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TEST CERTIFICATE
SUMMARY OF CHEMICAL TESTS
BS 1377 : Part 3 1990



Report No. : J9007-04.86

Customer : EPD
 Agreement No. CE 26/2022(EP)
 Project : Development of Integrated Waste Management Facilities Phase 2 - IDC


Job No. : J9007
 Contract No. : GE/2022/04


Service Order No. : GE/2022/04.086
 Date : 04/03/2024

Borehole No.	Sample			Clause			Dry Mass Of Original Sample Passing 2mm Test Sieve (%)	Preparation Method	Description
				6	-				
No.	No.	Type	Depth (m)	Titration Carbonate Content CO ₂ (%)	Chloride Content (Mohr's method) ppm				
BH1	6	M	4.00 - 5.00	1.1			84	O.D.	Dark grey, gravelly, very silty SAND
BH2	15	M	11.40 - 12.40	0.65			92	O.D.	Dark grey, clayey, gravelly, silty SAND with shell fragments
BH3	16	M	7.90 - 8.90	4.2			100	O.D.	Dark grey, slightly sandy SILT
BH4	21	M	11.10 - 12.10	3.6			100	O.D.	Grey, slightly sandy SILT

Symbols : U - Undisturbed Sample; W - Water Sample; SPTL - SPT Split-Barrel Sample; A.R. - As Received;
 LB - Large Disturbed Sample; P - Piston Sample; D - Small Disturbed Sample; A.D. - Air Dried;
 BLK - Block Sample; M - Mazier Sample; IS - Insufficient Sample; O.D. - Oven Dried;
 W.S. - Wet Sieved.

Notes: 1. This test report is a simplified report and full details of the report are available from the laboratory, unless it is prohibited by law.
 2. This is an electronic test report. For any enquiries related to this report, please contact Public Works Laboratories (PWL).

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 Choy Chi Kit
 Senior Laboratory Supervisor

**TEST CERTIFICATE
SUMMARY OF CHEMICAL TESTS
GEOSPEC 3 : 2001**



Report No. : J9007-04.86

Customer : EPD

Job No. : J9007

Service Order No. : GE/2022/04.086

Agreement No. CE 26/2022(EP)

Project : Development of Integrated Waste Management Facilities Phase 2 - IDC


Contract No.: GE/2022/04


Date : 04/03/2024

Borehole No.	Sample			Test Method							Dry Mass Of Original Sample Passing 2mm Test Sieve (%)	Preparation Method	Description	Sample Origin
				9.1	9.2	9.3			9.4	9.5				
	No.	Type	Depth (m)	Organic Matter Content (%)	Mass Loss On Ignition (%)	Acid Soluble Sulphate Content (%)	Water Soluble Sulphate Content (%)	Ground Water Sulphate Content (g/L)	Water Soluble Chloride Content (%)	pH Value				
BH1	6	M	4.00 - 5.00	1.0	1.5	0.12	0.03		<0.01		84	O.D.	Dark grey, gravelly, very silty SAND	FILL †
BH1	6	M	4.00 - 5.00							7.4	84	A.D.	Dark grey, gravelly, very silty SAND	FILL †
BH2	15	M	11.40 - 12.40	0.5	1.2	0.14	0.03		0.11		92	O.D.	Dark grey, clayey, gravelly, silty SAND with shell fragments	FILL †
BH2	15	M	11.40 - 12.40							7.7	92	A.D.	Dark grey, clayey, gravelly, silty SAND with shell fragments	FILL †
BH3	16	M	7.90 - 8.90	1.7	3.3	0.61	0.28		0.22		100	O.D.	Dark grey, slightly sandy SILT	FILL †
BH3	16	M	7.90 - 8.90							7.5	100	A.D.	Dark grey, slightly sandy SILT	FILL †
BH4	21	M	11.10 - 12.10	1.4	4.2	0.53	0.22		1.05		100	O.D.	Grey, slightly sandy SILT	FILL †
BH4	21	M	11.10 - 12.10							7.6	100	A.D.	Grey, slightly sandy SILT	FILL †

Symbols : U - Undisturbed Sample; P - Piston Sample; A.R. - As Received; Sampling History - Refer the Individual Test Report;
 LB - Large Disturbed Sample; M - Mazier Sample; H.P. - Hand Picked; Estimated Uncertainty - Refer the Individual Test Report.
 BLK - Block Sample; SPTL - SPT Split-Barrel Sample; A.D. - Air Dried; † - Information provided by customer.
 W - Water Sample; D - Small Disturbed Sample; O.D. - Oven Dried; IS - Insufficient Sample;
 W.S. - Wet Sieved; Tf - To Follow on supplementary Report.

Notes: 1. This test report is a simplified report and full details of the report are available from the laboratory, unless it is prohibited by law.
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Technology Centre

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**TEST CERTIFICATE
SUMMARY OF ELECTRO-CHEMICAL TEST RESULT
BS 1377 : Part 3 : 1990**



Report No : J9007-04.86

Customer : EPD

Job No. : J9007

Service Order No. : GE/2022/04.086

Agreement No. CE 26/2022(EP)

Project : Development of Integrated Waste Management Facilities Phase 2 - IDC

Contract No.: GE/2022/04


Date : 04/03/2024

Borehole No.	Sample			Soil Resistivity (Clause : 10.2 / 10.4 *)			Redox Potential (Method :11) (mV)	Preparation Method	Description	Sample Origin
	No.	Type	Depth (m)	Soil Resistivity r_s ($\Omega.m$)	Resistivity Corrected to 20°C r_{20} ($\Omega.m$)	Moisture Content (%)				
BH1	6	M	4.00 - 5.00	32 / 32 [▲]	32 / 32 [▲]	48	-	R	Dark grey, gravelly, very silty SAND	FILL [‡]
BH2	15	M	11.40 - 12.40	2.0 / 2.0 [▲]	2.0 / 2.0 [▲]	36	-	R	Dark grey, clayey, gravelly, silty SAND with shell fragments	FILL [‡]
BH3	16	M	7.90 - 8.90	4.0 / 4.0 [▲]	4.0 / 4.0 [▲]	77	-	R	Dark grey, slightly sandy SILT	FILL [‡]
BH4	21	M	11.10 - 12.10	1.0 / 1.0 [▲]	1.0 / 1.0 [▲]	72	-	R	Grey, slightly sandy SILT	FILL [‡]

Symbols : U - Undisturbed Sample; P - Piston Sample; A.D. - Air Dried; Sampling History - Refer the Individual Test Report.
 LB - Large Disturbed Sample; M - Mazier Sample; A.R. - As Received; Estimated Uncertainty - Refer the Individual Test Report.
 BLK - Block Sample; D - Small Disturbed Sample; O.D. - Oven Dried; ‡ - Information provided by customer.
 SPTL - SPT Split-Barrel Sample; ▲ - Initially/After 1 hour; R - Remould Sample. * - Delete as Appropriate.

Notes: 1. This test report is a simplified report and full details of the report are available from the laboratory, unless it is prohibited by law.
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TEST CERTIFICATE
SUMMARY OF SOIL CLASSIFICATION TEST RESULT
GEOSPEC 3 : 2001



Report No : J9007-04.86

Customer : EPD

Job No. : J9007

Service Order No. : GE/2022/04.086

Agreement No. CE 26/2022(EP)

Project : Development of Integrated Waste Management Facilities Phase 2 - IDC

Contract No.: GE/2022/04

Date : 04/03/2024

Borehole No.	Sample			Δ Moisture Content (%)	Test 6.1 Liquid Limit (%)	Test 6.1 Plastic Limit (%)	Test 6.1 Plasticity Index (%)	Test 6.2 Liquidity Index (%)	Passing 425µm Test Sieve (%)	Preparation Method	Particle Size Distribution				Description	Sample Origin	
	No.	Type	Depth (m)								# Test Method	Percentage (%)					
												Gravel (%)	Sand (%)	Silt (%)			Clay (%)
BH1	6	M	4.00 - 5.00	58B		N.P.			58	W.S.	1,5,7	16	57	25	2	Dark grey, gravelly, very silty SAND	FILL ‡
BH1	14	M	8.60 - 9.60	64B [^]		N.P.			97	W.S.	1,5,7	1	30	67	2	Dark grey, slightly sandy SILT	FILL ‡
BH1	26	M	14.80 - 15.80	-		-					1,5,7	23	45	13	19	Brown, silty, very clayey, very gravelly SAND	FILL ‡
BH1	33	M	18.80 - 19.80	-		-					1,5,7	42	40	12	6	Light brown, clayey, silty, very sandy GRAVEL	CDG ‡
BH1	42	M	23.80 - 24.80	-		-					1,5,7	46	39	10	5	Light brown, clayey, silty, very sandy GRAVEL	CDG ‡
BH2	15	M	11.40 - 12.40	33B [^]		N.P.			83	W.S.	1,5,7	8	75	10	7	Dark grey, clayey, gravelly, silty SAND with shell fragments	FILL ‡
BH2	33	M	20.50 - 21.50	-		-					1,5,7	35	43	15	7	Pinkish brown, clayey, silty, very gravelly SAND	CDG ‡
BH2	45	M	26.50 - 27.50	-		-					1,5,7	38	40	14	8	Light brown, clayey, silty, very gravelly SAND	CDG ‡
BH3	16	M	7.90 - 8.90	82B [^]		N.P.			95	W.S.	1,5,7	0	22	74	4	Dark grey, slightly sandy SILT	FILL ‡
BH3	20	M	10.45 - 11.45	74B [^]		N.P.			95	W.S.	1,5,7	3	42	53	2	Dark grey, sandy SILT	FILL ‡

Legend : Test Method in accordance with GEOSPEC 3 : 2001 Test 5.1 Moisture Content at 45°C ± 5°C (A), Test 5.2 Moisture Content at 105°C ± 5°C (B), Test 5.3 Comparative Moisture Content 45/105°C ± 5°C (C)
 # = Test Method in accordance with GEOSPEC3 : 2001 Test 8.1 (1), 8.2 (2), 8.3 (3), 8.4 (4), 8.5 (5), 8.6 (6), 8.7 (7).

Symbols : U - Undisturbed Sample; P - Piston Sample; N.P. - Non Plastic; A.D. - Air Dried; Sampling History - Refer the Individual Test Report;
 LB - Large Disturbed Sample; M - Mazier Sample; A.R. - As Received; O.D. - Oven Dried; Estimated Uncertainty - Refer the Individual Test Report.
 BLK - Block Sample; D - Small Disturbed Sample; H.P. - Hand Picked; W.S. - Wet Sieved; ‡ - Information provided by customer.
 SPTL - SPT Split-Barrel Sample; PT - Portable triple tube Sample; ^ - Moisture Content for A.L. Test. IS - Insufficient Sample; Tf - To Follow on supplementary Report.

Notes: 1. This test report is a simplified report and full details of the report are available from the laboratory, unless it is prohibited by law.
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Technology Centre

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TEST CERTIFICATE
SUMMARY OF SOIL CLASSIFICATION TEST RESULT
GEOSPEC 3 : 2001



Report No : J9007-04.86

Customer : EPD

Job No. : J9007

Service Order No. : GE/2022/04.086

Agreement No. CE 26/2022(EP)

Project : Development of Integrated Waste Management Facilities Phase 2 - IDC

Contract No.: GE/2022/04

Date : 04/03/2024

Borehole No.	Sample			Δ Moisture Content (%)	Test 6.1 Liquid Limit (%)	Test 6.1 Plastic Limit (%)	Test 6.1 Plasticity Index (%)	Test 6.2 Liquidity Index	Passing 425µm Test Sieve (%)	Preparation Method	Particle Size Distribution				Description	Sample Origin	
	No.	Type	Depth (m)								# Test Method	Percentage					
												Gravel (%)	Sand (%)	Silt (%)			Clay (%)
BH3	27	M	14.55 - 15.55			-					1,5,7	30	50	11	9	Dark grey, clayey, silty, very gravelly SAND with shell fragments	ALL ‡
BH3	38	M	21.65 - 22.65	21A ^		N.P.			42	W.S.	1,5,7	37	37	20	6	Brown, clayey, very silty, very gravelly SAND	CDG ‡
BH4	13	M	7.10 - 8.10	64B ^		N.P.			94	W.S.	1,5,7	1	20	76	3	Grey, slightly sandy SILT	FILL ‡
BH4	21	M	11.10 - 12.10	77B ^		N.P.			95	W.S.	1,5,7	0	18	76	6	Grey, slightly sandy SILT	FILL ‡

Legend : Test Method in accordance with GEOSPEC 3 : 2001 Test 5.1 Moisture Content at 45°C ± 5°C (A), Test 5.2 Moisture Content at 105°C ± 5°C (B), Test 5.3 Comparative Moisture Content 45/105°C ± 5°C (C)
 # = Test Method in accordance with GEOSPEC3 : 2001 Test 8.1 (1), 8.2 (2), 8.3 (3), 8.4 (4), 8.5 (5), 8.6 (6), 8.7 (7).

Symbols : U - Undisturbed Sample; P - Piston Sample; N.P. - Non Plastic; A.D. - Air Dried; Sampling History - Refer the Individual Test Report;
 LB - Large Disturbed Sample; M - Mazier Sample; A.R. - As Received; O.D. - Oven Dried; Estimated Uncertainty - Refer the Individual Test Report.
 BLK - Block Sample; D - Small Disturbed Sample; H.P. - Hand Picked; W.S. - Wet Sieved; ‡ - Information provided by customer.
 SPTL - SPT Split-Barrel Sample; PT - Portable triple tube Sample; ^ - Moisture Content for A.L. Test; IS - Insufficient Sample; Tf - To Follow on supplementary Report.

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TEST CERTIFICATE

SUMMARY OF TRIAXIAL TEST RESULTS

GEOSPEC 3 : 2001



Report No.: J9007-04.86

Customer : EPD

Job No. : J9007

Service Order No. : GE/2022/04.086

Agreement No. CE 26/2022(EP)

Project : Development of Integrated Waste Management Facilities Phase 2 - IDC

Contract No.: GE/2022/04


Date : 04/03/2024

Borehole No.				Δ Initial Moisture Content (%)	Initial Bulk Density (Mg/m ³)	Initial Dry Density (Mg/m ³)	Particle Density		Triaxial Test					Failure Mode	Description	Sample Origin
	No.	Type	Depth (m)				+ Test Method	(Mg/m ³)	* Test Method	Axial Strain (%)	Corrected Deviator Stress (kN/m ²)	s' (kN/m ²)	t (kN/m ²)			
BH1	6	M	4.00 - 5.00	65B	1.49	0.90	2	2.23	2S	10.8	468	353	234	B	Dark grey, gravelly, very silty SAND	FILL †
BH1	14	M	8.60 - 9.60	75B	1.45	0.83	2	2.26	2MU	1.2 3.2 4.8	174 220 245	111 166 192	87 110 123	B	Dark grey, slightly sandy SILT	FILL †
BH1	26	M	14.80 - 15.80	23B	2.08	1.70	2	2.66	2MU	3.0 6.5 9.2	112 204 309	81 174 284	56 102 155	B	Brown, silty, very clayey, very gravelly SAND	FILL †
BH1	33	M	18.80 - 19.80	22A	2.01	1.66	2	2.59	2MU	3.4 7.9 11.2	244 496 657	187 403 562	122 248 329	IN	Light brown, clayey, silty, very sandy GRAVEL	CDG †
BH1	42	M	23.80 - 24.80	22A	2.04	1.68	2	2.63	2S	15.5	1051	850	525	IN	Light brown, clayey, silty, very sandy GRAVEL	CDG †
BH2	15	M	11.40 - 12.40	31B	1.93	1.48	2	2.65	2MU	3.7 9.0 14.8	60 134 230	47 110 197	30 67 115	IN	Dark grey, clayey, gravelly, silty SAND with shell fragments	FILL †
BH2	33	M	20.50 - 21.50	23A	2.03	1.65	2	2.66	2S	17.4	432	368	216	IN	Pinkish brown, clayey, silty, very gravelly SAND	CDG †
BH2	45	M	26.50 - 27.50	26A	1.98	1.57	2	2.63	2S	9.6	613	510	306	B	Light brown, clayey, silty, very gravelly SAND	CDG †


Legend : Δ = Test Method in accordance with GEOSPEC 3 : 2001 Test 5.1 Moisture Content at 45°C ± 5°C (A), Test 5.2 Moisture Content at 105°C ± 5°C (B), Test 5.3 Comparative Moisture Content 45/105°C ± 5°C (C)
 + = Test Method in accordance with GEOSPEC3 : 2001 Test 7.1 Gas Jar Method (1), Test 7.2 Small Pycnometer Method (2)
 * = Test Method in accordance with GEOSPEC3 : 2001 Test 15.1 Unconsolidation Undrained Method (1), Test 15.2 Consolidation Undrained Triaxial Method (2), Test 15.3 Consolidation Drained Triaxial Method (3)

Symbols : U - Undisturbed Sample; P - Piston Sample; S = Single Stage; Sampling History - Refer the Individual Test Report;
 LB - Large Disturbed Sample; M - Mazier Sample; MU = Multi - Stage; Estimated Uncertainty † - Refer the Individual Test Report.
 BLK - Block Sample; D - Small Disturbed Sample; B = Brittle Failure ‡ - Information provided by customer.
 IN = Intermediate Failure PL = Plastic Failure

Notes: 1. This test report is a simplified report and full details of the report are available from the laboratory, unless it is prohibited by law.
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TEST CERTIFICATE

SUMMARY OF TRIAXIAL TEST RESULTS

GEOSPEC 3 : 2001



Report No.: J9007-04.86

Customer : EPD

Job No. : J9007

Service Order No. : GE/2022/04.086

Agreement No. CE 26/2022(EP)

Project : Development of Integrated Waste Management Facilities Phase 2 - IDC

Contract No.: GE/2022/04

Date : 04/03/2024

Borehole No.				Δ Initial Moisture Content (%)	Initial Bulk Density (Mg/m ³)	Initial Dry Density (Mg/m ³)	Particle Density		Triaxial Test					Failure Mode	Description	Sample Origin
	No.	Type	Depth (m)				+ Test Method	(Mg/m ³)	* Test Method	Axial Strain (%)	Corrected Deviator Stress (kN/m ²)	s' (kN/m ²)	t (kN/m ²)			
BH3	16	M	7.90 - 8.90	86B	1.44	0.78	2	2.29	2MU	1.5 4.0 6.9	112 147 176	75 110 140	56 73 88	PL	Dark grey, slightly sandy SILT	FILL ‡
BH3	20	M	10.45 - 11.45	96B	1.40	0.71	2	2.27	2MU	2.3 8.1 13.0	76 94 149	53 77 128	38 47 74	PL	Dark grey, sandy SILT	FILL ‡
BH3	27	M	14.55 - 15.55	31B	1.93	1.48	2	2.67	2MU	4.6 9.6 12.7	69 165 278	49 125 218	35 83 139	IN	Dark grey, clayey, silty, very gravelly SAND with shell fragments	ALL ‡
BH3	38	M	21.65 - 22.65	18A	2.12	1.80	2	2.62	2S	20.1	501	446	251	IN	Brown, clayey, very silty, very gravelly SAND	CDG ‡
BH4	13	M	7.10 - 8.10	77B	1.45	0.82	2	2.20	2MU	4.4 8.7 11.9	119 144 167	78 107 136	60 72 83	PL	Grey, slightly sandy SILT	FILL ‡
BH4	21	M	11.10 - 12.10	79B	1.45	0.81	2	2.21	2S	6.3	164	129	82	B	Grey, slightly sandy SILT	FILL ‡

Legend : Δ = Test Method in accordance with GEOSPEC 3 : 2001 Test 5.1 Moisture Content at 45°C ± 5°C (A), Test 5.2 Moisture Content at 105°C ± 5°C (B), Test 5.3 Comparative Moisture Content 45/105°C ± 5°C (C)

+ = Test Method in accordance with GEOSPEC3 : 2001 Test 7.1 Gas Jar Method (1), Test 7.2 Small Pycnometer Method (2)

* = Test Method in accordance with GEOSPEC3 : 2001 Test 15.1 Unconsolidation Undrained Triaxial Method (1), Test 15.2 Consolidation Undrained Triaxial Method (2), Test 15.3 Consolidation Drained Triaxial Method (3)

Symbols : U - Undisturbed Sample; P - Piston Sample; S = Single Stage; Sampling History - Refer the Individual Test Report;
 LB - Large Disturbed Sample; M - Mazier Sample; MU = Multi - Stage; Estimated Uncertainty ‡ - Refer the Individual Test Report.
 BLK - Block Sample; D - Small Disturbed Sample; B = Brittle Failure ‡ - Information provided by customer.
 IN = Intermediate Failure PL = Plastic Failure

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TEST CERTIFICATE

SUMMARY OF UNIAXIAL COMPRESSION TEST RESULTS

ASTM D2938-95 (WITH MODIFICATION)



Report No. : J9007-04.86

Customer : EPD
 Agreement No. CE 26/2022(EP)

Job No. : J9007

Service Order No. : GE/2022/04.086

Project : Development of Integrated Waste Management Facilities Phase 2 - IDC


Contract No.: GE/2022/04

Date : 04/03/2024


Borehole No.	Sample			Test Method								Description
				ASTM D2938-95 (WITH MODIFICATION)								
	No.	Depth (m)	Specimen Depth (m)	Dia. (mm)	Height (mm)	Weight (g)	Bulk Density (Mg/m³)	L/D Ratio	Max. Load (kN)	Failure Stress (MPa)	Failure # mode	
BH4	-	24.85 - 25.51	24.97 - 25.15	83.1	176.8	2538	2.65	2.13	658.1	121.5	M + J	Grey, dappled white, mottled black, slightly decomposed, medium grained GRANITE

Symbols : 1. # : Failure mode : J = Joint failure, M = Material failure. 3. D = Specimen mean diameter.
 Failure location see attached the photograph of specimen after test 4. Moisture condition of sample: 1. As Received. 2. Saturated. 3. Air Dry. 4. Oven Dry *.
 2. L = Specimen mean length of height.

Notes: 1. This test report is a simplified report and full details of the report are available from the laboratory, unless it is prohibited by law.
 2. This is an electronic test report. For any enquiries related to this report, please contact Public Works Laboratories (PWL).

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SUMMARY OF ROCK TEST RESULTS



Report No. : J9007-04.86

Customer : EPD

Job No. : J9007

Service Order No. : GE/2022/04.086

Agreement No. CE 26/2022(EP)

Project : Development of Integrated Waste Management Facilities Phase 2 - IDC

Contract No.: GE/2022/04


Date : 04/03/2024

Borehole No.	Sample			ASTM D2938-95								ASTM D3148-96						Description
	No.	Depth (m)	Spec. Depth (m)	Dia. (mm)	Height (mm)	Weight (g)	Bulk Density (Mg/m ³)	L/D Ratio	Max. Load (kN)	Failure Stress (MPa)	Failure # mode	Modulus of elasticity			Poisson's ratio			
												Secant 0-50% (GPa)	Tangent 45-55% (GPa)	Average 30-70% (GPa)	Secant 0-50%	Tangent 45-55%	Average 30-70%	
BH4	-	24.85 - 25.51	24.97 - 25.15									47.6	52.9	52.8	0.14	0.19	0.19	Grey, dappled white, mottled black, slightly decomposed, medium grained GRANITE

Note : 1. #: Failure mode : J = Joint failure, M = Material failure. Failure location see attached the photograph of specimen after test
 2. L = Specimen mean length of height.
 3. D = Specimen mean diameter.
 4. Moisture condition of sample: 1. As Received. 2. Saturated. 3. Air Dry. 4. Oven Dry*.
 5. ** = Range of other percentages.

Notes: 1. This test report is a simplified report and full details of the report are available from the laboratory, unless it is prohibited by law.
 2. This is an electronic test report. For any enquiries related to this report, please contact Public Works Laboratories (PWL).

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