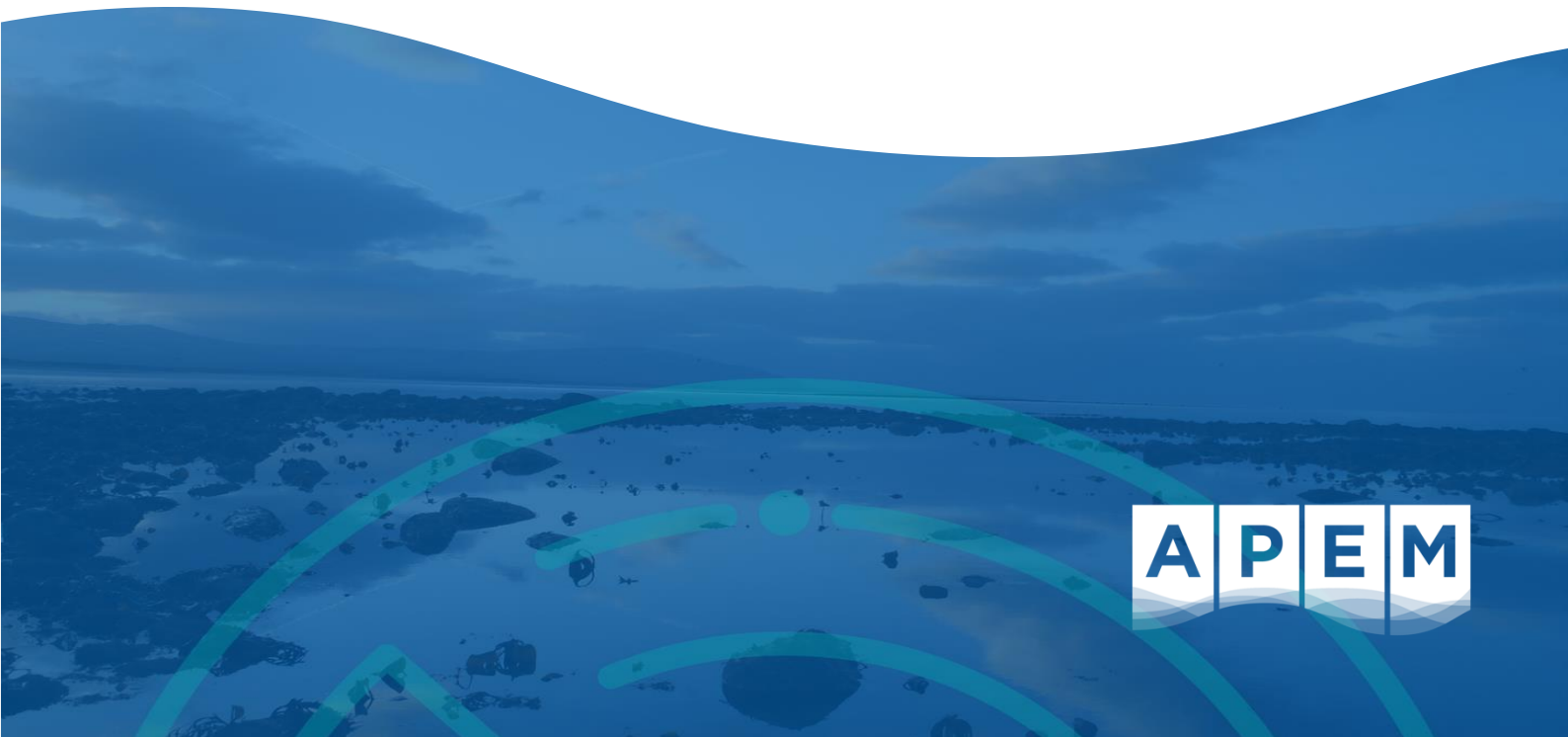
NMBAQC

NE Atlantic Marine Biological Analytical Quality Control Scheme

NMBAQC Scheme 2023/24

PS91 Report

Lydia McIntyre-Brown



Client: North East Atlantic Marine Biological Analytical Quality Control Scheme

Date of issue: 26/06/2024

Component Manager: Claire Mason (Cefas)

Project Manager: David Hall (Apem Ltd)

Component Administrator: Lydia McIntyre-Brown (Apem Ltd)

McIntyre-Brown, L. & Hall, D., 2024. National Marine Biological Analytical Quality Control Scheme. Particle Size Results: PS91 Report to the NMBAQC Scheme participants. Apem Report NMBAQCps91, 17pp, July 2024.

Revision and Amendment Register

Version Number	Date	Section(s)	Page(s)	Summary of Changes	Approved by
1.0	22/05/2024	All	All	Creation of Document	LMB
1.1	23/05/2024	All	All	Review of Document	DH
1.2	06/06/2024	2 & appendices	7 - 16	Update PSA_3011 results following re-submission	LMB

At the time of issue no data had been received from participants PSA_3009, PSA_3013 and PSA_30014.

Contents

List of Figures

List of Tables

Abbreviations

n/p – Not participating at the current time.

n/r – no response from participant/ no data submitted.

"-" – no data submitted.

1. BENCHMARK DATA

Table 1 Summary data for the Benchmark replicates distributed as PS91.

Sample	Method	% Gravel	% Sand	% Mud	Sediment Description
PSA_3036 BM REP 1	NMBAQC	43.32	51.48	5.20	Sandy Gravel
PSA_3037 BM REP2	NMBAQC	43.70	51.30	5.01	Sandy Gravel
PSA_3038 BM REP 3	NMBAQC	44.03	50.87	5.10	Sandy Gravel
PSA_3039 BM REP 4	NMBAQC	43.28	52.08	4.64	Sandy Gravel
PSA_3040 BM REP 5	NMBAQC	43.24	52.19	4.57	Sandy Gravel
BM Rep Average	NMBAQC	43.51	51.58	4.90	Sandy Gravel

Table 2 Summary of the sieve data the Benchmark replicates distributed as PS91.

Phi Interval; microns		PSA_3036 BM REP 1	PSA_3037 BM REP2	PSA_3038 BM REP 3	PSA_3039 BM REP 4	PSA_3040 BM REP 5	BM Rep Average
-6.50 to -6.00; 63 mm		0.00	0.00	0.00	0.00	0.00	0.00
-6.00 to -5.50; 45 mm		0.00	0.00	0.00	0.00	0.00	0.00
-5.50 to -5.00; 31.5 mm		0.00	0.00	0.00	0.00	0.00	0.00
-5.00 to -4.50; 22.4 mm		0.00	0.00	0.00	0.00	0.00	0.00
-4.50 to -4.00; 16 mm		0.00	0.00	0.00	0.00	0.00	0.00
-4.00 to -3.50; 11.2 mm		0.00	13.35	4.82	2.70	9.52	6.08
-3.50 to -3.00; 8 mm		120.55	121.13	118.97	126.43	115.47	120.51
-3.00 to -2.50; 5.6 mm		91.58	85.95	90.89	86.28	86.45	88.23
-2.50 to -2.00; 4 mm		69.81	69.86	71.51	69.00	70.49	70.13
-2.00 to -1.50; 2.8 mm		52.27	50.55	51.09	52.07	48.79	50.95
-1.50 to -1.00; 2 mm		61.35	60.33	60.76	60.30	65.67	61.68
-1.00 to -0.50; 1.4 mm		62.23	74.13	72.80	76.44	75.58	72.24
-0.50 to 0.00; 1.0 mm		154.56	151.40	144.56	150.06	150.36	150.19
>1.0mm		612.35	626.70	615.40	623.28	622.33	620.01
<1.0mm	Base Pan	81.26	45.13	69.42	50.76	63.73	62.06
	Oven dried	219.51	246.26	219.23	242.74	230.59	231.67
	Total	300.77	291.39	288.65	293.50	294.32	293.73
Total Weight		913.12	918.09	904.05	916.78	916.65	913.74

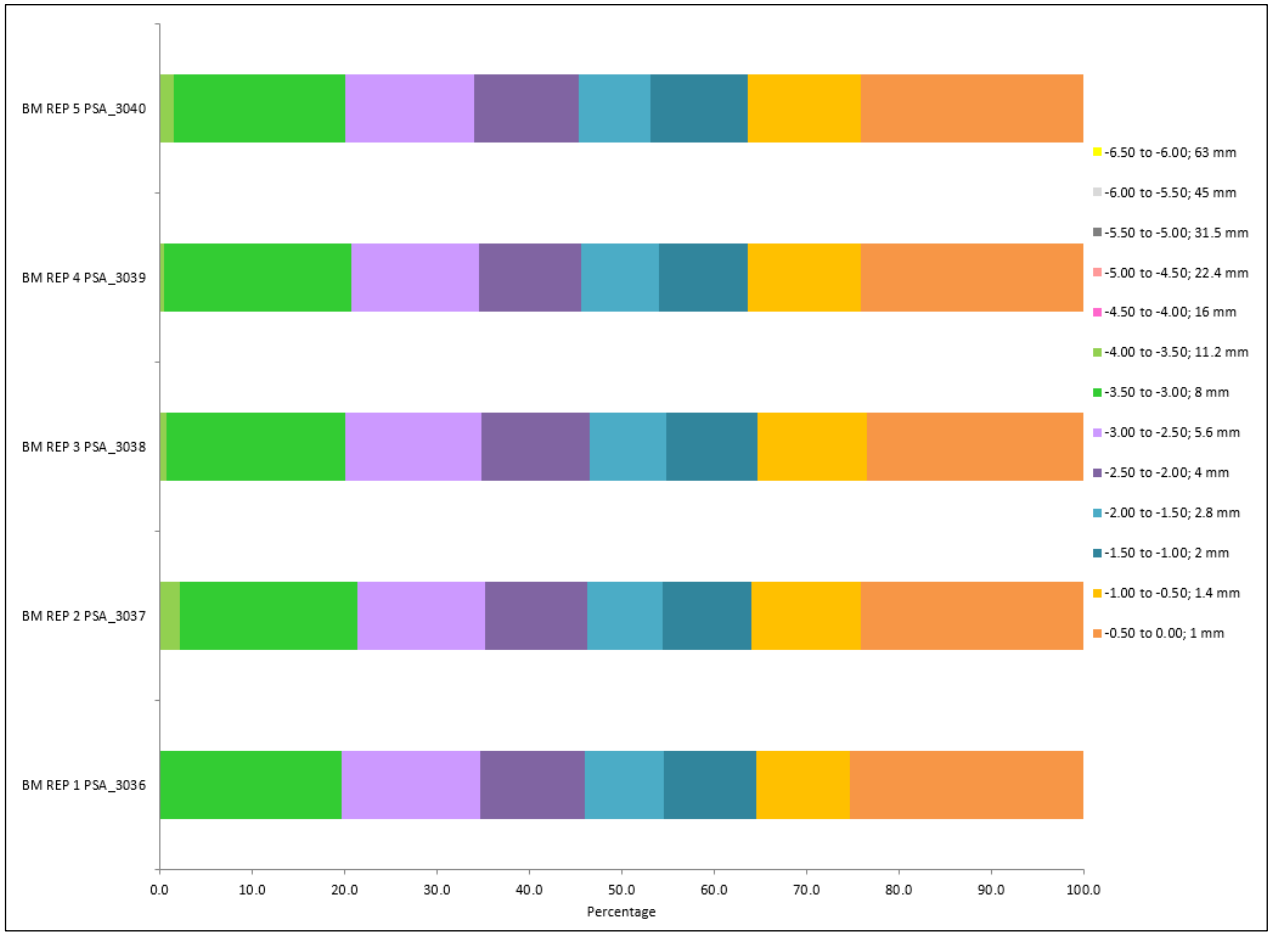


Figure 1 Particle size distribution curves resulting from final laser analysis of 5 replicate samples of sediment distributed as PS91 (Benchmark Data).

Table 3 Summary of the final laser data for the Benchmark replicates distributed as PS91.

Phi Interval; microns	PSA_3036 BM REP 1	PSA_3037 BM REP2	PSA_3038 BM REP 3	PSA_3039 BM REP 4	PSA_3040 BM REP 5	BM Rep Average
0.00 to 0.50; (707 µm)	40.47	39.73	40.74	41.86	42.76	41.11
0.50 to 1.00; (500 µm)	24.31	25.24	24.80	24.80	24.68	24.77
1.00 to 1.50; (353.6 µm)	8.03	8.05	7.99	7.89	8.03	8.00
1.50 to 2.00; (250 µm)	3.85	3.77	3.73	3.71	3.47	3.70
2.00 to 2.50; (176.8 µm)	2.83	2.67	2.45	2.68	2.59	2.64
2.50 to 3.00; (125 µm)	1.92	1.95	1.57	1.84	1.61	1.78
3.00 to 3.50; (88.39 µm)	1.69	1.62	1.65	1.60	1.52	1.61
3.50 to 4.00; (62.5 µm)	1.11	1.19	1.10	1.13	1.12	1.13
4.00 to 4.50; (44.19 µm)	1.18	1.15	1.18	1.11	1.10	1.14
4.50 to 5.00; (31.25 µm)	1.05	1.05	1.09	0.99	0.95	1.03
5.00 to 5.50; (22.097 µm)	1.33	1.28	1.42	1.17	1.19	1.28
5.50 to 6.00; (15.625 µm)	1.22	1.12	1.26	1.01	0.95	1.11
6.00 to 6.50; (11.049 µm)	1.86	1.78	1.94	1.58	1.55	1.74
6.50 to 7.00; (7.813 µm)	1.59	1.52	1.63	1.32	1.24	1.46
7.00 to 7.50; (5.524 µm)	1.68	1.66	1.71	1.47	1.41	1.58
7.50 to 8.00; (3.906 µm)	1.67	1.73	1.70	1.57	1.56	1.65
8.00 to 8.50; (2.762 µm)	0.99	1.06	0.99	0.99	0.97	1.00
8.50 to 9.00; (1.953 µm)	0.66	0.71	0.66	0.68	0.69	0.68
9.00 to 9.50; (1.381 µm)	0.63	0.68	0.62	0.65	0.67	0.65
9.50 to 10.00; (0.977 µm)	0.43	0.45	0.40	0.45	0.43	0.43
10.00 to 10.50; (0.691 µm)	0.22	0.22	0.21	0.23	0.22	0.22
10.50 to 11.00; (0.488 µm)	0.21	0.21	0.20	0.19	0.20	0.20
11.00 to 11.50; (0.345 µm)	0.29	0.31	0.27	0.25	0.28	0.28
11.50 to 12.00; (0.244 µm)	0.32	0.34	0.29	0.29	0.31	0.31
12.00 to 12.50; (0.173 µm)	0.24	0.25	0.22	0.24	0.24	0.24
12.50 to 13.00; (0.122 µm)	0.14	0.15	0.13	0.16	0.15	0.15
13.00 to 13.50; (0.086 µm)	0.06	0.06	0.06	0.09	0.07	0.07
13.50 to 14.00; (0.061 µm)	0.02	0.02	0.02	0.04	0.02	0.02
14.00 to 14.50; (0.043 µm)	0.00	0.00	0.00	0.01	0.00	0.00
>14.50; (0.01 µm)	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00
Mean	330.01	329.25	324.22	375.66	386.39	350.12
Sorting	4.27	4.30	4.32	3.90	3.84	4.10
Skewness	-0.78	-0.78	-0.79	-0.77	-0.78	-0.78
Kurtosis	2.14	2.21	2.26	2.50	2.68	2.35
Mode	Unimodal	Unimodal	Unimodal	Unimodal	Unimodal	Unimodal
Primary Mode	853.5	853.5	853.5	853.5	853.5	853.5

Table 4 Summary of Coefficient of Variation for Benchmark laser replicates for PS91.

		PSA_3036 BM REP 1	PSA_3037 BM REP2	PSA_3038 BM REP 3	PSA_3039 BM REP 4	PSA_3040 BM REP 5
D_{10}	Sub-sample 1	5.52	2.32	1.02	0.92	4.97
	Sub-sample 2	2.54	4.18	4.35	3.27	4.79
	Sub-sample 3	4.48	3.38	2.87	7.37	0.50
D_{50}	Sub-sample 1	0.57	0.25	0.28	0.54	0.22
	Sub-sample 2	0.93	0.17	0.50	0.07	0.60
	Sub-sample 3	0.39	0.07	0.99	0.69	0.11
D_{90}	Sub-sample 1	0.08	0.05	0.03	0.09	0.04
	Sub-sample 2	0.17	0.06	0.07	0.02	0.08
	Sub-sample 3	0.06	0.03	0.19	0.10	0.02

$$COV = \left(\frac{StDev}{Mean}\right) * 100$$

ISO 133020 defines good reproducibility when: COV is <3% for D50

COV is <5% for D10 and D90

All limits double when the D50 is <10microns.

In reality 3% and 5% are low and greater variability is expected for natural sediment samples therefore a maximum of 20% (based on three replicates being measured) will be used as a guide. **The Benchmark replicates show good reproducibility.**

Table 5 Laser Metadata for the Benchmark replicates for PS91**.**

	Benchmark Lab
Laser used:	Beckman Coulter LS 13320
Dispersion Unit:	Universal Liquid Module
Analysis model:	Mie
Dispersion Used	Water (RI – 1.33)
Particle Refractive Index	1.55
Particle Absorption Index:	0.1
Fines extension	PIDS system
Obscuration	10 - 12%
Pump Speed (% or rpm)	80%
Stirrer speed (% or rpm)	n/a
Ultrasonic duration	20
Ultrasonic level	2

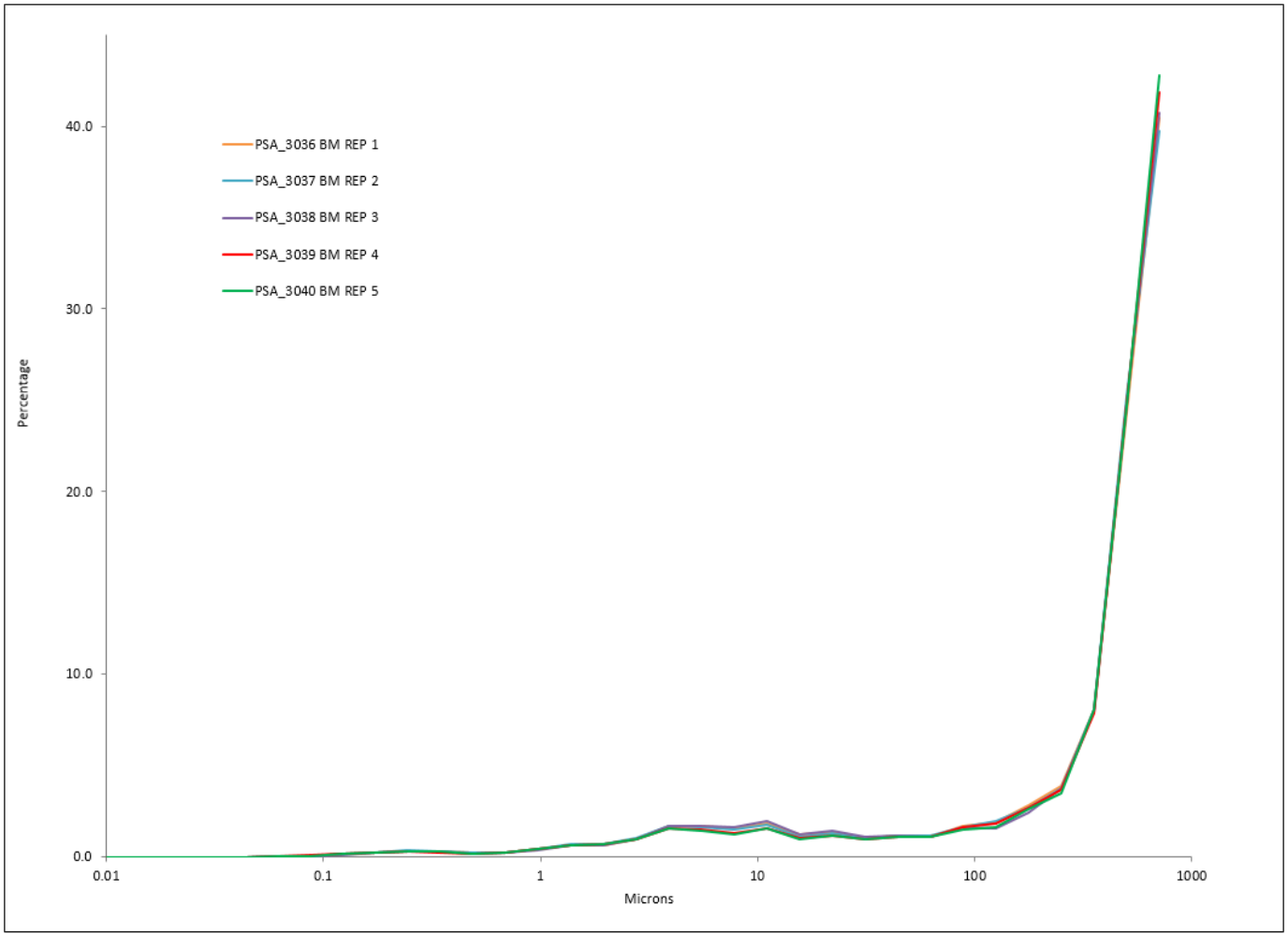


Figure 2 Particle size distribution curves resulting from final laser analysis of 5 replicate samples of sediment distributed as PS91 (Benchmark Data).

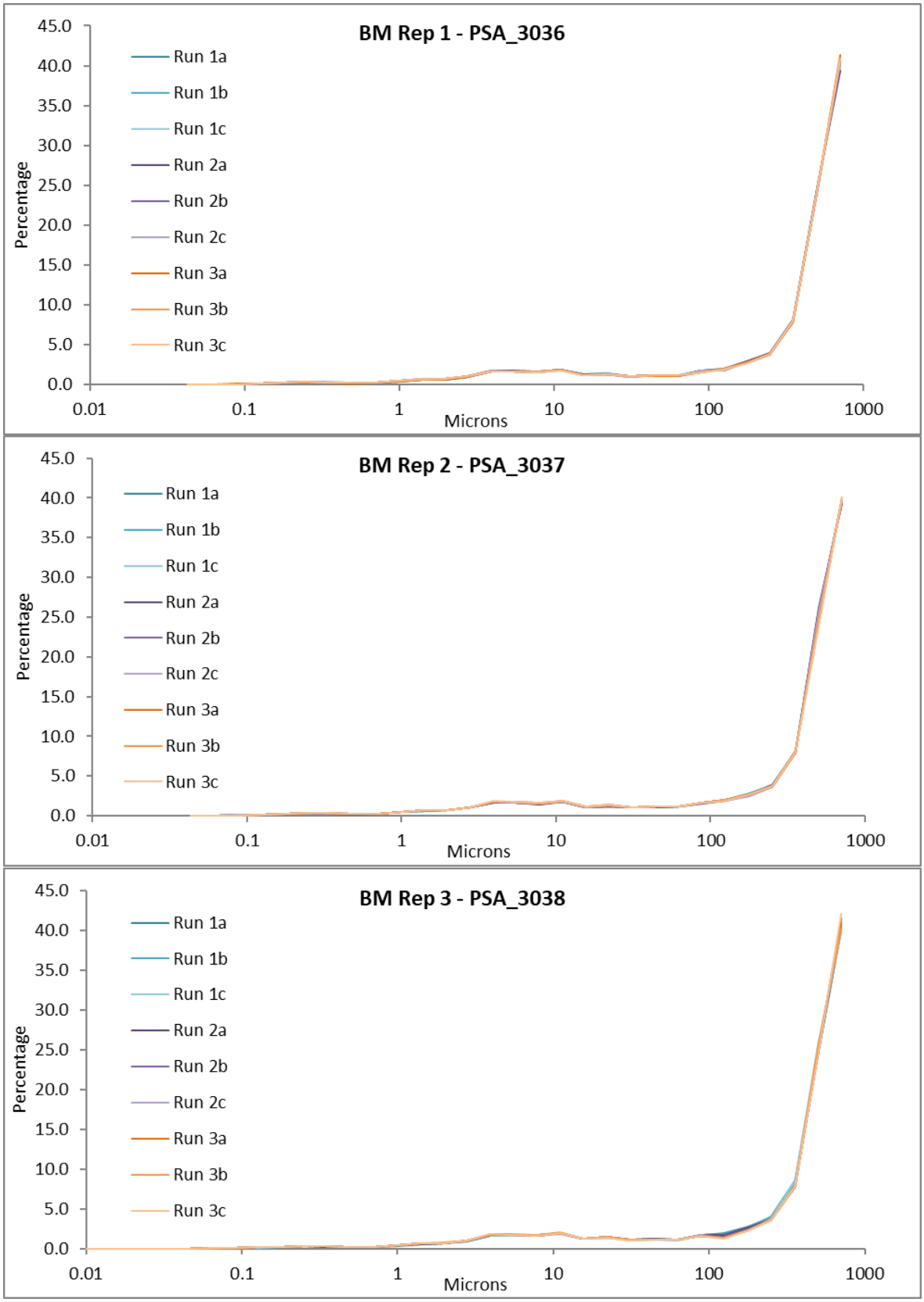


Figure 3 Particle size distribution curves resulting from laser analysis of five replicate samples of sediment distributed as PS91.

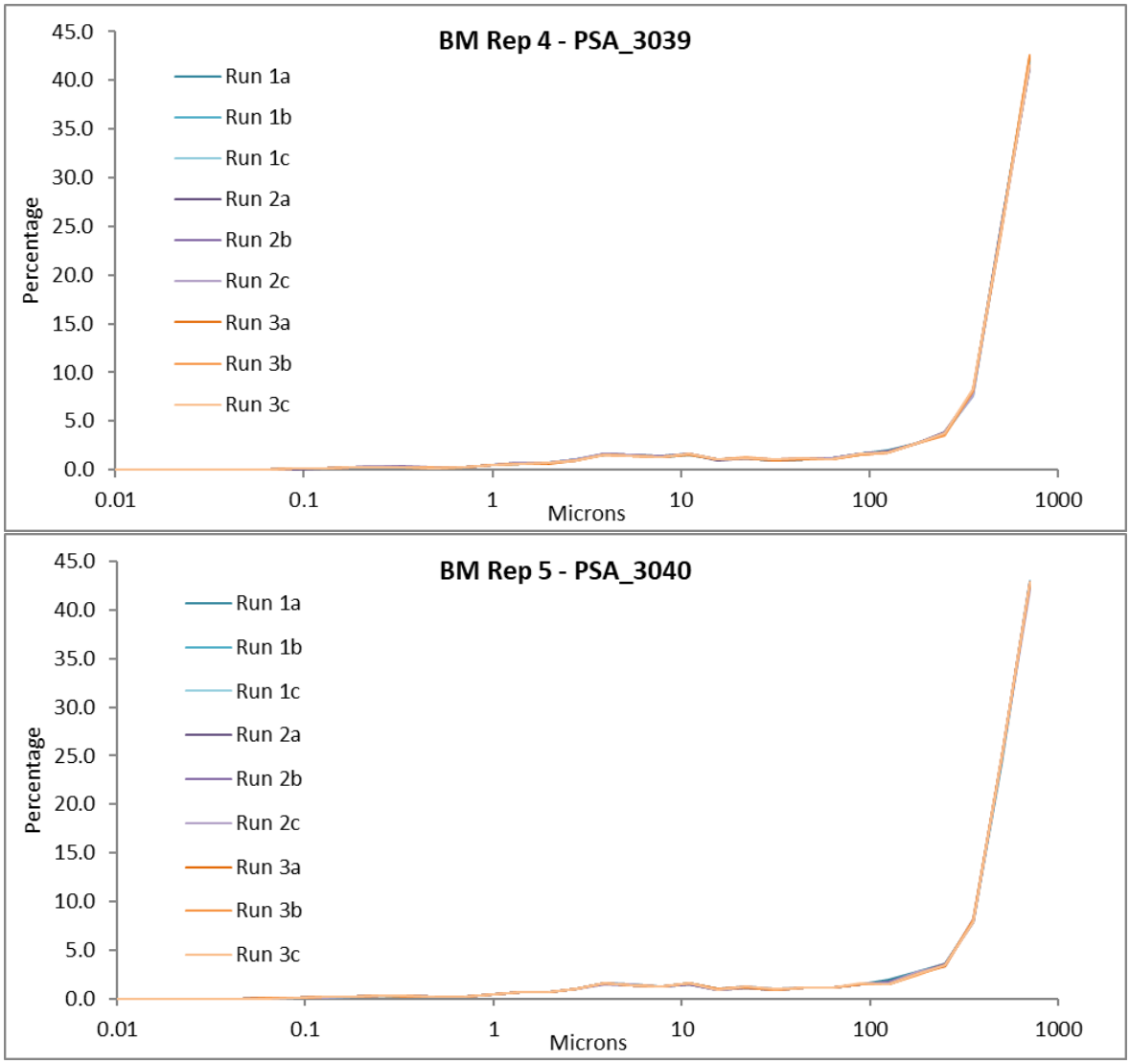


Figure 3 Particle size distribution curves resulting from laser analysis of five replicate samples of sediment distributed as PS91.

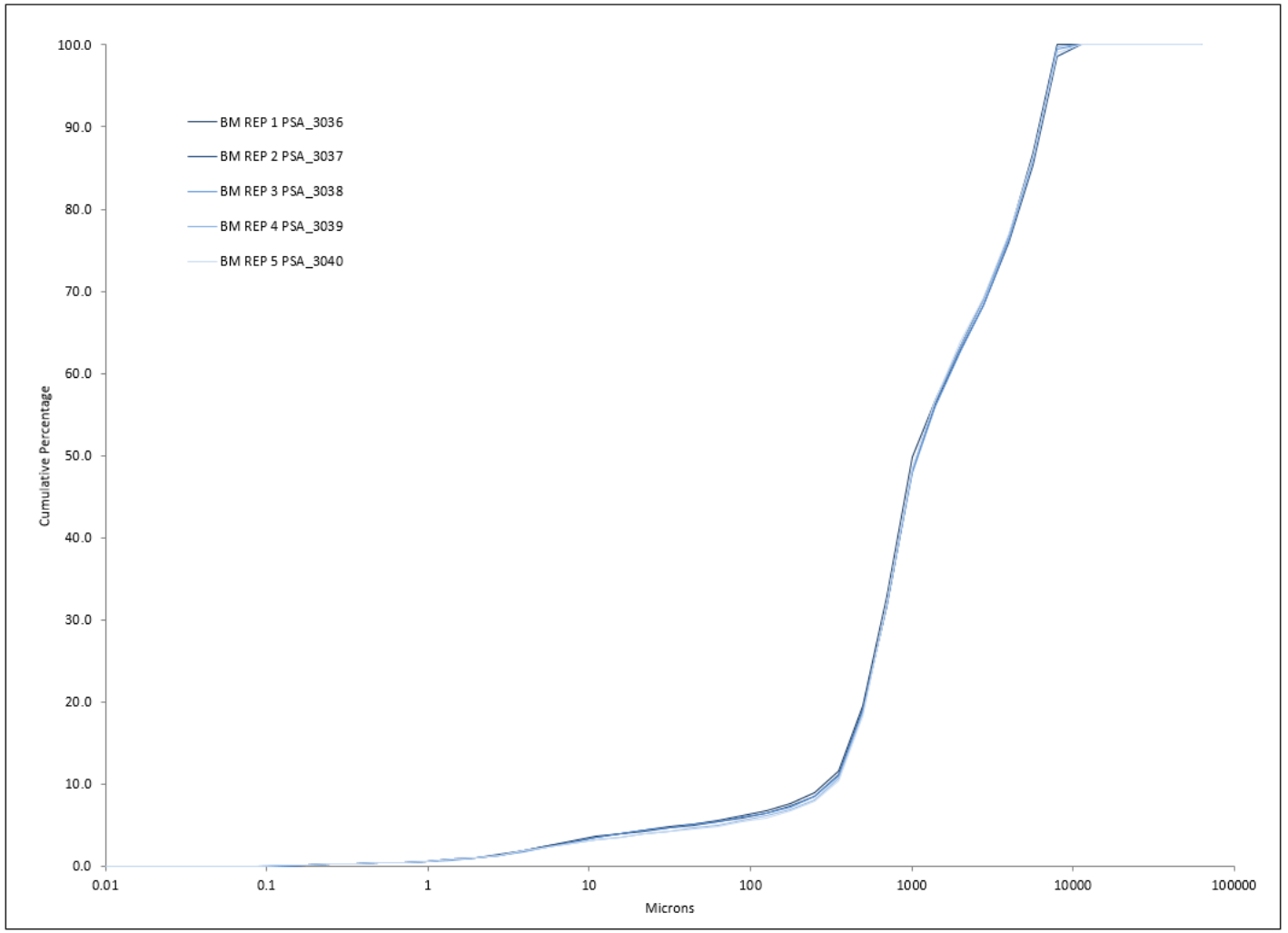


Figure 4 Particle size distribution curves resulting from analysis of 5 replicate samples of sediment distributed as PS91 (Benchmark Data).

2. PARTICIPANT DATA

Table 6 Summary of equipment and methods used by participants and sample summary data provided by participants for sediment distributed as PS91.

Lab	Equipment Used		Method Used	Chemical Dispersant	Peroxide pre-treatment	Summary Data			Sediment Description	
	Sieves	Laser				% Gravel	% Sand	% Mud	(post analysis)	Gradistat Textural Group
BM Average	Yes	Yes	NMBAQC	No	No	43.51	51.58	4.90	Sandy Gravel	Sandy Gravel
PSA_3001_a	Yes	Yes	NMBAQC	No	No	43.45	52.83	3.72	Sandy Gravel	Sandy Gravel
PSA_3001_b	Yes	Yes	NMBAQC	No	No	43.45	49.55	7.00	Muddy Sandy Gravel	Muddy Sandy Gravel
PSA_3002	Yes	Yes	OTHER	No	No	45.62	51.52	2.85	Sandy Gravel	Sandy Gravel
PSA_3003	Yes	Yes	NMBAQC	No	No	43.60	52.58	3.82	Sandy Gravel	Sandy Gravel
PSA_3004	Yes	Yes	NMBAQC	No	No	43.9	49.40	6.70	Muddy Sandy Gravel	Muddy Sandy Gravel
PSA_3005	Yes	Yes	NMBAQC	No	No	43.50	49.50	7.00	Muddy Sandy Gravel	Muddy Sandy Gravel
PSA_3006	Yes	Yes	NMBAQC	No	No	42.30	52.85	4.85	Sandy Gravel	Sandy Gravel
PSA_3007	Yes	Yes	OTHER	No	No	47.30	51.07	1.62	Sandy Gravel	Sandy Gravel
PSA_3008	Yes	Yes	NMBAQC	No	No	43.83	50.79	5.38	Sandy Gravel	Sandy Gravel
PSA_3009	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p
PSA_3010	Yes	Yes	NMBAQC	No	No	50.08	45.57	4.35	Sandy Gravel	Sandy Gravel
PSA_3011	Yes	Yes	NMBAQC	No	No	43.11	50.85	6.04	Muddy Sandy Gravel	Muddy Sandy Gravel
PSA_3012	Yes	Yes	NMBAQC	No	No	43.34	51.01	5.65	Sandy Gravel	Sandy Gravel
PSA_3013	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
PSA_3014	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p
PSA_3015	Yes	Yes	NMBAQC	No	No	43.93	45.07	11.00	Muddy Sandy Gravel	Muddy Sandy Gravel

Table 7 Summary of the sieve data provided by participants for sediment distributed as PS91.

Phi interval (explicit); Sieve mesh (mm)		Benchmark Average	PSA_3001_a	PSA_3002	PSA_3003	PSA_3004	PSA_3005	PSA_3006	PSA_3007
Sieves Used		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
-6.50 to -6.00; 63 mm		0.00	0.00	0.00			0.00	0.00	
-6.00 to -5.50; 45 mm		0.00	0.00	0.00			0.00	0.00	
-5.50 to -5.00; 31.5 mm		0.00	0.00	0.00			0.00	0.00	
-5.00 to -4.50; 22.4 mm		0.00	0.00	0.00	0.00		0.00	0.00	
-4.50 to -4.00; 16 mm		0.00	0.00	0.00	0.00		0.00	0.00	
-4.00 to -3.50; 11.2 mm		6.08	9.24	12.73	7.75	12.84	0.00	2.61	
-3.50 to -3.00; 8 mm		120.51	93.95	112.97	99.99	103.82	136.00	120.06	
-3.00 to -2.50; 5.6 mm		88.23	99.87	115.60	93.00	100.72	96.52	85.53	
-2.50 to -2.00; 4 mm		70.13	59.72	62.17	60.43	62.81	68.34	69.77	
-2.00 to -1.50; 2.8 mm		50.95	56.62	62.47	50.88	52.06	56.20	54.49	
-1.50 to -1.00; 2 mm		61.68	63.23	67.70	58.20	75.60	65.97	58.70	459.17
-1.00 to -0.50; 1.4 mm		72.24	71.08	84.23	63.15	70.56	62.30	67.51	
-0.50 to 0.00; 1 mm		150.19	142.70	160.60	133.33	161.21	157.76	160.87	236.33
Total		620.01	596.42	678.46	566.73	639.62	643.10	619.54	695.50
Summary Data									
>1 mm		612.35	596.42	678.46	566.73	639.89	643.10	619.54	695.50
<1 mm	Base pan	81.26	97.11	-	58.20	126.89	0.60	52.92	-
	Oven dried	219.51	187.15	271.97	224.21	162.94	328.11	252.17	-
	Total	300.77	284.26	271.97	282.41	289.83	328.70	305.09	-
Total Sample Weight		913.12	880.68	950.43	849.14	929.45	971.80	924.63	695.50

Table 7 Summary of the sieve data provided by participants for sediment distributed as PS91**.**

Phi interval (explicit); Sieve mesh (mm)		Benchmark Average	PSA_3008	PSA_3009	PSA_3010	PSA_3011	PSA_3012	PSA_3013	PSA_3014	PSA_3015
Sieves Used		Yes	Yes	n/p	Yes	Yes	Yes	n/r	n/p	Yes
-6.50 to -6.00; 63 mm		0.00	0.00	n/p	0.00	0.00	0.00	n/r	n/p	0.00
-6.00 to -5.50; 45 mm		0.00	0.00	n/p	0.00	0.00	0.00	n/r	n/p	0.00
-5.50 to -5.00; 31.5 mm		0.00	0.00	n/p	0.00	0.00	0.00	n/r	n/p	0.00
-5.00 to -4.50; 22.4 mm		0.00	0.00	n/p	0.00	0.00	0.00	n/r	n/p	0.00
-4.50 to -4.00; 16 mm		0.00	9.52	n/p	0.00	0.00	0.00	n/r	n/p	0.00
-4.00 to -3.50; 11.2 mm		6.08	3.13	n/p	17.90	21.05	8.02	n/r	n/p	3.99
-3.50 to -3.00; 8 mm		120.51	90.30	n/p	113.76	100.63	102.57	n/r	n/p	129.76
-3.00 to -2.50; 5.6 mm		88.23	81.51	n/p	114.49	103.49	90.73	n/r	n/p	102.74
-2.50 to -2.00; 4 mm		70.13	61.30	n/p	72.32	63.13	55.04	n/r	n/p	65.01
-2.00 to -1.50; 2.8 mm		50.95	46.52	n/p	85.30	55.50	50.74	n/r	n/p	60.62
-1.50 to -1.00; 2 mm		61.68	56.36	n/p	93.18	63.73	61.86	n/r	n/p	69.16
-1.00 to -0.50; 1.4 mm		72.24	57.52	n/p	96.82	70.23	63.84	n/r	n/p	144.50
-0.50 to 0.00; 1 mm		150.19	139.66	n/p	158.14	153.82	172.63	n/r	n/p	185.80
Total		620.01	545.82	n/p	751.91	631.58	605.43	n/r	n/p	761.58
Summary Data										
>1 mm		612.35	545.82	n/p	751.91	631.58	605.43	n/r	n/p	761.58
<1 mm	Base pan	81.26	80.17	n/p	0.00	122.55	128.53	n/r	n/p	0.00
	Oven dried	219.51	169.40	n/p	240.48	191.10	117.43	n/r	n/p	220.21
	Total	300.77	249.57	n/p	240.48	313.65	245.96	n/r	n/p	220.21
Total Sample Weight		913.12	795.39	n/p	992.39	945.23	851.39	n/r	n/p	981.79

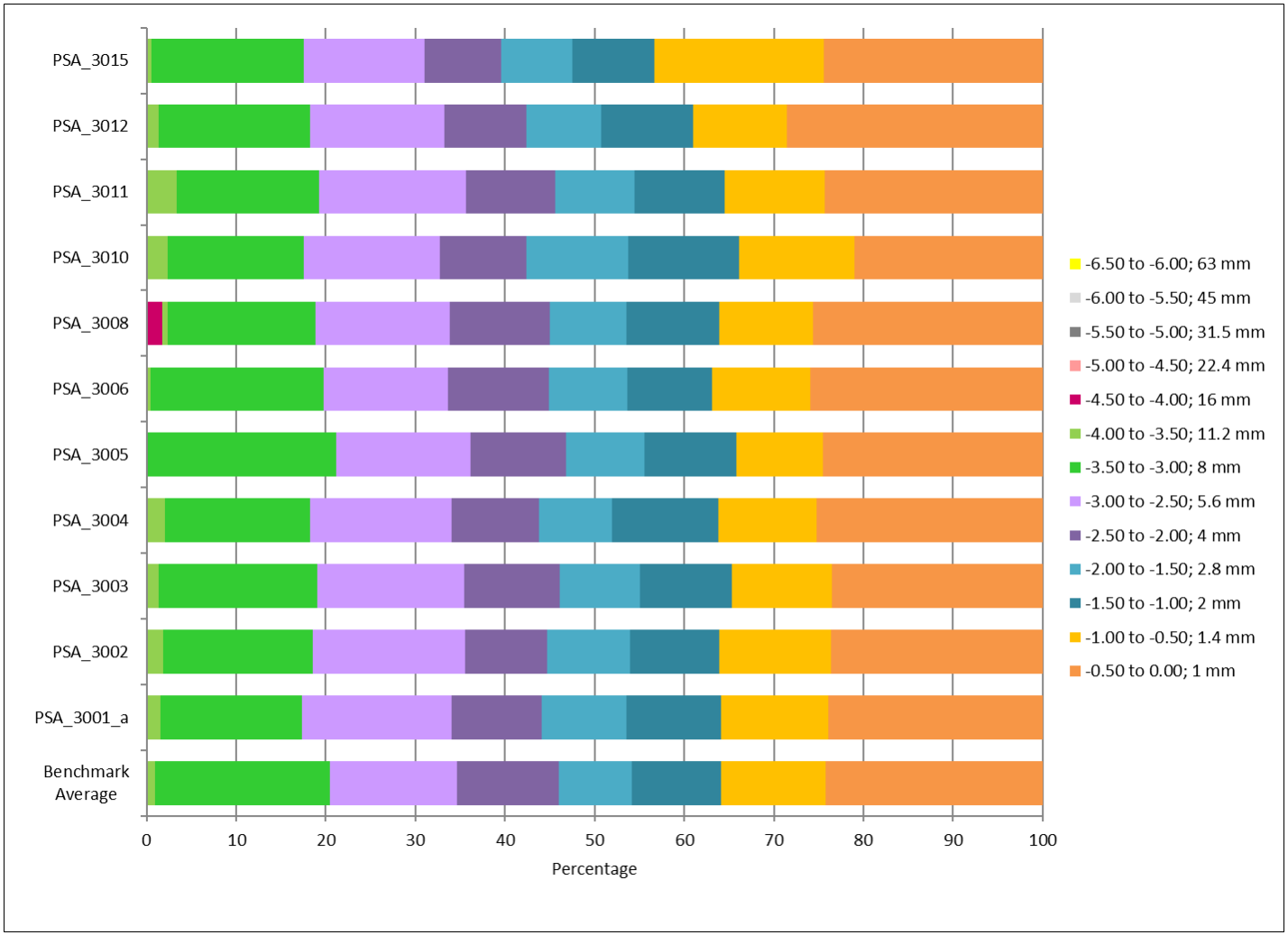


Figure 5 Final sieve data (in percentages) provided by each participant for sediment distributed as PS91.

Table 8 Summary of final laser data for the participants for sediment distributed as PS91 with Gradistat output.

Microns	Benchmark Average	PSA_3001_a	PSA_3001_b	PSA_3002	PSA_3003	PSA_3004
707	41.11	35.01	29.41	39.53	50.14	28.74
500	24.77	28.81	22.24	27.19	23.74	22.79
353.6	8.00	14.32	10.50	10.95	7.01	11.06
250	3.70	3.83	3.92	2.59	2.70	4.13
176.8	2.64	1.09	3.33	2.14	1.79	3.28
125	1.78	1.85	3.77	3.10	1.19	3.70
88.39	1.61	2.12	3.08	2.71	1.07	3.02
62.5	1.13	1.45	2.07	1.82	0.86	2.01
44.19	1.14	0.88	1.65	1.41	0.89	1.54
31.25	1.03	0.80	1.67	1.36	0.59	1.55
22.097	1.28	0.96	1.79	1.27	1.13	1.74
15.625	1.11	1.09	1.93	1.11	0.68	1.87
11.049	1.74	1.16	2.16	1.00	0.93	1.98
7.813	1.46	1.23	2.42	0.96	1.25	2.31
5.524	1.58	1.29	2.53	0.91	1.28	2.46
3.906	1.65	1.27	2.35	0.80	1.16	2.36
2.762	1.00	1.10	1.97	0.64	0.89	2.12
1.953	0.68	0.81	1.37	0.44	0.68	1.34
1.381	0.65	0.51	0.76	0.08	0.50	0.78
0.977	0.43	0.31	0.49	0.00	0.33	0.55
0.691	0.22	0.11	0.49	0.00	0.24	0.56
0.488	0.20	0.00	0.10	0.00	0.20	0.13
0.345	0.28	0.00	0.00	0.00	0.19	0.00
0.244	0.31	0.00	0.00	0.00	0.17	0.00
0.173	0.24	0.00	0.00	0.00	0.14	0.00
0.122	0.15	0.00	0.00	0.00	0.11	0.00
0.086	0.07	0.00	0.00	0.00	0.07	0.00
0.061	0.02	0.00	0.00	0.00	0.03	0.00
0.043	0.00	0.00	0.00	0.00	0.01	0.00
0.01	0.00	0.00	0.00	0.00	0.00	
Total	100.00	100.00	100.00	100.00	100.00	100.00
Gradistat Outputs						
MEAN:	350.12	421.13	203.84	429.84	527.22	204.74
SORTING:	4.10	3.26	5.86	2.88	3.03	5.86
SKEWNESS:	-0.78	-0.69	-0.76	-0.70	-0.77	-0.76
KURTOSIS:	2.35	2.81	1.14	2.26	3.62	1.18
MODE:	Unimodal	Unimodal	Unimodal	Unimodal	Unimodal	Unimodal
Primary Mode	853.50	853.50	853.50	853.50	853.50	853.50

Table 8 Summary of final laser data for the participants for sediment distributed as PS91 with Gradistat output.

Microns	Benchmark Average	PSA_3005	PSA_3006	PSA_3007	PSA_3008	PSA_3009	PSA_3010
707	41.11	32.95	41.63	40.29	38.19	n/p	19.79
500	24.77	24.46	24.39	30.46	26.22	n/p	19.76
353.6	8.00	11.07	8.11	13.51	8.56	n/p	18.35
250	3.70	2.87	3.85	2.65	3.78	n/p	11.41
176.8	2.64	1.30	2.71	0.46	2.39	n/p	5.15
125	1.78	2.16	1.85	1.45	1.41	n/p	2.64
88.39	1.61	2.45	1.63	1.62	1.30	n/p	2.45
62.5	1.13	2.07	1.15	1.04	1.01	n/p	2.50
44.19	1.14	1.76	1.07	0.81	1.12	n/p	2.31
31.25	1.03	1.77	1.04	1.03	1.29	n/p	2.04
22.097	1.28	1.94	1.17	1.21	1.91	n/p	1.87
15.625	1.11	2.11	1.06	1.14	2.86	n/p	1.77
11.049	1.74	2.24	1.63	0.95	3.36	n/p	1.66
7.813	1.46	2.28	1.39	0.81	2.84	n/p	1.57
5.524	1.58	2.21	1.52	0.73	1.84	n/p	1.48
3.906	1.65	2.01	1.60	0.65	1.05	n/p	1.35
2.762	1.00	1.67	0.99	0.53	0.63	n/p	1.16
1.953	0.68	1.20	0.68	0.39	0.22	n/p	0.95
1.381	0.65	0.73	0.64	0.25	0.00	n/p	0.68
0.977	0.43	0.41	0.43	0.00	0.00	n/p	0.44
0.691	0.22	0.28	0.22	0.00	0.00	n/p	0.29
0.488	0.20	0.08	0.19	0.00	0.00	n/p	0.24
0.345	0.28	0.00	0.27	0.00	0.00	n/p	0.14
0.244	0.31	0.00	0.31	0.00	0.00	n/p	0.00
0.173	0.24	0.00	0.24	0.00	0.00	n/p	0.00
0.122	0.15	0.00	0.15	0.00	0.00	n/p	0.00
0.086	0.07	0.00	0.07	0.00	0.00	n/p	
0.061	0.02	0.00	0.02	0.00	0.00	n/p	
0.043	0.00	0.00	0.00	0.00	0.00	n/p	
0.01	0.00	0.00	0.00	0.00	0.00	n/p	
Total	100.00	100.00	100.00	100.00	100.00	n/p	100.00
Gradistat Outputs							
MEAN:	350.12	228.44	368.90	581.24	284.36	n/p	243.61
SORTING:	4.10	5.43	3.95	2.26	4.26	n/p	4.40
SKEWNESS:	-0.78	-0.78	-0.77	-0.54	-0.78	n/p	-0.63
KURTOSIS:	2.35	1.20	2.40	2.73	1.91	n/p	1.55
MODE:	Unimodal	Unimodal	Unimodal	Unimodal	Unimodal	n/p	Unimodal
Primary Mode	853.50	853.5	853.5	853.5	853.5	n/p	853.5

Table 8 Summary of final laser data for the participants for sediment distributed as PS91 with Gradistat output.

Microns	Benchmark Average	PSA_3011	PSA_3012	PSA_3013	PSA_3014	PSA_3015
707	41.11	33.22	31.50	n/r	n/p	33.61
500	24.77	24.79	24.60	n/r	n/p	15.65
353.6	8.00	9.38	11.37	n/r	n/p	1.67
250	3.70	4.26	3.39	n/r	n/p	0.03
176.8	2.64	3.67	2.40	n/r	n/p	0.00
125	1.78	2.88	3.04	n/r	n/p	0.00
88.39	1.61	2.06	2.53	n/r	n/p	0.00
62.5	1.13	1.55	1.61	n/r	n/p	0.00
44.19	1.14	1.43	1.26	n/r	n/p	0.01
31.25	1.03	1.41	1.38	n/r	n/p	0.08
22.097	1.28	1.34	1.59	n/r	n/p	1.33
15.625	1.11	1.56	1.77	n/r	n/p	4.41
11.049	1.74	1.86	2.00	n/r	n/p	5.20
7.813	1.46	1.68	2.19	n/r	n/p	7.78
5.524	1.58	1.71	2.32	n/r	n/p	7.21
3.906	1.65	1.63	2.17	n/r	n/p	4.43
2.762	1.00	1.14	1.83	n/r	n/p	4.77
1.953	0.68	0.89	1.28	n/r	n/p	3.50
1.381	0.65	0.83	0.72	n/r	n/p	2.05
0.977	0.43	0.59	0.48	n/r	n/p	2.17
0.691	0.22	0.37	0.48	n/r	n/p	1.71
0.488	0.20	0.38	0.10	n/r	n/p	1.08
0.345	0.28	0.48	0.00	n/r	n/p	1.21
0.244	0.31	0.45	0.00	n/r	n/p	0.97
0.173	0.24	0.26	0.00	n/r	n/p	0.54
0.122	0.15	0.11	0.00	n/r	n/p	0.45
0.086	0.07	0.05	0.00	n/r	n/p	0.14
0.061	0.02	0.02	0.00	n/r	n/p	0.00
0.043	0.00	0.00	0.00	n/r	n/p	0.00
0.01	0.00	0.00		n/r	n/p	0.00
Total	100.00	100.00	100.00	n/r	n/p	100.00
Gradistat Outputs						
MEAN:	350.12	258.9	226.95	n/r	n/p	105.60
SORTING:	4.10	5.171	5.48	n/r	n/p	11.80
SKEWNESS:	-0.78	-0.775	-0.78	n/r	n/p	-0.77
KURTOSIS:	2.35	1.611	1.35	n/r	n/p	0.60
MODE:	Unimodal	Unimodal	Unimodal	n/r	n/p	Bimodal
Primary Mode	853.50	854.5	853.5	n/r	n/p	853.5
Secondary Mode	-	-	-	n/r	n/p	9.4

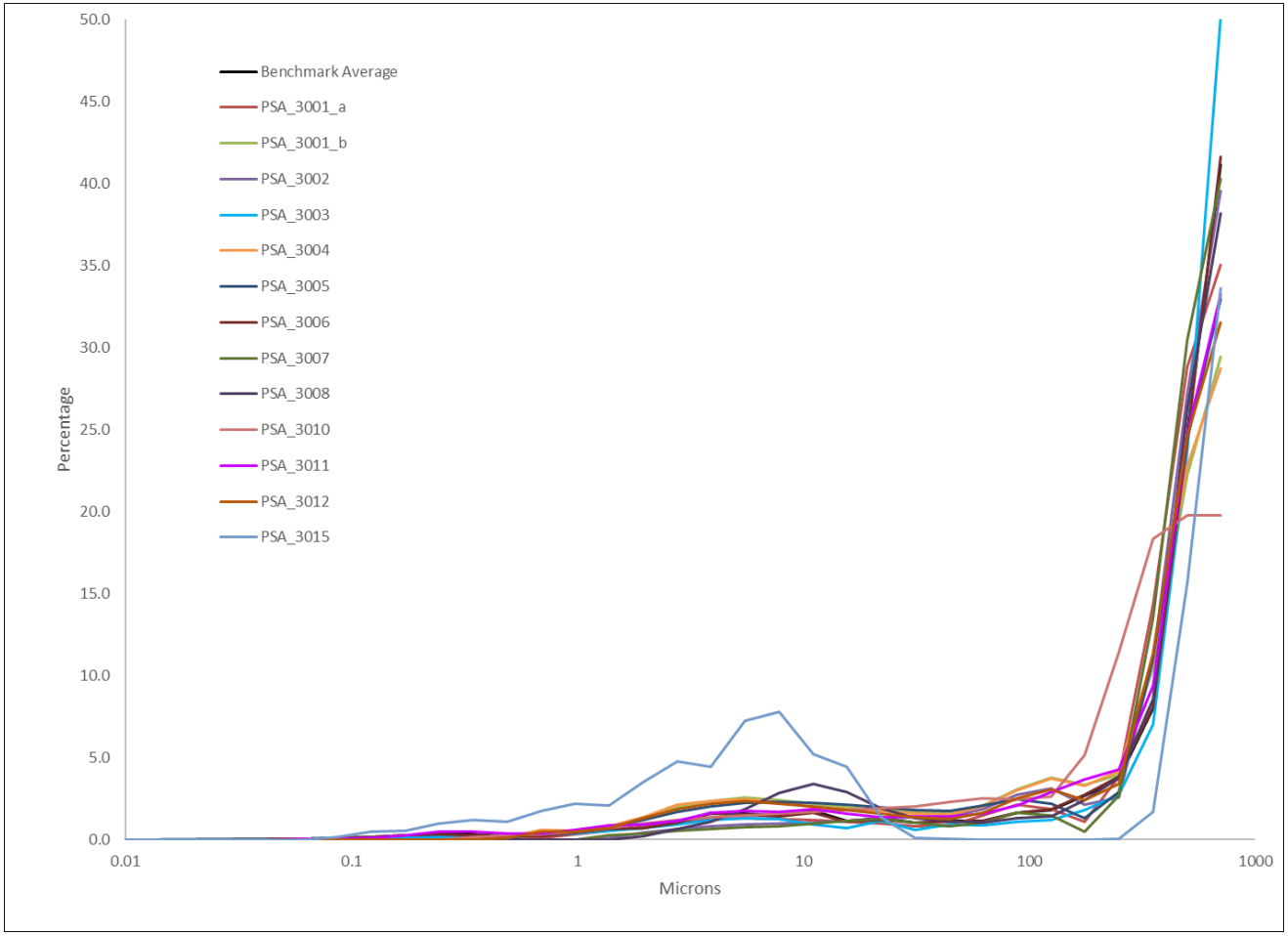


Figure 6 Final laser data (in percentages) provided by each participant and the Benchmark average for sediment distributed as PS91.

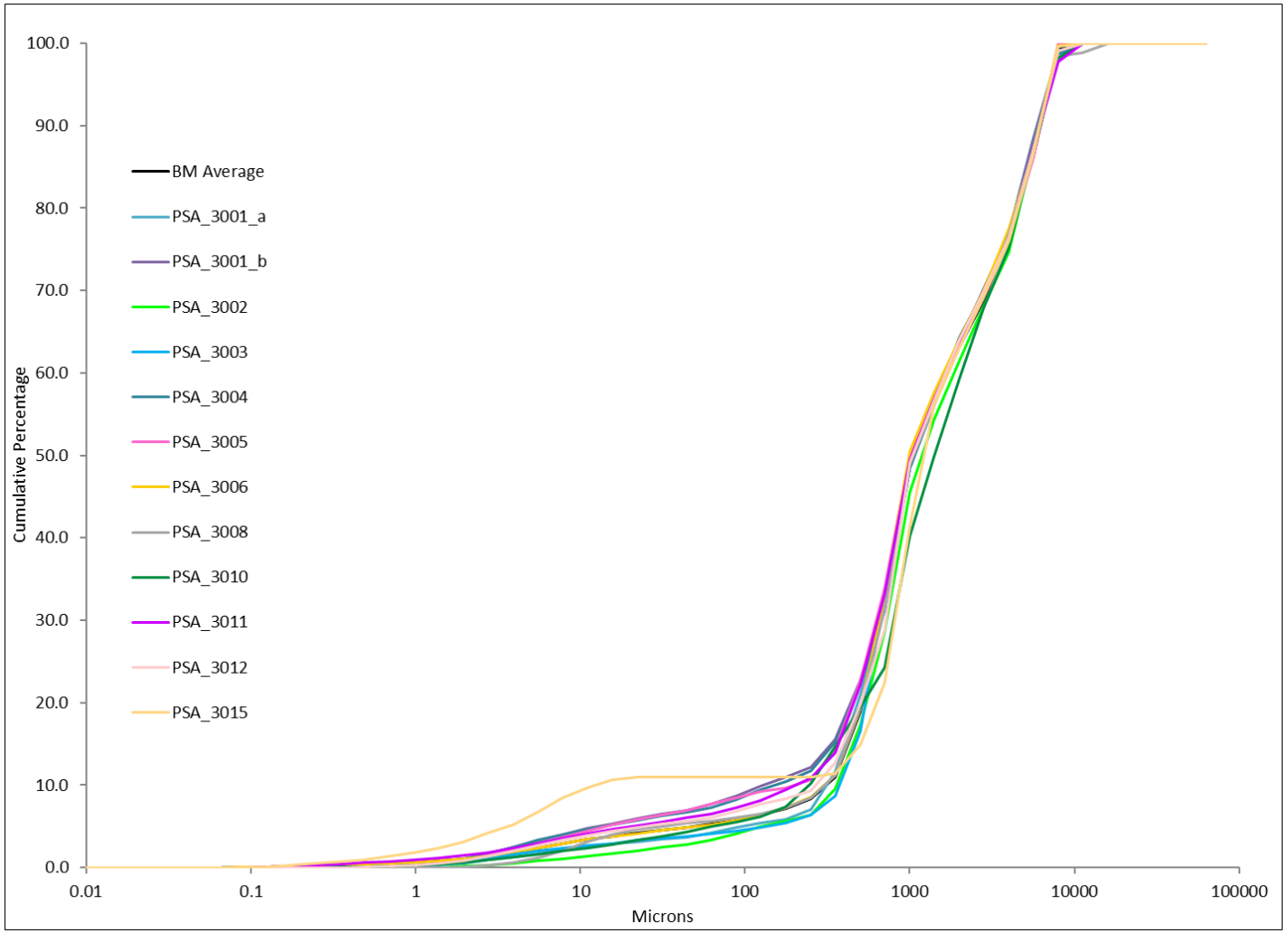


Figure 7 Particle size distribution curves from all participating laboratories and the Benchmark average for sediment distributed as PS91.

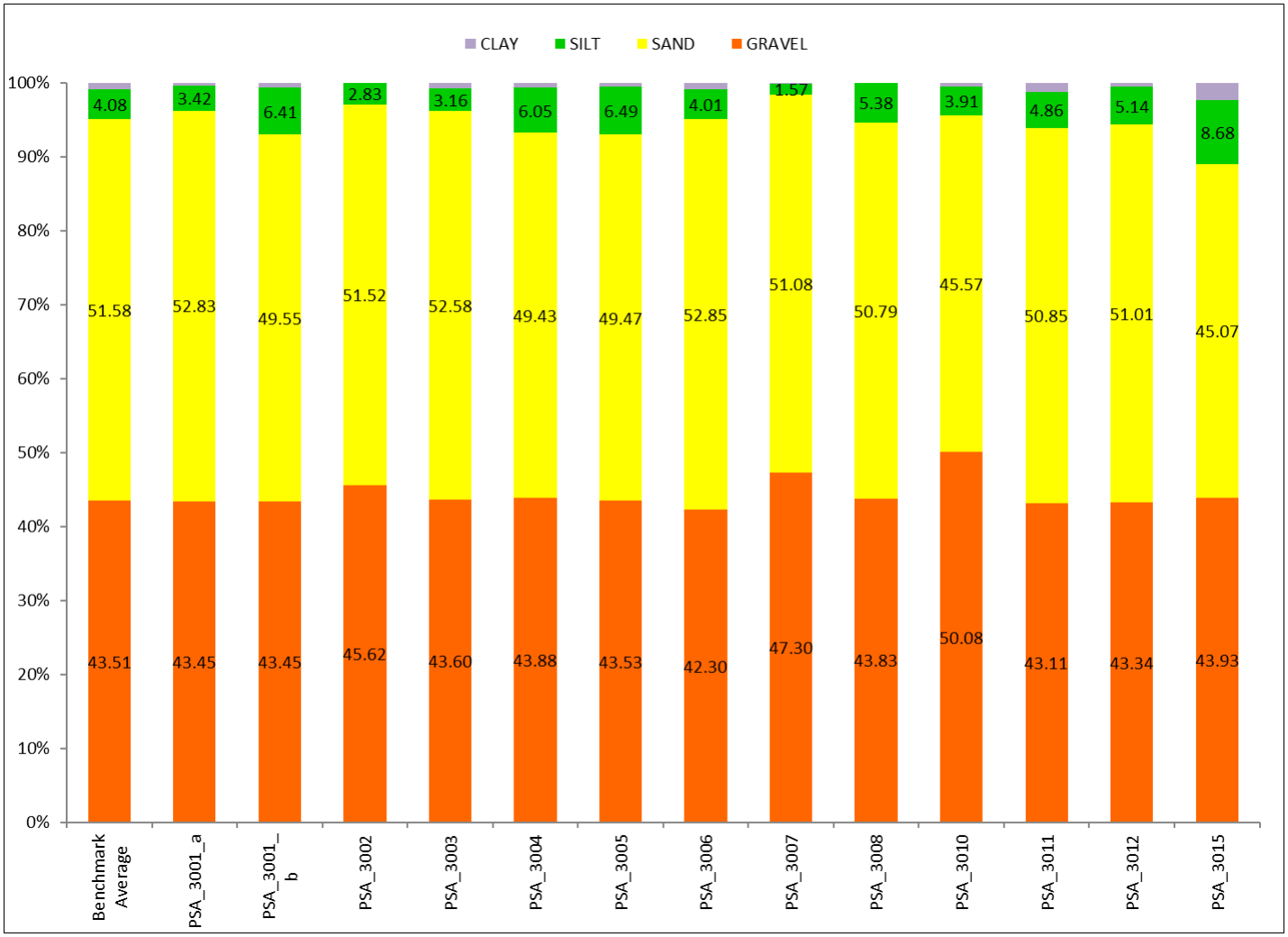


Figure 8 Bar charts showing the percentage gravel, sand, silt and clay recorded by each participating laboratory and the Benchmark average for PS91.

All appendices are MS Excel files embedded within this PDF Report.

Appendix 1 – Benchmark and Participant laser replicate data for sediment distributed as PS91.

Appendix 2 - Gradistat output of size categories based on final merged data provided by each participant and the Benchmark Average for sediment distributed as PS91.

Appendix 3 – Benchmark Lab and Participant Final Merged Data for sediment distributed as PS91.

Appendix 4 – Individual comparison of participant and Benchmark sieve data for sediment distributed as PS91.