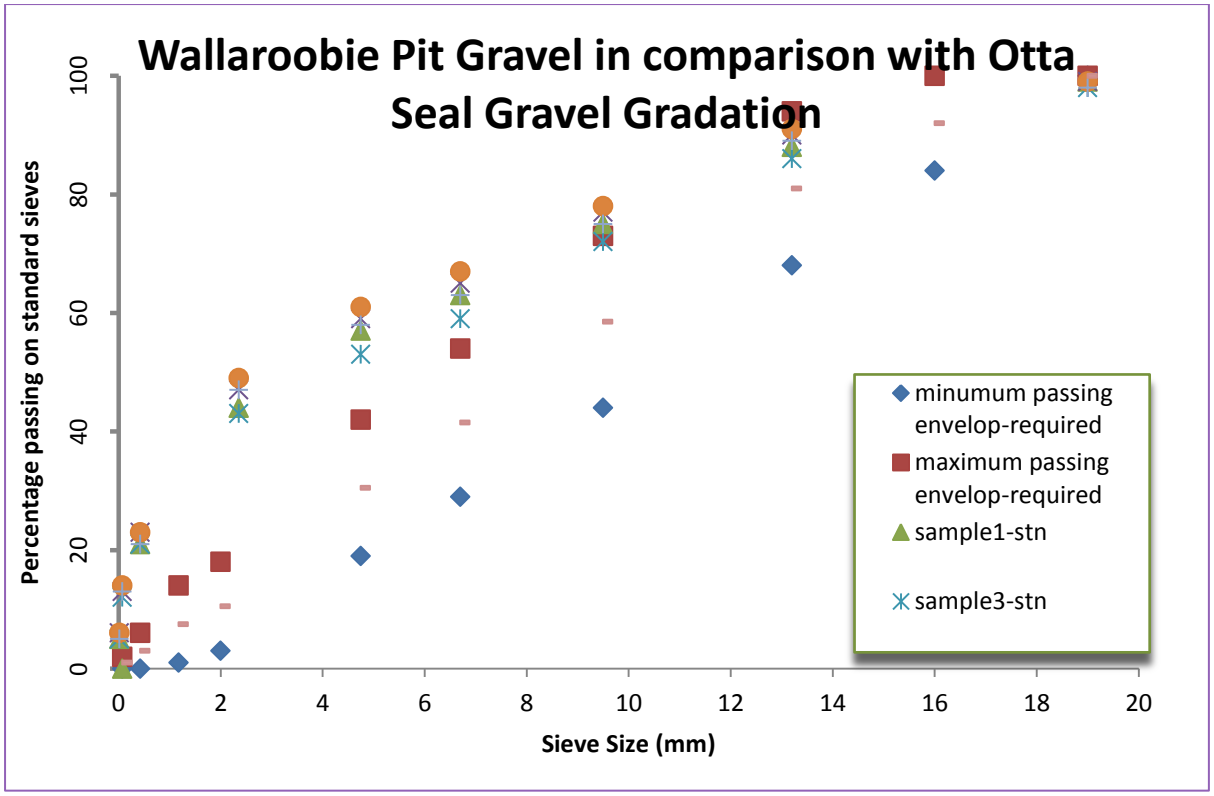
Strontian Quarry Sieve Analysis

	Passing % from various sieve size				
Sample/Sieve (mm)	**1**	**2**	**3**	**4**	**5**
19	99	99	99	98	98
13.2	89	87	87	85	89
9.5	78	74	75	72	77
6.7	68	63	65	61	67
4.75	59	54	56	53	58
2.36	47	42	45	42	47
0.425	30	25	27	26	30
0.075	14	10	12	10	12
0.0135	8	5	6	6	7



Walleroobie Quarry Sieve Analysis

	Passing % from various sieve size				
Sample/Sieve (mm)	**1**	**2**	**3**	**4**	**5**
19	99	99	98	99	98
13.2	88	90	86	91	89
9.5	75	77	72	78	75
6.7	63	65	59	67	63
4.75	57	59	53	61	58
2.36	44	47	43	49	47
0.425	21	23	21	23	21
0.075		13	12	14	13
0.0135	5	6	5	6	5


Wallaroobie Pit Gravel in comparison with Otta Seal Gravel Gradation
Percentage passing on standard sieves
0
20
40
60
80
100
0
2
4
6
8
10
12
14
16
18
20
Sieve Size (mm)
minumum passing envelop-required
maximum passing envelop-required
sample1-stn
sample3-stn

Aitken Rowe Test Results:

AITKEN ROWE Testing Laboratories Pty Ltd
4/2 Riedell St. Wagga Wagga N.S.W. 2650

PAGE: 1
OF: 1

TEST REPORT
PAVEMENT MATERIALS, FILL, SUBGRADE AND SOILS

CLIENT : MILBRAE QUARRIES - LEETON
JOB DESCRIPTION : QUALITY ASSURANCE TESTING

SUBMITTED BY : ARTL
DATE SAMPLED: 14/02/2014
DATE SUBMITTED: 14/02/2014
QUANTITY REP.: 4000t
SAMPLING METHOD: AS1141.3.1
SAMPLING CLAUSE: 9.4
SPECIFICATION: RMS 3051

MATERIAL SOURCE : STRONTIAN PIT
PROPOSED USE : DGS20(C)
MATERIAL TYPE : SANDSTONE

LOT No.: *
TRAFFIC CATEGORY: C
ORDER No.: *

REGISTRATION No : R31 S14-048

		SAMPLE NUMBER :			1	2	3	4	5
		SITE OR CHAINAGE (m) :			*	*	*	*	*
		DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :			*	*	*	*	*
		PRETREATMENT METHOD AND CONDITIONS:			T102 CA3	T102 CA3	T102 CA3	T102 CA3	T102 CA3
TESTS		SPECIFIED LIMITS LISTED BELOW FOR :	MIN.	MAX.	*	*	*	*	*
T106		PASS 75.0mm SIEVE %	*	*	*	*	*	*	*
		PASS 53.0mm SIEVE %	*	*	*	*	*	*	*
		PASS 37.5mm SIEVE %	*	*	*	*	*	*	*
		PASS 26.5mm SIEVE %	100	*	100	100	100	100	100
		PASS 19.0mm SIEVE %	95	100	99	99	99	98	98
		PASS 13.2mm SIEVE %	70	90	89	87	87	85	89
		PASS 9.50mm SIEVE %	58	80	78	74	75	72	77
		PASS 6.70mm SIEVE %	*	*	68	63	65	61	67
		PASS 4.75mm SIEVE %	43	65	59	54	56	53	58
		PASS 2.36mm SIEVE %	30	55	47	42	45	42	47
T107	WHOLE	PASS 425 µm SIEVE %	10	30	30	25	27	26	30
	SAMPLE	PASS 75 µm SIEVE %	4	17	14	10	12	10	12
		LESS THAN 13.5 µm %	2	10	8	5	6	6	7
T107		PASS 425 µm SIEVE %	*	*	64	60	59	61	65
	-2.36mm	PASS 75 µm SIEVE %	*	*	30	24	27	24	25
		LESS THAN 13.5 µm %	*	*	16	13	14	15	16
		OBSERVATIONS	*	*	*	*	*	*	*
T106/T107		PASS 37.5mm, RET. 26.5mm SIEVE %	*	*	*	*	*	*	*
		PASS 26.5mm, RET. 19.0mm SIEVE %	*	*	1	2	1	2	2
		PASS 19.0mm, RET. 13.2mm SIEVE %	*	*	9	12	12	13	10
		PASS 13.2mm, RET. 9.5mm SIEVE %	*	*	11	13	12	13	11
		PASS 9.5mm, RET. 4.75mm SIEVE %	*	*	20	20	19	19	19
		PASS 4.75mm, RET. 2.36mm SIEVE %	*	*	12	12	11	11	12
		PASS 2.36mm, RET 425 µm SIEVE %	*	*	17	17	19	16	16
		PASS 425 µm, RET. 75 µm SIEVE %	*	*	16	15	14	15	19
		PASS 75 µm, GREATER THAN 13.5 µm %	*	*	6	5	6	4	4
T108		LIQUID LIMIT %	*	23	21	20	19	20	20
T109		PLASTIC LIMIT %	*	20	16	16	16	16	16
T109		PLASTICITY INDEX	*	10	5	4	3	4	4
		PREPARATION METHOD	*	*	AS1289.1.1-5.3	AS1289.1.1-5.3	AS1289.1.1-5.3	AS1289.1.1-5.3	AS1289.1.1-5.3
T112		MODIFIED MAX. DRY DENSITY (1L MOULD, A.1ii) t/m^3	*	*	*	*	*	*	*
		OPTIMUM MOISTURE CONTENT %	*	*	*	*	*	*	*
T213		PARTICLE SHAPE (2:1) % MISSHAPEN	*	35	21	*	*	*	*
T215		SIZE OF TEST PORTION (mm)	*	*	-19.0+9.5	*	*	*	*
(Duplicate)		SIZE OF TEST CYLINDER (mm)	*	*	150x115	*	*	*	*
		DRY STRENGTH kN	*	*	199	*	*	*	*
		WET STRENGTH kN	50	*	123	*	*	*	*
		WET/DRY STRENGTH VARIATION%	40	*	39	*	*	*	*

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Number: 4679

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*
*

All samples are oven dried and dry sieved during preparation unless otherwise stated

APPROVED SIGNATORY : ..... DATE: 19/02/2014

Gary Lyons

Form R31 Revised 24/12/2013

AITKEN ROWE Testing Laboratories Pty Ltd

4/2 Riedell St. Wagga Wagga N.S.W. 2650

TEST REPORT

PAVEMENT MATERIALS, FILL, SUBGRADE AND SOILS

CLIENT : MILBRAE QUARRIES - LEETON

JOB DESCRIPTION : QUALITY ASSURANCE TESTING OF QUARRY PRODUCTS

PAGE: 1
OF: 1
SUBMITTED BY : ARTL
DATE SAMPLED: 15/06/2015
DATE SUBMITTED: 15/06/2015
QUANTITY REP.: 4000t
SAMPLING METHOD: AS1141.3.1
SAMPLING CLAUSE: 9.4
SPECIFICATION: RMS 3051

MATERIAL SOURCE : WALLEROOBIE QUARRY
PROPOSED USE : DGB20HD
MATERIAL TYPE : PORPHRY

LOT No.: RB180
TRAFFIC CATEGORY: A
ORDER No.: 21134

REGISTRATION No : R31 S15-235

					SAMPLE NUMBER :	1246	1247	1248	1249	1250
					SITE OR CHAINAGE (m) :	*	*	*	*	*
					DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :	*	*	*	*	*
					PRETREATMENT METHOD AND CONDITIONS:	T102 CA3	T102 CA3	T102 CA3	T102 CA3	T102 CA3
TESTS			SPECIFIED LIMITS LISTED BELOW FOR :	MIN.	MAX.	*	*	*	*	*
T106			PASS 75.0mm SIEVE %	*	*	*	*	*	*	*
			PASS 53.0mm SIEVE %	*	*	*	*	*	*	*
			PASS 37.5mm SIEVE %	*	*	*	*	*	*	*
			PASS 26.5mm SIEVE %	100	*	100	100	100	100	100
			PASS 19.0mm SIEVE %	95	100	99	99	98	99	98
			PASS 13.2mm SIEVE %	78	92	88	90	86	91	89
			PASS 9.50mm SIEVE %	63	83	75	77	72	78	75
			PASS 6.70mm SIEVE %	*	*	63	65	59	67	63
			PASS 4.75mm SIEVE %	44	64	57	59	53	61	58
			PASS 2.36mm SIEVE %	33	49	44	47	43	49	47
T107		WHOLE	PASS 425 µm SIEVE %	14	23	21	23	21	23	21
		SAMPLE	PASS 75 µm SIEVE %	7	14	11	13	12	14	13
			LESS THAN 13.5 µm %	3	7	5	6	5	6	5
T107			PASS 425 µm SIEVE %	*	*	48	49	48	46	44
		-2.36mm	PASS 75 µm SIEVE %	*	*	26	28	28	28	27
			LESS THAN 13.5 µm %	*	*	12	13	12	13	11
			OBSERVATIONS	*	*	*	*	*	*	*
T106/T107			PASS 37.5mm, RET. 26.5mm SIEVE %	*	*	0	0	0	0	0
			PASS 26.5mm, RET. 19.0mm SIEVE %	*	*	1	1	2	1	2
			PASS 19.0mm, RET. 13.2mm SIEVE %	7	17	11	9	12	8	9
			PASS 13.2mm, RET. 9.5mm SIEVE %	8	16	13	13	14	13	14
			PASS 9.5mm, RET. 4.75mm SIEVE %	14	24	18	18	18	17	17
			PASS 4.75mm, RET. 2.36mm SIEVE %	8	18	13	12	10	12	11
			PASS 2.36mm, RET 425 µm SIEVE %	14	28	23	24	22	26	26
			PASS 425 µm, RET. 75 µm SIEVE %	6	13	10	10	9	9	8
			PASS 75 µm, GREATER THAN 13.5 µm %	3	7	6	7	7	7	7
T108			LIQUID LIMIT %	*	20	19	21	19	21	20
T109			PLASTIC LIMIT %	*	20	17	16	17	17	18
T109			PLASTICITY INDEX	2	6	2	5	2	4	2
(AIR DRIED)			PREPARATION METHOD	*	*	AS1289.1.1-5.3	AS1289.1.1-5.3	AS1289.1.1-5.3	AS1289.1.1-5.3	AS1289.1.1-5.3
T112			MODIFIED MAX. DRY DENSITY (1L MOULD, A.1ii) t/m^3	*	*	2.29	*	*	*	*
			OPTIMUM MOISTURE CONTENT %	*	*	5.6	*	*	*	*
T213			PARTICLE SHAPE (2:1) % MISSHAPEN	*	35	17	*	*	*	*
T215			SIZE OF TEST PORTION (mm)	*	*	-19+9.5	*	*	*	*
(Duplicate)			SIZE OF TEST CYLINDER (mm)	*	*	150x115	*	*	*	*
			DRY STRENGTH kN	*	*	284	*	*	*	*
			WET STRENGTH kN	100	*	245	*	*	*	*
			WET/DRY STRENGTH VARIATION%	*	35	14	*	*	*	*
AS1289.6.7.2			(FALLING HEAD) COEFFICIENT OF PERMEABILITY m/sec.	*	5x10-8	4×10^{-8}	*	*	*	*
			LABORATORY MOISTURE RATIO %	*	*	100	*	*	*	*
			LABORATORY DENSITY RATIO %	*	*	98	*	*	*	*