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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	**BULURI - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 11**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = 496.6 gr
Wt. container No ..... = 40.11 gr
Wt. Of air dry soil W' = 456.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **456.49** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	81.80	40.11	41.69		9.13	90.87
4.75	115.50		75.39		16.52	83.48
2.00	168.10		127.99		28.04	71.96

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	**BULURI - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 11**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = 141.23 gr — Specific Gravity : **2.735**

Wt. of container M-68 = 40.11 gr — Plasticity Index : %

Wt. Of air dry soil W' = 101.12 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 71.96 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-26			NO	T-16			NO	T-26		
WW	49.16	DW	48.86	WW	51.96	DW	51.64	WW	49.71	DW	49.38	Mean value	
DW	48.86	TW	37.22	DW	51.64	TW	40.00	DW	49.38	TW	38.09	w	
Ww	0.30	Ws	11.64	Ww	0.32	Ws	11.64	Ww	0.33	Ws	11.29	2.75	%
w	2.58	%		w	2.75	%		w	2.92	%			

$$W = \frac{100 \times W'}{100 + w} : 98.414 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.5	17.5	27	11.180	11.180	3.3437	0.01228	0.0411	14.50	23.23	16.71
2	15.5	16.5	27	11.432	5.716	2.3909	0.01228	0.0294	13.50	21.62	15.56
5	14.0	15.0	27	11.811	2.362	1.5369	0.01228	0.0189	12.00	19.22	13.83
15	12.0	13.0	27	12.315	0.821	0.9061	0.01228	0.0111	10.00	16.02	11.53
30	11.0	12.0	27	12.568	0.419	0.6472	0.01228	0.0079	9.00	14.42	10.37
60	10.0	11.0	27	12.820	0.214	0.4622	0.01228	0.0057	8.00	12.81	9.22
240	8.0	9.0	28	13.325	0.056	0.2356	0.01215	0.0029	6.00	9.61	6.92
1140	6.5	7.5	27	13.703	0.012	0.1096	0.01228	0.0013	4.50	7.21	5.19

P = 100/W = 1.0161

$$Mx = \frac{G_s}{G_s - 1} = 1.5764$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	47.44	22.02	25.420		25.83	74.17	53.37
0.42	68.25		46.230		46.98	53.02	38.16
0.25	82.21		60.190		61.16	38.84	27.95
0.105	91.07		69.050		70.16	29.84	21.47
0.074	94.06		72.040		73.20	26.80	19.29

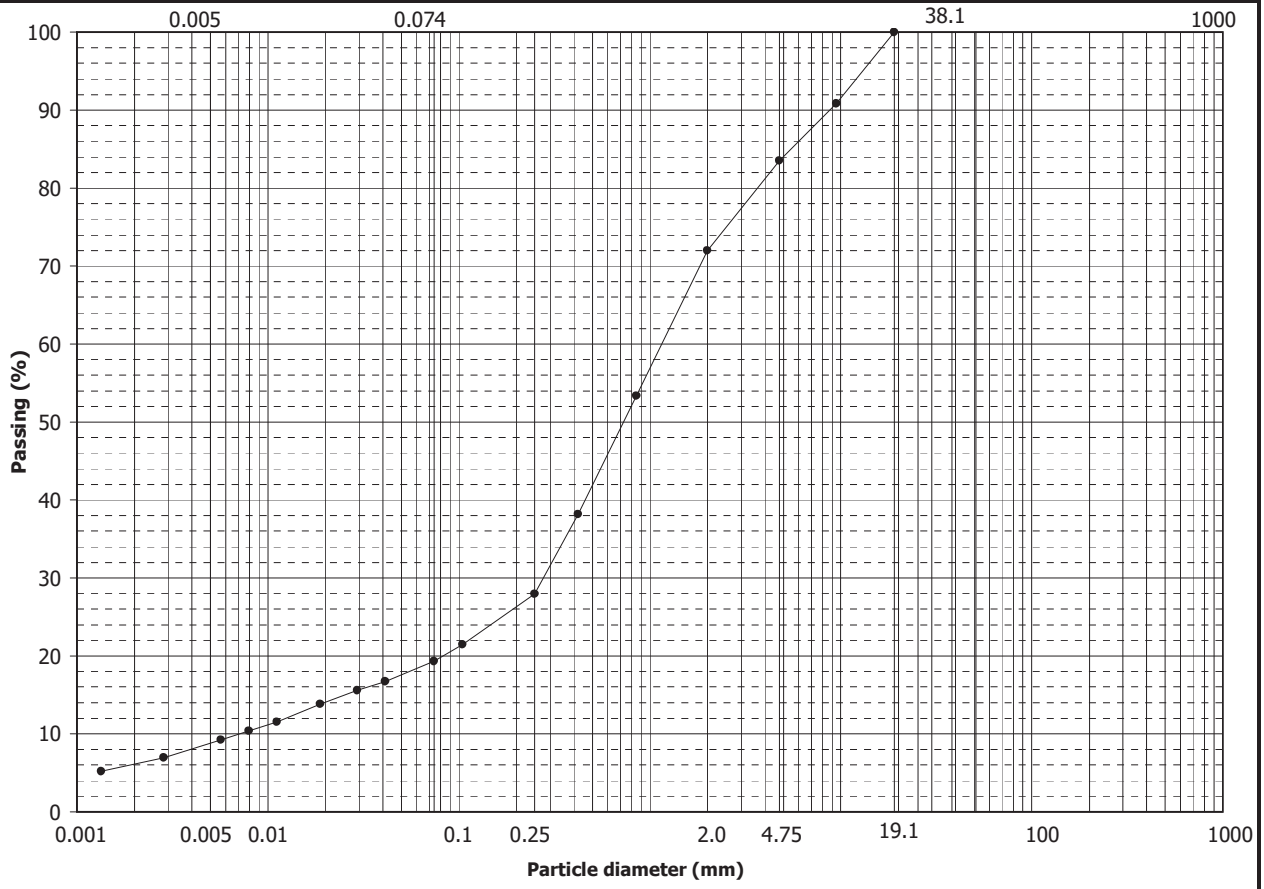
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 17, 2019
LOCATION	**BULURI - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 11**	DEPTH	**19.50 - 20.00**

SPECIFIC GRAVITY : **2.735**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
16.52	64.20	10.49	8.79	19.10	8.960	1.2599	0.7546	0.2841	0.0072	174.69	71.96	38.16	19.29



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	BULURI - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 11	DEPTH (m)		1.50 - 2.00

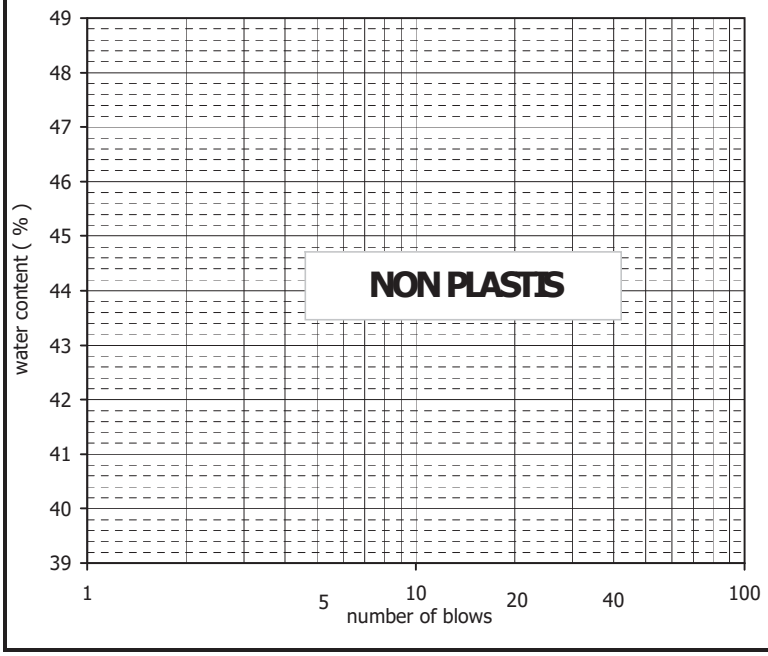
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	BULURI - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 11	DEPTH (m)		2.50 - 3.00

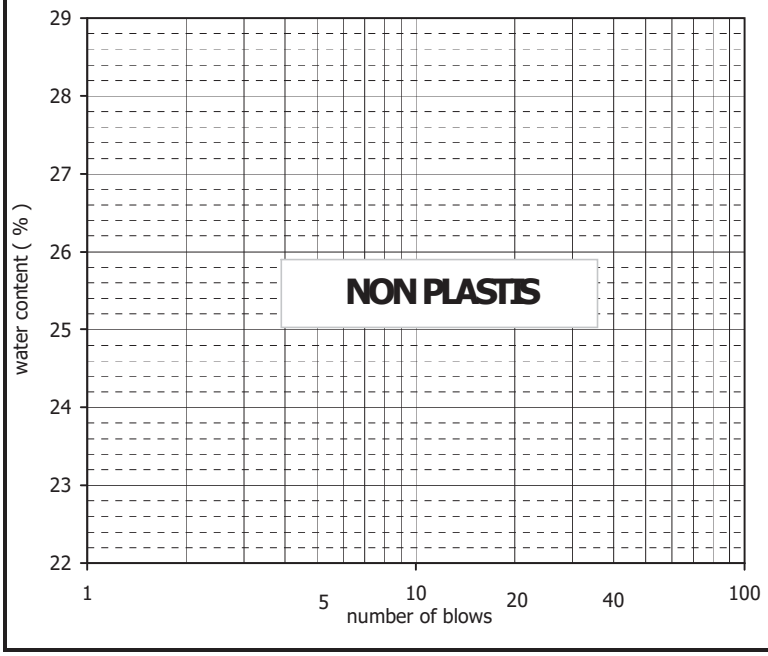
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	BULURI - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 11	DEPTH (m)		3.50 - 4.00

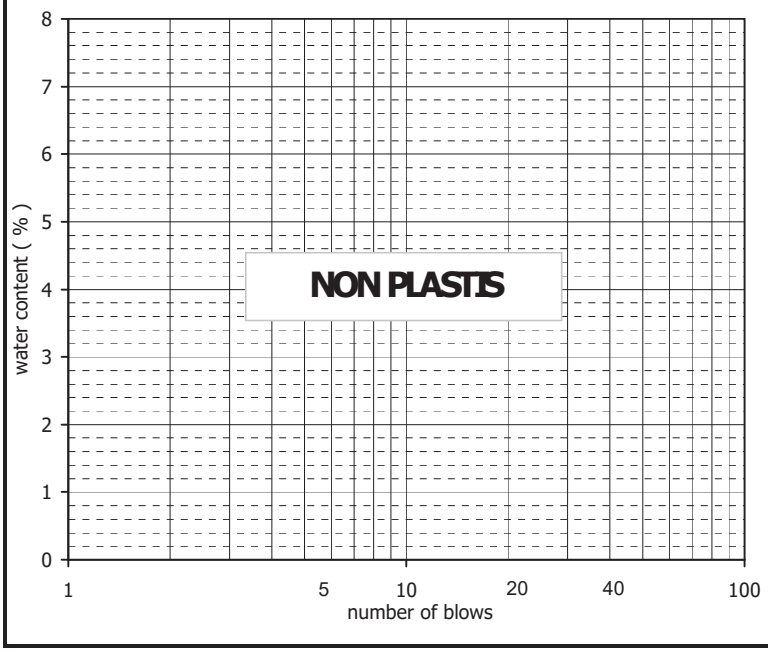
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	BULURI - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 11	DEPTH (m)		4.50 - 5.00

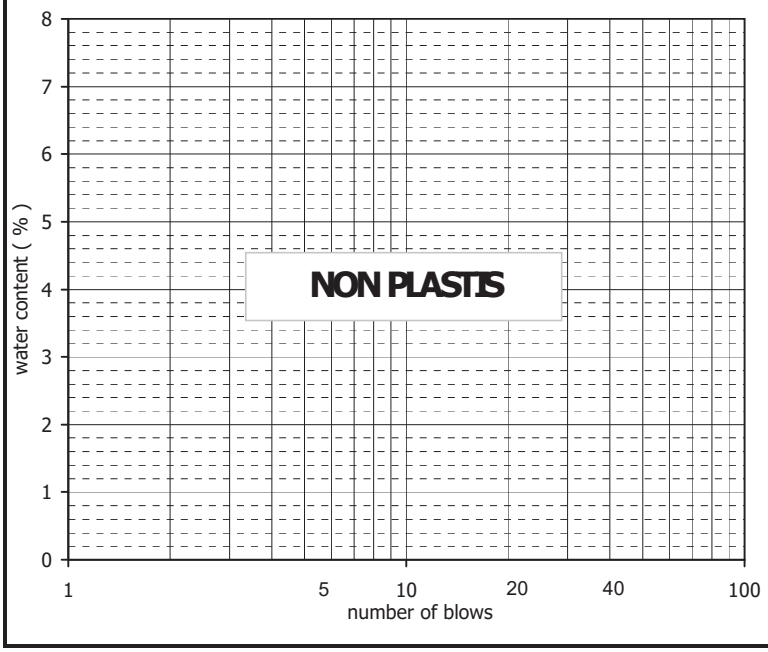
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	BULURI - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 11	DEPTH (m)		10.50 - 11.00

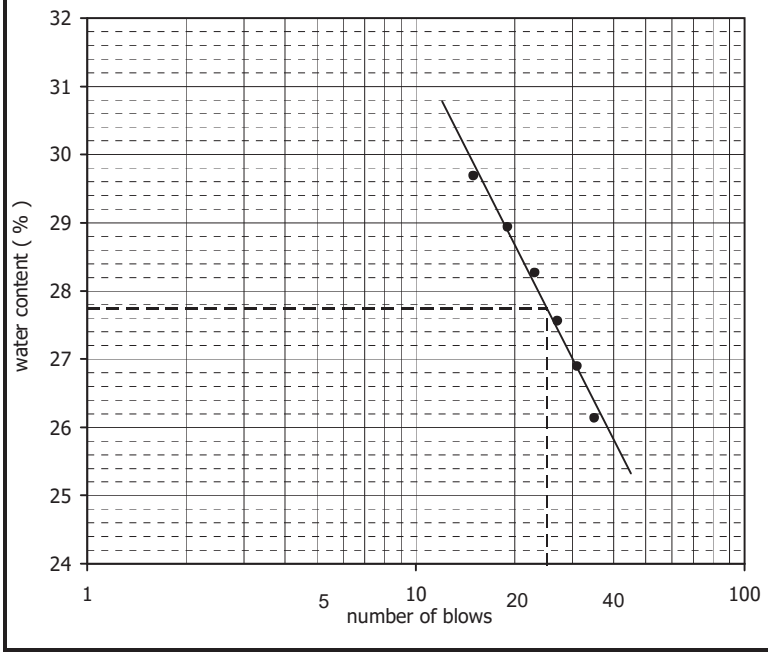
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	A-29			No.	A-71			No.	L-29
WW	52.640	DW	49.660	WW	54.330	DW	51.180	WW	46.640	DW	44.780
DW	49.660	TW	38.260	DW	51.180	TW	39.470	DW	44.780	TW	38.030
Ww	2.980	Ws	11.400	Ww	3.150	Ws	11.710	Ww	1.860	Ws	6.750
	W =	26.14	%		W =	26.90	%		W =	27.56	%

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	T-08			No.	T-91			No.	L-09
WW	55.350	DW	52.080	WW	45.600	DW	43.580	WW	52.980	DW	49.670
DW	52.080	TW	40.510	DW	43.580	TW	36.600	DW	49.670	TW	38.520
Ww	3.270	Ws	11.570	Ww	2.020	Ws	6.980	Ww	3.310	Ws	11.150
	W =	28.26	%		W =	28.94	%		W =	29.69	%

PLASTIC LIMIT

1				2				3			
		No.	T-49			No.	A-03			No.	T-15
WW	55.450	DW	52.640	WW	55.280	DW	52.430	WW	51.550	DW	49.380
DW	52.640	TW	38.340	DW	52.430	TW	37.650	DW	49.380	TW	38.170
Ww	2.810	Ws	14.300	Ww	2.850	Ws	14.780	Ww	2.170	Ws	11.210
	W =	19.65	%		W =	19.28	%		W =	19.36	%



LIQUID LIMIT	=	27.75	%
PLASTIC LIMIT	=	19.43	%
PLASTICITY INDEX	=	8.32	%
FLOW INDEX	=	9.50	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	BULURI - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 11	DEPTH (m)		11.50 - 12.00

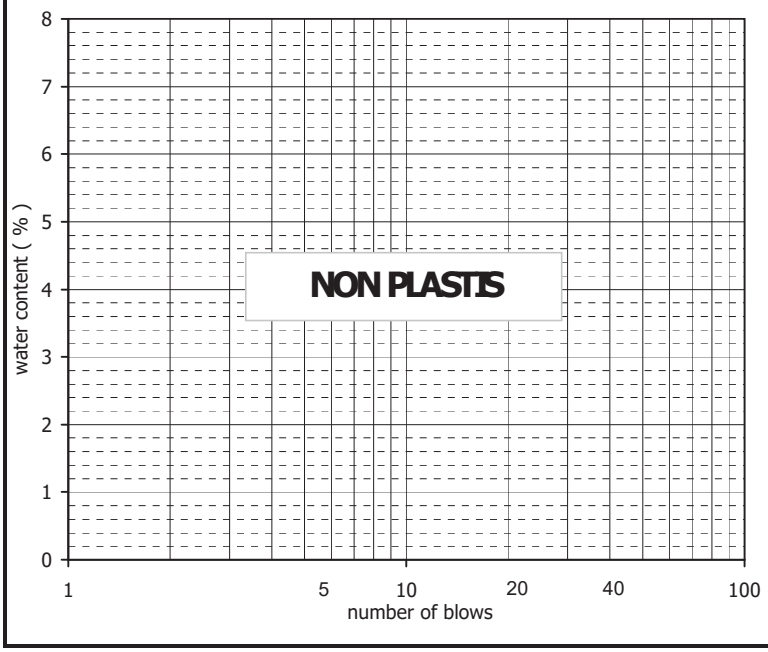
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	BULURI - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 11	DEPTH (m)		12.50 - 13.00

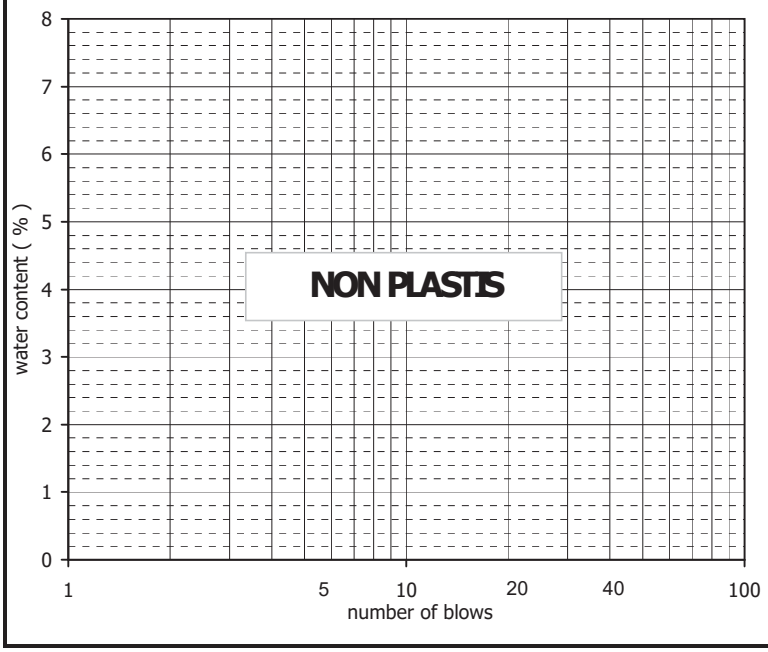
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	BULURI - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 11	DEPTH (m)		19.50 - 20.00

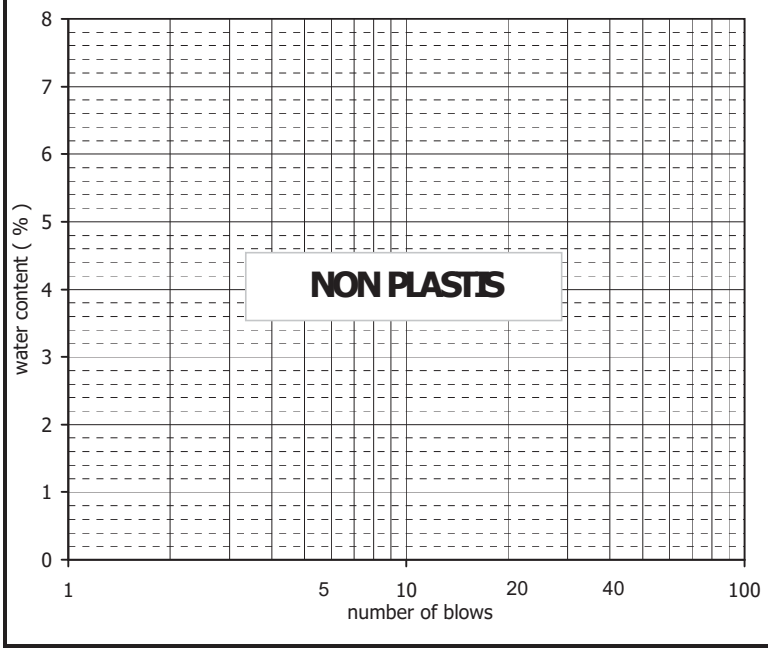
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**SILAE - PALU**									
SAMPLE No			BAY - 12	BAY - 12	BAY - 12	BAY - 12	BAY - 12	BAY - 12	BAY - 12	BAY - 12	BAY - 12
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	14.34	19.25	20.10	35.60	40.70	45.67	51.07	13.30	17.66
	Specific gravity of soil	*Gs*	2.687	2.689	2.685	2.696	2.695	2.704	2.693	2.690	2.691
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.19	1.49
	Proportion – Sand part	(%)	68.41	85.70	89.25	39.97	9.43	9.85	17.32	61.92	63.52
	Proportion – Silt part	(%)	23.87	10.39	6.94	38.38	57.03	56.77	34.29	28.66	25.86
	Proportion – Clay part	(%)	7.72	3.91	3.81	21.65	33.54	33.39	48.39	8.23	9.13
	Max. diameter	(mm)	4.75	4.75	4.75	4.75	4.75	4.75	4.75	19.10	19.10
	90 % diameter	(mm)	0.7937	1.0108	1.1534	0.3518	0.0718	0.0735	0.3538	0.8140	0.9176
	60 % diameter	(mm)	0.2938	0.3927	0.5094	0.0739	0.0148	0.0148	0.0092	0.1967	0.2103
	50 % diameter	(mm)	0.2062	0.3218	0.3995	0.0436	0.0103	0.0103	0.0055	0.1261	0.1448
	30 % diameter	(mm)	0.0686	0.1814	0.2622	0.0098	0.0040	0.0042	-	0.0601	0.0614
	10 % diameter	(mm)	0.0079	0.0415	0.0644	-	-	-	-	0.0076	0.0060
	Uniformity Coefficient		37.07	9.46	7.91	-	-	-	-	25.99	34.94
	Passing # 200		31.59	14.30	10.75	60.03	90.57	90.15	82.68	36.89	34.99
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	33.22	46.20	46.55	49.08	NON PLASTIS	NON PLASTIS
	Plastic limit	*PL* (%)				23.65	28.55	28.44	29.26		
	Plasticity index	*PI* (%)				9.57	17.64	18.11	19.82		
	Flow index					10.02	13.18	13.08	14.20		
	Unified Classification					ML	ML	ML	ML		

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**SILAE - PALU**									
SAMPLE No			BAY - 12	BAY - 12	BAY - 12	BAY - 12	BAY - 12	BAY - 12			
DEPTH (m)			9.50 - 10.00	11.50 - 12.00	14.50 - 15.00	17.50 - 18.00	20.50 - 21.00	23.50 - 24.00			
PROPERTIES	Natural Water Content	(%)	27.37	28.08	17.29	27.51	38.64	40.27			
	Specific gravity of soil	*Gs*	2.689	2.699	2.696	2.694	2.685	2.686			
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	0.00	0.00	26.75	0.00	0.00	0.00			
	Proportion – Sand part	(%)	45.99	52.43	51.48	3.18	5.96	1.08			
	Proportion – Silt part	(%)	45.96	39.68	19.11	56.75	53.49	52.20			
	Proportion – Clay part	(%)	8.05	7.89	2.66	40.07	40.55	46.72			
	Max. diameter	(mm)	4.75	4.75	25.40	2.00	4.75	2.00			
	90 % diameter	(mm)	0.2012	0.2004	14.6127	0.0417	0.0428	0.0206			
	60 % diameter	(mm)	0.0813	0.0857	1.3552	0.0102	0.0086	0.0080			
	50 % diameter	(mm)	0.0702	0.0763	0.5904	0.0075	0.0068	0.0058			
	30 % diameter	(mm)	0.0511	0.0538	0.1596	0.0023	0.0026	0.0017			
	10 % diameter	(mm)	0.0096	0.0096	0.0299	-	-	-			
	Uniformity Coefficient		8.49	8.90	45.30	-	-	-			
	Passing # 200		54.01	47.57	21.77	96.82	94.04	98.92			
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	55.21	53.49	55.95			
	Plastic limit	*PL* (%)				30.99	30.92	31.14			
	Plasticity index	*PI* (%)				24.22	22.57	24.81			
	Flow index					15.75	16.86	16.61			
	Unified Classification					MH	MH	MH			

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ISO 9001 CCBS-3117003
ISO 14001 CCBS-3118004
OHSAS 18001 CCBS-3118027

NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	SILAE - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	T-59								No	T-03	
11/01	BAY - 12		WW	131.38	DW	119.60			11/01	BAY - 12		WW	112.00	DW	101.35		
2019	0.50 - 1.00	14.34	DW	119.60	TW	37.45			2019	8.50 - 9.00	17.66	DW	101.35	TW	41.03		
			Ww	11.78	Ws	82.15						Ww	10.65	Ws	60.32		
					WC	(%)	14.34							WC	(%)	17.66	
						No	T-39								No	T-90	
11/01	BAY - 12		WW	110.90	DW	98.70			11/01	BAY - 12		WW	134.99	DW	114.13		
2019	1.50 - 2.00	19.25	DW	98.70	TW	35.31			2019	9.50 - 10.00	27.37	DW	114.13	TW	37.92		
			Ww	12.20	Ws	63.39						Ww	20.86	Ws	76.21		
					WC	(%)	19.25							WC	(%)	27.37	
						No	J-77								No	J-82	
11/01	BAY - 12		WW	119.58	DW	106.13			11/01	BAY - 12		WW	118.41	DW	100.95		
2019	2.50 - 3.00	20.10	DW	106.13	TW	39.23			2019	11.50 - 12.00	28.08	DW	100.95	TW	38.76		
			Ww	13.45	Ws	66.90						Ww	17.46	Ws	62.19		
					WC	(%)	20.10							WC	(%)	28.08	
						No	J-70								No	T-55	
11/01	BAY - 12		WW	112.39	DW	92.94			11/01	BAY - 12		WW	127.24	DW	113.74		
2019	3.50 - 4.00	35.60	DW	92.94	TW	38.31			2019	14.50 - 15.00	17.29	DW	113.74	TW	35.66		
			Ww	19.45	Ws	54.63						Ww	13.50	Ws	78.08		
					WC	(%)	35.60							WC	(%)	17.29	
						No	A-104								No	T-67	
11/01	BAY - 12		WW	81.60	DW	68.05			11/01	BAY - 12		WW	131.38	DW	110.83		
2019	4.50 - 5.00	40.70	DW	68.05	TW	34.76			2019	17.50 - 18.00	27.51	DW	110.83	TW	36.13		
			Ww	13.55	Ws	33.29						Ww	20.55	Ws	74.70		
					WC	(%)	40.70							WC	(%)	27.51	
						No	A-35								No	T-22	
11/01	BAY - 12		WW	116.06	DW	92.24			11/01	BAY - 12		WW	114.50	DW	93.19		
2019	5.50 - 6.00	45.67	DW	92.24	TW	40.08			2019	20.50 - 21.00	38.64	DW	93.19	TW	38.04		
			Ww	23.82	Ws	52.16						Ww	21.31	Ws	55.15		
					WC	(%)	45.67							WC	(%)	38.64	
						No	L-36								No	T-52	
11/01	BAY - 12		WW	103.40	DW	82.09			11/01	BAY - 12		WW	92.06	DW	75.66		
2019	6.50 - 7.00	51.07	DW	82.09	TW	40.36			2019	23.50 - 24.00	40.27	DW	75.66	TW	34.93		
			Ww	21.31	Ws	41.73						Ww	16.40	Ws	40.73		
					WC	(%)	51.07							WC	(%)	40.27	
						No	L-10								No		
11/01	BAY - 12		WW	140.73	DW	129.00						WW		DW			
2019	7.50 - 8.00	13.30	DW	129.00	TW	40.81						DW		TW			
			Ww	11.73	Ws	88.19						Ww		Ws			
					WC	(%)	13.30							WC	(%)		

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				34	15	56	
Weight of Pycnometer		Wf	(gr)	52.710	77.130	52.690	
Weight of (Pycnometer + Water)		Wa	(gr)	152.200	173.150	152.160	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	165.280	186.050	164.950	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.540	38.260	38.100	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.760	20.480	20.320	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	152.2000	173.1500	152.1600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.680	7.580	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.703	2.702	2.699	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.689	2.688	2.685	
Average Specific Gravity at 20° C							**2.687**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				27	23	45	
Weight of Pycnometer		Wf	(gr)	39.750	43.180	37.860	
Weight of (Pycnometer + Water)		Wa	(gr)	140.000	146.380	139.180	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	152.830	159.350	151.910	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.110	38.400	37.990	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.330	20.620	20.210	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	140.0000	146.3800	139.1800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.650	7.480	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.711	2.695	2.702	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.697	2.682	2.688	
Average Specific Gravity at 20° C							**2.689**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				39	8	61	
Weight of Pycnometer		Wf	(gr)	36.940	67.390	37.700	
Weight of (Pycnometer + Water)		Wa	(gr)	136.930	168.560	146.520	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.680	181.440	159.550	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.020	38.240	38.490	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.240	20.460	20.710	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9300	168.5600	146.5200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.490	7.580	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.702	2.699	2.697	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.688	2.685	2.683	
Average Specific Gravity at 20° C							**2.685**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				37	29	55	
Weight of Pycnometer		Wf	(gr)	50.940	36.900	51.050	
Weight of (Pycnometer + Water)		Wa	(gr)	151.200	135.800	151.910	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.400	148.500	164.810	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.680	37.930	38.220	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.900	20.150	20.440	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.2000	135.8000	151.9100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.700	7.450	7.540	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.714	2.705	2.711	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.700	2.691	2.697	
Average Specific Gravity at 20° C							**2.696**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				77	44	58	
Weight of Pycnometer		Wf	(gr)	39.760	38.880	35.070	
Weight of (Pycnometer + Water)		Wa	(gr)	139.850	139.990	145.730	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	152.460	152.770	158.420	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.780	38.030	37.890	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.000	20.250	20.110	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	139.8500	139.9900	145.7300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.390	7.470	7.420	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.706	2.711	2.710	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.692	2.697	2.696	
Average Specific Gravity at 20° C							**2.695**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				30	24	68	
Weight of Pycnometer		Wf	(gr)	38.460	38.140	34.650	
Weight of (Pycnometer + Water)		Wa	(gr)	138.140	137.560	134.460	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.150	150.270	147.230	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.360	37.870	38.000	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.580	20.090	20.220	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1400	137.5600	134.4600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.380	7.450	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.719	2.722	2.714	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.705	2.708	2.700	
Average Specific Gravity at 20° C							**2.704**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				32	21	42	
Weight of Pycnometer		Wf	(gr)	51.260	40.730	39.190	
Weight of (Pycnometer + Water)		Wa	(gr)	151.350	145.610	142.220	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	163.970	158.310	155.090	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.810	37.900	38.190	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.030	20.120	20.410	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.3500	145.6100	142.2200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.410	7.420	7.540	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.703	2.712	2.707	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.689	2.698	2.693	
Average Specific Gravity at 20° C							**2.693**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				67	9	76	
Weight of Pycnometer		Wf	(gr)	36.820	65.320	38.610	
Weight of (Pycnometer + Water)		Wa	(gr)	137.620	167.290	139.040	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.340	180.080	151.690	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.960	38.090	37.840	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.180	20.310	20.060	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.6200	167.2900	139.0400	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.460	7.520	7.410	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.705	2.701	2.707	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.691	2.687	2.693	
Average Specific Gravity at 20° C							**2.690**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				33	6	75	
Weight of Pycnometer		Wf	(gr)	37.510	65.150	35.700	
Weight of (Pycnometer + Water)		Wa	(gr)	138.180	167.850	135.380	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.390	180.970	148.080	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.730	38.620	37.910	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.950	20.840	20.130	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1800	167.8500	135.3800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.740	7.720	7.430	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.707	2.699	2.709	
Coefficient for Temperature Correction K				0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.693	2.686	2.695	
Average Specific Gravity at 20° C							**2.691**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				41	13	53	
Weight of Pycnometer		Wf	(gr)	35.950	66.070	52.280	
Weight of (Pycnometer + Water)		Wa	(gr)	137.160	167.270	153.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.180	180.220	166.340	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.450	38.330	38.680	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.670	20.550	20.900	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.1600	167.2700	153.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.600	7.730	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.702	2.704	2.704	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.688	2.690	2.690	
Average Specific Gravity at 20° C							**2.689**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	11.50 - 12.00

Determination No				1	2	3	4
No of Pycnometer				14	10	64	
Weight of Pycnometer		Wf	(gr)	69.710	67.070	37.070	
Weight of (Pycnometer + Water)		Wa	(gr)	170.370	168.920	148.310	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	183.030	181.930	161.590	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.840	38.370	38.820	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.060	20.590	21.040	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	170.3700	168.9200	148.3100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.400	7.580	7.760	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.711	2.716	2.711	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.697	2.702	2.697	
Average Specific Gravity at 20° C							**2.699**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	14.50 - 15.00

Determination No				1	2	3	4
No of Pycnometer				7	17	69	
Weight of Pycnometer		Wf	(gr)	68.750	64.940	36.570	
Weight of (Pycnometer + Water)		Wa	(gr)	169.400	169.440	137.650	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.350	182.120	150.860	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.290	37.890	38.710	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.510	20.110	20.930	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.4000	169.4400	137.6500	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.560	7.430	7.720	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.713	2.707	2.711	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.699	2.693	2.697	
Average Specific Gravity at 20° C							**2.696**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	17.50 - 18.00

Determination No				1	2	3	4
No of Pycnometer				81	48	51	
Weight of Pycnometer		Wf	(gr)	36.910	37.760	53.870	
Weight of (Pycnometer + Water)		Wa	(gr)	135.890	139.170	154.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.850	152.050	167.370	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.330	38.190	38.550	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.550	20.410	20.770	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8900	139.1700	154.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.590	7.530	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.708	2.710	2.704	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.694	2.697	2.691	
Average Specific Gravity at 20° C							**2.694**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	20.50 - 21.00

Determination No				1	2	3	4
No of Pycnometer				2	28	83	
Weight of Pycnometer		Wf	(gr)	66.900	34.010	38.130	
Weight of (Pycnometer + Water)		Wa	(gr)	168.750	135.370	137.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.610	148.340	150.410	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.170	38.420	38.090	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.390	20.640	20.310	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.7500	135.3700	137.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.670	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.708	2.691	2.697	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.694	2.677	2.683	
Average Specific Gravity at 20° C							**2.685**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 12	DEPTH	23.50 - 24.00

Determination No				1	2	3	4
No of Pycnometer				31	26	71	
Weight of Pycnometer		Wf	(gr)	34.630	38.840	39.800	
Weight of (Pycnometer + Water)		Wa	(gr)	134.510	138.580	140.220	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	147.110	151.640	152.850	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.800	38.500	37.860	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.020	20.720	20.080	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	134.5100	138.5800	140.2200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.420	7.660	7.450	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.698	2.705	2.695	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.684	2.691	2.681	
Average Specific Gravity at 20° C							**2.686**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 630.4 gr
Wt. container No ..... = 36.35 gr
Wt. Of air dry soil W' = 594.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **594.05** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	40.63	36.35	4.28		0.72	99.28

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 133.64 gr — Specific Gravity : **2.687**

Wt. of container B-59 = 36.36 gr — Plasticity Index : %

Wt. Of air dry soil W' = 97.28 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.28 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

			NO	J-11			NO	J-06			NO	J-17		
WW	50.59	DW	50.08		WW	51.23	DW	50.75	WW	49.15	DW	48.66	Mean value	
DW	50.08	TW	39.43		DW	50.75	TW	40.48	DW	48.66	TW	37.60	w	
Ww	0.51	Ws	10.65		Ww	0.48	Ws	10.27	Ww	0.49	Ws	11.06	4.63	%
w	4.79	%			w	4.67	%		w	4.43	%			

$$W = \frac{100 \times W'}{100 + w} : 92.974 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01232	0.0419	13.00	22.27	22.11
2	13.0	14.0	28	12.063	6.032	2.4559	0.01232	0.0302	11.00	18.84	18.71
5	11.0	12.0	28	12.568	2.514	1.5854	0.01232	0.0195	9.00	15.42	15.31
15	9.0	10.0	28	13.072	0.871	0.9335	0.01232	0.0115	7.00	11.99	11.91
30	8.0	9.0	28	13.325	0.444	0.6664	0.01232	0.0082	6.00	10.28	10.20
60	7.0	8.0	28	13.577	0.226	0.4757	0.01232	0.0059	5.00	8.57	8.50
240	5.0	6.0	29	14.081	0.059	0.2422	0.01218	0.0030	3.00	5.14	5.10
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01232	0.0014	1.50	2.57	2.55

P = 100/W = 1.0756

$$Mx = \frac{Gs}{Gs - 1} = 1.5928$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.35	22.02	6.330		6.81	93.19	92.52
0.42	46.37		24.350		26.19	73.81	73.28
0.25	63.12		41.100		44.21	55.79	55.39
0.105	79.83		57.810		62.18	37.82	37.55
0.074	85.41		63.390		68.18	31.82	31.59

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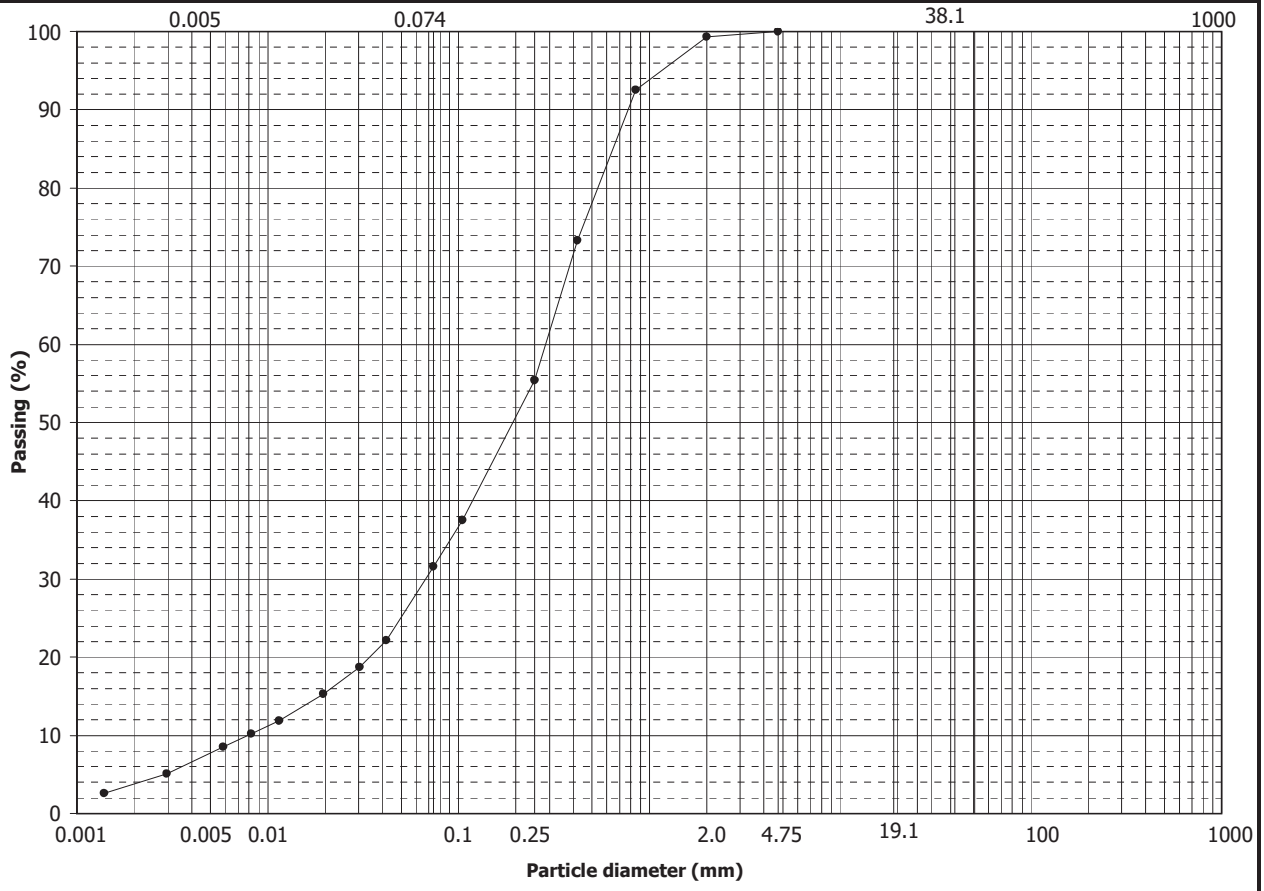
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.687**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	68.41	23.87	7.72	4.75	0.7937	0.2938	0.2062	0.0686	0.0079	37.07	99.28	73.28	31.59



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 544.1 gr
Wt. container No ..... = 40.15 gr
Wt. Of air dry soil W' = 504.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **503.95** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	40.30	40.15	0.15		0.03	99.97

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 130.87 gr — Specific Gravity : **2.689**

Wt. of container B-47 = 34.96 gr — Plasticity Index : %

Wt. Of air dry soil W' = 95.91 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.97 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-15			NO	J-08			NO	J-02		
WW	52.79	DW	52.08	WW	54.99	DW	54.31	WW	54.34	DW	53.66	Mean value	
DW	52.08	TW	37.95	DW	54.31	TW	41.21	DW	53.66	TW	40.30	w	
Ww	0.71	Ws	14.13	Ww	0.68	Ws	13.10	Ww	0.68	Ws	13.36	5.10	%
w	5.02	%		w	5.19	%		w	5.09	%			

$$W = \frac{100 \times W'}{100 + w} : 91.254 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	8.0	9.0	28	13.325	13.325	3.6503	0.01231	0.0449	6.00	10.47	10.46
2	7.0	8.0	28	13.577	6.788	2.6055	0.01231	0.0321	5.00	8.72	8.72
5	6.0	7.0	28	13.829	2.766	1.6631	0.01231	0.0205	4.00	6.98	6.98
15	5.5	6.5	28	13.955	0.930	0.9645	0.01231	0.0119	3.50	6.11	6.10
30	5.0	6.0	28	14.081	0.469	0.6851	0.01231	0.0084	3.00	5.23	5.23
60	4.5	5.5	28	14.208	0.237	0.4866	0.01231	0.0060	2.50	4.36	4.36
240	3.5	4.5	29	14.460	0.060	0.2455	0.01218	0.0030	1.50	2.62	2.62
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01231	0.0014	1.00	1.74	1.74

P = 100/W = 1.0958

$$Mx = \frac{Gs}{Gs - 1} = 1.5921$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	32.60	22.02	10.580		11.59	88.41	88.38
0.42	54.99		32.970		36.13	63.87	63.85
0.25	76.88		54.860		60.12	39.88	39.87
0.105	95.93		73.910		80.99	19.01	19.00
0.074	100.22		78.200		85.69	14.31	14.30

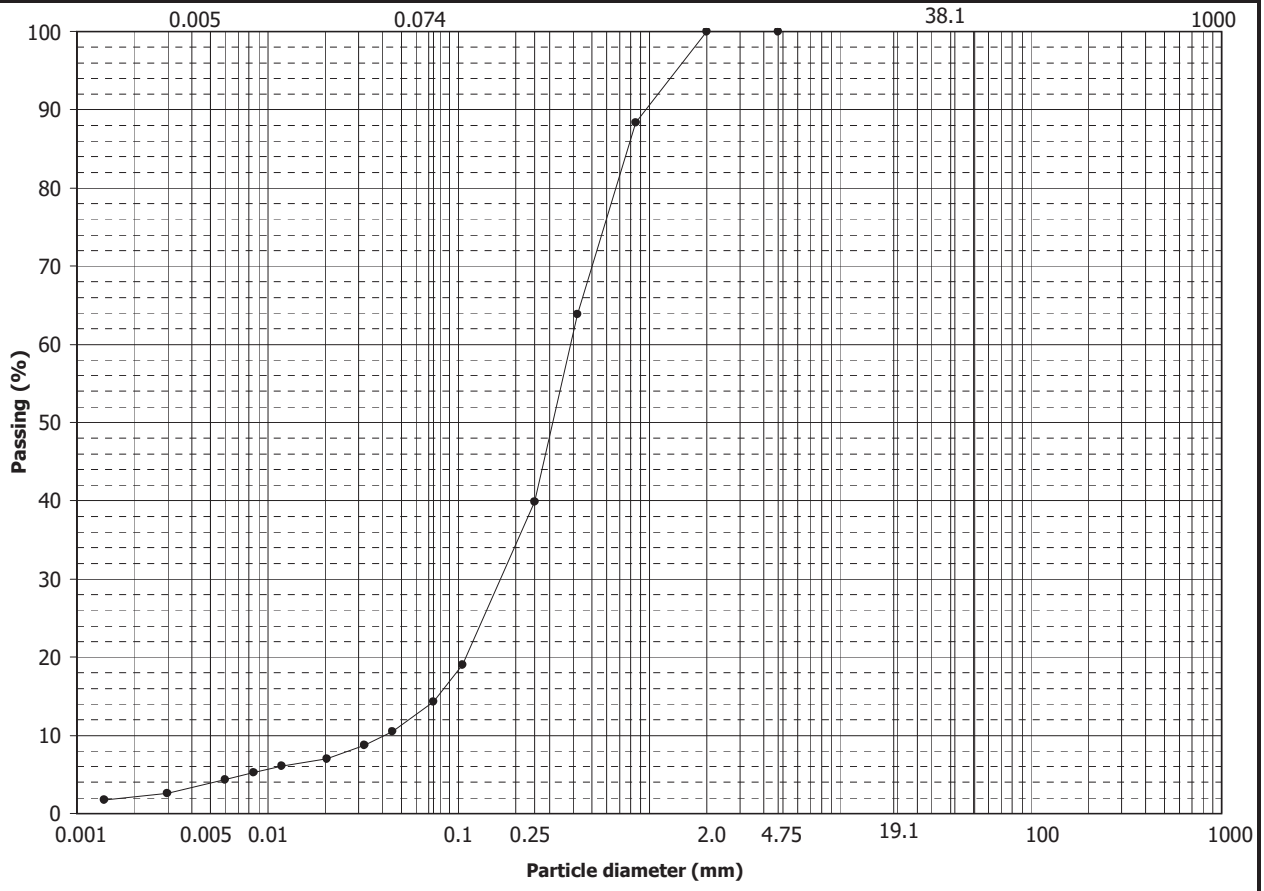
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.689**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	85.70	10.39	3.91	4.75	1.0108	0.3927	0.3218	0.1814	0.0415	9.46	99.97	63.85	14.30



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 476.4 gr
Wt. container No ..... = 33.79 gr
Wt. Of air dry soil W' = 442.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **442.61** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	36.93	33.79	3.14		0.71	99.29

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 130.51 gr — Specific Gravity : **2.685**

Wt. of container B-82 = 33.81 gr — Plasticity Index : %

Wt. Of air dry soil W' = 96.70 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.29 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-20			NO	J-28			NO	J-49		
WW	52.12	DW	51.58	WW	52.54	DW	51.89	WW	53.29	DW	52.79	Mean value	
DW	51.58	TW	39.07	DW	51.89	TW	36.12	DW	52.79	TW	40.36	w	
Ww	0.54	Ws	12.51	Ww	0.65	Ws	15.77	Ww	0.50	Ws	12.43	4.15	%
w	4.32	%		w	4.12	%		w	4.02	%			

$$W = \frac{100 \times W'}{100 + w} : 92.844 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	7.0	8.0	28	13.577	13.577	3.6847	0.01232	0.0454	5.00	8.58	8.52
2	6.5	7.5	28	13.703	6.852	2.6175	0.01232	0.0323	4.50	7.72	7.67
5	6.0	7.0	28	13.829	2.766	1.6631	0.01232	0.0205	4.00	6.87	6.82
15	5.5	6.5	28	13.955	0.930	0.9645	0.01232	0.0119	3.50	6.01	5.96
30	5.0	6.0	28	14.081	0.469	0.6851	0.01232	0.0084	3.00	5.15	5.11
60	4.5	5.5	28	14.208	0.237	0.4866	0.01232	0.0060	2.50	4.29	4.26
240	3.5	4.5	29	14.460	0.060	0.2455	0.01219	0.0030	1.50	2.57	2.56
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01232	0.0014	1.00	1.72	1.70

P = 100/W = 1.0771

$$Mx = \frac{G_s}{G_s - 1} = 1.5935$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	33.82	22.02	11.800		12.71	87.29	86.67
0.42	65.31		43.290		46.63	53.37	52.99
0.25	88.48		66.460		71.58	28.42	28.22
0.105	102.34		80.320		86.51	13.49	13.39
0.074	104.81		82.790		89.17	10.83	10.75

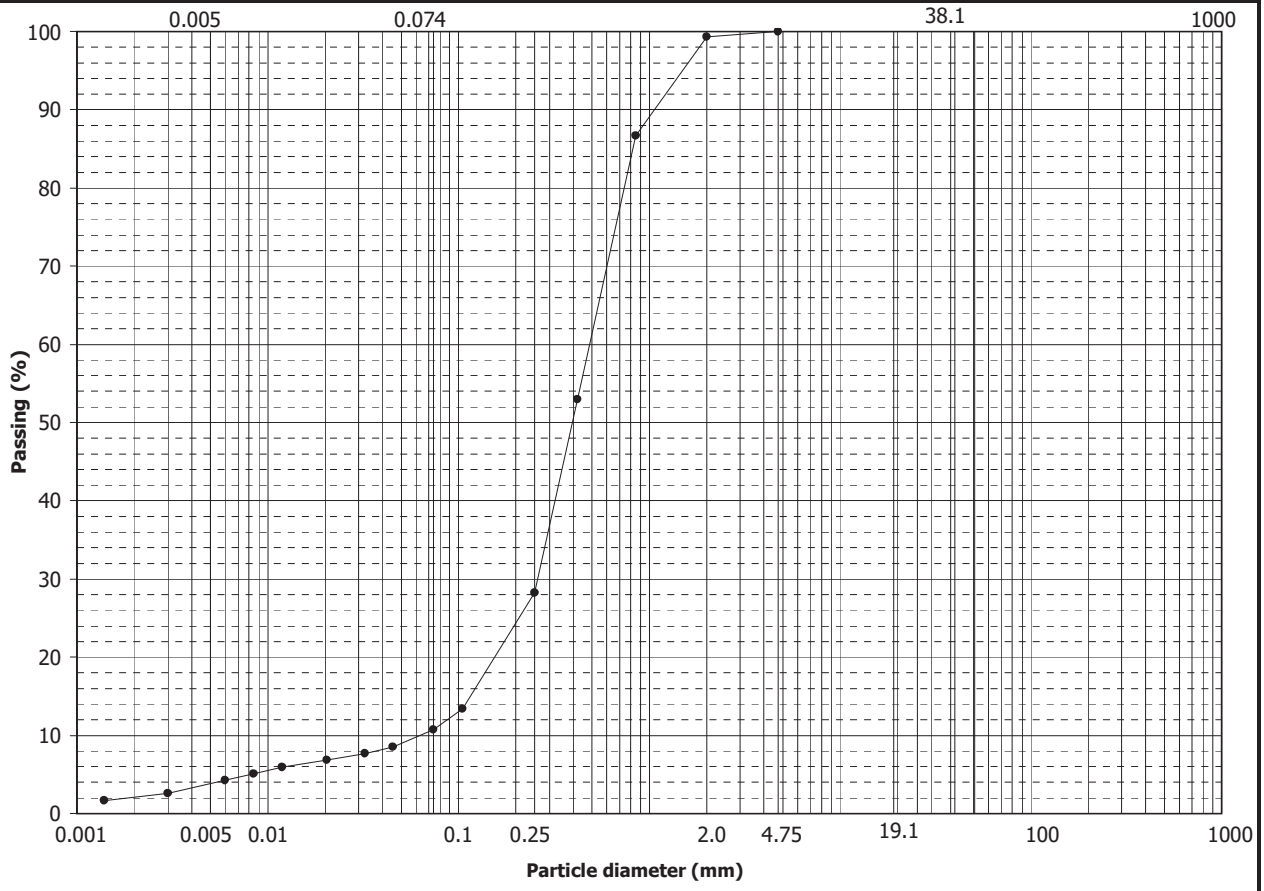
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.685**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	89.25	6.94	3.81	4.75	1.1534	0.5094	0.3995	0.2622	0.0644	7.91	99.29	52.99	10.75



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 631.2 gr
Wt. container No ..... = 33.69 gr
Wt. Of air dry soil W' = 597.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **597.51** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	36.32	33.69	2.63		0.44	99.56

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 131.94 gr — Specific Gravity : **2.696**

Wt. of container B-97 = 33.70 gr — Plasticity Index : %

Wt. Of air dry soil W' = 98.24 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.56 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-53			NO	J-35			NO	J-18		
WW	52.74	DW	51.92	WW	48.47	DW	47.67	WW	51.24	DW	50.42	Mean value	
DW	51.92	TW	38.74	DW	47.67	TW	34.38	DW	50.42	TW	37.00	w	
Ww	0.82	Ws	13.18	Ww	0.80	Ws	13.29	Ww	0.82	Ws	13.42	6.12	%
w	6.22	%		w	6.02	%		w	6.11	%			

$$W = \frac{100 \times W'}{100 + w} : 92.577 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	29.5	30.5	28	7.900	7.900	2.8107	0.01228	0.0345	27.50	47.22	47.01
2	27.0	28.0	28	8.531	4.265	2.0653	0.01228	0.0254	25.00	42.93	42.74
5	24.0	25.0	28	9.288	1.858	1.3629	0.01228	0.0167	22.00	37.78	37.61
15	20.0	21.0	28	10.297	0.686	0.8285	0.01228	0.0102	18.00	30.91	30.77
30	17.0	18.0	28	11.054	0.368	0.6070	0.01228	0.0075	15.00	25.76	25.64
60	15.0	16.0	28	11.558	0.193	0.4389	0.01228	0.0054	13.00	22.32	22.22
240	12.0	13.0	29	12.315	0.051	0.2265	0.01215	0.0028	10.00	17.17	17.10
1140	10.0	11.0	28	12.820	0.011	0.1060	0.01228	0.0013	8.00	13.74	13.68

P = 100/W = 1.0802

$$Mx = \frac{Gs}{Gs - 1} = 1.5896$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	24.77	22.02	2.750		2.97	97.03	96.60
0.42	28.67		6.650		7.18	92.82	92.41
0.25	34.25		12.230		13.21	86.79	86.41
0.105	50.94		28.920		31.24	68.76	68.46
0.074	58.78		36.760		39.71	60.29	60.03

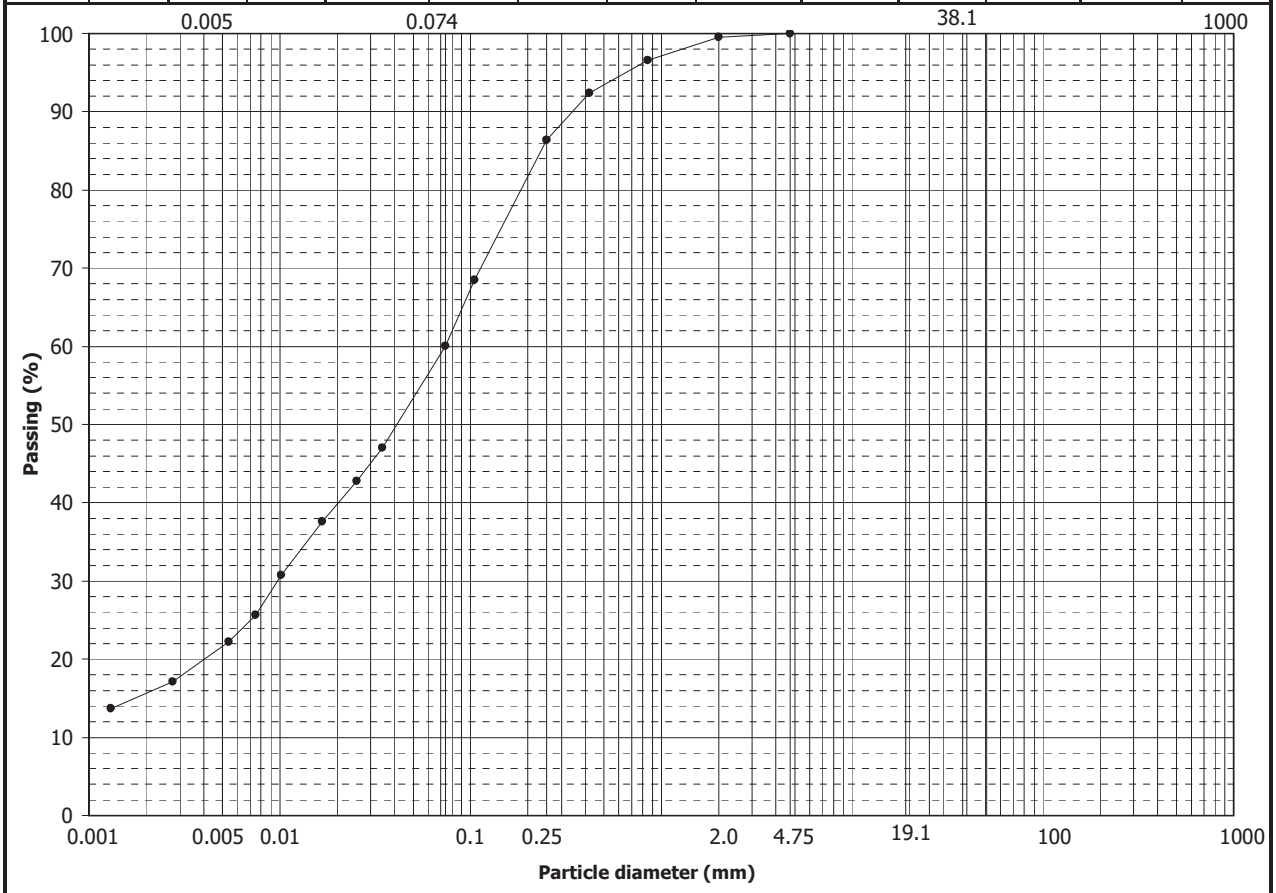
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.696**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	39.97	38.38	21.65	4.75	0.3518	0.0739	0.0436	0.0098	-	-	99.56	92.41	60.03



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 611.7 gr
Wt. container No ..... = 36.10 gr
Wt. Of air dry soil W' = 575.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **575.60** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	38.92	36.10	2.82		0.49	99.51

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 105.21 gr — Specific Gravity : **2.695**

Wt. of container B-10 = 36.09 gr — Plasticity Index : %

Wt. Of air dry soil W' = 69.12 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.51 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-01			NO	J-17			NO	J-32		
WW	52.14	DW	51.23	WW	51.15	DW	50.24	WW	52.11	DW	51.28	Mean value	
DW	51.23	TW	38.73	DW	50.24	TW	37.60	DW	51.28	TW	39.90	w	
Ww	0.91	Ws	12.50	Ww	0.91	Ws	12.64	Ww	0.83	Ws	11.38	7.26	%
w	7.28	%		w	7.20	%		w	7.29	%			

$$W = \frac{100 \times W'}{100 + w} : 64.443 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	34.5	35.5	28	6.639	6.639	2.5766	0.01229	0.0317	32.50	80.19	79.79
2	32.0	33.0	28	7.269	3.635	1.9065	0.01229	0.0234	30.00	74.02	73.66
5	27.5	28.5	28	8.405	1.681	1.2965	0.01229	0.0159	25.50	62.92	62.61
15	22.0	23.0	28	9.792	0.653	0.8080	0.01229	0.0099	20.00	49.35	49.10
30	19.0	20.0	28	10.549	0.352	0.5930	0.01229	0.0073	17.00	41.94	41.74
60	16.0	17.0	28	11.306	0.188	0.4341	0.01229	0.0053	14.00	34.54	34.37
240	12.5	13.5	29	12.189	0.051	0.2254	0.01215	0.0027	10.50	25.91	25.78
1140	10.5	11.5	28	12.694	0.011	0.1055	0.01229	0.0013	8.50	20.97	20.87

P = 100/W = 1.5518

$$Mx = \frac{G_s}{G_s - 1} = 1.5900$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.55	22.02	0.530		0.82	99.18	98.69
0.42	23.15		1.130		1.75	98.25	97.77
0.25	23.74		1.720		2.67	97.33	96.85
0.105	26.03		4.010		6.22	93.78	93.32
0.074	27.81		5.790		8.98	91.02	90.57

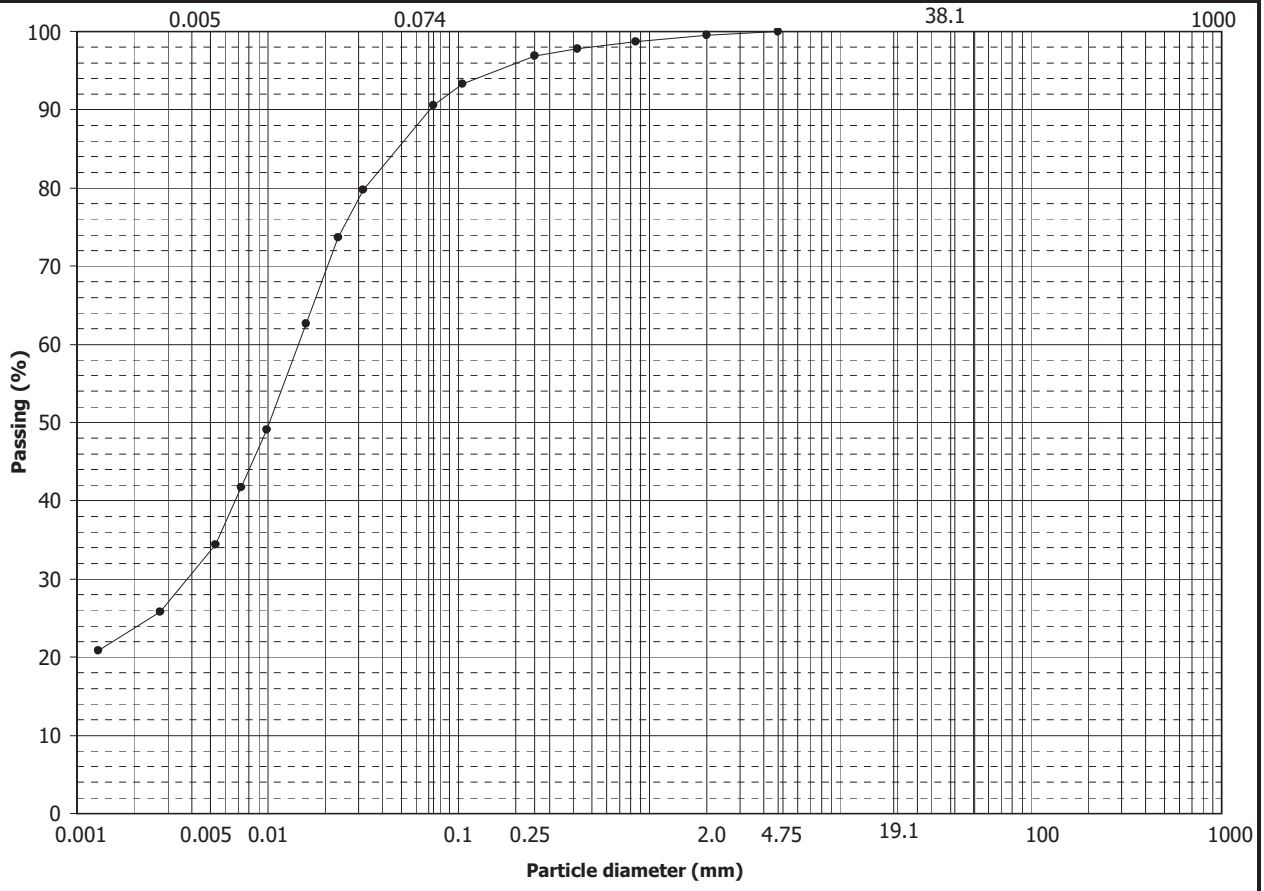
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.695**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	9.43	57.03	33.54	4.75	0.0718	0.0148	0.0103	0.0040	-	-	99.51	97.77	90.57



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 611.7 gr
Wt. container No ..... = 36.10 gr
Wt. Of air dry soil W' = 575.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **575.60** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	38.92	36.10	2.82		0.49	99.51

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 105.21 gr — Specific Gravity : **2.704**

Wt. of container B-10 = 36.09 gr — Plasticity Index : %

Wt. Of air dry soil W' = 69.12 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.51 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-01			NO	J-17			NO	J-32		
WW	52.14	DW	51.23	WW	51.15	DW	50.24	WW	52.11	DW	51.28	Mean value	
DW	51.23	TW	38.73	DW	50.24	TW	37.60	DW	51.28	TW	39.90	w	
Ww	0.91	Ws	12.50	Ww	0.91	Ws	12.64	Ww	0.83	Ws	11.38	7.26	%
w	7.28	%		w	7.20	%		w	7.29	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 64.443 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	34.0	35.0	28	6.765	6.765	2.6009	0.01226	0.0319	32.00	78.80	78.41
2	32.0	33.0	28	7.269	3.635	1.9065	0.01226	0.0234	30.00	73.87	73.51
5	27.5	28.5	28	8.405	1.681	1.2965	0.01226	0.0159	25.50	62.79	62.48
15	22.0	23.0	28	9.792	0.653	0.8080	0.01226	0.0099	20.00	49.25	49.01
30	19.0	20.0	28	10.549	0.352	0.5930	0.01226	0.0073	17.00	41.86	41.66
60	16.0	17.0	28	11.306	0.188	0.4341	0.01226	0.0053	14.00	34.47	34.31
240	12.0	13.0	29	12.315	0.051	0.2265	0.01212	0.0027	10.00	24.62	24.50
1140	10.0	11.0	28	12.820	0.011	0.1060	0.01226	0.0013	8.00	19.70	19.60

P = 100/W = 1.5518

$$Mx = \frac{G_s}{G_s - 1} = 1.5869$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.99	22.02	0.970		1.51	98.49	98.01
0.42	23.90		1.880		2.92	97.08	96.61
0.25	24.53		2.510		3.89	96.11	95.63
0.105	26.15		4.130		6.41	93.59	93.13
0.074	28.08		6.060		9.40	90.60	90.15

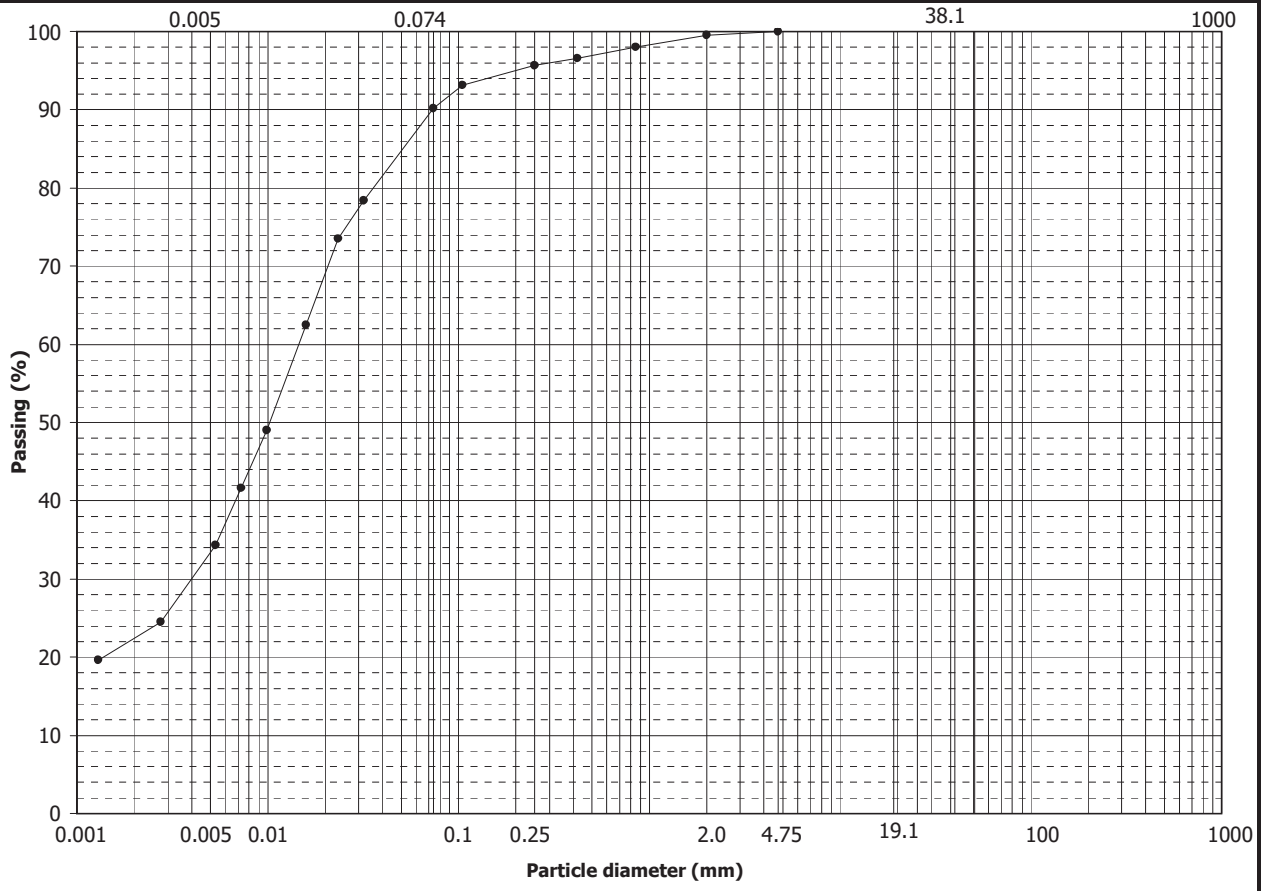
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.704**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	9.85	56.77	33.39	4.75	0.0735	0.0148	0.0103	0.0042	-	-	99.51	96.61	90.15



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 522.3 gr
Wt. container No ..... = 36.89 gr
Wt. Of air dry soil W' = 485.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **485.41** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	39.37	36.89	2.48		0.51	99.49

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 99.28 gr — Specific Gravity : **2.693**

Wt. of container E-70 = 36.90 gr — Plasticity Index : %

Wt. Of air dry soil W' = 62.38 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.49 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-51			NO	J-15			NO	J-48		
WW	49.71	DW	48.85	WW	50.40	DW	49.65	WW	49.53	DW	48.77	Mean value	
DW	48.85	TW	36.07	DW	49.65	TW	37.95	DW	48.77	TW	37.11	w	
Ww	0.86	Ws	12.78	Ww	0.75	Ws	11.70	Ww	0.76	Ws	11.66	6.55	%
w	6.73	%		w	6.41	%		w	6.52	%			

$$W = \frac{100 \times W'}{100 + w} : 58.544 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	30.5	31.5	28	7.648	7.648	2.7655	0.01229	0.0340	28.50	77.44	77.04
2	29.0	30.0	28	8.026	4.013	2.0033	0.01229	0.0246	27.00	73.36	72.99
5	27.0	28.0	28	8.531	1.706	1.3062	0.01229	0.0161	25.00	67.93	67.58
15	24.5	25.5	28	9.162	0.611	0.7815	0.01229	0.0096	22.50	61.13	60.82
30	22.5	23.5	28	9.666	0.322	0.5676	0.01229	0.0070	20.50	55.70	55.41
60	20.0	21.0	28	10.297	0.172	0.4143	0.01229	0.0051	18.00	48.91	48.66
240	16.5	17.5	29	11.180	0.047	0.2158	0.01216	0.0026	14.50	39.40	39.20
1140	14.0	15.0	28	11.811	0.010	0.1018	0.01229	0.0013	12.00	32.60	32.44

P = 100/W = 1.7081

$$Mx = \frac{G_s}{G_s - 1} = 1.5907$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	24.49	22.02	2.470		4.22	95.78	95.29
0.42	27.00		4.980		8.51	91.49	91.03
0.25	28.55		6.530		11.15	88.85	88.39
0.105	30.90		8.880		15.17	84.83	84.40
0.074	31.91		9.890		16.89	83.11	82.68

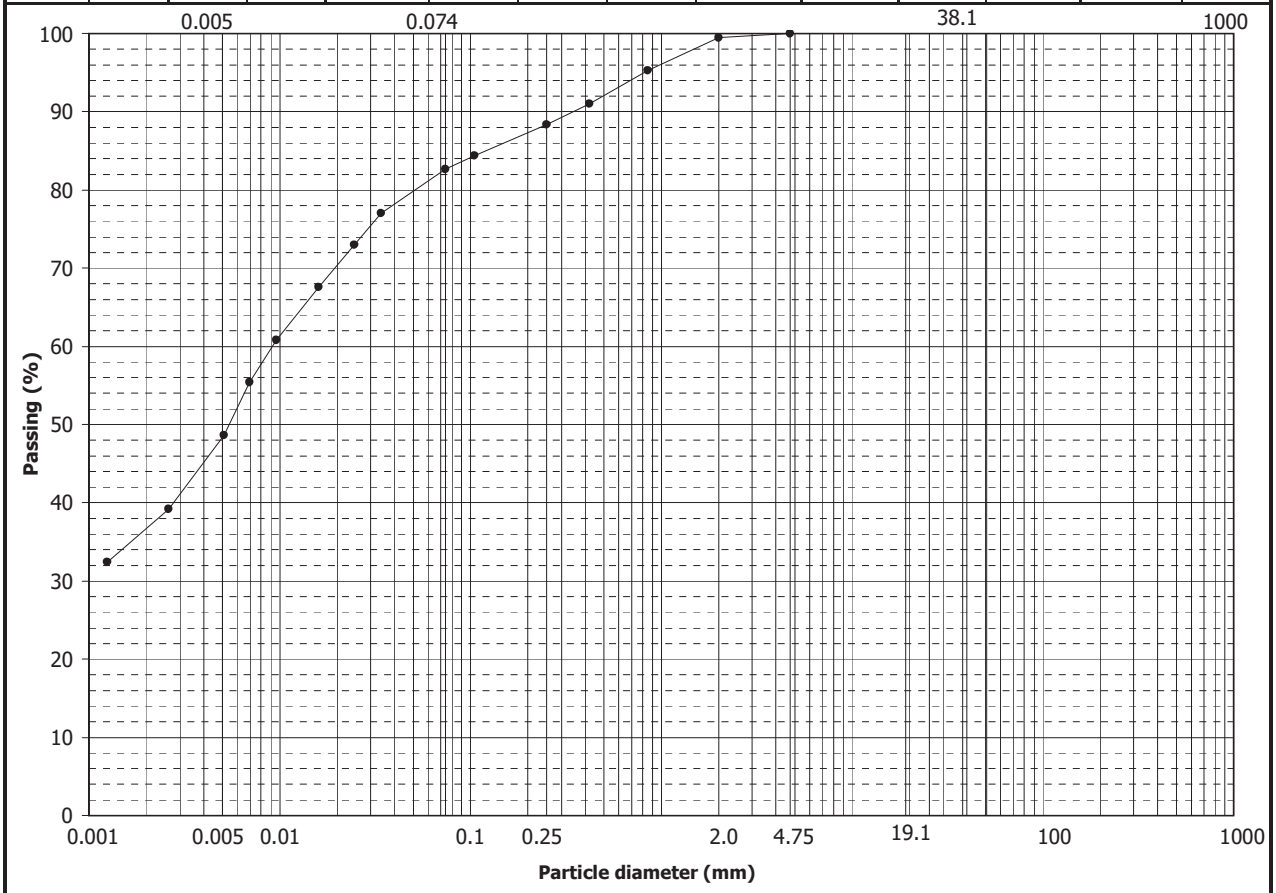
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.693**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	17.32	34.29	48.39	4.75	0.3538	0.0092	0.0055	-	-	-	99.49	91.03	82.68



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 614.4 gr
Wt. container No ..... = 39.74 gr
Wt. Of air dry soil W' = 574.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **574.66** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	41.29	39.74	1.55		0.27	99.73
4.75	46.58		6.84		1.19	98.81
2.00	58.19		18.45		3.21	96.79

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 149.86 gr — Specific Gravity : **2.690**

Wt. of container M-23 = 40.17 gr — Plasticity Index : %

Wt. Of air dry soil W' = 109.69 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 96.79 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-44			NO	J-36			NO	J-52		
WW	54.81	DW	53.94	WW	56.71	DW	55.84	WW	55.34	DW	54.37	Mean value	
DW	53.94	TW	37.46	DW	55.84	TW	38.80	DW	54.37	TW	36.71	w	
Ww	0.87	Ws	16.48	Ww	0.87	Ws	17.04	Ww	0.97	Ws	17.66	5.29	%
w	5.28	%		w	5.11	%		w	5.49	%			

$$W = \frac{100 \times W'}{100 + w} : 104.176 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	28	11.306	11.306	3.3625	0.01231	0.0414	14.00	21.39	20.70
2	13.5	14.5	28	11.937	5.968	2.4430	0.01231	0.0301	11.50	17.57	17.01
5	11.5	12.5	28	12.442	2.488	1.5774	0.01231	0.0194	9.50	14.52	14.05
15	10.0	11.0	28	12.820	0.855	0.9245	0.01231	0.0114	8.00	12.22	11.83
30	9.0	10.0	28	13.072	0.436	0.6601	0.01231	0.0081	7.00	10.70	10.35
60	8.0	9.0	28	13.325	0.222	0.4712	0.01231	0.0058	6.00	9.17	8.87
240	6.0	7.0	29	13.829	0.058	0.2400	0.01217	0.0029	4.00	6.11	5.92
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01231	0.0014	2.50	3.82	3.70

P = 100/W = 0.9599

$$Mx = \frac{G_s}{G_s - 1} = 1.5917$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.20	22.02	6.180		5.93	94.07	91.05
0.42	41.66		19.640		18.85	81.15	78.54
0.25	53.50		31.480		30.22	69.78	67.54
0.105	75.60		53.580		51.43	48.57	47.01
0.074	86.49		64.470		61.89	38.11	36.89

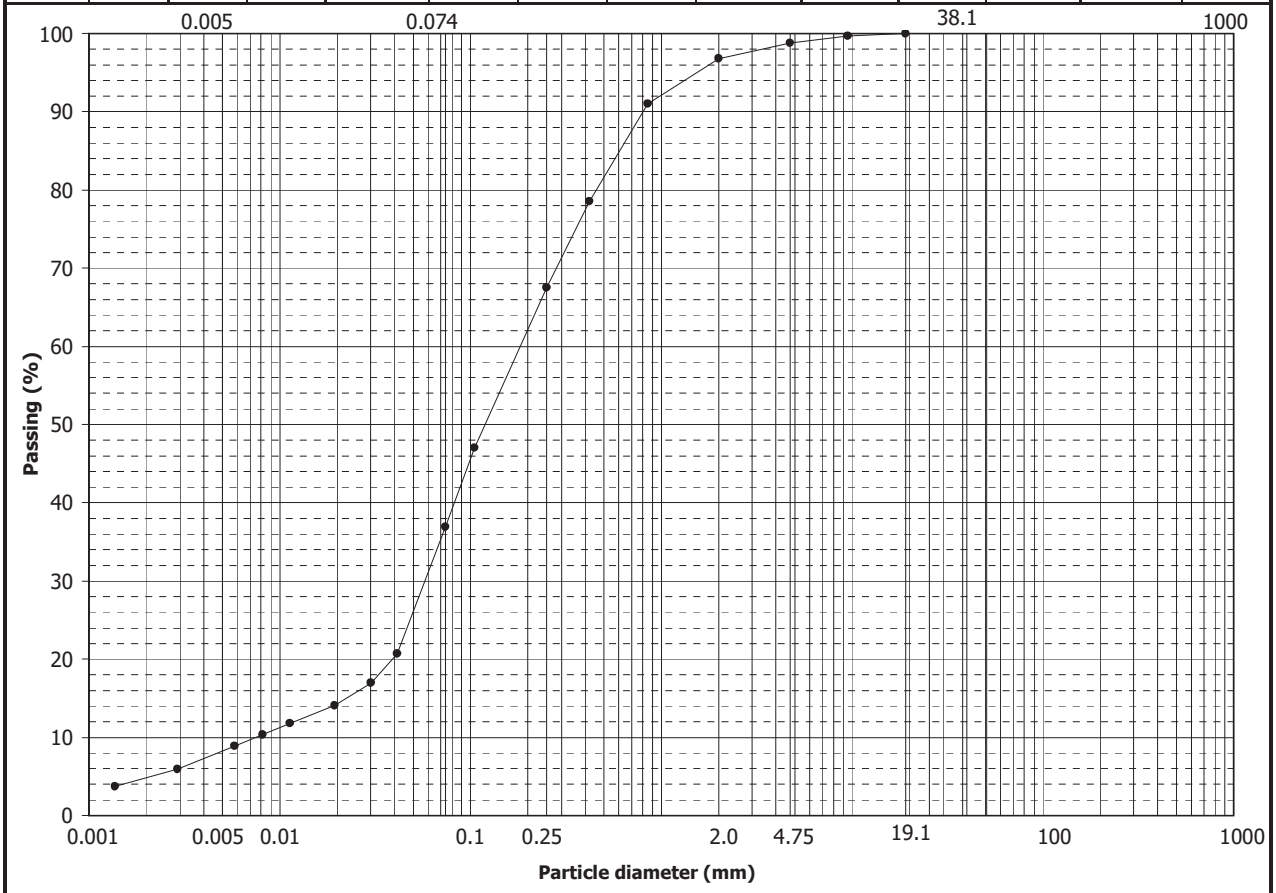
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.690**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
1.19	61.92	28.66	8.23	19.10	0.8140	0.1967	0.1261	0.0601	0.0076	25.99	96.79	78.54	36.89



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 664.5 gr
Wt. container No ..... = 48.20 gr
Wt. Of air dry soil W' = 616.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **616.30** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	50.90	48.20	2.70		0.44	99.56
4.75	57.40		9.20		1.49	98.51
2.00	71.80		23.60		3.83	96.17

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 133.07 gr — Specific Gravity : **2.691**

Wt. of container B-18 = 34.51 gr — Plasticity Index : %

Wt. Of air dry soil W' = 98.56 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 96.17 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-08			NO	J-28			NO	J-38		
WW	53.12	DW	52.48	WW	49.80	DW	49.05	WW	50.93	DW	50.24	Mean value	
DW	52.48	TW	41.21	DW	49.05	TW	36.12	DW	50.24	TW	37.58	w	
Ww	0.64	Ws	11.27	Ww	0.75	Ws	12.93	Ww	0.69	Ws	12.66	5.64	%
w	5.68	%		w	5.80	%		w	5.45	%			

$$W = \frac{100 \times W'}{100 + w} : 93.295 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.5	16.5	28	11.432	11.432	3.3812	0.01230	0.0416	13.50	23.03	22.15
2	13.5	14.5	28	11.937	5.968	2.4430	0.01230	0.0301	11.50	19.62	18.86
5	12.0	13.0	28	12.315	2.463	1.5694	0.01230	0.0193	10.00	17.06	16.40
15	10.0	11.0	28	12.820	0.855	0.9245	0.01230	0.0114	8.00	13.65	13.12
30	9.0	10.0	28	13.072	0.436	0.6601	0.01230	0.0081	7.00	11.94	11.48
60	8.0	9.0	28	13.325	0.222	0.4712	0.01230	0.0058	6.00	10.23	9.84
240	6.0	7.0	29	13.829	0.058	0.2400	0.01217	0.0029	4.00	6.82	6.56
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01230	0.0014	2.50	4.26	4.10

P = 100/W = 1.0719

$$Mx = \frac{G_s}{G_s - 1} = 1.5914$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.38	22.02	6.360		6.82	93.18	89.61
0.42	41.35		19.330		20.72	79.28	76.24
0.25	51.24		29.220		31.32	68.68	66.05
0.105	72.70		50.680		54.32	45.68	43.93
0.074	81.37		59.350		63.62	36.38	34.99

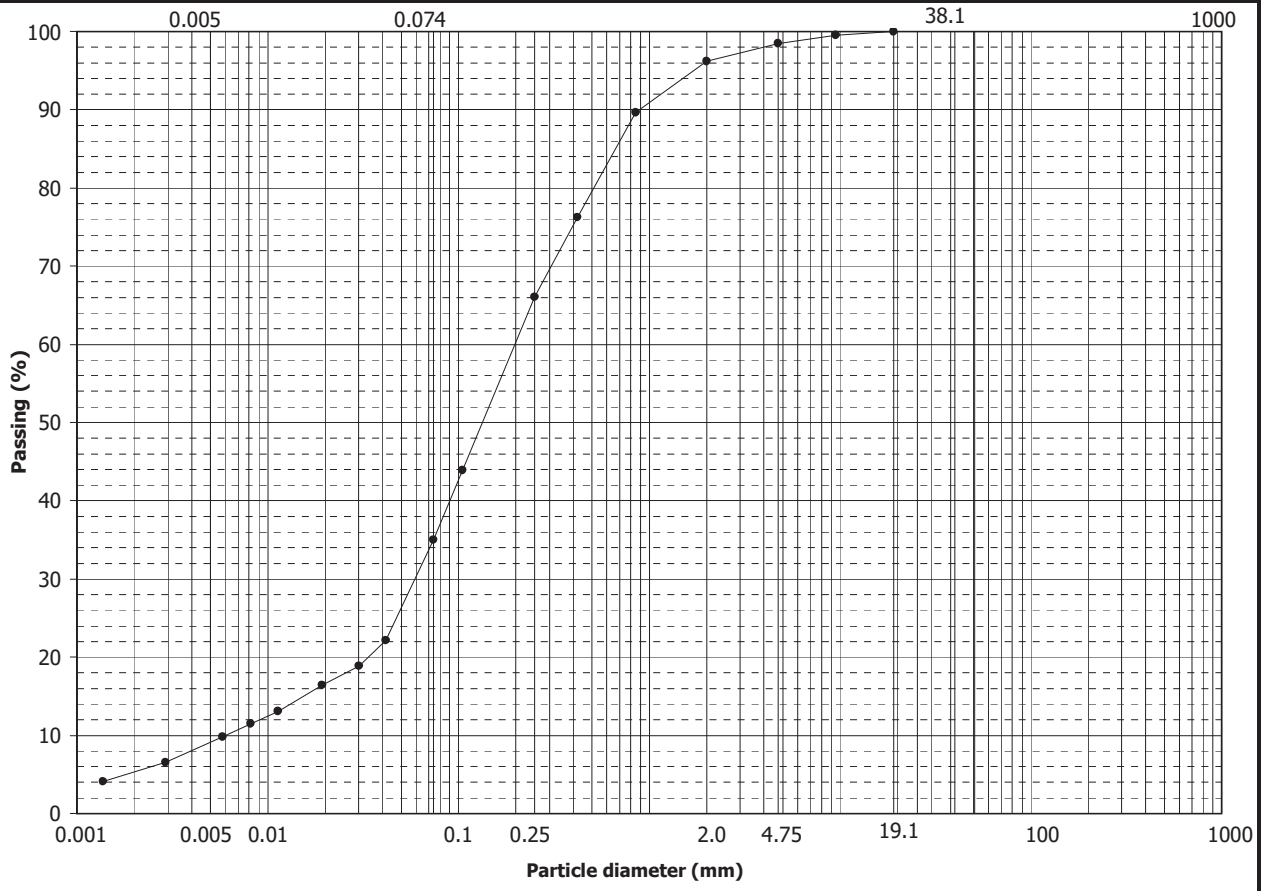
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.691**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
1.49	63.52	25.86	9.13	19.10	0.9176	0.2103	0.1448	0.0614	0.0060	34.94	96.17	76.24	34.99



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 760.7 gr
Wt. container No ..... = 38.57 gr
Wt. Of air dry soil W' = 722.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **722.13** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	39.15	38.57	0.58		0.08	99.92

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 151.42 gr — Specific Gravity : **2.689**

Wt. of container M-18 = 43.06 gr — Plasticity Index : %

Wt. Of air dry soil W' = 108.36 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.92 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-20			NO	J-42			NO	J-53		
WW	51.87	DW	51.14	WW	52.22	DW	51.46	WW	52.47	DW	51.67	Mean value	
DW	51.14	TW	39.07	DW	51.46	TW	39.10	DW	51.67	TW	38.74	w	
Ww	0.73	Ws	12.07	Ww	0.76	Ws	12.36	Ww	0.80	Ws	12.93	6.13	%
w	6.05	%		w	6.15	%		w	6.19	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 102.103 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01231	0.0418	13.00	20.27	20.25
2	12.5	13.5	28	12.189	6.095	2.4687	0.01231	0.0304	10.50	16.37	16.36
5	10.5	11.5	28	12.694	2.539	1.5934	0.01231	0.0196	8.50	13.25	13.24
15	9.0	10.0	28	13.072	0.871	0.9335	0.01231	0.0115	7.00	10.91	10.91
30	8.0	9.0	28	13.325	0.444	0.6664	0.01231	0.0082	6.00	9.36	9.35
60	7.5	8.5	28	13.451	0.224	0.4735	0.01231	0.0058	5.50	8.58	8.57
240	6.0	7.0	29	13.829	0.058	0.2400	0.01218	0.0029	4.00	6.24	6.23
1140	5.0	6.0	28	14.081	0.012	0.1111	0.01231	0.0014	3.00	4.68	4.67

P = 100/W = 0.9794

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5921$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.37	22.02	0.350		0.34	99.66	99.58
0.42	24.26		2.240		2.19	97.81	97.73
0.25	26.71		4.690		4.59	95.41	95.33
0.105	42.90		20.880		20.45	79.55	79.49
0.074	68.93		46.910		45.94	54.06	54.01

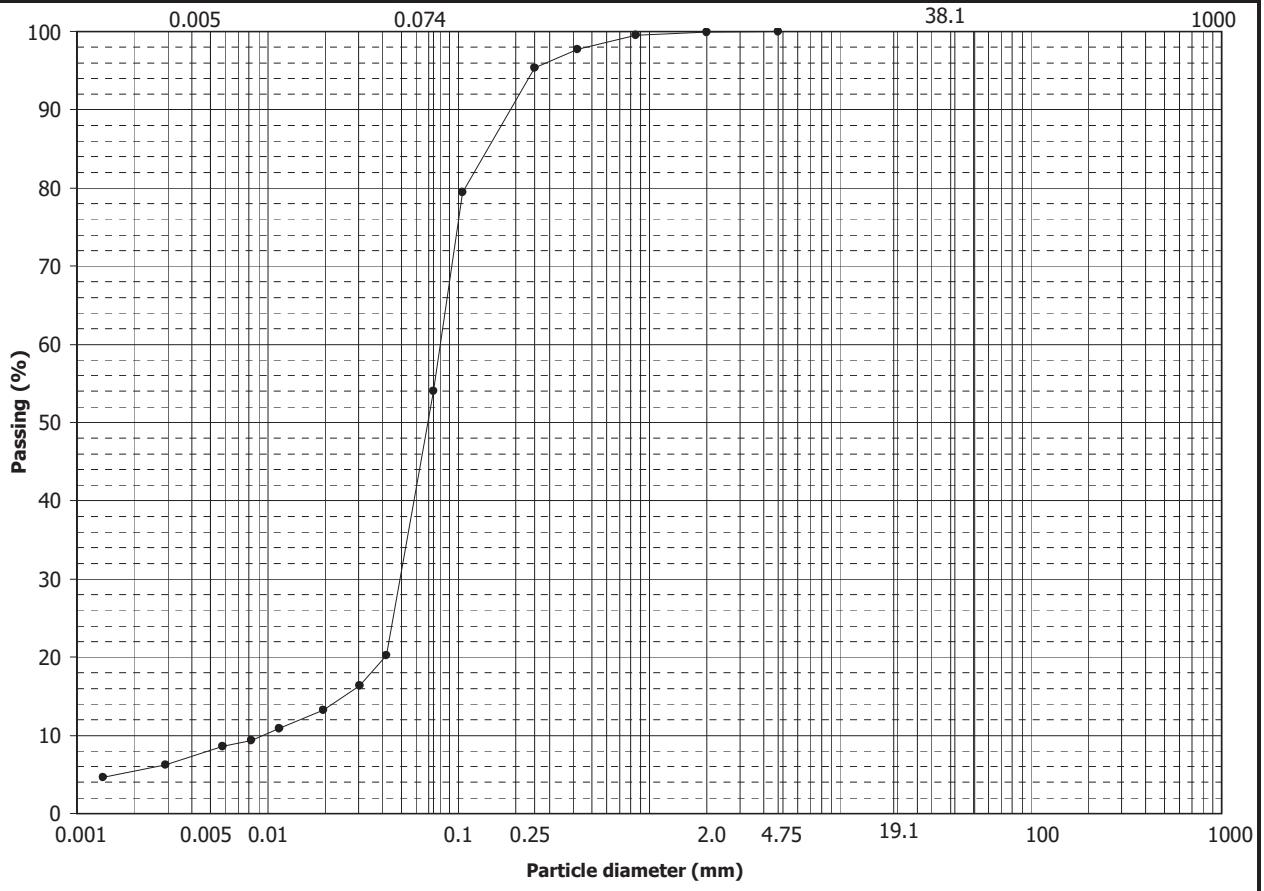
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.689**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	45.99	45.96	8.05	4.75	0.2012	0.0813	0.0702	0.0511	0.0096	8.49	99.92	97.73	54.01



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = 487.1 gr
Wt. container No ..... = 40.25 gr
Wt. Of air dry soil W' = 446.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **446.85** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	40.79	40.25	0.54		0.12	99.88

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = 126.45 gr — Specific Gravity : **2.699**

Wt. of container B-22 = 35.57 gr — Plasticity Index : %

Wt. Of air dry soil W' = 90.88 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.88 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-34			NO	J-26			NO	J-04		
WW	53.48	DW	52.75	WW	52.71	DW	51.96	WW	51.03	DW	50.22	Mean value	
DW	52.750	TW	40.290	DW	51.960	TW	38.610	DW	50.220	TW	36.646	w	
Ww	0.73	Ws	12.46	Ww	0.75	Ws	13.35	Ww	0.81	Ws	13.57	5.81	%
w	5.86	%		w	5.62	%		w	5.97	%			

$$W = \frac{100 \times W'}{100 + w} : 85.886 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	28	12.063	12.063	3.4732	0.01227	0.0426	11.00	20.35	20.32
2	11.0	12.0	28	12.568	6.284	2.5068	0.01227	0.0308	9.00	16.65	16.63
5	9.5	10.5	28	12.946	2.589	1.6091	0.01227	0.0197	7.50	13.87	13.86
15	8.0	9.0	28	13.325	0.888	0.9425	0.01227	0.0116	6.00	11.10	11.08
30	7.0	8.0	28	13.577	0.453	0.6727	0.01227	0.0083	5.00	9.25	9.24
60	6.5	7.5	28	13.703	0.228	0.4779	0.01227	0.0059	4.50	8.32	8.31
240	5.5	6.5	29	13.955	0.058	0.2411	0.01214	0.0029	3.50	6.47	6.47
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01227	0.0014	2.50	4.62	4.62

P = 100/W = 1.1643

$$Mx = \frac{Gs}{Gs - 1} = 1.5886$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.48	22.02	0.460		0.54	99.46	99.34
0.42	24.18		2.160		2.51	97.49	97.37
0.25	26.30		4.280		4.98	95.02	94.90
0.105	38.61		16.590		19.32	80.68	80.59
0.074	67.00		44.980		52.37	47.63	47.57

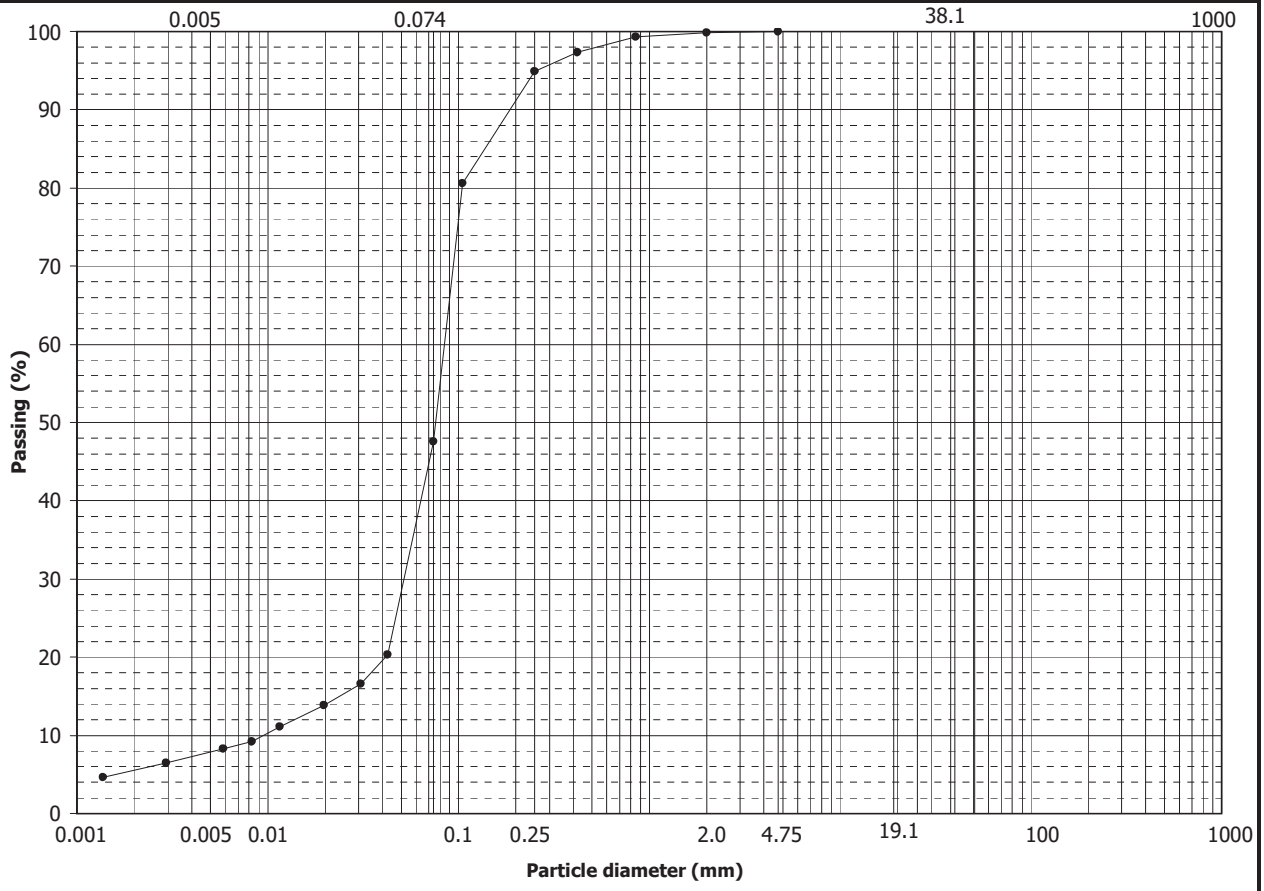
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**11.50 - 12.00**

SPECIFIC GRAVITY : **2.699**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	52.43	39.68	7.89	4.75	0.2004	0.0857	0.0763	0.0538	0.0096	8.90	99.88	97.37	47.57



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**14.50 - 15.00**

Wt. (Air dry soil + container) = 704.5 gr
Wt. container No ..... = 43.73 gr
Wt. Of air dry soil W' = 660.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **660.77** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	77.30	43.73	33.57		5.08	94.92
9.52	146.70		102.97		15.58	84.42
4.75	220.50		176.77		26.75	73.25
2.00	278.07		234.34		35.46	64.54

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**14.50 - 15.00**

Wt. (Air dry soil + container) = 140.51 gr — Specific Gravity : **2.696**

Wt. of container B-93 = 35.10 gr — Plasticity Index : %

Wt. Of air dry soil W' = 105.41 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 64.54 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-20			NO	J-42			NO	J-53		
WW	51.62	DW	51.14	WW	51.97	DW	51.46	WW	52.22	DW	51.67	Mean value	
DW	51.14	TW	39.07	DW	51.46	TW	39.10	DW	51.67	TW	38.74	w	
Ww	0.48	Ws	12.07	Ww	0.51	Ws	12.36	Ww	0.55	Ws	12.93	4.12	%
w	3.98	%		w	4.13	%		w	4.25	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 101.240 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01228	0.0418	13.00	20.41	13.17
2	12.0	13.0	28	12.315	6.158	2.4815	0.01228	0.0305	10.00	15.70	10.13
5	9.5	10.5	28	12.946	2.589	1.6091	0.01228	0.0198	7.50	11.78	7.60
15	7.0	8.0	28	13.577	0.905	0.9514	0.01228	0.0117	5.00	7.85	5.07
30	6.0	7.0	28	13.829	0.461	0.6789	0.01228	0.0083	4.00	6.28	4.05
60	5.0	6.0	28	14.081	0.235	0.4844	0.01228	0.0060	3.00	4.71	3.04
240	3.5	4.5	29	14.460	0.060	0.2455	0.01215	0.0030	1.50	2.36	1.52
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01228	0.0014	1.00	1.57	1.01

P = 100/W = 0.9878

$$Mx = \frac{G_s}{G_s - 1} = 1.5896$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	34.71	22.02	12.690		12.53	87.47	56.45
0.42	51.46		29.440		29.08	70.92	45.77
0.25	65.04		43.020		42.49	57.51	37.11
0.105	82.94		60.920		60.17	39.83	25.70
0.074	89.11		67.090		66.27	33.73	21.77

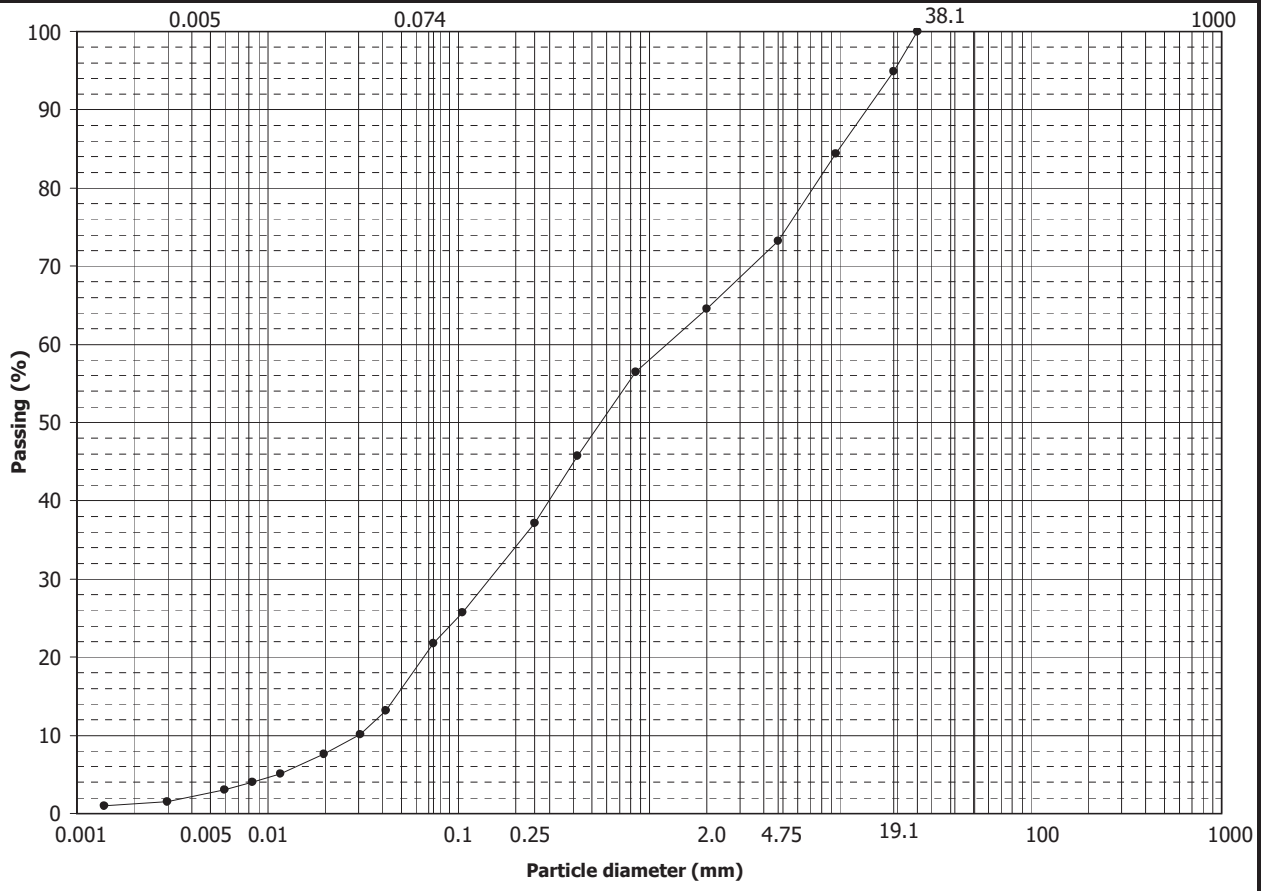
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**14.50 - 15.00**

SPECIFIC GRAVITY : **2.696**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
26.75	51.48	19.11	2.66	25.40	14.613	1.3552	0.5904	0.1596	0.0299	45.30	64.54	45.77	21.77



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**17.50 - 18.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**17.50 - 18.00**

Wt. (Air dry soil + container) = 105.78 gr — Specific Gravity : **2.694**

Wt. of container M-50 = 38.75 gr — Plasticity Index : %

Wt. Of air dry soil W' = 67.03 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-33			NO	J-49			NO	J-58		
WW	50.18	DW	49.26	WW	53.31	DW	52.47	WW	52.54	DW	51.67	Mean value	
DW	49.26	TW	36.17	DW	52.47	TW	40.36	DW	51.67	TW	39.57	w	
Ww	0.92	Ws	13.09	Ww	0.84	Ws	12.11	Ww	0.87	Ws	12.10	7.05	%
w	7.03	%		w	6.94	%		w	7.19	%			

$$W = \frac{100 \times W'}{100 + w} : 62.615 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	36.5	37.5	28	6.134	6.134	2.4767	0.01229	0.0304	34.50	87.62	87.62
2	34.5	35.5	28	6.639	3.319	1.8219	0.01229	0.0224	32.50	82.55	82.55
5	30.5	31.5	28	7.648	1.530	1.2368	0.01229	0.0152	28.50	72.39	72.39
15	25.0	26.0	28	9.035	0.602	0.7761	0.01229	0.0095	23.00	58.42	58.42
30	21.0	22.0	28	10.045	0.335	0.5786	0.01229	0.0071	19.00	48.26	48.26
60	18.0	19.0	28	10.802	0.180	0.4243	0.01229	0.0052	16.00	40.64	40.64
240	14.5	15.5	29	11.685	0.049	0.2206	0.01216	0.0027	12.50	31.75	31.75
1140	12.0	13.0	28	12.315	0.011	0.1039	0.01229	0.0013	10.00	25.40	25.40

P = 100/W = 1.5971

$$Mx = \frac{G_s}{G_s - 1} = 1.5903$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.33	22.02	0.310		0.50	99.50	99.50
0.42	22.53		0.510		0.81	99.19	99.19
0.25	22.80		0.780		1.25	98.75	98.75
0.105	23.05		1.030		1.64	98.36	98.36
0.074	24.01		1.990		3.18	96.82	96.82

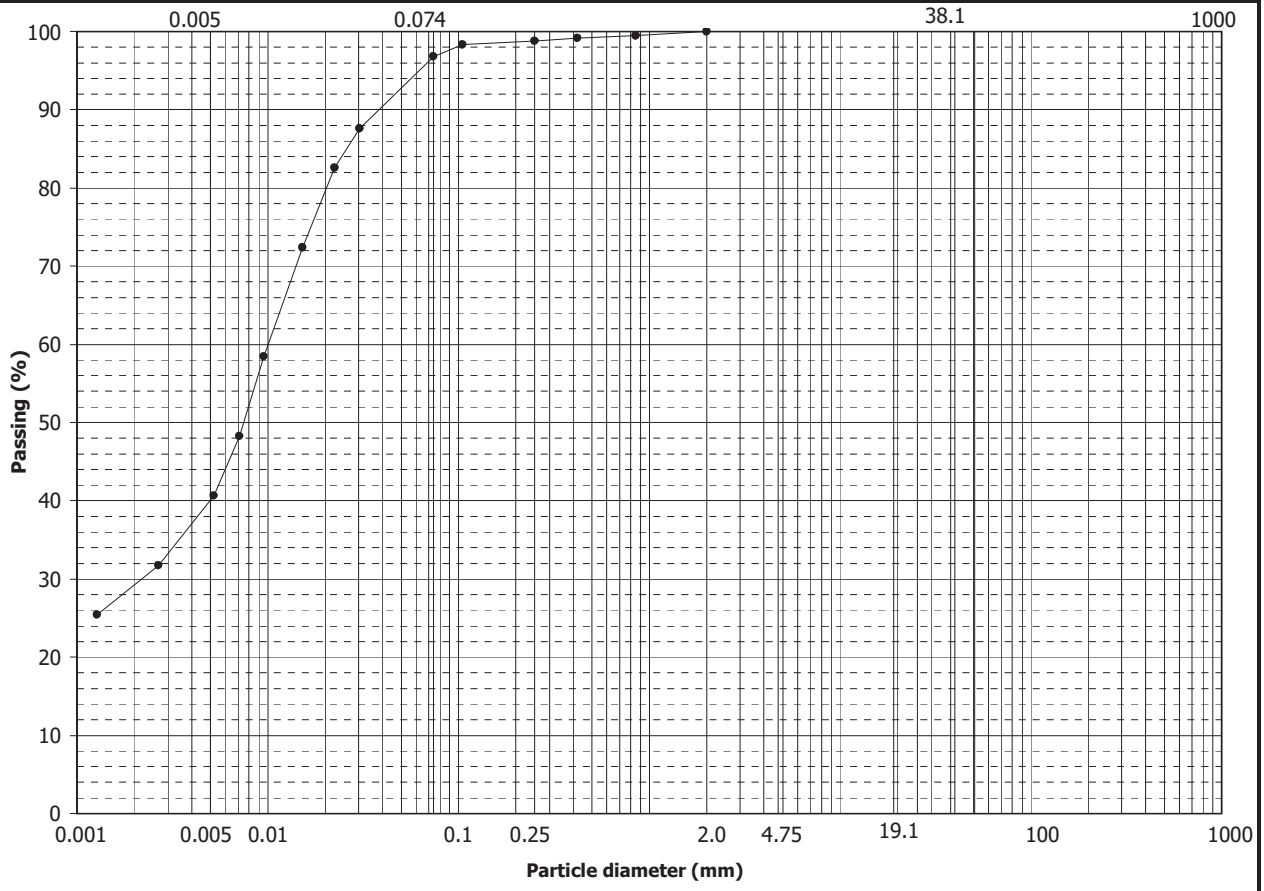
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**17.50 - 18.00**

SPECIFIC GRAVITY : **2.694**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	3.18	56.75	40.07	2.00	0.0417	0.0102	0.0075	0.0023	-	-	100.00	99.19	96.82



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**20.50 - 21.00**

Wt. (Air dry soil + container) = 654.3 gr
Wt. container No ..... = 40.08 gr
Wt. Of air dry soil W' = 614.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **614.22** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	40.88	40.08	0.80		0.13	99.87

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**20.50 - 21.00**

Wt. (Air dry soil + container) = 102.97 gr — Specific Gravity : **2.685**

Wt. of container B-91 = 32.94 gr — Plasticity Index : %

Wt. Of air dry soil W' = 70.03 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.87 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-29			NO	J-66			NO	J-56		
WW	50.98	DW	50.15	WW	51.07	DW	50.27	WW	52.03	DW	51.29	Mean value	
DW	50.15	TW	37.51	DW	50.27	TW	37.71	DW	51.29	TW	39.44	w	
Ww	0.83	Ws	12.64	Ww	0.80	Ws	12.56	Ww	0.74	Ws	11.85	6.39	%
w	6.57	%		w	6.37	%		w	6.25	%			

$$W = \frac{100 \times W'}{100 + w} : 65.821 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	38.5	39.5	28	5.629	5.629	2.3726	0.01232	0.0292	36.50	88.36	88.25
2	37.0	38.0	28	6.008	3.004	1.7332	0.01232	0.0214	35.00	84.73	84.62
5	34.0	35.0	28	6.765	1.353	1.1632	0.01232	0.0143	32.00	77.47	77.37
15	28.0	29.0	28	8.279	0.552	0.7429	0.01232	0.0092	26.00	62.94	62.86
30	23.0	24.0	28	9.540	0.318	0.5639	0.01232	0.0069	21.00	50.84	50.77
60	19.0	20.0	28	10.549	0.176	0.4193	0.01232	0.0052	17.00	41.16	41.10
240	14.5	15.5	29	11.685	0.049	0.2206	0.01219	0.0027	12.50	30.26	30.22
1140	12.0	13.0	28	12.315	0.011	0.1039	0.01232	0.0013	10.00	24.21	24.18

P = 100/W = 1.5193

$$Mx = \frac{G_s}{G_s - 1} = 1.5935$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.39	22.02	0.370		0.56	99.44	99.31
0.42	22.92		0.900		1.37	98.63	98.50
0.25	23.37		1.350		2.05	97.95	97.82
0.105	24.93		2.910		4.42	95.58	95.45
0.074	25.86		3.840		5.83	94.17	94.04

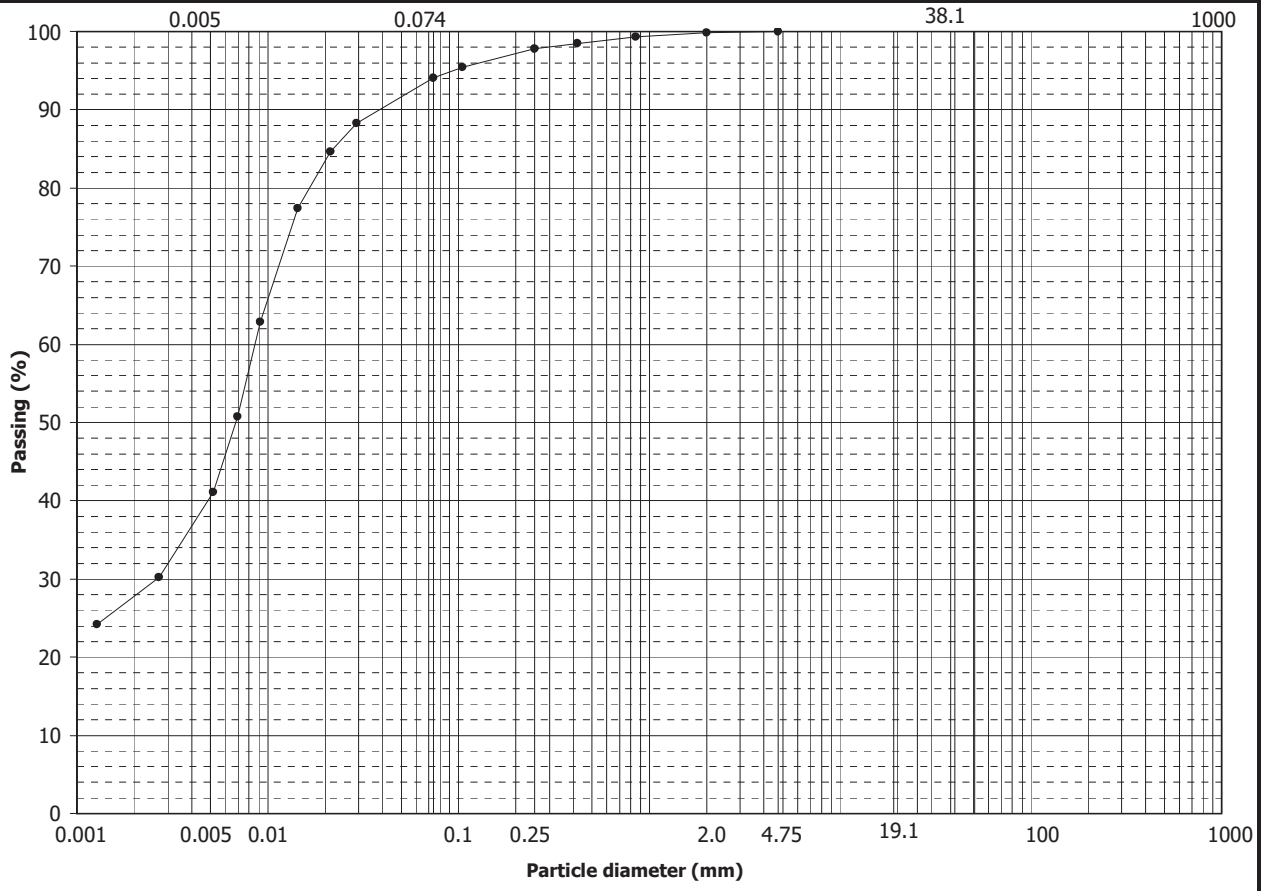
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**20.50 - 21.00**

SPECIFIC GRAVITY : **2.685**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	5.96	53.49	40.55	4.75	0.0428	0.0086	0.0068	0.0026	-	-	99.87	98.50	94.04



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**23.50 - 24.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 18, 2019
LOCATION	SILAE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 12	DEPTH	23.50 - 24.00

Wt. (Air dry soil + container) = 97.48 gr — Specific Gravity : 2.686
Wt. of container E-41 = 36.10 gr — Plasticity Index : %
Wt. Of air dry soil W' = 61.38 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-23			NO	J-35			NO	J-43		
WW	49.98	DW	49.02	WW	50.04	DW	49.00	WW	49.89	DW	49.01	Mean value	
DW	49.02	TW	36.20	DW	49.00	TW	34.38	DW	49.01	TW	36.94	w	
Ww	0.96	Ws	12.82	Ww	1.04	Ws	14.62	Ww	0.88	Ws	12.07	7.30	%
w	7.49	%		w	7.11	%		w	7.29	%			

$$W = \frac{100 \times W'}{100 + w} : 57.205 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	36.5	37.5	28	6.134	6.134	2.4767	0.01232	0.0305	34.50	96.08	96.08
2	35.0	36.0	28	6.512	3.256	1.8045	0.01232	0.0222	33.00	91.90	91.90
5	32.0	33.0	28	7.269	1.454	1.2058	0.01232	0.0149	30.00	83.55	83.55
15	26.0	27.0	28	8.783	0.586	0.7652	0.01232	0.0094	24.00	66.84	66.84
30	22.0	23.0	28	9.792	0.326	0.5713	0.01232	0.0070	20.00	55.70	55.70
60	19.0	20.0	28	10.549	0.176	0.4193	0.01232	0.0052	17.00	47.34	47.34
240	14.5	15.5	29	11.685	0.049	0.2206	0.01219	0.0027	12.50	34.81	34.81
1140	12.0	13.0	28	12.315	0.011	0.1039	0.01232	0.0013	10.00	27.85	27.85

P = 100/W = 1.7481

$$Mx = \frac{G_s}{G_s - 1} = 1.5931$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.05	22.02	0.030		0.05	99.95	99.95
0.42	22.13		0.110		0.19	99.81	99.81
0.25	22.24		0.220		0.38	99.62	99.62
0.105	22.37		0.350		0.61	99.39	99.39
0.074	22.64		0.620		1.08	98.92	98.92

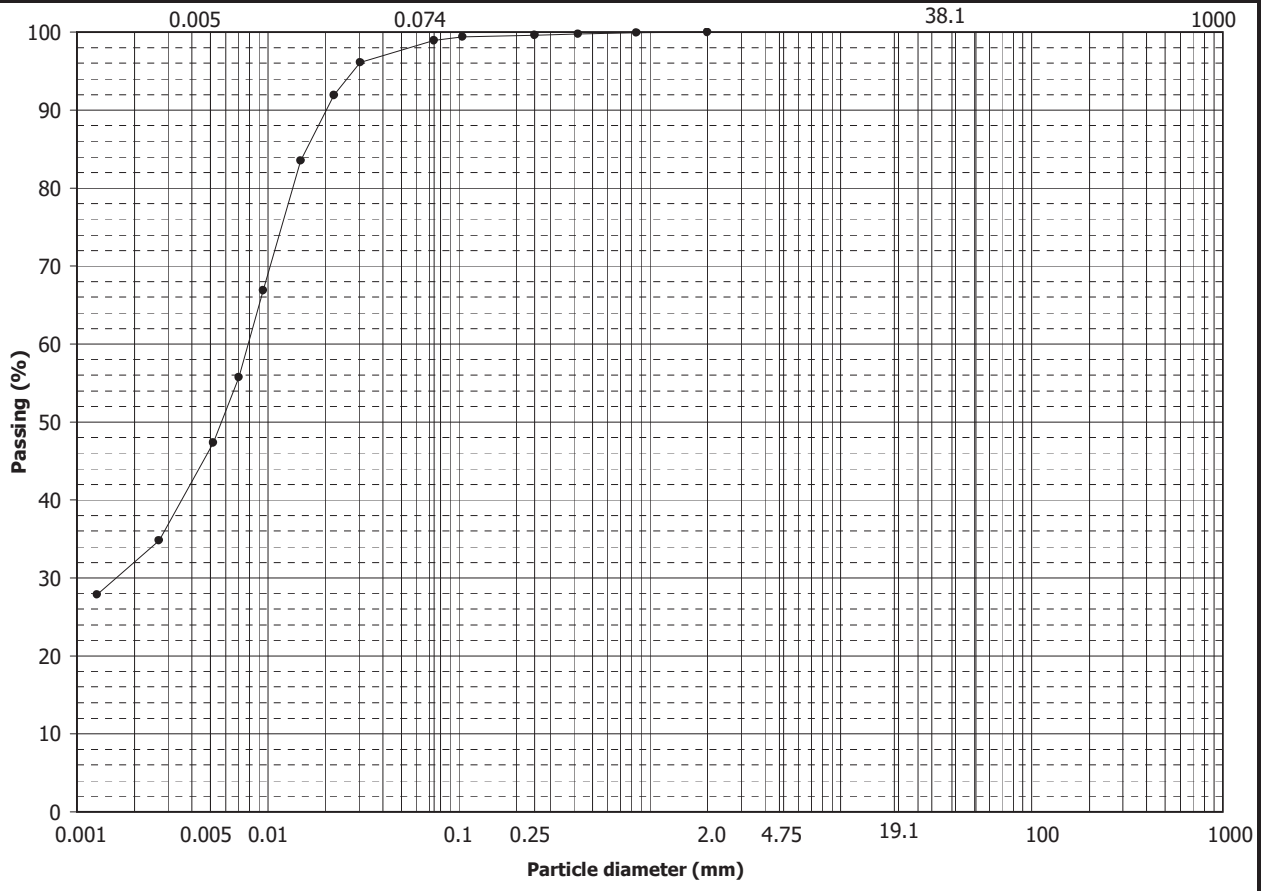
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Cab. Sby : Jalan Jemursari 27 Malang Telp.: (0341) 362391, Fax.: (0341) 334472, E-mail : divisi.ukl@indrakarya.co.id atau lab_geoteknik_ika@yahoo.com

RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 18, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 12**	DEPTH	**23.50 - 24.00**

SPECIFIC GRAVITY : **2.686**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	1.08	52.20	46.72	2.00	0.0206	0.0080	0.0058	0.0017	-	-	100.00	99.81	98.92



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		0.50 - 1.00

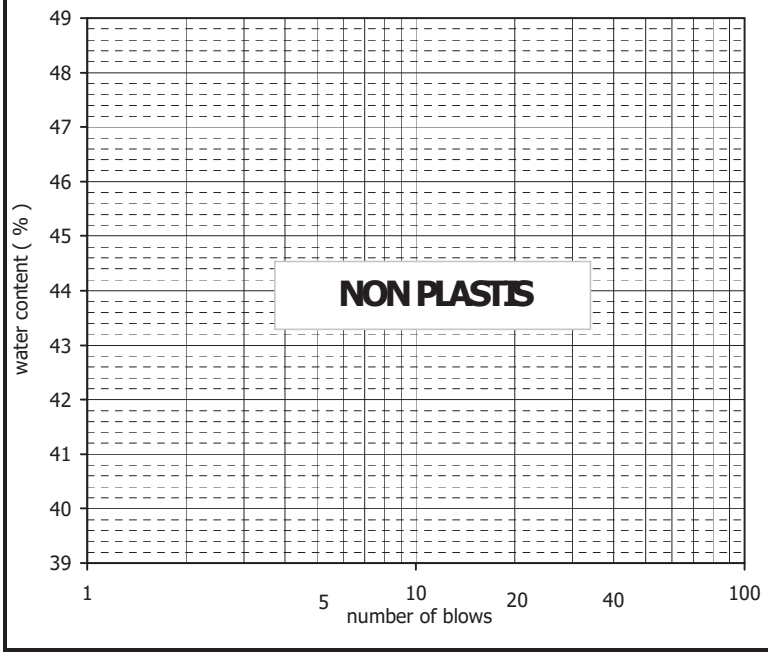
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		1.50 - 2.00

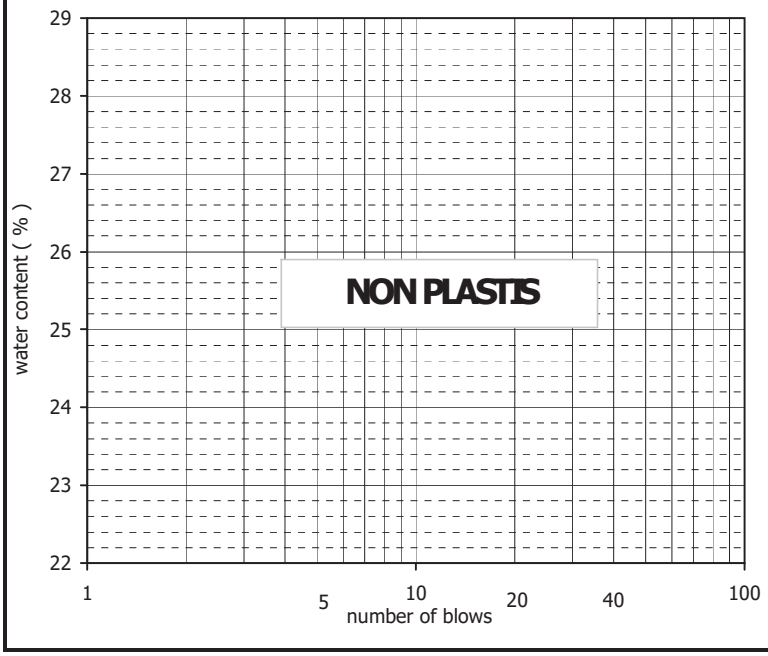
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		2.50 - 3.00

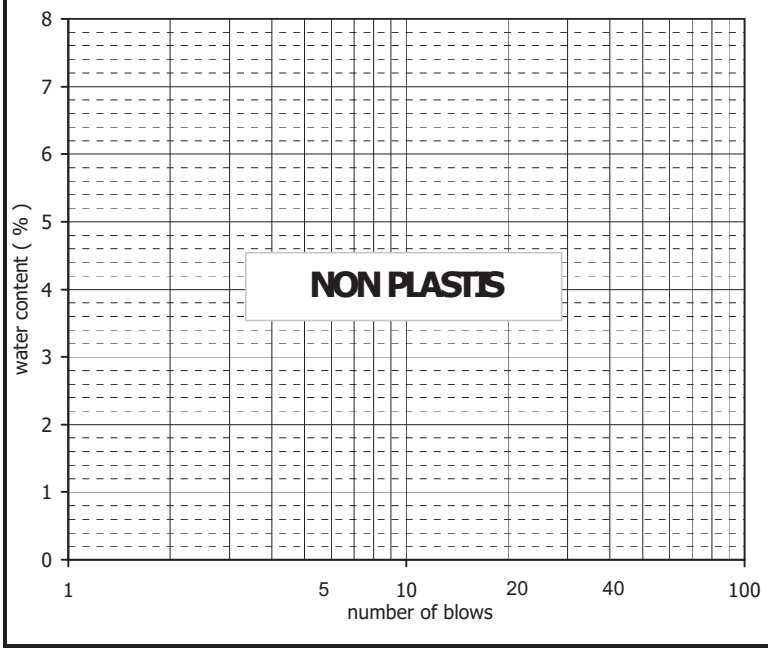
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		3.50 - 4.00

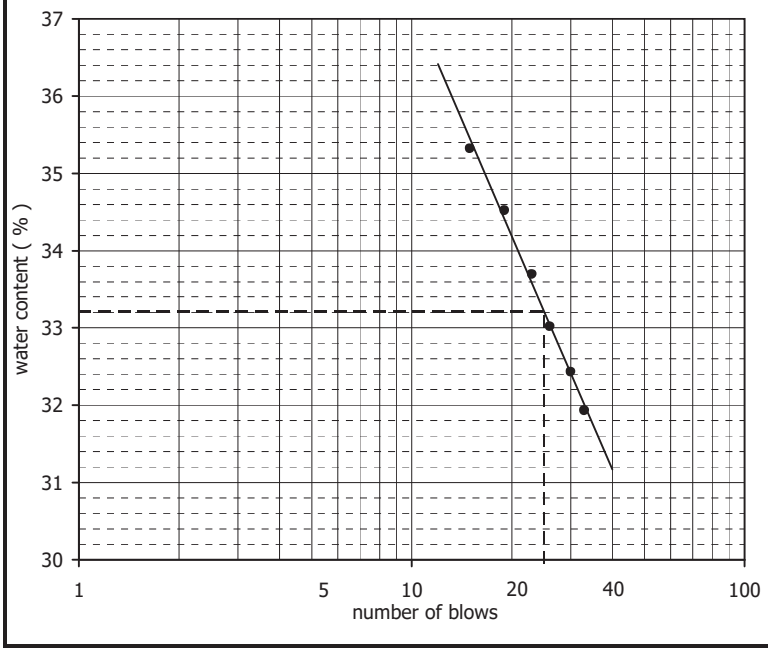
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			33 x	NO. OF BLOWS			30 x	NO. OF BLOWS			26 x
		No.	T-05			No.	A-01			No.	A-108
WW	55.570	DW	51.250	WW	55.100	DW	51.010	WW	53.770	DW	48.920
DW	51.250	TW	37.720	DW	51.010	TW	38.400	DW	48.920	TW	34.230
Ww	4.320	Ws	13.530	Ww	4.090	Ws	12.610	Ww	4.850	Ws	14.690
	W =		31.93 %		W =		32.43 %		W =		33.02 %

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	T-94			No.	A-58			No.	A-13
WW	54.950	DW	50.600	WW	54.360	DW	50.100	WW	52.850	DW	48.760
DW	50.600	TW	37.690	DW	50.100	TW	37.760	DW	48.760	TW	37.180
Ww	4.350	Ws	12.910	Ww	4.260	Ws	12.340	Ww	4.090	Ws	11.580
	W =		33.69 %		W =		34.52 %		W =		35.32 %

PLASTIC LIMIT

1				2				3			
		No.	L-10			No.	T-14			No.	T-52
WW	56.440	DW	53.460	WW	56.170	DW	52.820	WW	50.260	DW	47.350
DW	53.460	TW	40.810	DW	52.820	TW	38.840	DW	47.350	TW	34.930
Ww	2.980	Ws	12.650	Ww	3.350	Ws	13.980	Ww	2.910	Ws	12.420
	W =		23.56 %		W =		23.96 %		W =		23.43 %



LIQUID LIMIT	=	33.22	%
PLASTIC LIMIT	=	23.65	%
PLASTICITY INDEX	=	9.57	%
FLOW INDEX	=	10.02	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		4.50 - 5.00

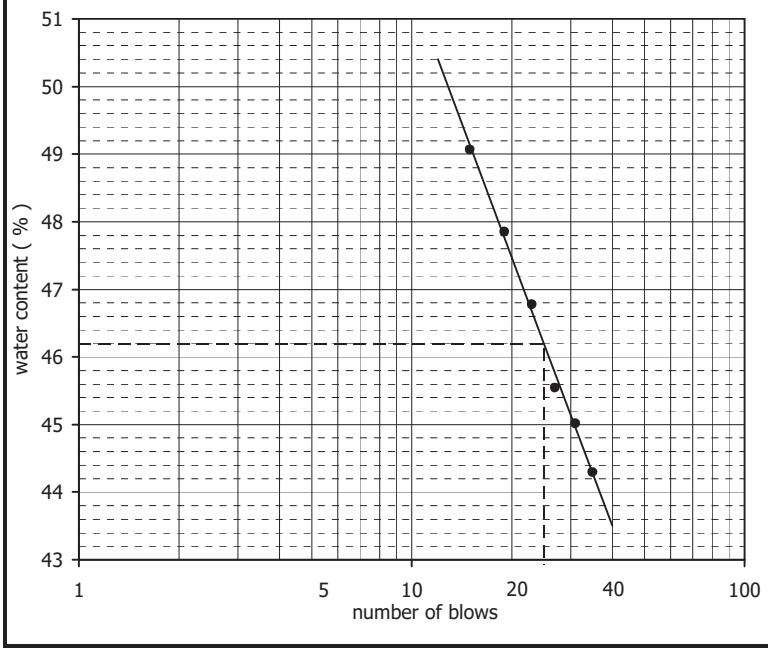
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-15			No.	J-19			No.	L-18
WW	56.940	DW	51.110	WW	56.970	DW	51.010	WW	53.770	DW	48.920
DW	51.110	TW	37.949	DW	51.010	TW	37.770	DW	48.920	TW	38.270
Ww	5.830	Ws	13.161	Ww	5.960	Ws	13.240	Ww	4.850	Ws	10.650
	W =	44.30	%		W =	45.02	%		W =	45.54	%

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	A-11			No.	A-14			No.	L-33
WW	55.860	DW	50.850	WW	56.110	DW	50.100	WW	56.230	DW	50.710
DW	50.850	TW	40.140	DW	50.100	TW	37.540	DW	50.710	TW	39.460
Ww	5.010	Ws	10.710	Ww	6.010	Ws	12.560	Ww	5.520	Ws	11.250
	W =	46.78	%		W =	47.85	%		W =	49.07	%

PLASTIC LIMIT

1				2				3			
		No.	L-15			No.	T-78			No.	T-91
WW	56.930	DW	53.660	WW	54.020	DW	50.360	WW	51.480	DW	48.160
DW	53.660	TW	42.180	DW	50.360	TW	37.500	DW	48.160	TW	36.600
Ww	3.270	Ws	11.480	Ww	3.660	Ws	12.860	Ww	3.320	Ws	11.560
	W =	28.48	%		W =	28.46	%		W =	28.72	%



LIQUID LIMIT	=	46.20	%
PLASTIC LIMIT	=	28.55	%
PLASTICITY INDEX	=	17.64	%
FLOW INDEX	=	13.18	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		5.50 - 6.00

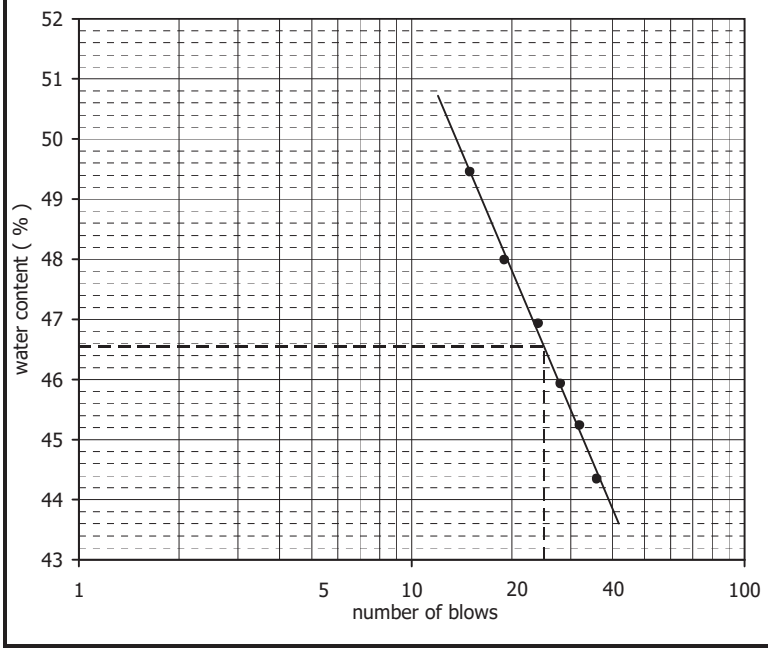
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	J-13			No.	J-86			No.	J-22
WW	56.830	DW	51.890	WW	56.840	DW	50.720	WW	54.960	DW	49.940
DW	51.890	TW	40.750	DW	50.720	TW	37.190	DW	49.940	TW	39.010
Ww	4.940	Ws	11.140	Ww	6.120	Ws	13.530	Ww	5.020	Ws	10.930
	W =	44.34	%		W =	45.23	%		W =	45.93	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	L-02			No.	L-21			No.	J-65
WW	58.370	DW	52.480	WW	56.700	DW	50.150	WW	56.340	DW	49.030
DW	52.480	TW	39.930	DW	50.150	TW	36.500	DW	49.030	TW	34.250
Ww	5.890	Ws	12.550	Ww	6.550	Ws	13.650	Ww	7.310	Ws	14.780
	W =	46.93	%		W =	47.99	%		W =	49.46	%

PLASTIC LIMIT

1				2				3			
		No.	T-29			No.	A-35			No.	A-72
WW	55.280	DW	51.080	WW	57.170	DW	53.400	WW	56.500	DW	52.090
DW	51.080	TW	36.390	DW	53.400	TW	40.080	DW	52.090	TW	36.570
Ww	4.200	Ws	14.690	Ww	3.770	Ws	13.320	Ww	4.410	Ws	15.520
	W =	28.59	%		W =	28.30	%		W =	28.41	%



LIQUID LIMIT	=	46.55	%
PLASTIC LIMIT	=	28.44	%
PLASTICITY INDEX	=	18.11	%
FLOW INDEX	=	13.08	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		6.50 - 7.00

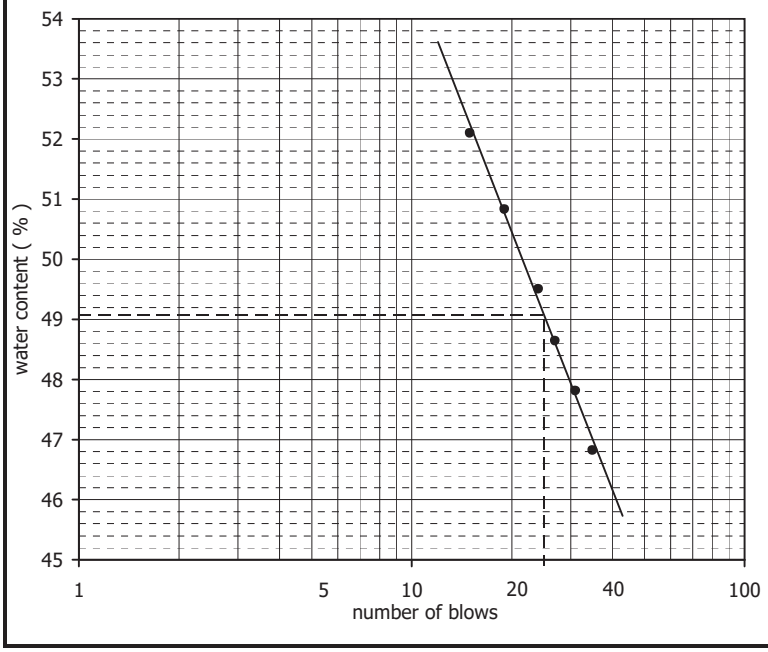
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	T-15			No.	T-42			No.	J-37
WW	58.270	DW	51.860	WW	55.250	DW	50.230	WW	56.760	DW	49.960
DW	51.860	TW	38.170	DW	50.230	TW	39.730	DW	49.960	TW	35.980
Ww	6.410	Ws	13.690	Ww	5.020	Ws	10.500	Ww	6.800	Ws	13.980
	W =	46.82	%		W =	47.81	%		W =	48.64	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	T-73			No.	A-29			No.	J-45
WW	51.300	DW	45.770	WW	57.400	DW	50.950	WW	55.620	DW	49.660
DW	45.770	TW	34.600	DW	50.950	TW	38.260	DW	49.660	TW	38.220
Ww	5.530	Ws	11.170	Ww	6.450	Ws	12.690	Ww	5.960	Ws	11.440
	W =	49.51	%		W =	50.83	%		W =	52.10	%

PLASTIC LIMIT

1				2				3			
		No.	J-48			No.	A-63			No.	T-50
WW	55.520	DW	51.320	WW	57.400	DW	53.470	WW	53.730	DW	50.220
DW	51.320	TW	37.110	DW	53.470	TW	39.920	DW	50.220	TW	38.210
Ww	4.200	Ws	14.210	Ww	3.930	Ws	13.550	Ww	3.510	Ws	12.010
	W =	29.56	%		W =	29.00	%		W =	29.23	%



LIQUID LIMIT	=	49.08	%
PLASTIC LIMIT	=	29.26	%
PLASTICITY INDEX	=	19.82	%
FLOW INDEX	=	14.20	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		7.50 - 8.00

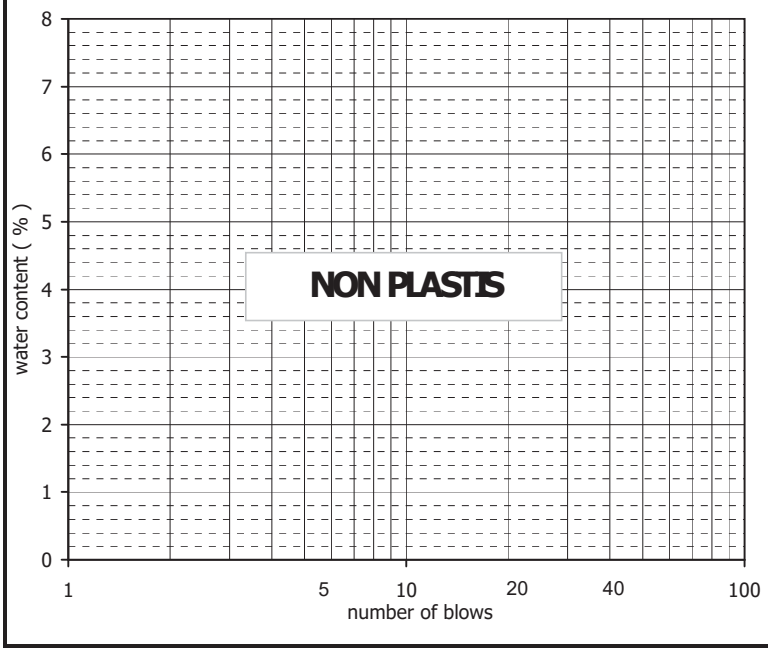
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		8.50 - 9.00

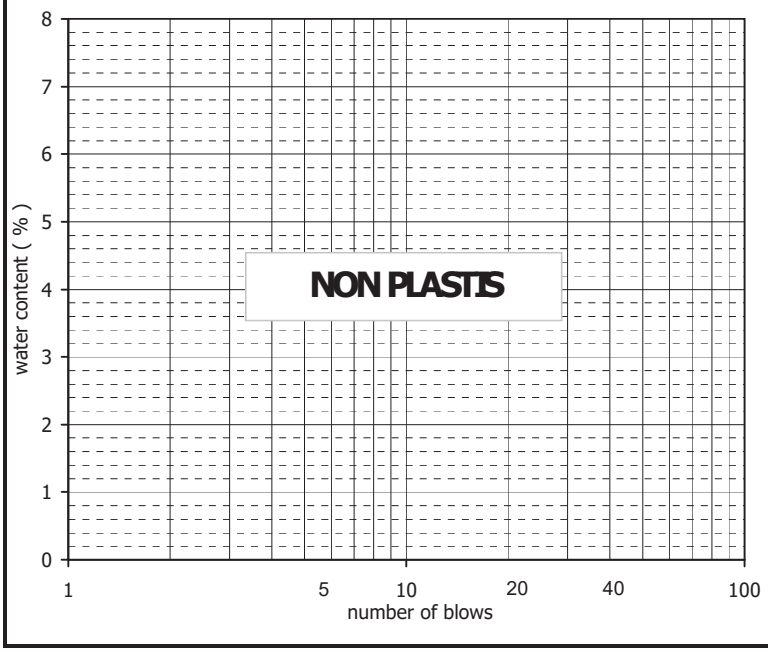
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		9.50 - 10.00

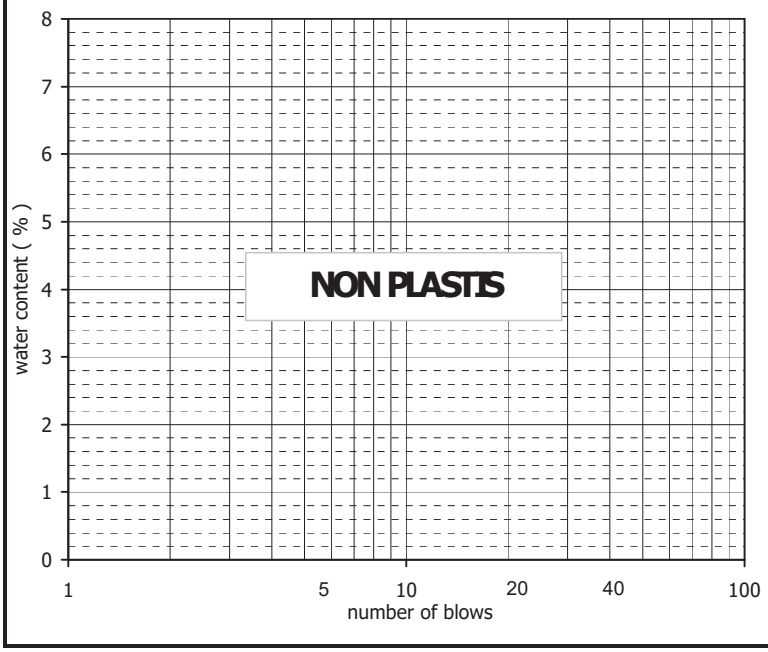
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		11.50 - 12.00

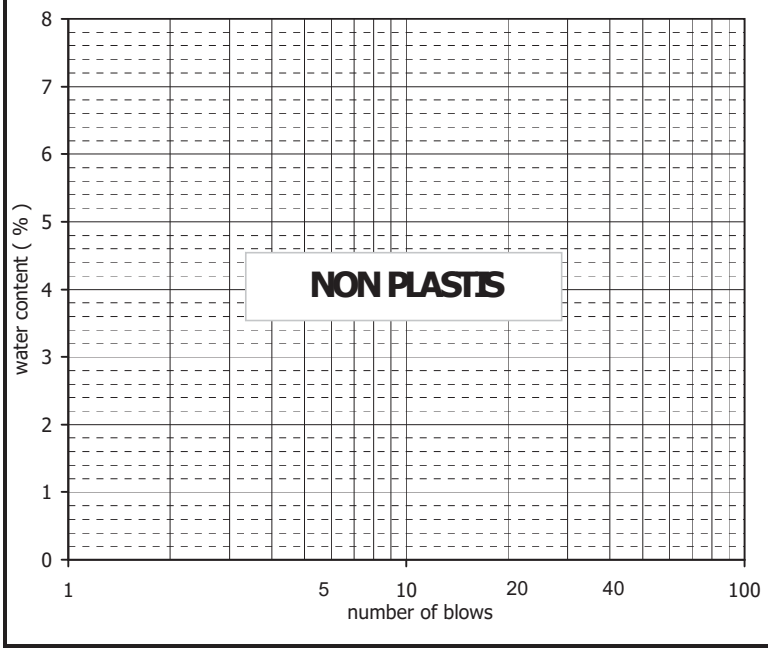
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		14.50 - 15.00

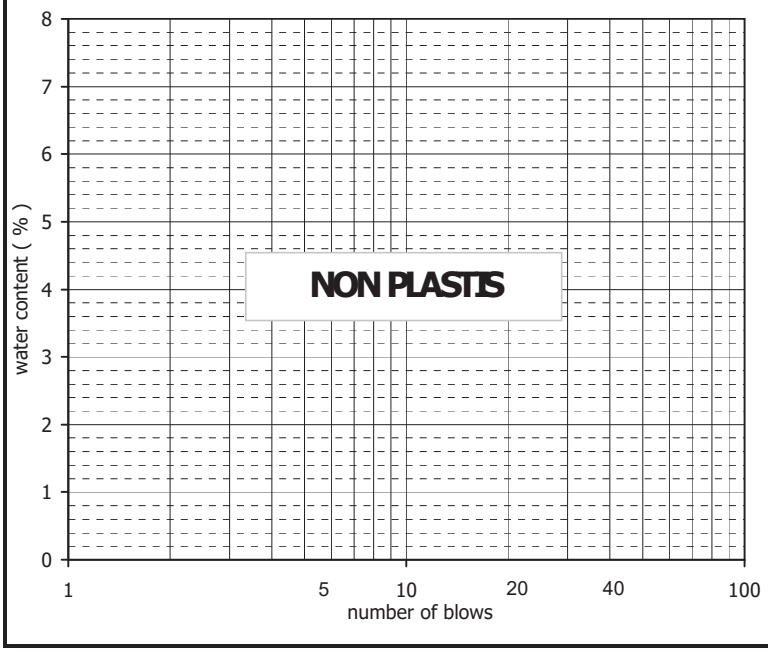
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		17.50 - 18.00

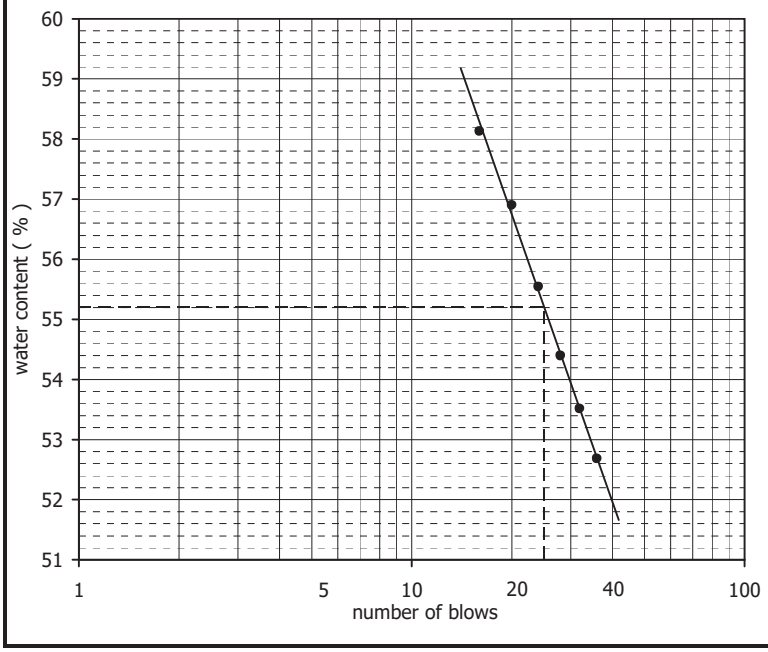
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	A-50			No.	A-65			No.	A-12
WW	56.790	DW	50.110	WW	57.680	DW	51.060	WW	56.590	DW	50.220
DW	50.110	TW	37.430	DW	51.060	TW	38.690	DW	50.220	TW	38.510
Ww	6.680	Ws	12.680	Ww	6.620	Ws	12.370	Ww	6.370	Ws	11.710
	W =	52.68	%		W =	53.52	%		W =	54.40	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	L-22			No.	A-64			No.	A-81
WW	59.030	DW	52.170	WW	54.670	DW	47.870	WW	53.600	DW	46.630
DW	52.170	TW	39.820	DW	47.870	TW	35.920	DW	46.630	TW	34.640
Ww	6.860	Ws	12.350	Ww	6.800	Ws	11.950	Ww	6.970	Ws	11.990
	W =	55.55	%		W =	56.90	%		W =	58.13	%

PLASTIC LIMIT

1				2				3			
		No.	J-91			No.	L-38			No.	L-23
WW	54.150	DW	50.220	WW	52.980	DW	49.630	WW	51.790	DW	48.330
DW	50.220	TW	37.510	DW	49.630	TW	38.850	DW	48.330	TW	37.160
Ww	3.930	Ws	12.710	Ww	3.350	Ws	10.780	Ww	3.460	Ws	11.170
	W =	30.92	%		W =	31.08	%		W =	30.98	%



LIQUID LIMIT	=	55.21	%
PLASTIC LIMIT	=	30.99	%
PLASTICITY INDEX	=	24.22	%
FLOW INDEX	=	15.75	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		20.50 - 21.00

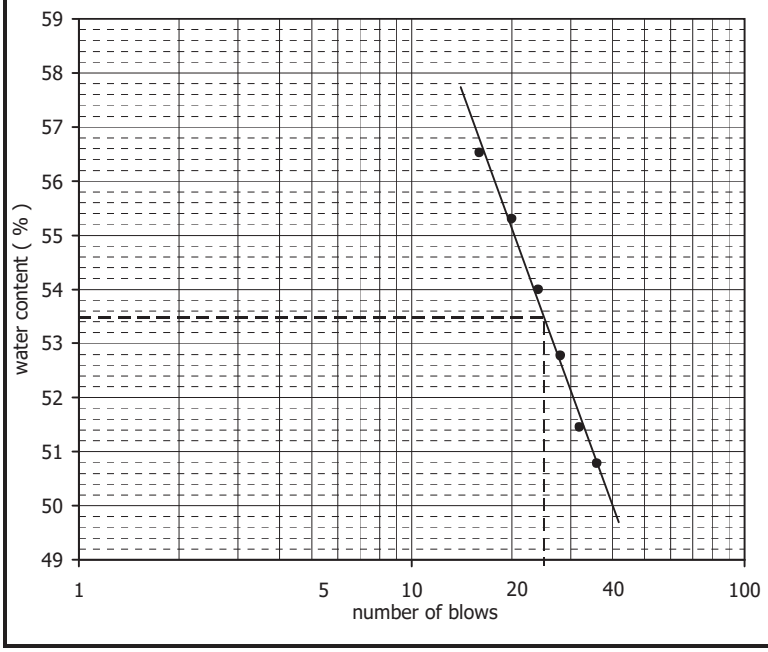
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	J-05			No.	J-92			No.	J-12
WW	54.190	DW	48.240	WW	53.600	DW	48.290	WW	57.450	DW	50.410
DW	48.240	TW	36.523	DW	48.290	TW	37.970	DW	50.410	TW	37.070
Ww	5.950	Ws	11.717	Ww	5.310	Ws	10.320	Ww	7.040	Ws	13.340
	W =	50.78	%		W =	51.45	%		W =	52.77	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	A-54			No.	T-36			No.	J-24
WW	57.090	DW	50.200	WW	54.950	DW	48.690	WW	54.180	DW	46.630
DW	50.200	TW	37.440	DW	48.690	TW	37.370	DW	46.630	TW	33.272
Ww	6.890	Ws	12.760	Ww	6.260	Ws	11.320	Ww	7.550	Ws	13.358
	W =	54.00	%		W =	55.30	%		W =	56.52	%

PLASTIC LIMIT

1				2				3			
		No.	A-36			No.	J-09			No.	J-83
WW	52.310	DW	48.480	WW	58.430	DW	54.160	WW	57.760	DW	53.140
DW	48.480	TW	36.350	DW	54.160	TW	40.120	DW	53.140	TW	38.130
Ww	3.830	Ws	12.130	Ww	4.270	Ws	14.040	Ww	4.620	Ws	15.010
	W =	31.57	%		W =	30.41	%		W =	30.78	%



LIQUID LIMIT	=	53.49	%
PLASTIC LIMIT	=	30.92	%
PLASTICITY INDEX	=	22.57	%
FLOW INDEX	=	16.86	

REMARKS :

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DW : Wt. of container + dry soil in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	SILAE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 12	DEPTH (m)		23.50 - 24.00

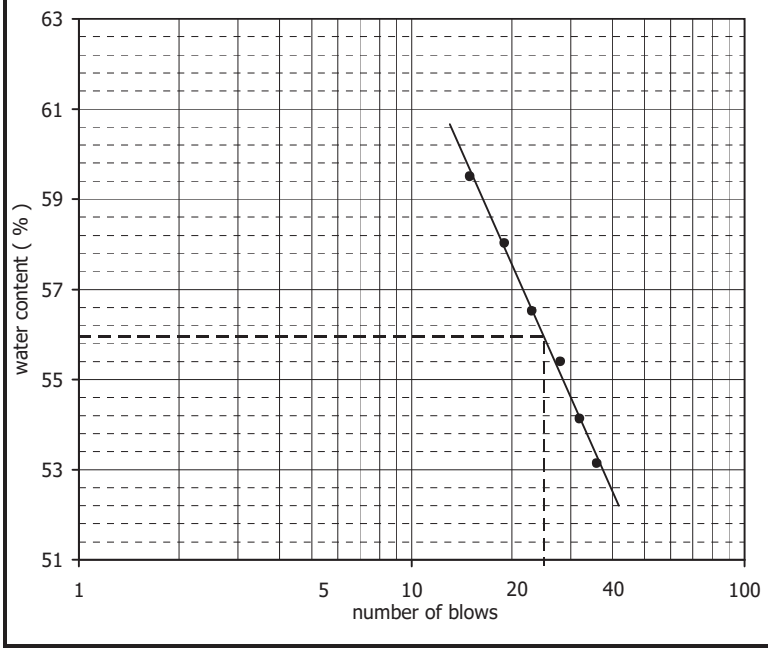
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	J-58			No.	T-24			No.	A-76
WW	56.860	DW	50.860	WW	58.620	DW	51.080	WW	58.360	DW	50.090
DW	50.860	TW	39.570	DW	51.080	TW	37.150	DW	50.090	TW	35.160
Ww	6.000	Ws	11.290	Ww	7.540	Ws	13.930	Ww	8.270	Ws	14.930
	W =	53.14	%		W =	54.13	%		W =	55.39	%

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	T-49			No.	J-33			No.	A-09
WW	53.100	DW	47.770	WW	57.250	DW	49.510	WW	59.080	DW	52.130
DW	47.770	TW	38.340	DW	49.510	TW	36.170	DW	52.130	TW	40.450
Ww	5.330	Ws	9.430	Ww	7.740	Ws	13.340	Ww	6.950	Ws	11.680
	W =	56.52	%		W =	58.02	%		W =	59.50	%

PLASTIC LIMIT

1				2				3			
		No.	L-11			No.	T-82			No.	J-35
WW	56.680	DW	53.110	WW	53.420	DW	49.840	WW	47.990	DW	44.800
DW	53.110	TW	41.640	DW	49.840	TW	38.540	DW	44.800	TW	34.380
Ww	3.570	Ws	11.470	Ww	3.580	Ws	11.300	Ww	3.190	Ws	10.420
	W =	31.12	%		W =	31.68	%		W =	30.61	%



LIQUID LIMIT	=	55.95	%
PLASTIC LIMIT	=	31.14	%
PLASTICITY INDEX	=	24.81	%
FLOW INDEX	=	16.61	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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SUMMARY OF SOIL TEST

PROJECT			**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**								
LOCATION			**MAMBORO - PALU**								
SAMPLE No			BAY - 13	BAY - 13	BAY - 13	BAY - 13	BAY - 13	BAY - 13	BAY - 13	BAY - 13	BAY - 13
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	12.10	21.36	21.98	10.45	13.22	10.53	14.25	14.04	28.67
	Specific gravity of soil	*Gs*	2.658	2.639	2.643	2.674	2.669	2.674	2.678	2.650	2.679
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	0.00	4.85	21.69	12.09	0.38	8.58	0.00	0.00	0.00
	Proportion — Sand part	(%)	77.34	38.65	54.88	67.94	81.47	62.17	35.31	72.76	30.18
	Proportion — Silt part	(%)	18.53	43.37	13.92	13.62	14.50	23.16	43.26	18.73	49.15
	Proportion — Clay part	(%)	4.14	13.13	9.51	6.35	3.65	6.09	21.44	8.52	20.68
	Max. diameter	(mm)	4.75	25.40	25.40	19.10	9.52	19.10	4.75	2.00	2.00
	90 % diameter	(mm)	2.0365	1.5133	19.6946	6.5024	1.6351	4.1966	0.2347	0.8320	0.5553
	60 % diameter	(mm)	0.5066	0.0856	0.5678	0.8495	0.4745	0.4077	0.0668	0.3474	0.0600
	50 % diameter	(mm)	0.3109	0.0665	0.3516	0.5653	0.3477	0.2610	0.0515	0.2676	0.0458
	30 % diameter	(mm)	0.1176	0.0434	0.1349	0.2102	0.1626	0.0778	0.0168	0.0878	0.0170
	10 % diameter	(mm)	0.0229	0.0026	0.0057	0.0144	0.0208	0.0099	-	0.0074	-
	Uniformity Coefficient		22.16	33.50	98.78	59.16	22.85	41.30	-	47.07	-
	Passing # 200		22.66	56.50	23.42	19.97	18.15	29.25	64.69	27.24	69.82
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	24.89	NON PLASTIS	30.90
	Plastic limit	*PL* (%)							18.36		26.24
	Plasticity index	*PI* (%)							6.53		4.66
	Flow index								8.33		9.08
	Unified Classification								CL - ML		CL - ML

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**MAMBORO - PALU**									
SAMPLE No			BAY - 13	BAY - 13	BAY - 13	BAY - 13					
DEPTH (m)			9.50 - 10.00	12.50 - 13.00	15.50 - 16.00	18.50 - 19.00					
PROPERTIES	Natural Water Content	(%)	31.19	10.59	9.72	20.06					
	Specific gravity of soil	*Gs*	2.698	2.655	2.662	2.658					
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	0.00	1.84	41.03	0.00					
	Proportion — Sand part	(%)	23.03	61.27	45.34	32.82					
	Proportion — Silt part	(%)	67.63	27.59	9.48	59.30					
	Proportion — Clay part	(%)	9.34	9.30	4.15	7.89					
	Max. diameter	(mm)	2.00	4.75	25.40	2.00					
	90 % diameter	(mm)	0.1036	0.9091	23.2634	0.6961					
	60 % diameter	(mm)	0.0603	0.2418	6.4173	0.0675					
	50 % diameter	(mm)	0.0523	0.1542	1.6823	0.0584					
	30 % diameter	(mm)	0.0352	0.0562	0.4415	0.0396					
	10 % diameter	(mm)	0.0057	0.0058	0.0380	0.0078					
	Uniformity Coefficient		10.66	41.67	169.01	8.65					
	Passing # 200		76.97	36.89	13.63	67.18					
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS					
	Plastic limit	*PL* (%)									
	Plasticity index	*PI* (%)									
	Flow index										
	Unified Classification										

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	MAMBORO - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	A-97								No	J-50	
04/02	BAY - 13		WW	104.88	DW	97.39			04/02	BAY - 13		WW	97.57	DW	84.35		
2019	0.50 - 1.00	12.10	DW	97.39	TW	35.47			2019	8.50 - 9.00	28.67	DW	84.35	TW	38.24		
			Ww	7.49	Ws	61.92						Ww	13.22	Ws	46.11		
				WC	(%)	12.10							WC	(%)	28.67		
					No	J-41								No	A-20		
04/02	BAY - 13		WW	99.82	DW	88.75			04/02	BAY - 13		WW	108.81	DW	92.26		
2019	1.50 - 2.00	21.36	DW	88.75	TW	36.92			2019	9.50 - 10.00	31.19	DW	92.26	TW	39.20		
			Ww	11.07	Ws	51.83						Ww	16.55	Ws	53.06		
				WC	(%)	21.36							WC	(%)	31.19		
					No	T-50								No	J-11		
04/02	BAY - 13		WW	91.77	DW	82.12			04/02	BAY - 13		WW	110.15	DW	103.38		
2019	2.50 - 3.00	21.98	DW	82.12	TW	38.21			2019	12.50 - 13.00	10.59	DW	103.38	TW	39.43		
			Ww	9.65	Ws	43.91						Ww	6.77	Ws	63.95		
				WC	(%)	21.98							WC	(%)	10.59		
					No	A-35								No	J-75		
04/02	BAY - 13		WW	107.19	DW	100.84			04/02	BAY - 13		WW	98.54	DW	92.92		
2019	3.50 - 4.00	10.45	DW	100.84	TW	40.08			2019	15.50 - 16.00	9.72	DW	92.92	TW	35.09		
			Ww	6.35	Ws	60.76						Ww	5.62	Ws	57.83		
				WC	(%)	10.45							WC	(%)	9.72		
					No	T-14								No	A-25		
04/02	BAY - 13		WW	111.30	DW	102.84			04/02	BAY - 13		WW	107.46	DW	96.07		
2019	4.50 - 5.00	13.22	DW	102.84	TW	38.84			2019	18.50 - 19.00	20.06	DW	96.07	TW	39.30		
			Ww	8.46	Ws	64.00						Ww	11.39	Ws	56.77		
				WC	(%)	13.22							WC	(%)	20.06		
					No	A-83								No			
04/02	BAY - 13		WW	82.90	DW	78.35						WW		DW			
2019	5.50 - 6.00	10.53	DW	78.35	TW	35.15						DW		TW			
			Ww	4.55	Ws	43.20						Ww		Ws			
				WC	(%)	10.53							WC	(%)			
					No	A-105								No			
04/02	BAY - 13		WW	76.32	DW	71.11						WW		DW			
2019	6.50 - 7.00	14.25	DW	71.11	TW	34.56						DW		TW			
			Ww	5.21	Ws	36.55						Ww		Ws			
				WC	(%)	14.25							WC	(%)			
					No	A-36								No			
04/02	BAY - 13		WW	117.57	DW	107.57						WW		DW			
2019	7.50 - 8.00	14.04	DW	107.57	TW	36.35						DW		TW			
			Ww	10.00	Ws	71.22						Ww		Ws			
				WC	(%)	14.04							WC	(%)			

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 9, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				63	82	52	
Weight of Pycnometer		Wf	(gr)	45.527	37.300	52.420	
Weight of (Pycnometer + Water)		Wa	(gr)	149.488	137.000	153.990	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	162.080	149.660	166.620	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.880	38.040	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.100	20.260	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	149.4884	137.0000	153.9900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.508	7.600	7.550	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.677	2.666	2.673	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.663	2.652	2.659	
Average Specific Gravity at 20° C							**2.658**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				78	44	11	
Weight of Pycnometer		Wf	(gr)	36.640	38.880	68.490	
Weight of (Pycnometer + Water)		Wa	(gr)	136.850	139.990	168.640	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.390	152.580	181.180	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.880	38.010	37.910	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.100	20.230	20.130	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.8500	139.9900	168.6400	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.560	7.640	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.659	2.648	2.652	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.645	2.634	2.639	
Average Specific Gravity at 20° C							**2.639**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				10	50	81	
Weight of Pycnometer		Wf	(gr)	67.070	52.650	36.910	
Weight of (Pycnometer + Water)		Wa	(gr)	168.920	154.080	135.890	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.590	166.670	148.510	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.100	37.960	38.030	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.320	20.180	20.250	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.9200	154.0800	135.8900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.590	7.630	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.656	2.659	2.654	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.643	2.645	2.640	
Average Specific Gravity at 20° C							**2.643**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				31	5	49	
Weight of Pycnometer		Wf	(gr)	34.630	65.390	39.190	
Weight of (Pycnometer + Water)		Wa	(gr)	134.510	168.330	141.110	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	147.210	180.930	153.170	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.970	37.850	37.020	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.190	20.070	19.240	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	134.5100	168.3300	141.1100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.490	7.470	7.180	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.696	2.687	2.680	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.682	2.673	2.666	
Average Specific Gravity at 20° C							**2.674**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				29	1	59	
Weight of Pycnometer		Wf	(gr)	36.900	62.150	33.640	
Weight of (Pycnometer + Water)		Wa	(gr)	135.800	165.770	144.580	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.610	178.700	157.360	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.200	38.400	38.150	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.420	20.620	20.370	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8000	165.7700	144.5800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.610	7.690	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.683	2.681	2.684	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.670	2.668	2.670	
Average Specific Gravity at 20° C							**2.669**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				51	73	13	
Weight of Pycnometer		Wf	(gr)	53.870	34.550	66.070	
Weight of (Pycnometer + Water)		Wa	(gr)	154.280	135.120	167.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	166.880	147.880	179.930	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.870	38.080	37.930	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.090	20.300	20.150	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	154.2800	135.1200	167.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.490	7.540	7.490	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.682	2.692	2.690	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.668	2.678	2.676	
Average Specific Gravity at 20° C							**2.674**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 9, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				16	48	74	
Weight of Pycnometer		Wf	(gr)	66.000	37.760	38.550	
Weight of (Pycnometer + Water)		Wa	(gr)	169.300	139.170	138.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.330	151.880	151.440	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.530	37.990	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.750	20.210	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.3000	139.1700	138.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.720	7.500	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.688	2.695	2.692	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.674	2.681	2.678	
Average Specific Gravity at 20° C							**2.678**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				34	39	66	
Weight of Pycnometer		Wf	(gr)	52.710	36.940	36.290	
Weight of (Pycnometer + Water)		Wa	(gr)	152.200	136.930	136.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	165.120	149.520	148.930	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.460	37.950	38.020	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.680	20.170	20.240	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	152.2000	136.9300	136.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.760	7.580	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.665	2.661	2.667	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.651	2.647	2.653	
Average Specific Gravity at 20° C							**2.650**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				30	38	58	
Weight of Pycnometer		Wf	(gr)	38.460	37.290	35.070	
Weight of (Pycnometer + Water)		Wa	(gr)	138.140	136.940	145.730	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.930	149.910	158.370	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.120	38.440	37.860	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.340	20.660	20.080	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1400	136.9400	145.7300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.550	7.690	7.440	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.694	2.687	2.699	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.680	2.673	2.685	
Average Specific Gravity at 20° C							**2.679**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				27	4	65	
Weight of Pycnometer		Wf	(gr)	39.750	65.900	34.080	
Weight of (Pycnometer + Water)		Wa	(gr)	140.000	167.100	134.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	152.880	179.810	147.100	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.140	37.940	38.120	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.360	20.160	20.340	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	140.0000	167.1000	134.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.480	7.450	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.722	2.706	2.708	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.708	2.692	2.694	
Average Specific Gravity at 20° C							**2.698**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 9, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	12.50 - 13.00

Determination No				1	2	3	4
No of Pycnometer				28	20	80	
Weight of Pycnometer		Wf	(gr)	34.010	68.510	34.060	
Weight of (Pycnometer + Water)		Wa	(gr)	135.370	168.600	134.970	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.370	181.450	147.720	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.590	38.320	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.810	20.540	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.3700	168.6000	134.9700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.810	7.690	7.630	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.665	2.671	2.671	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.651	2.657	2.657	
Average Specific Gravity at 20° C							**2.655**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	15.50 - 16.00

Determination No				1	2	3	4
No of Pycnometer				35	45	60	
Weight of Pycnometer		Wf	(gr)	37.070	37.860	43.180	
Weight of (Pycnometer + Water)		Wa	(gr)	136.920	139.180	146.610	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.540	151.760	159.310	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.930	37.880	38.050	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.150	20.100	20.270	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9200	139.1800	146.6100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.520	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.676	2.673	2.678	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.662	2.659	2.664	
Average Specific Gravity at 20° C							**2.662**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	MAMBORO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 13	DEPTH	18.50 - 19.00

Determination No				1	2	3	4
No of Pycnometer				43	71	83	
Weight of Pycnometer		Wf	(gr)	40.060	39.800	38.130	
Weight of (Pycnometer + Water)		Wa	(gr)	142.260	140.220	137.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	154.930	152.840	150.320	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.010	37.970	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.230	20.190	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	142.2600	140.2200	137.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.560	7.570	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.676	2.667	2.672	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.662	2.653	2.658	
Average Specific Gravity at 20° C							**2.658**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 278.9 gr
Wt. container No ..... = 63.47 gr
Wt. Of air dry soil W' = 215.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **215.40** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	85.30	63.47	21.83		10.13	89.87

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	0.50 - 1.00

Wt. (Air dry soil + container) = 146.56 gr — Specific Gravity : 2.658
Wt. of container B-22 = 35.57 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.99 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 89.87 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-17			NO	J-66			NO	J-42		
WW	59.20	DW	58.48	WW	58.73	DW	58.05	WW	61.31	DW	60.61	Mean value	
DW	58.48	TW	37.60	DW	58.05	TW	37.71	DW	60.61	TW	39.10	w	
Ww	0.72	Ws	20.88	Ww	0.68	Ws	20.34	Ww	0.70	Ws	21.51	3.35	%
w	3.45	%		w	3.34	%		w	3.25	%			

$$W = \frac{100 \times W'}{100 + w} : 107.394 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	27	12.063	12.063	3.4732	0.01256	0.0436	11.00	16.42	14.76
2	11.0	12.0	27	12.568	6.284	2.5068	0.01256	0.0315	9.00	13.43	12.07
5	9.0	10.0	27	13.072	2.614	1.6169	0.01256	0.0203	7.00	10.45	9.39
15	7.5	8.5	27	13.451	0.897	0.9470	0.01256	0.0119	5.50	8.21	7.38
30	6.5	7.5	27	13.703	0.457	0.6758	0.01256	0.0085	4.50	6.72	6.04
60	5.5	6.5	27	13.955	0.233	0.4823	0.01256	0.0061	3.50	5.22	4.70
240	4.0	5.0	28	14.334	0.060	0.2444	0.01242	0.0030	2.00	2.99	2.68
1140	3.0	4.0	27	14.586	0.013	0.1131	0.01256	0.0014	1.00	1.49	1.34

P = 100/W = 0.9312

$$Mx = \frac{G_s}{G_s - 1} = 1.6031$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	42.36	22.02	20.340		18.94	81.06	72.85
0.42	61.58		39.560		36.84	63.16	56.76
0.25	74.17		52.150		48.56	51.44	46.23
0.105	95.41		73.390		68.34	31.66	28.45
0.074	102.33		80.310		74.78	25.22	22.66

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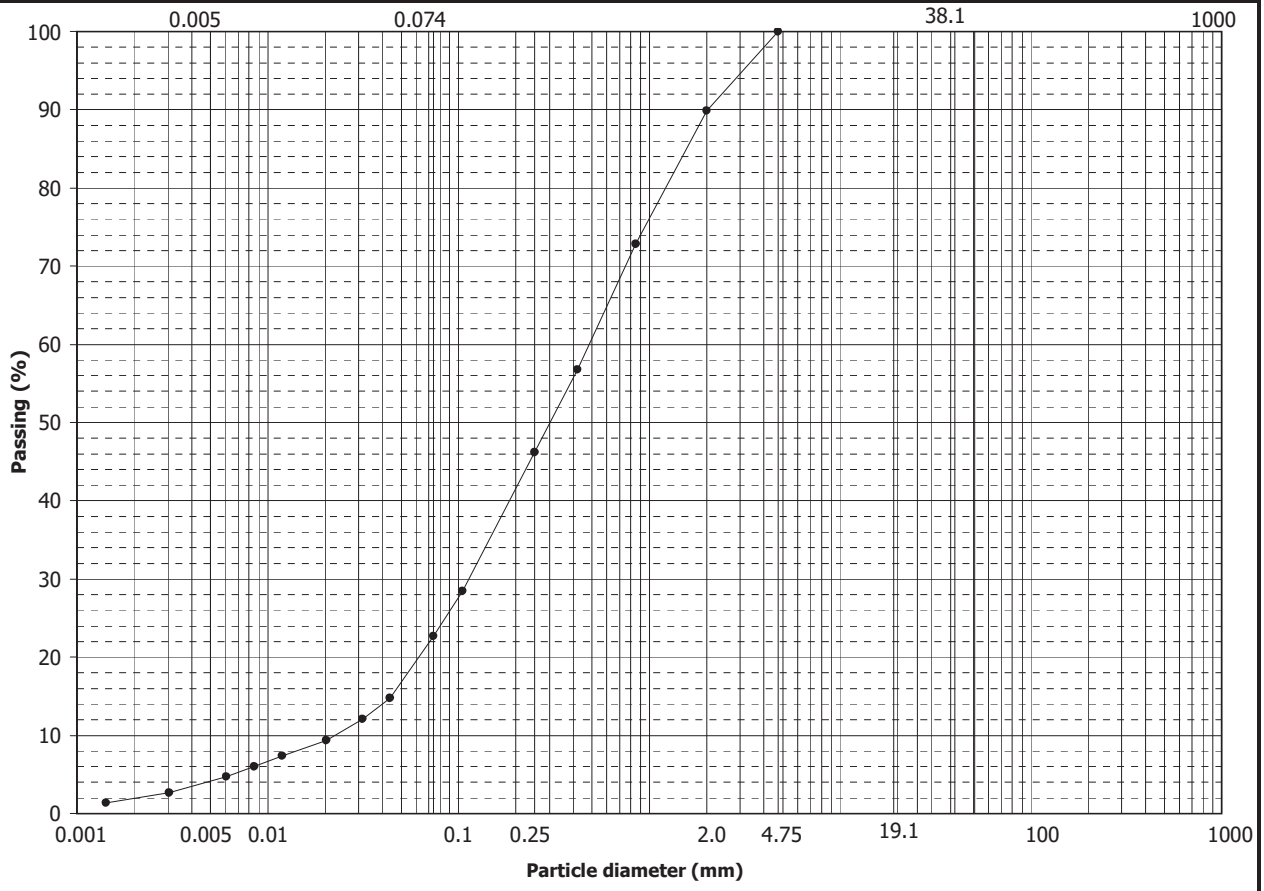
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.658**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	77.34	18.53	4.14	4.75	2.0365	0.5066	0.3109	0.1176	0.0229	22.16	89.87	56.76	22.66



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 804.6 gr
Wt. container No ..... = 76.98 gr
Wt. Of air dry soil W' = 727.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **727.60** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	87.70	76.98	10.72		1.47	98.53
9.52	97.40		20.42		2.81	97.19
4.75	112.30		35.32		4.85	95.15
2.00	134.10		57.12		7.85	92.15

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	1.50 - 2.00

Wt. (Air dry soil + container) = 136.93 gr — Specific Gravity : 2.639
Wt. of container B-89 = 36.63 gr — Plasticity Index : %
Wt. Of air dry soil W' = 100.30 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 92.15 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-28			NO	J-50			NO	J-05		
WW	58.24	DW	57.48	WW	61.99	DW	61.20	WW	59.28	DW	58.49	Mean value	
DW	57.48	TW	36.12	DW	61.20	TW	38.24	DW	58.49	TW	36.52	w	
Ww	0.76	Ws	21.36	Ww	0.79	Ws	22.96	Ww	0.79	Ws	21.97	3.53	%
w	3.56	%		w	3.44	%		w	3.60	%			

$$W = \frac{100 \times W'}{100 + w} : 96.879 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.0	21.0	27	10.297	10.297	3.2089	0.01264	0.0406	18.00	29.92	27.57
2	17.0	18.0	27	11.054	5.527	2.3509	0.01264	0.0297	15.00	24.93	22.97
5	15.0	16.0	27	11.558	2.312	1.5204	0.01264	0.0192	13.00	21.61	19.91
15	13.0	14.0	27	12.063	0.804	0.8968	0.01264	0.0113	11.00	18.28	16.85
30	12.0	13.0	27	12.315	0.411	0.6407	0.01264	0.0081	10.00	16.62	15.32
60	11.0	12.0	27	12.568	0.209	0.4577	0.01264	0.0058	9.00	14.96	13.78
240	9.0	10.0	28	13.072	0.054	0.2334	0.01250	0.0029	7.00	11.63	10.72
1140	7.0	8.0	27	13.577	0.012	0.1091	0.01264	0.0014	5.00	8.31	7.66

P = 100/W = 1.0322

$$Mx = \frac{G_s}{G_s - 1} = 1.6101$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	27.36	22.02	5.340		5.51	94.49	87.07
0.42	33.33		11.310		11.67	88.33	81.39
0.25	38.28		16.260		16.78	83.22	76.68
0.105	49.64		27.620		28.51	71.49	65.88
0.074	59.50		37.480		38.69	61.31	56.50

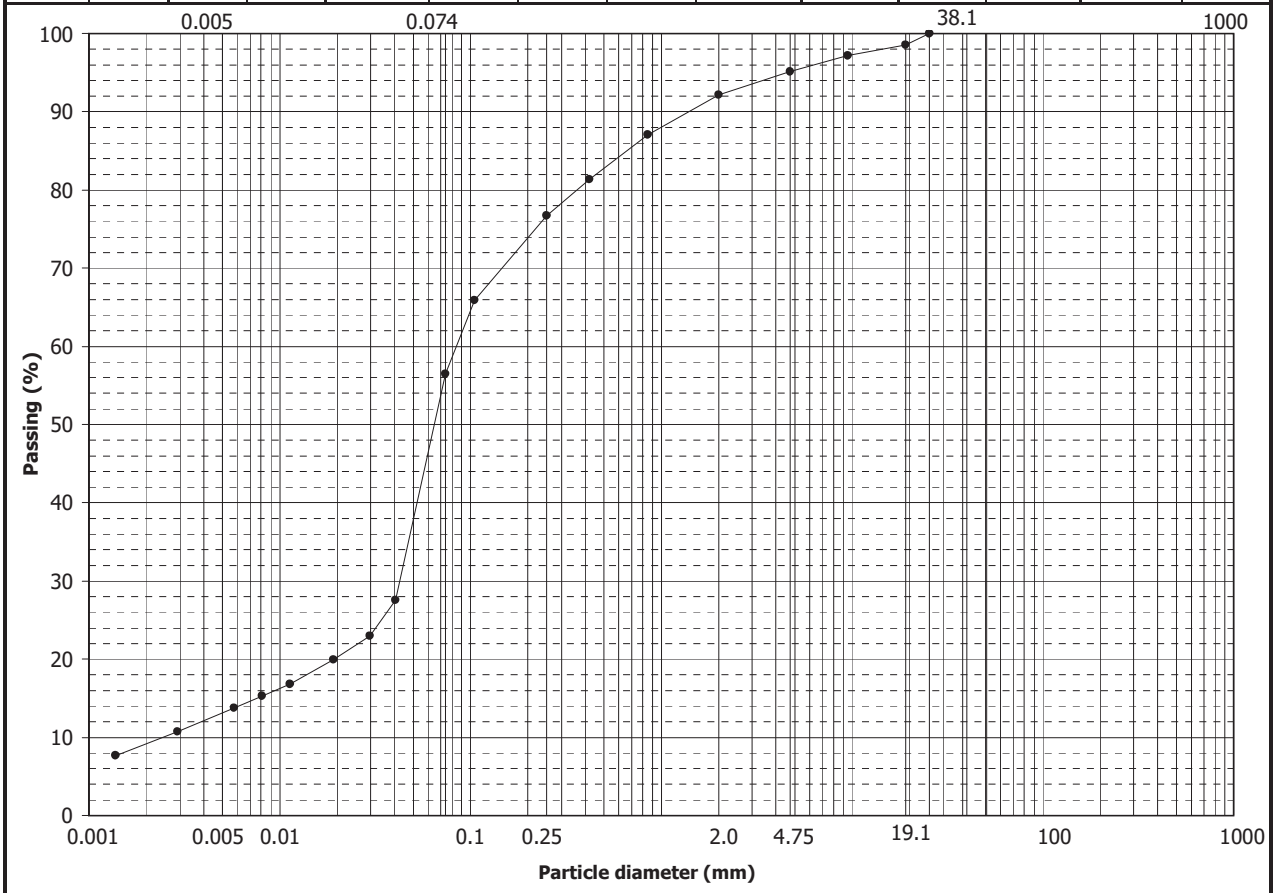
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.639**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
4.85	38.65	43.37	13.13	25.40	1.513	0.0856	0.0665	0.0434	0.0026	33.50	92.15	81.39	56.50



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 479.2 gr
Wt. container No ..... = 51.02 gr
Wt. Of air dry soil W' = 428.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **428.18** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	98.30	51.02	47.28		11.04	88.96
9.52	129.70		78.68		18.38	81.62
4.75	143.90		92.88		21.69	78.31
2.00	152.20		101.18		23.63	76.37

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	2.50 - 3.00

Wt. (Air dry soil + container) = 138.24 gr — Specific Gravity : 2.643
Wt. of container E-78 = 37.40 gr — Plasticity Index : %
Wt. Of air dry soil W' = 100.84 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 76.37 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-91			NO	J-14			NO	J-33		
WW	53.36	DW	52.85	WW	51.12	DW	50.62	WW	52.22	DW	51.67	Mean value	
DW	52.85	TW	37.51	DW	50.62	TW	35.20	DW	51.67	TW	36.17	w	
Ww	0.51	Ws	15.34	Ww	0.50	Ws	15.42	Ww	0.55	Ws	15.50	3.37	%
w	3.32	%		w	3.24	%		w	3.55	%			

$$W = \frac{100 \times W'}{100 + w} : 97.551 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\eta}{980(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	27	11.054	11.054	3.3247	0.01262	0.0420	15.00	24.74	18.89
2	16.0	17.0	27	11.306	5.653	2.3776	0.01262	0.0300	14.00	23.09	17.63
5	14.0	15.0	27	11.811	2.362	1.5369	0.01262	0.0194	12.00	19.79	15.11
15	12.0	13.0	27	12.315	0.821	0.9061	0.01262	0.0114	10.00	16.49	12.59
30	11.0	12.0	27	12.568	0.419	0.6472	0.01262	0.0082	9.00	14.84	11.33
60	10.0	11.0	27	12.820	0.214	0.4622	0.01262	0.0058	8.00	13.19	10.07
240	8.0	9.0	28	13.325	0.056	0.2356	0.01248	0.0029	6.00	9.89	7.56
1140	6.5	7.5	27	13.703	0.012	0.1096	0.01262	0.0014	4.50	7.42	5.67

P = 100/W = 1.0251

$$Mx = \frac{G_s}{G_s - 1} = 1.6086$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	33.00	22.02	10.980		11.26	88.74	67.77
0.42	48.13		26.110		26.77	73.23	55.93
0.25	66.96		44.940		46.07	53.93	41.19
0.105	84.97		62.950		64.53	35.47	27.09
0.074	89.65		67.630		69.33	30.67	23.42

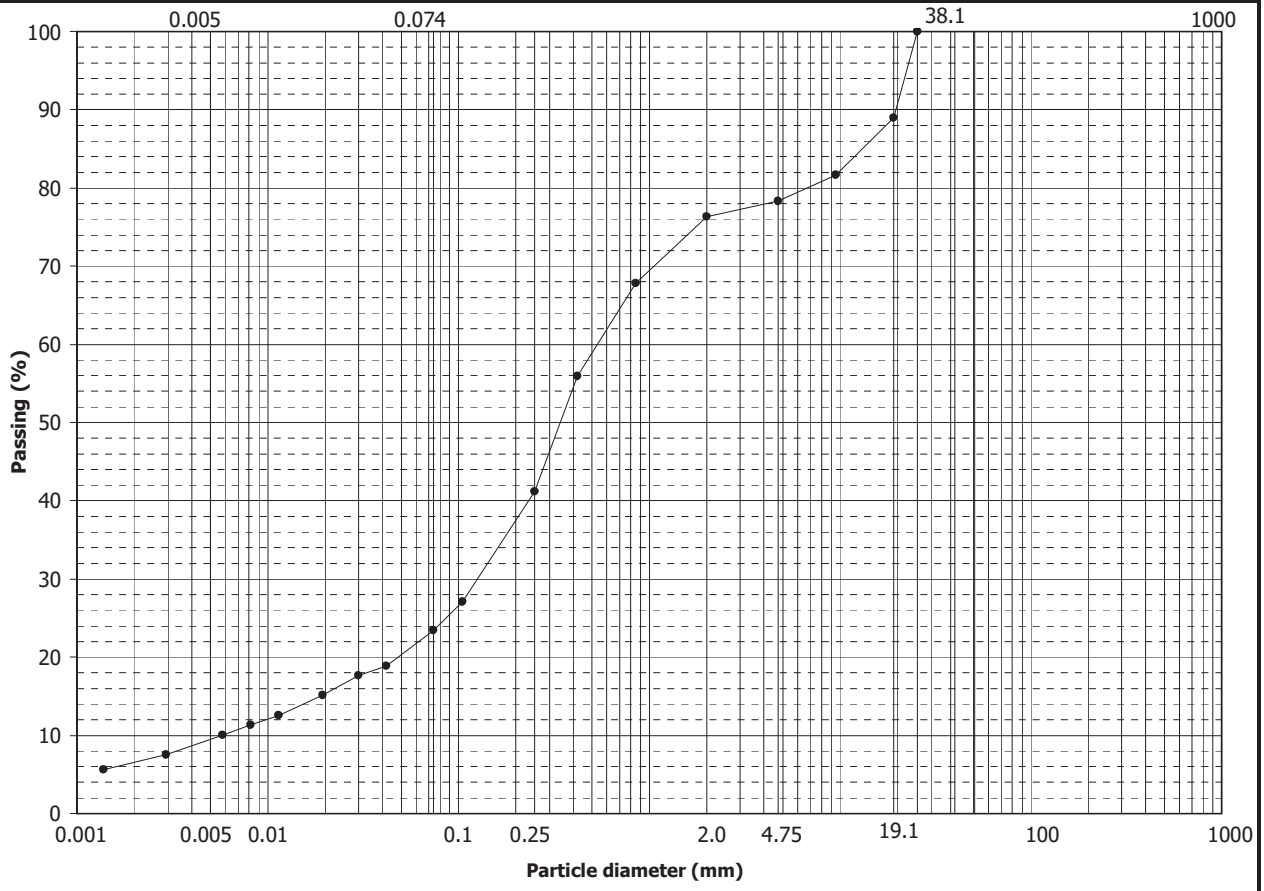
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.643**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
21.69	54.88	13.92	9.51	25.40	19.695	0.5678	0.3516	0.1349	0.0057	98.78	76.37	55.93	23.42



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 456.0 gr
Wt. container No ..... = 39.77 gr
Wt. Of air dry soil W' = 416.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **416.23** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	66.40	39.77	26.63		6.40	93.60
4.75	90.10		50.33		12.09	87.91
2.00	132.20		92.43		22.21	77.79

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	3.50 - 4.00

Wt. (Air dry soil + container) = 145.92 gr — Specific Gravity : 2.674
Wt. of container B-03 = 35.13 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.79 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 77.79 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-49			NO	J-84			NO	J-90		
WW	53.99	DW	53.64	WW	55.11	DW	54.74	WW	55.25	DW	54.85	Mean value	
DW	53.64	TW	40.36	DW	54.74	TW	39.59	DW	54.85	TW	39.14	w	
Ww	0.35	Ws	13.28	Ww	0.37	Ws	15.15	Ww	0.40	Ws	15.71	2.54	%
w	2.64	%		w	2.44	%		w	2.55	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 108.044 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	27	11.306	11.306	3.3625	0.01250	0.0420	14.00	20.70	16.10
2	14.0	15.0	27	11.811	5.905	2.4301	0.01250	0.0304	12.00	17.74	13.80
5	12.0	13.0	27	12.315	2.463	1.5694	0.01250	0.0196	10.00	14.78	11.50
15	10.0	11.0	27	12.820	0.855	0.9245	0.01250	0.0116	8.00	11.83	9.20
30	9.0	10.0	27	13.072	0.436	0.6601	0.01250	0.0083	7.00	10.35	8.05
60	8.0	9.0	27	13.325	0.222	0.4712	0.01250	0.0059	6.00	8.87	6.90
240	6.0	7.0	28	13.829	0.058	0.2400	0.01236	0.0030	4.00	5.91	4.60
1140	4.5	5.5	27	14.208	0.012	0.1116	0.01250	0.0014	2.50	3.70	2.88

P = 100/W = 0.9255

$$Mx = \frac{G_s}{G_s - 1} = 1.5974$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	46.71	22.02	24.690		22.85	77.15	60.02
0.42	67.72		45.700		42.30	57.70	44.89
0.25	84.25		62.230		57.60	42.40	32.99
0.105	99.37		77.350		71.59	28.41	22.10
0.074	102.33		80.310		74.33	25.67	19.97

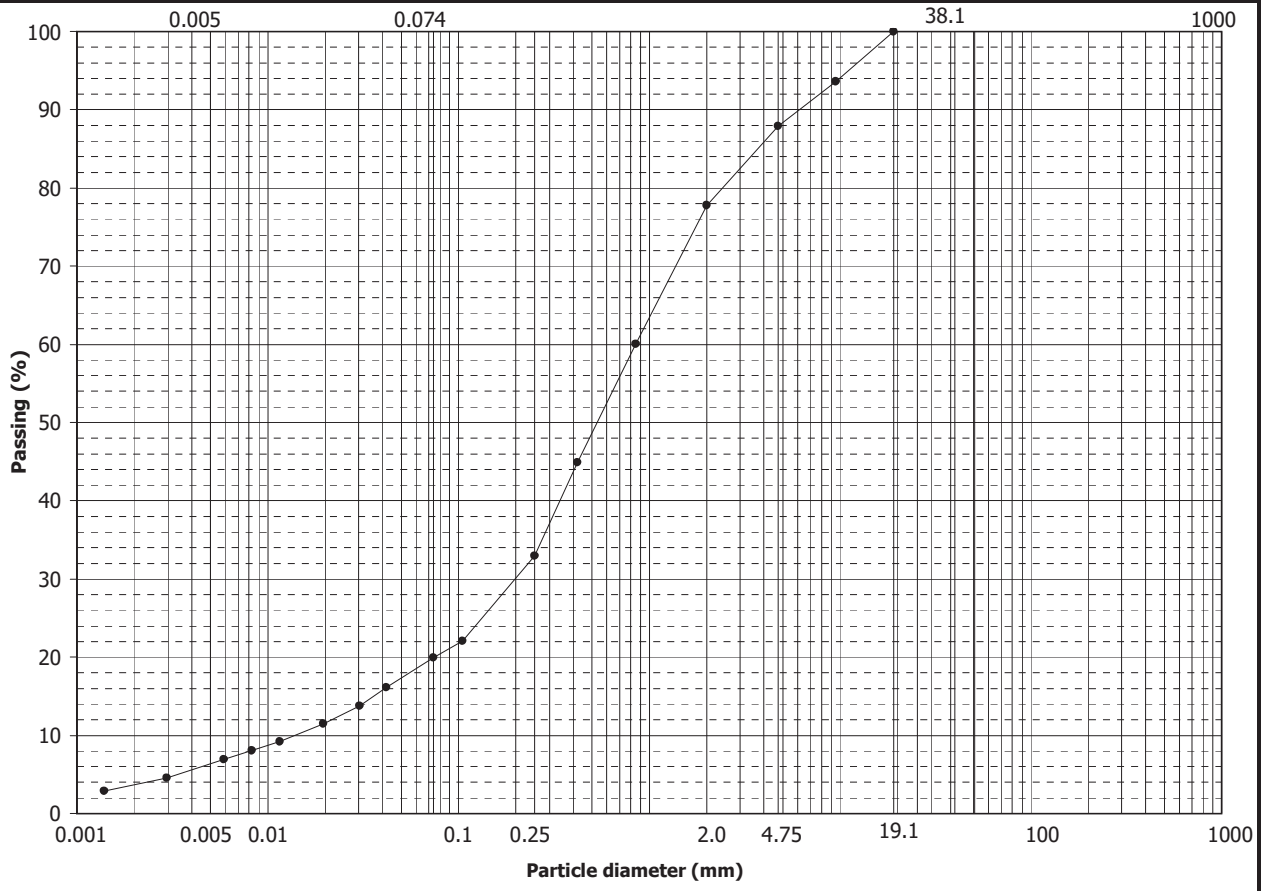
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.674**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
12.09	67.94	13.62	6.35	19.10	6.5024	0.8495	0.5653	0.2102	0.0144	59.16	77.79	44.89	19.97



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 644.3 gr
Wt. container No ..... = 34.55 gr
Wt. Of air dry soil W' = 609.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **609.75** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	36.84	34.55	2.29		0.38	99.62
2.00	65.43		30.88		5.06	94.94

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	4.50 - 5.00

Wt. (Air dry soil + container) = 145.92 gr — Specific Gravity : 2.669
Wt. of container B-61 = 34.57 gr — Plasticity Index : %
Wt. Of air dry soil W' = 111.35 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 94.94 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-50			NO	J-16			NO	J-68		
WW	54.51	DW	53.92	WW	56.14	DW	55.57	WW	52.44	DW	51.79	Mean value	
DW	53.92	TW	38.24	DW	55.57	TW	39.56	DW	51.79	TW	35.44	w	
Ww	0.59	Ws	15.68	Ww	0.57	Ws	16.01	Ww	0.65	Ws	16.35	3.77	%
w	3.76	%		w	3.56	%		w	3.97	%			

$$W = \frac{100 \times W'}{100 + w} : 107.309 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	27	12.315	12.315	3.5093	0.01252	0.0439	10.00	14.90	14.15
2	10.5	11.5	27	12.694	6.347	2.5193	0.01252	0.0315	8.50	12.67	12.03
5	9.0	10.0	27	13.072	2.614	1.6169	0.01252	0.0202	7.00	10.43	9.90
15	7.0	8.0	27	13.577	0.905	0.9514	0.01252	0.0119	5.00	7.45	7.07
30	6.0	7.0	27	13.829	0.461	0.6789	0.01252	0.0085	4.00	5.96	5.66
60	5.0	6.0	27	14.081	0.235	0.4844	0.01252	0.0061	3.00	4.47	4.24
240	3.5	4.5	28	14.460	0.060	0.2455	0.01238	0.0030	1.50	2.24	2.12
1140	2.5	3.5	27	14.712	0.013	0.1136	0.01252	0.0014	0.50	0.75	0.71

P = 100/W = 0.9319

$$Mx = \frac{G_s}{G_s - 1} = 1.5992$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	39.60	22.02	17.580		16.38	83.62	79.38
0.42	64.69		42.670		39.76	60.24	57.19
0.25	83.80		61.780		57.57	42.43	40.28
0.105	103.08		81.060		75.54	24.46	23.22
0.074	108.81		86.790		80.88	19.12	18.15

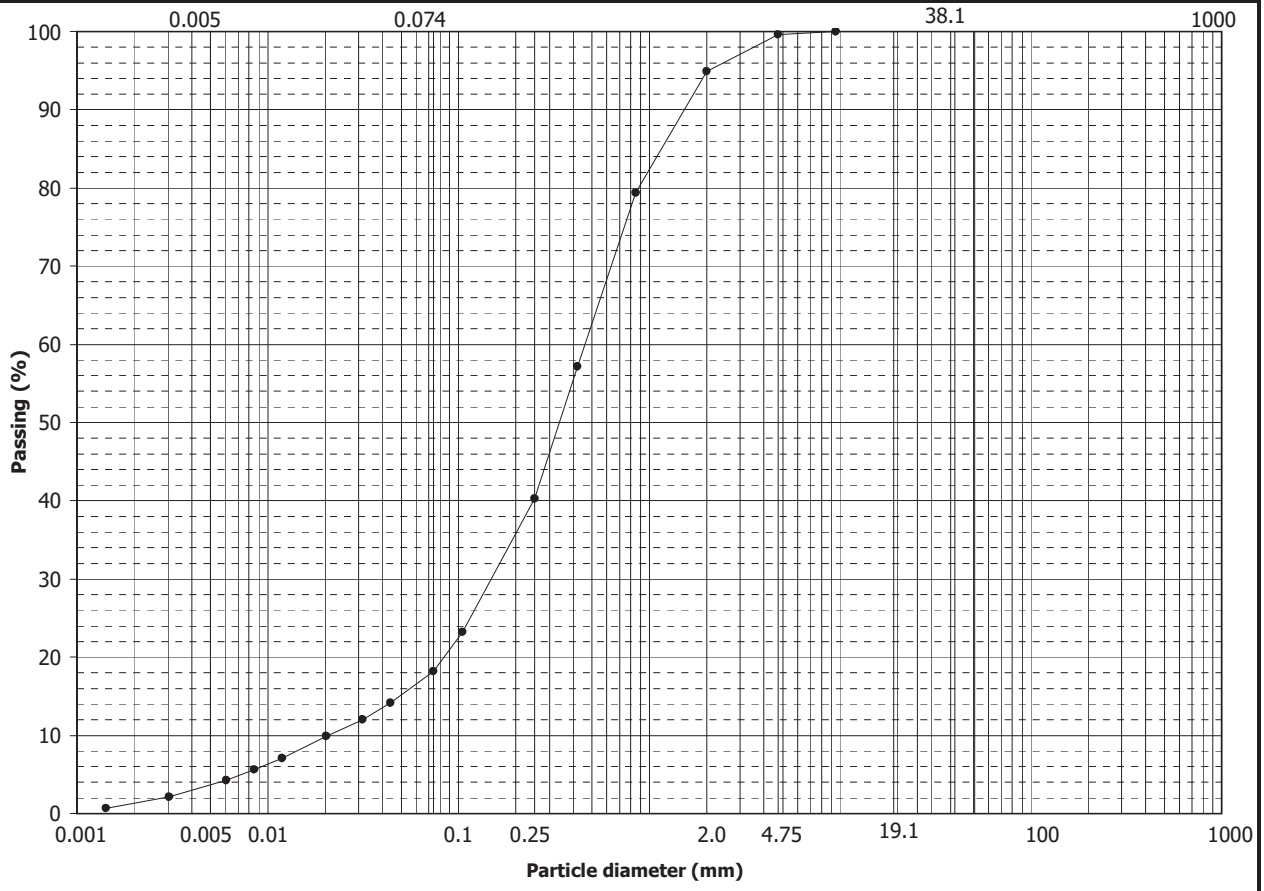
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.669**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.38	81.47	14.50	3.65	9.52	1.6351	0.4745	0.3477	0.1626	0.0208	22.85	94.94	57.19	18.15



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 432.0 gr
Wt. container No ..... = 85.03 gr
Wt. Of air dry soil W' = 347.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **347.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	96.30	85.03	11.27		3.25	96.75
4.75	114.80		29.77		8.58	91.42
2.00	139.30		54.27		15.64	84.36

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	5.50 - 6.00

Wt. (Air dry soil + container) = 146.53 gr — Specific Gravity : 2.674
Wt. of container B-71 = 34.62 gr — Plasticity Index : %
Wt. Of air dry soil W' = 111.91 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 84.36 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-20			NO	J-67			NO	J-62		
WW	60.92	DW	60.15	WW	56.87	DW	56.08	WW	59.32	DW	58.57	Mean value	
DW	60.15	TW	39.07	DW	56.08	TW	34.89	DW	58.57	TW	37.29	w	
Ww	0.77	Ws	21.08	Ww	0.79	Ws	21.19	Ww	0.75	Ws	21.28	3.64	%
w	3.65	%		w	3.73	%		w	3.52	%			

$$W = \frac{100 \times W'}{100 + w} : 107.985 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	27	10.549	10.549	3.2480	0.01250	0.0406	17.00	25.15	21.21
2	17.0	18.0	27	11.054	5.527	2.3509	0.01250	0.0294	15.00	22.19	18.72
5	14.0	15.0	27	11.811	2.362	1.5369	0.01250	0.0192	12.00	17.75	14.97
15	11.0	12.0	27	12.568	0.838	0.9153	0.01250	0.0114	9.00	13.31	11.23
30	9.0	10.0	27	13.072	0.436	0.6601	0.01250	0.0083	7.00	10.35	8.74
60	7.5	8.5	27	13.451	0.224	0.4735	0.01250	0.0059	5.50	8.14	6.86
240	5.0	6.0	28	14.081	0.059	0.2422	0.01236	0.0030	3.00	4.44	3.74
1140	3.0	4.0	27	14.586	0.013	0.1131	0.01250	0.0014	1.00	1.48	1.25

P = 100/W = 0.9261

$$Mx = \frac{G_s}{G_s - 1} = 1.5974$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	37.65	22.02	15.630		14.47	85.53	72.15
0.42	52.13		30.110		27.88	72.12	60.84
0.25	66.96		44.940		41.62	58.38	49.25
0.105	84.75		62.730		58.09	41.91	35.35
0.074	92.56		70.540		65.32	34.68	29.25

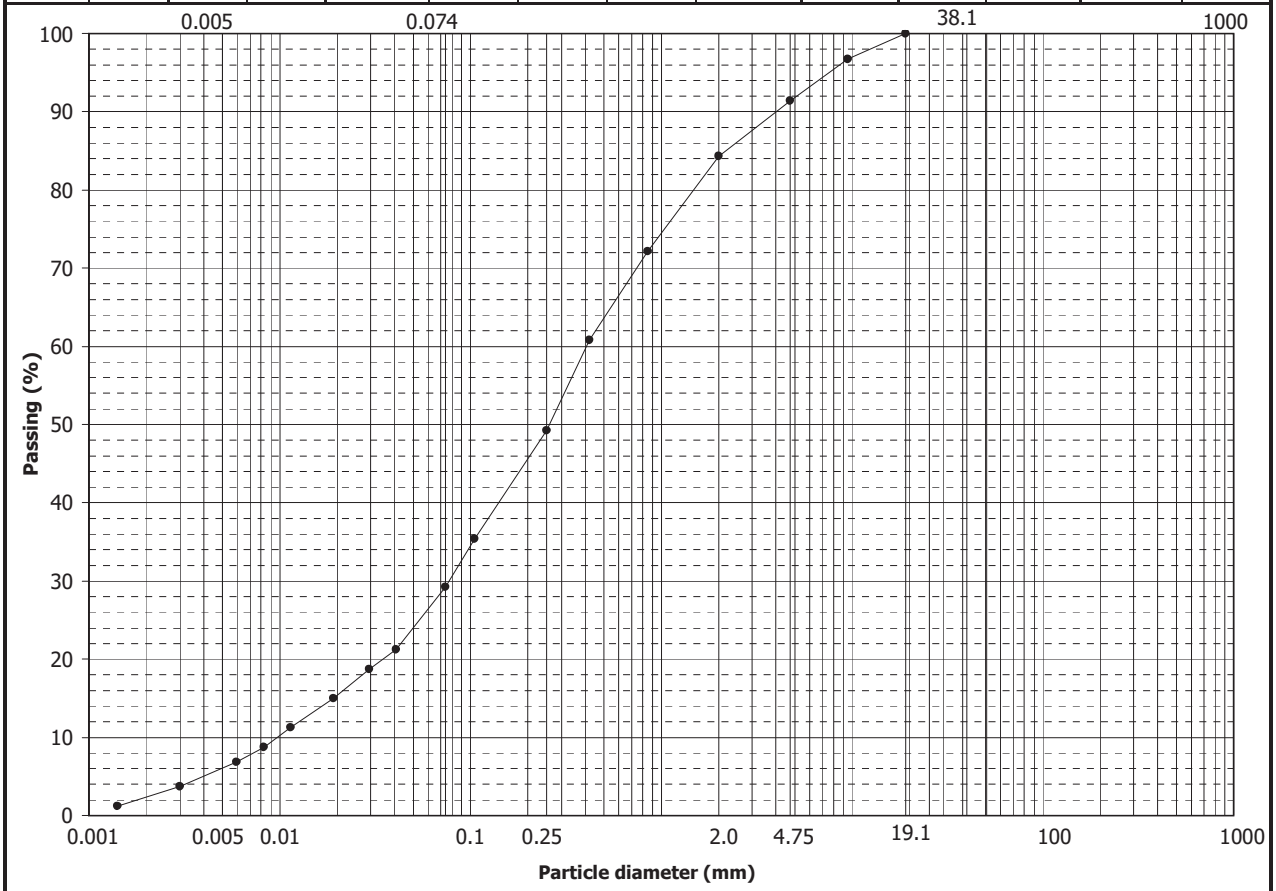
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.674**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
8.58	62.17	23.16	6.09	19.10	4.197	0.4077	0.2610	0.0778	0.0099	41.30	84.36	60.84	29.25



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 200.7 gr
Wt. container No ..... = 43.95 gr
Wt. Of air dry soil W' = 156.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **156.75** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	45.75	43.95	1.80		1.15	98.85

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	6.50 - 7.00

Wt. (Air dry soil + container) = 111.61 gr — Specific Gravity : 2.678
Wt. of container B-49 = 35.90 gr — Plasticity Index : %
Wt. Of air dry soil W' = 75.71 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 98.85 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-31			NO	J-25			NO	J-69		
WW	46.55	DW	45.62	WW	51.42	DW	50.47	WW	54.83	DW	53.84	Mean value	
DW	45.62	TW	31.91	DW	50.47	TW	36.05	DW	53.84	TW	39.38	w	
Ww	0.93	Ws	13.71	Ww	0.95	Ws	14.42	Ww	0.99	Ws	14.46	6.74	%
w	6.78	%		w	6.59	%		w	6.85	%			

$$W = \frac{100 \times W'}{100 + w} : 70.930 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.0	22.0	27	10.045	10.045	3.1693	0.01249	0.0396	19.00	42.75	42.26
2	18.5	19.5	27	10.675	5.338	2.3103	0.01249	0.0289	16.50	37.13	36.70
5	16.0	17.0	27	11.306	2.261	1.5037	0.01249	0.0188	14.00	31.50	31.14
15	14.0	15.0	27	11.811	0.787	0.8873	0.01249	0.0111	12.00	27.00	26.69
30	13.0	14.0	27	12.063	0.402	0.6341	0.01249	0.0079	11.00	24.75	24.47
60	12.0	13.0	27	12.315	0.205	0.4531	0.01249	0.0057	10.00	22.50	22.24
240	10.0	11.0	28	12.820	0.053	0.2311	0.01235	0.0029	8.00	18.00	17.79
1140	8.5	9.5	27	13.198	0.012	0.1076	0.01249	0.0013	6.50	14.63	14.46

P = 100/W = 1.4098

$$Mx = \frac{Gs}{Gs - 1} = 1.5959$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.00	22.02	0.980		1.38	98.62	97.49
0.42	24.66		2.640		3.72	96.28	95.17
0.25	27.37		5.350		7.54	92.46	91.40
0.105	36.87		14.850		20.94	79.06	78.16
0.074	46.53		24.510		34.56	65.44	64.69

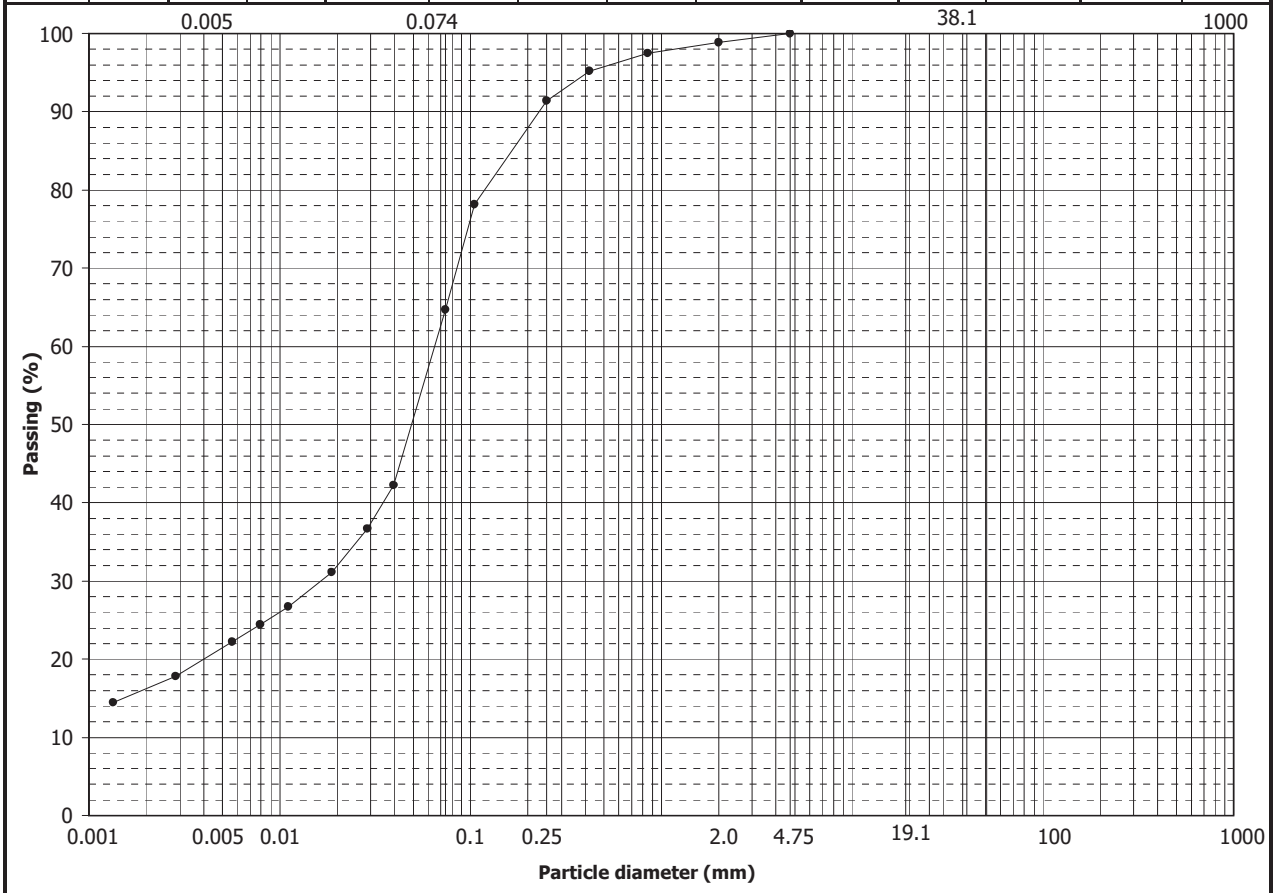
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.678**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	35.31	43.26	21.44	4.75	0.2347	0.0668	0.0515	0.0168	-	-	98.85	95.17	64.69



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	7.50 - 8.00

Wt. (Air dry soil + container) = 143.60 gr — Specific Gravity : 2.650
Wt. of container B-45 = 32.86 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.74 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-07			NO	J-30			NO	J-70		
WW	55.52	DW	54.77	WW	55.64	DW	54.92	WW	54.35	DW	53.68	Mean value	
DW	54.77	TW	38.25	DW	54.92	TW	37.61	DW	53.68	TW	38.31	w	
Ww	0.75	Ws	16.52	Ww	0.72	Ws	17.31	Ww	0.67	Ws	15.37	4.35	%
w	4.54	%		w	4.16	%		w	4.36	%			

$$W = \frac{100 \times W'}{100 + w} : 106.121 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.5	16.5	27	11.432	11.432	3.3812	0.01259	0.0426	13.50	20.43	20.43
2	14.0	15.0	27	11.811	5.905	2.4301	0.01259	0.0306	12.00	18.16	18.16
5	12.0	13.0	27	12.315	2.463	1.5694	0.01259	0.0198	10.00	15.13	15.13
15	10.0	11.0	27	12.820	0.855	0.9245	0.01259	0.0116	8.00	12.11	12.11
30	9.0	10.0	27	13.072	0.436	0.6601	0.01259	0.0083	7.00	10.59	10.59
60	8.0	9.0	27	13.325	0.222	0.4712	0.01259	0.0059	6.00	9.08	9.08
240	6.5	7.5	28	13.703	0.057	0.2389	0.01245	0.0030	4.50	6.81	6.81
1140	5.5	6.5	27	13.955	0.012	0.1106	0.01259	0.0014	3.50	5.30	5.30

P = 100/W = 0.9423

$$Mx = \frac{G_s}{G_s - 1} = 1.6061$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	31.66	22.02	9.640		9.08	90.92	90.92
0.42	54.82		32.800		30.91	69.09	69.09
0.25	77.42		55.400		52.20	47.80	47.80
0.105	92.66		70.640		66.57	33.43	33.43
0.074	99.23		77.210		72.76	27.24	27.24

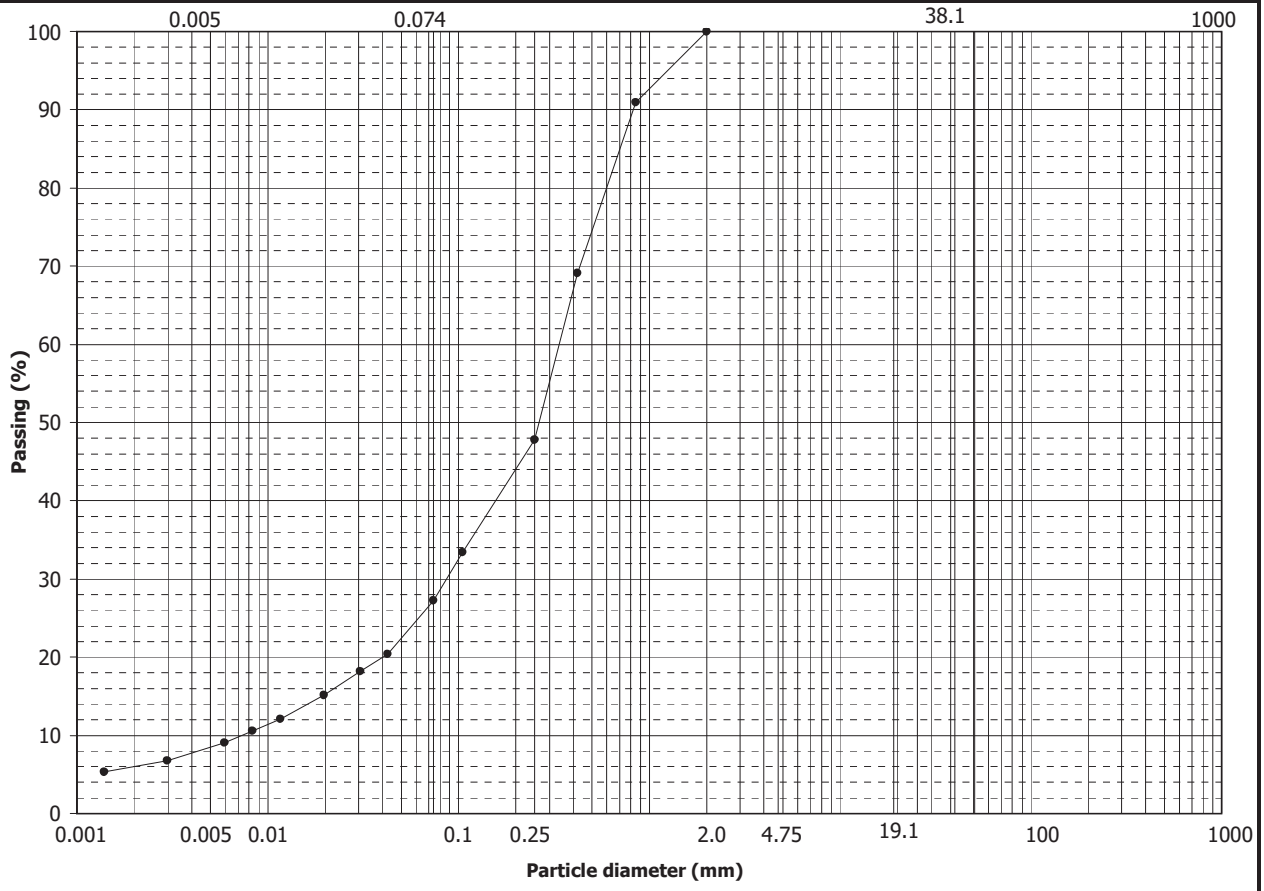
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.650**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	72.76	18.73	8.52	2.00	0.8320	0.3474	0.2676	0.0878	0.0074	47.07	100.00	69.09	27.24



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 105.38 gr — Specific Gravity : **2.679**

Wt. of container B-19 = 34.83 gr — Plasticity Index : %

Wt. Of air dry soil W' = 70.55 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-46			NO	L-30			NO	L-39		
WW	58.08	DW	56.90	WW	55.97	DW	54.89	WW	57.47	DW	56.36	Mean value	
DW	56.90	TW	37.82	DW	54.89	TW	37.71	DW	56.36	TW	38.09	w	
Ww	1.18	Ws	19.08	Ww	1.08	Ws	17.18	Ww	1.11	Ws	18.27	6.18	%
w	6.18	%		w	6.29	%		w	6.08	%			

$$W = \frac{100 \times W'}{100 + w} : 66.442 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.0	22.0	27	10.045	10.045	3.1693	0.01249	0.0396	19.00	45.63	45.63
2	18.0	19.0	27	10.802	5.401	2.3240	0.01249	0.0290	16.00	38.42	38.42
5	15.0	16.0	27	11.558	2.312	1.5204	0.01249	0.0190	13.00	31.22	31.22
15	13.0	14.0	27	12.063	0.804	0.8968	0.01249	0.0112	11.00	26.42	26.42
30	12.0	13.0	27	12.315	0.411	0.6407	0.01249	0.0080	10.00	24.01	24.01
60	11.0	12.0	27	12.568	0.209	0.4577	0.01249	0.0057	9.00	21.61	21.61
240	9.0	10.0	28	13.072	0.054	0.2334	0.01235	0.0029	7.00	16.81	16.81
1140	8.0	9.0	27	13.325	0.012	0.1081	0.01249	0.0013	6.00	14.41	14.41

P = 100/W = 1.5051

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5956$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	26.06	22.02	4.040		6.08	93.92	93.92
0.42	29.86		7.840		11.80	88.20	88.20
0.25	32.16		10.140		15.26	84.74	84.74
0.105	37.22		15.200		22.88	77.12	77.12
0.074	42.07		20.050		30.18	69.82	69.82

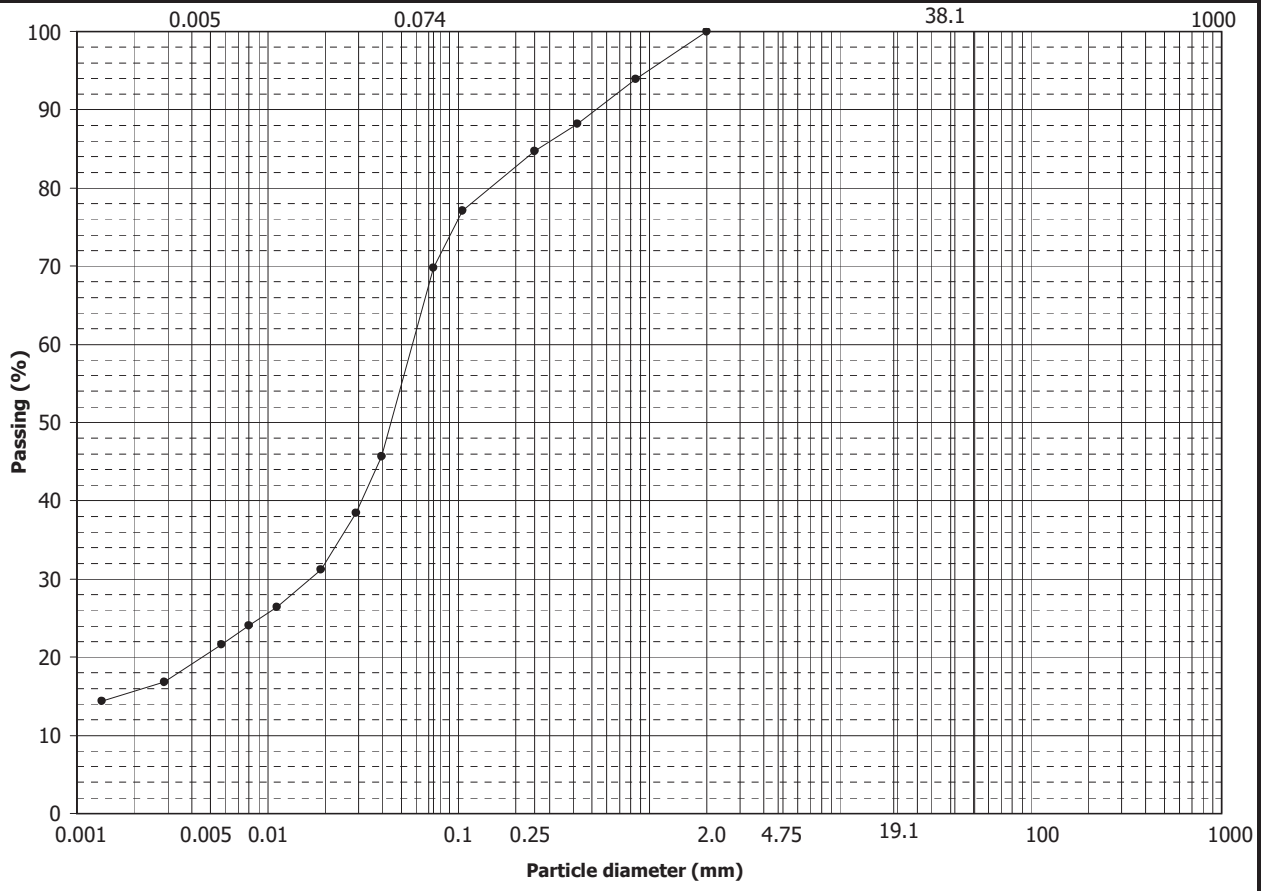
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.679**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	30.18	49.15	20.68	2.00	0.5553	0.0600	0.0458	0.0170	-	-	100.00	88.20	69.82



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 113.60 gr — Specific Gravity : **2.698**

Wt. of container B-92 = 34.39 gr — Plasticity Index : %

Wt. Of air dry soil W' = 79.21 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-32			NO	J-44			NO	L-45		
WW	56.31	DW	55.69	WW	55.38	DW	54.85	WW	58.84	DW	58.23	Mean value	
DW	55.69	TW	36.04	DW	54.85	TW	37.46	DW	58.23	TW	39.60	w	
Ww	0.62	Ws	19.65	Ww	0.53	Ws	17.39	Ww	0.61	Ws	18.63	3.16	%
w	3.16	%		w	3.05	%		w	3.27	%			

$$W = \frac{100 \times W'}{100 + w} : 76.784 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	27	10.549	10.549	3.2480	0.01242	0.0403	17.00	35.18	35.18
2	14.0	15.0	27	11.811	5.905	2.4301	0.01242	0.0302	12.00	24.83	24.83
5	11.0	12.0	27	12.568	2.514	1.5854	0.01242	0.0197	9.00	18.62	18.62
15	9.0	10.0	27	13.072	0.871	0.9335	0.01242	0.0116	7.00	14.49	14.49
30	8.0	9.0	27	13.325	0.444	0.6664	0.01242	0.0083	6.00	12.42	12.42
60	7.0	8.0	27	13.577	0.226	0.4757	0.01242	0.0059	5.00	10.35	10.35
240	5.0	6.0	28	14.081	0.059	0.2422	0.01228	0.0030	3.00	6.21	6.21
1140	4.0	5.0	27	14.334	0.013	0.1121	0.01242	0.0014	2.00	4.14	4.14

P = 100/W = 1.3023

$$Mx = \frac{Gs}{Gs - 1} = 1.5889$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.36	22.02	0.340		0.44	99.56	99.56
0.42	22.94		0.920		1.20	98.80	98.80
0.25	24.22		2.200		2.87	97.13	97.13
0.105	29.22		7.200		9.38	90.62	90.62
0.074	39.70		17.680		23.03	76.97	76.97

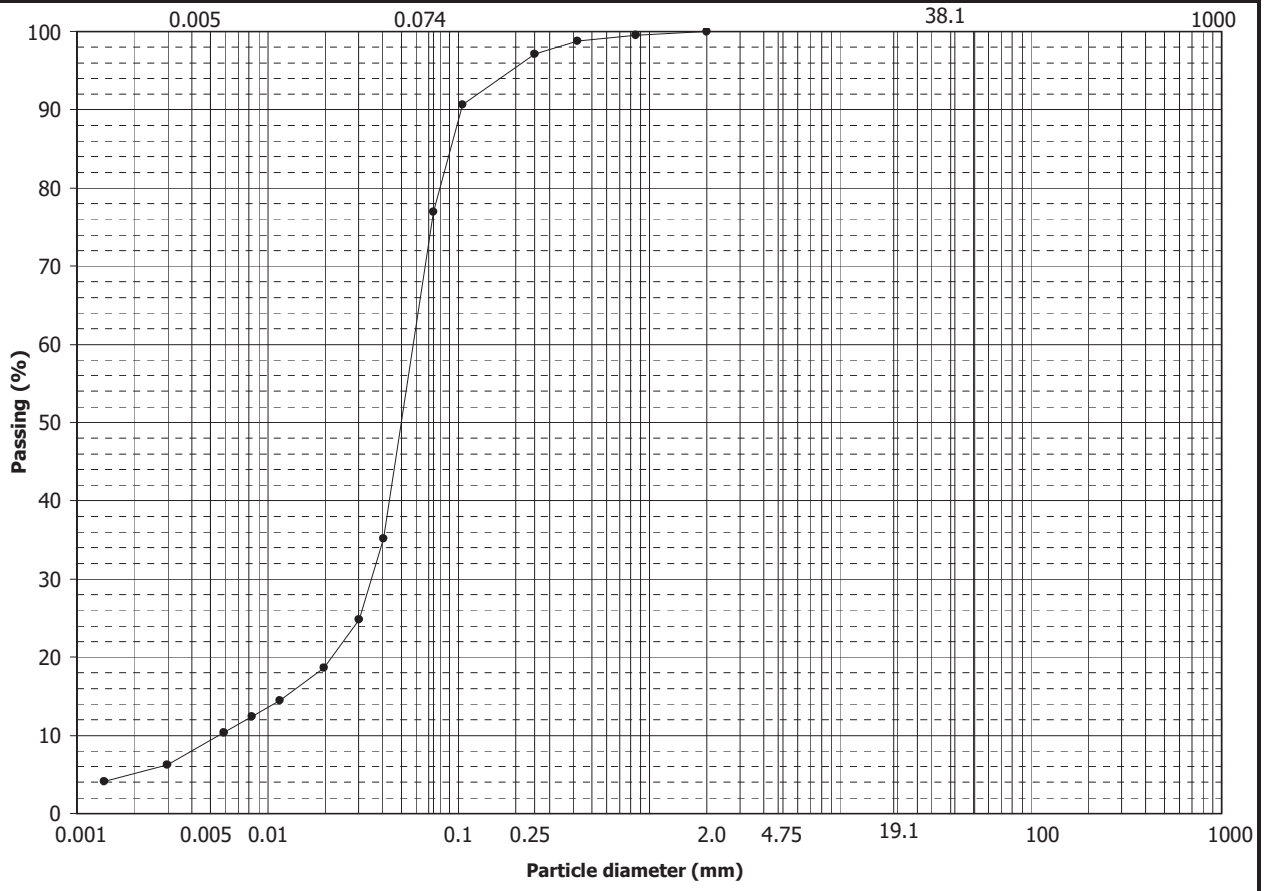
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.698**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	23.03	67.63	9.34	2.00	0.1036	0.0603	0.0523	0.0352	0.0057	10.66	100.00	98.80	76.97



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**12.50 - 13.00**

Wt. (Air dry soil + container) = 624.3 gr
Wt. container No ..... = 34.55 gr
Wt. Of air dry soil W' = 589.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **589.75** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	45.43	34.55	10.88		1.84	98.16

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	12.50 - 13.00

Wt. (Air dry soil + container) = 131.98 gr — Specific Gravity : 2.655
Wt. of container E-56 = 36.15 gr — Plasticity Index : %
Wt. Of air dry soil W' = 95.83 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 98.16 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-94			NO	T-52			NO	L-38		
WW	53.14	DW	52.69	WW	52.35	DW	51.85	WW	53.63	DW	53.23	Mean value	
DW	52.69	TW	36.89	DW	51.85	TW	34.93	DW	53.23	TW	38.85	w	
Ww	0.45	Ws	15.80	Ww	0.50	Ws	16.92	Ww	0.40	Ws	14.38	2.86	%
w	2.85	%		w	2.96	%		w	2.78	%			

$$W = \frac{100 \times W'}{100 + w} : 93.164 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.5	17.5	27	11.180	11.180	3.3437	0.01258	0.0420	14.50	24.97	24.51
2	14.0	15.0	27	11.811	5.905	2.4301	0.01258	0.0306	12.00	20.66	20.28
5	12.0	13.0	27	12.315	2.463	1.5694	0.01258	0.0197	10.00	17.22	16.90
15	10.0	11.0	27	12.820	0.855	0.9245	0.01258	0.0116	8.00	13.78	13.52
30	9.0	10.0	27	13.072	0.436	0.6601	0.01258	0.0083	7.00	12.05	11.83
60	8.0	9.0	27	13.325	0.222	0.4712	0.01258	0.0059	6.00	10.33	10.14
240	6.0	7.0	28	13.829	0.058	0.2400	0.01244	0.0030	4.00	6.89	6.76
1140	5.0	6.0	27	14.081	0.012	0.1111	0.01258	0.0014	3.00	5.17	5.07

P = 100/W = 1.0734

$$Mx = \frac{G_s}{G_s - 1} = 1.6042$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	30.18	22.02	8.160		8.76	91.24	89.56
0.42	44.80		22.780		24.45	75.55	74.15
0.25	57.35		35.330		37.92	62.08	60.93
0.105	73.06		51.040		54.79	45.21	44.38
0.074	80.17		58.150		62.42	37.58	36.89

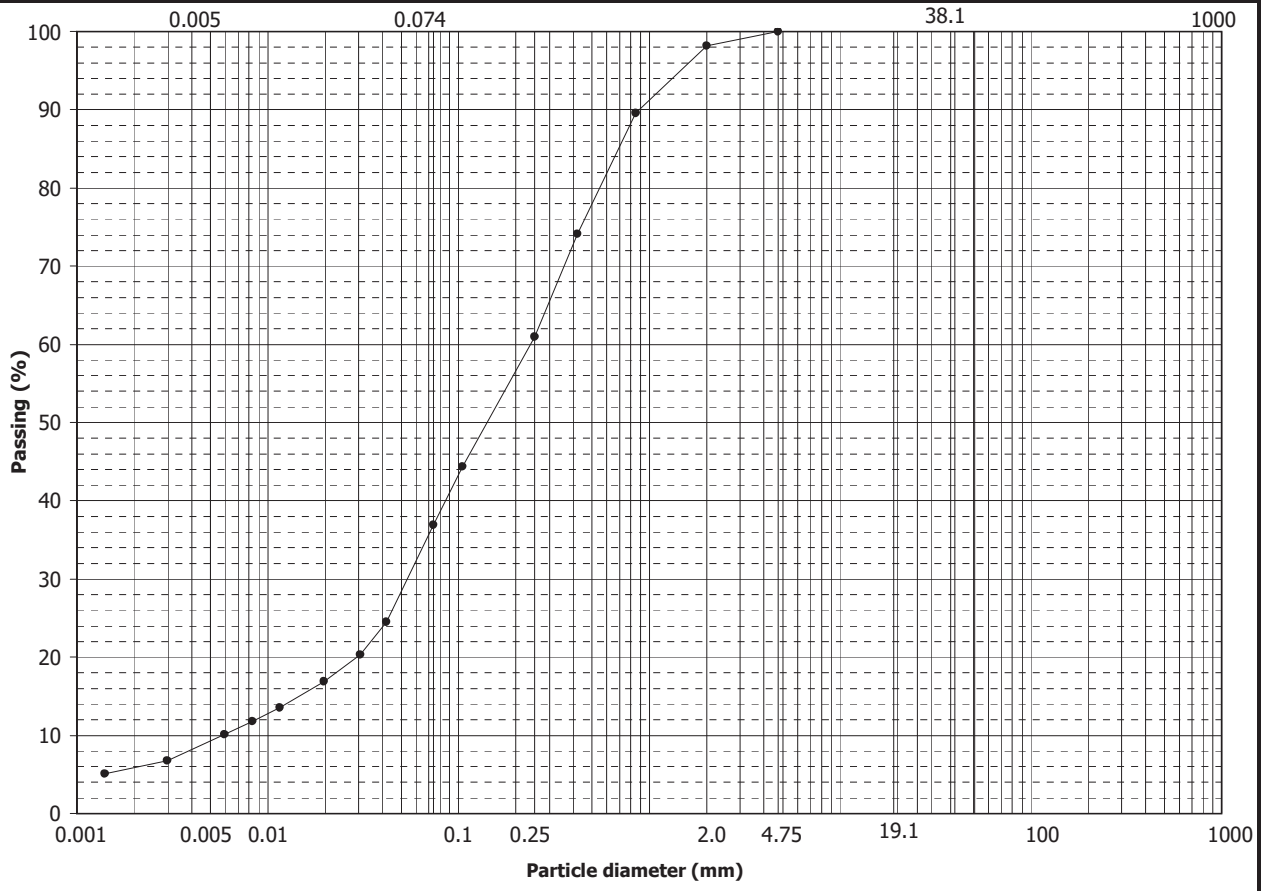
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**12.50 - 13.00**

SPECIFIC GRAVITY : **2.655**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
1.84	61.27	27.59	9.30	4.75	0.9091	0.2418	0.1542	0.0562	0.0058	41.67	98.16	74.15	36.89



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 414.5 gr
Wt. container No ..... = 50.60 gr
Wt. Of air dry soil W' = 363.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **363.90** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	107.30	50.60	107.30		29.49	70.51
9.52	138.60		138.60		38.09	61.91
4.75	149.30		149.30		41.03	58.97
2.00	169.73		169.73		46.64	53.36

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	15.50 - 16.00

Wt. (Air dry soil + container) = 153.32 gr — Specific Gravity : 2.662
Wt. of container B-34 = 35.23 gr — Plasticity Index : %
Wt. Of air dry soil W' = 118.09 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 53.36 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-80			NO	J-15			NO	J-90		
WW	56.14	DW	55.36	WW	60.63	DW	59.74	WW	58.44	DW	57.67	Mean value	
DW	55.36	TW	35.67	DW	59.74	TW	37.95	DW	57.67	TW	39.14	w	
Ww	0.78	Ws	19.69	Ww	0.89	Ws	21.79	Ww	0.77	Ws	18.53	4.07	%
w	3.96	%		w	4.08	%		w	4.16	%			

$$W = \frac{100 \times W'}{100 + w} : 113.475 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	27	11.306	11.306	3.3625	0.01255	0.0422	14.00	19.76	10.54
2	14.0	15.0	27	11.811	5.905	2.4301	0.01255	0.0305	12.00	16.94	9.04
5	12.0	13.0	27	12.315	2.463	1.5694	0.01255	0.0197	10.00	14.11	7.53
15	10.0	11.0	27	12.820	0.855	0.9245	0.01255	0.0116	8.00	11.29	6.03
30	9.0	10.0	27	13.072	0.436	0.6601	0.01255	0.0083	7.00	9.88	5.27
60	8.0	9.0	27	13.325	0.222	0.4712	0.01255	0.0059	6.00	8.47	4.52
240	6.0	7.0	28	13.829	0.058	0.2400	0.01241	0.0030	4.00	5.65	3.01
1140	4.5	5.5	27	14.208	0.012	0.1116	0.01255	0.0014	2.50	3.53	1.88

P = 100/W = 0.8813

$$Mx = \frac{G_s}{G_s - 1} = 1.6017$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	47.87	22.02	25.850		22.78	77.22	41.20
0.42	72.95		50.930		44.88	55.12	29.41
0.25	88.32		66.300		58.43	41.57	22.18
0.105	101.29		79.270		69.86	30.14	16.08
0.074	106.51		84.490		74.46	25.54	13.63

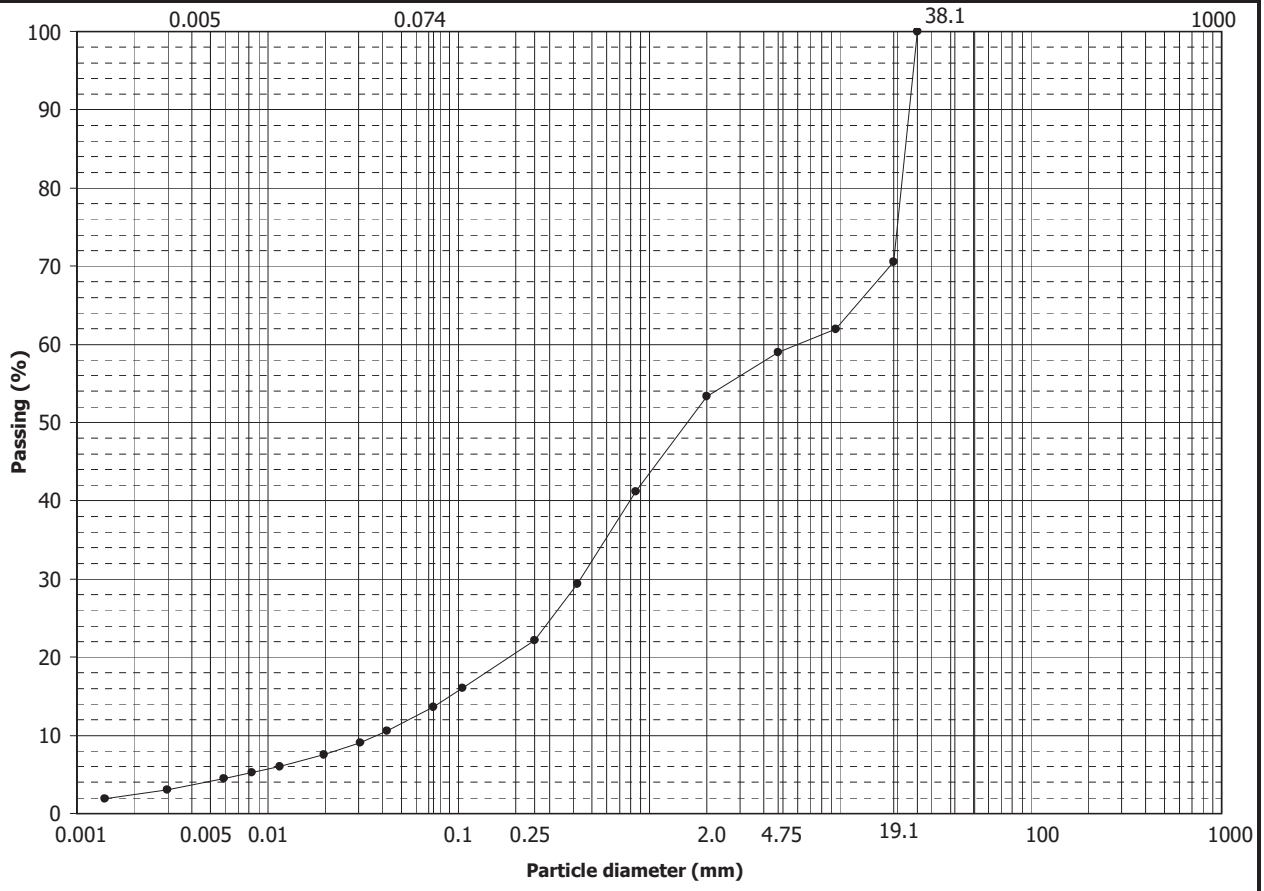
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**15.50 - 16.00**

SPECIFIC GRAVITY : **2.662**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
41.03	45.34	9.48	4.15	25.40	23.263	6.417	1.6823	0.4415	0.0380	169.01	53.36	29.41	13.63



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**18.50 - 19.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	MAMBORO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 13	DEPTH	18.50 - 19.00

Wt. (Air dry soil + container) = 114.29 gr — Specific Gravity : 2.658
Wt. of container B-92 = 35.23 gr — Plasticity Index : %
Wt. Of air dry soil W' = 79.06 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-04			NO	J-23			NO	T-33		
WW	56.74	DW	55.90	WW	57.51	DW	56.65	WW	60.13	DW	59.23	Mean value	
DW	55.90	TW	36.65	DW	56.65	TW	36.20	DW	59.23	TW	38.15	w	
Ww	0.84	Ws	19.25	Ww	0.86	Ws	20.45	Ww	0.90	Ws	21.08	4.28	%
w	4.36	%		w	4.21	%		w	4.27	%			

$$W = \frac{100 \times W'}{100 + w} : 75.816 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	27	11.054	11.054	3.3247	0.01256	0.0418	15.00	31.72	31.72
2	13.0	14.0	27	12.063	6.032	2.4559	0.01256	0.0309	11.00	23.26	23.26
5	10.0	11.0	27	12.820	2.564	1.6012	0.01256	0.0201	8.00	16.92	16.92
15	8.0	9.0	27	13.325	0.888	0.9425	0.01256	0.0118	6.00	12.69	12.69
30	7.0	8.0	27	13.577	0.453	0.6727	0.01256	0.0085	5.00	10.57	10.57
60	6.0	7.0	27	13.829	0.230	0.4801	0.01256	0.0060	4.00	8.46	8.46
240	5.0	6.0	28	14.081	0.059	0.2422	0.01242	0.0030	3.00	6.34	6.34
1140	4.5	5.5	27	14.208	0.012	0.1116	0.01256	0.0014	2.50	5.29	5.29

P = 100/W = 1.319

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6031$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.32	22.02	6.300		8.31	91.69	91.69
0.42	31.90		9.880		13.03	86.97	86.97
0.25	35.16		13.140		17.33	82.67	82.67
0.105	41.90		19.880		26.22	73.78	73.78
0.074	46.90		24.880		32.82	67.18	67.18

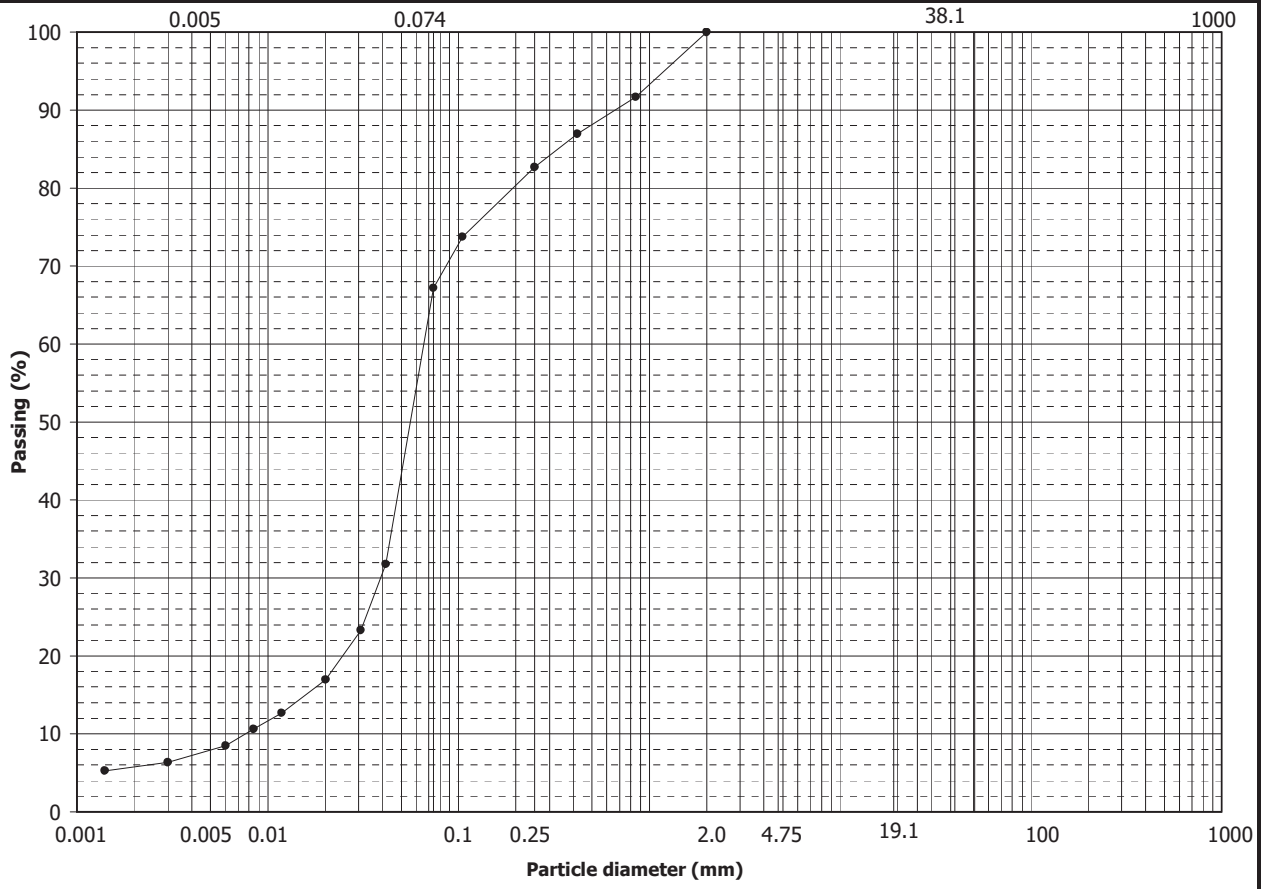
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**MAMBORO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 13**	DEPTH	**18.50 - 19.00**

SPECIFIC GRAVITY : **2.658**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	32.82	59.30	7.89	2.00	0.6961	0.0675	0.0584	0.0396	0.0078	8.65	100.00	86.97	67.18



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		0.50 - 1.00

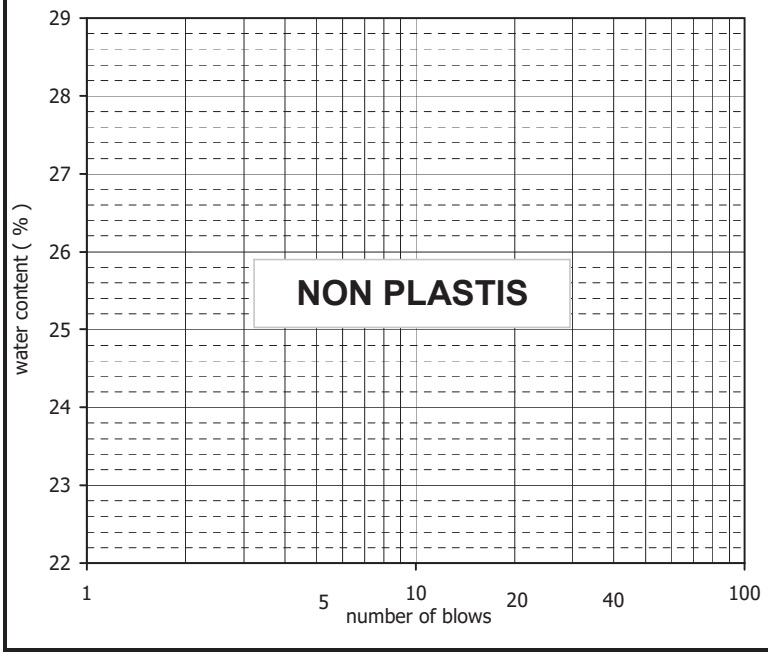
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

PT INDRA KARYA (PERSERO)
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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		1.50 - 2.00

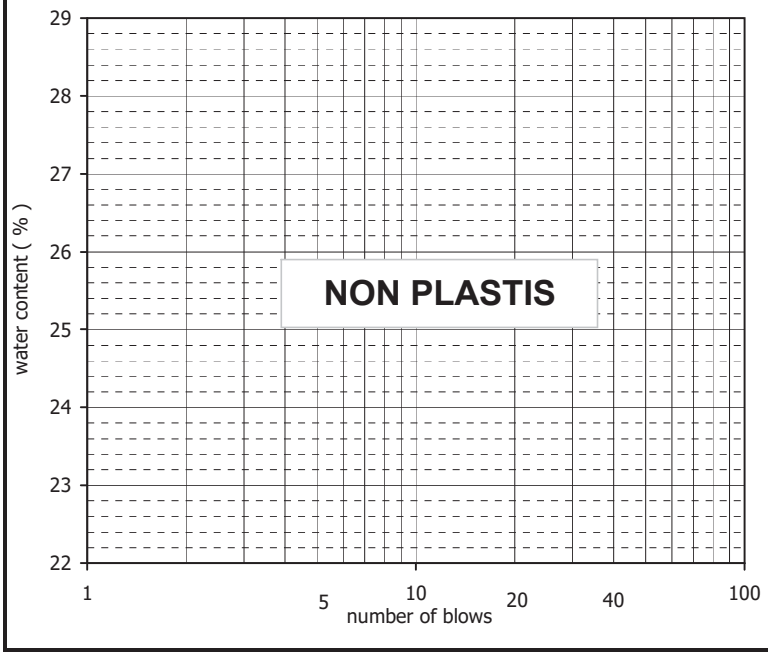
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		2.50 - 3.00

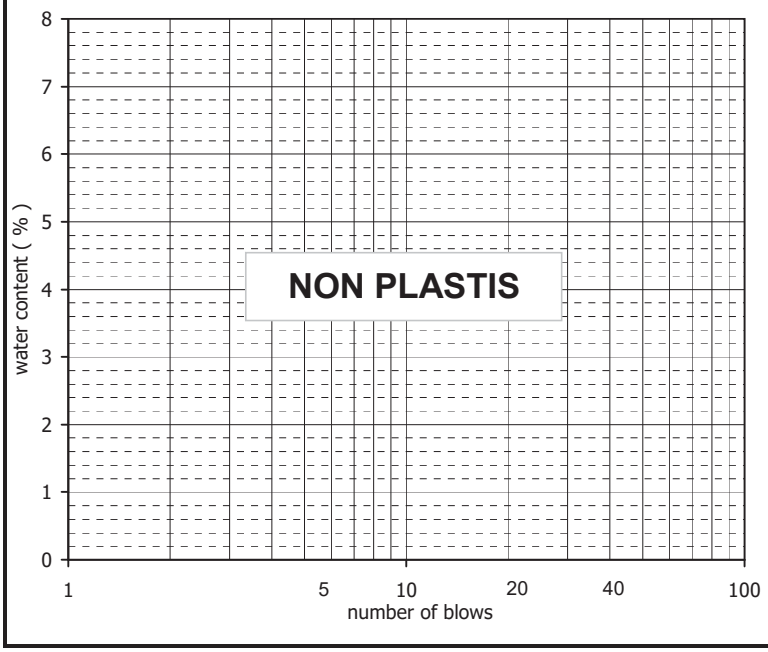
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		3.50 - 4.00

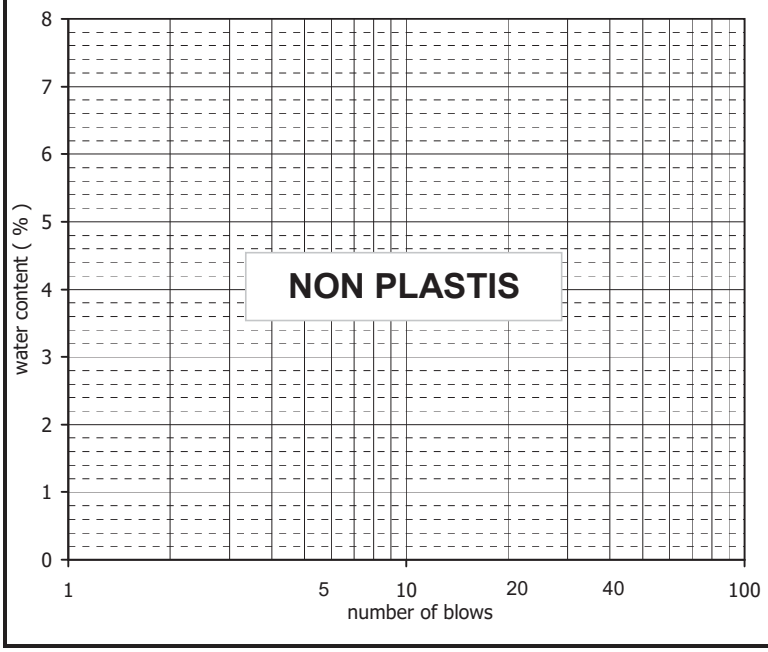
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		4.50 - 5.00

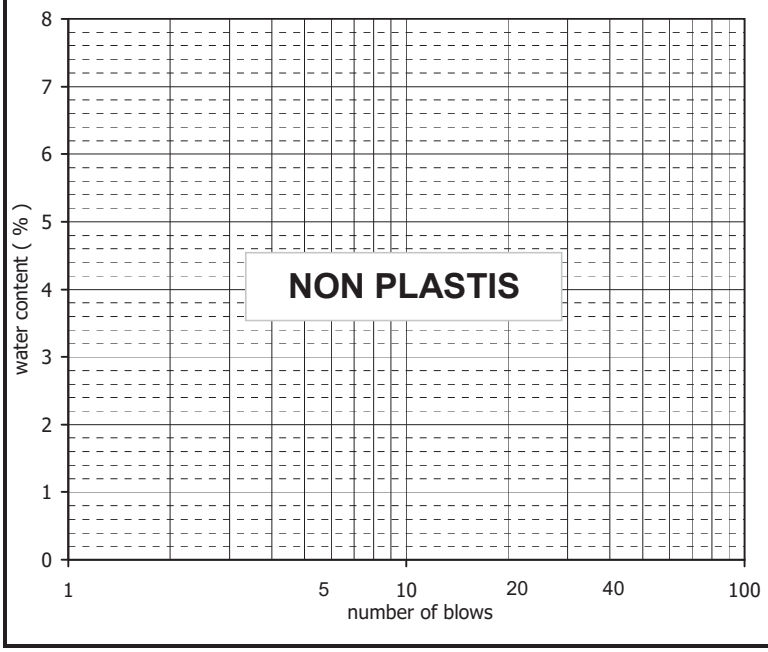
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		5.50 - 6.00

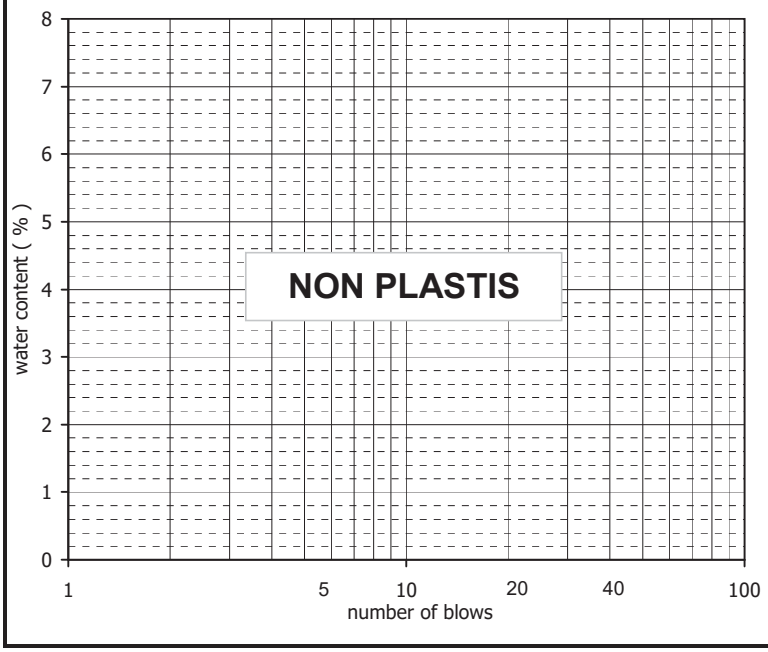
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 8, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		6.50 - 7.00

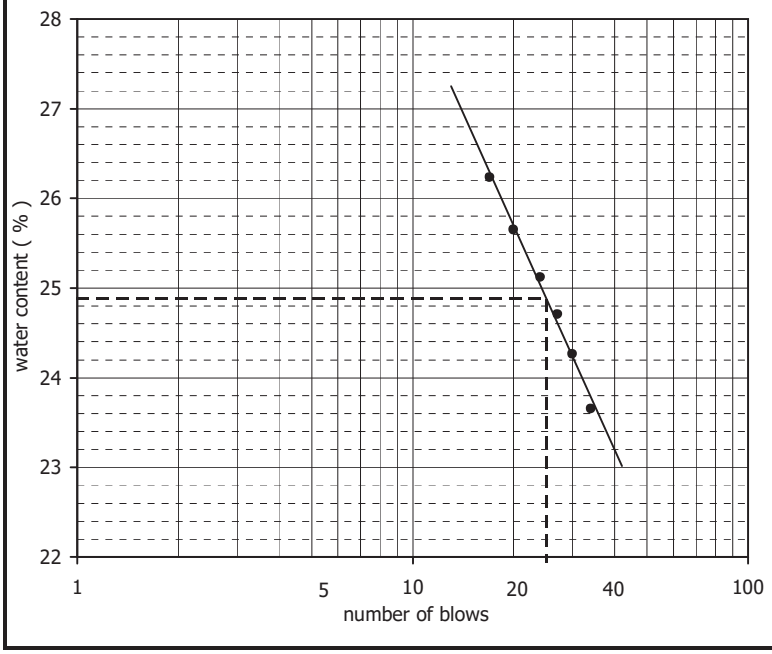
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			30 x	NO. OF BLOWS			27 x
		No.	J-77			No.	J-69			No.	T-03
WW	52.090	DW	49.630	WW	54.130	DW	51.250	WW	54.810	DW	52.080
DW	49.630	TW	39.230	DW	51.250	TW	39.380	DW	52.080	TW	41.030
Ww	2.460	Ws	10.400	Ww	2.880	Ws	11.870	Ww	2.730	Ws	11.050
W =	23.65	%		W =	24.26	%		W =	24.71	%	

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	A-86			No.	T-21			No.	T-18
WW	52.700	DW	50.060	WW	52.360	DW	49.410	WW	51.720	DW	48.590
DW	50.060	TW	39.550	DW	49.410	TW	37.910	DW	48.590	TW	36.660
Ww	2.640	Ws	10.510	Ww	2.950	Ws	11.500	Ww	3.130	Ws	11.930
W =	25.12	%		W =	25.65	%		W =	26.24	%	

PLASTIC LIMIT

1				2				3			
		No.	T-23			No.	A-22			No.	T-35
WW	53.500	DW	50.980	WW	53.900	DW	51.200	WW	56.250	DW	53.690
DW	50.980	TW	37.060	DW	51.200	TW	36.690	DW	53.690	TW	39.750
Ww	2.520	Ws	13.920	Ww	2.700	Ws	14.510	Ww	2.560	Ws	13.940
W =	18.10	%		W =	18.61	%		W =	18.36	%	



LIQUID LIMIT	=	24.89	%
PLASTIC LIMIT	=	18.36	%
PLASTICITY INDEX	=	6.53	%
FLOW INDEX	=	8.33	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		7.50 - 8.00

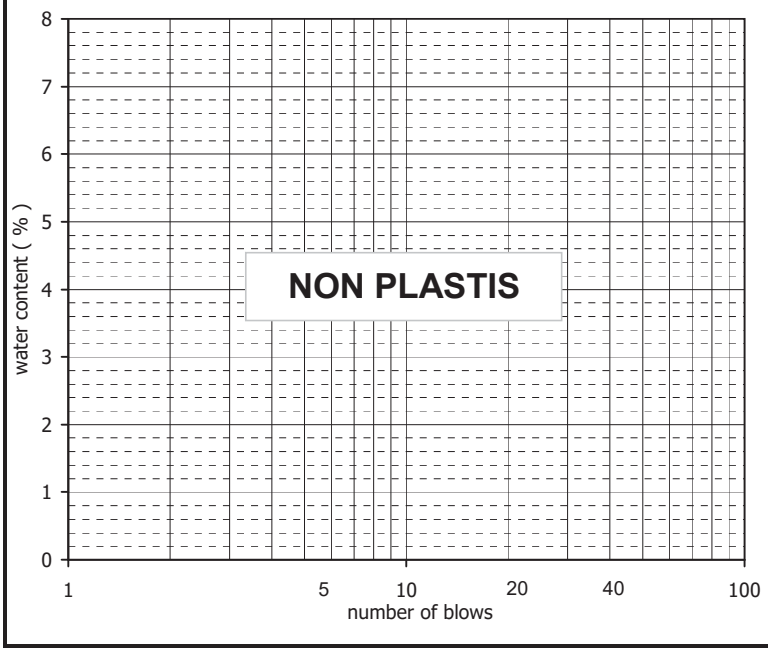
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		8.50 - 9.00

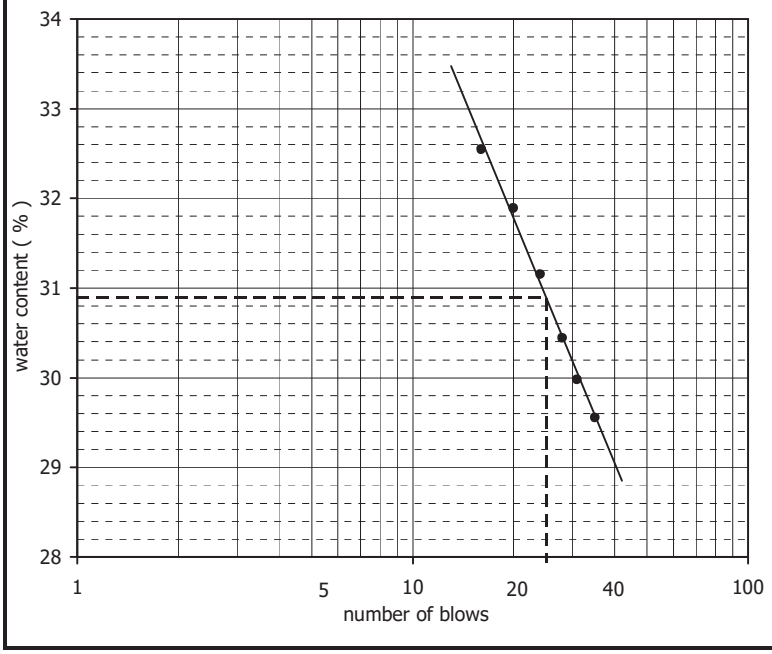
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	A-50			No.	A-76			No.	T-20
WW	52.290	DW	48.900	WW	51.680	DW	47.870	WW	51.750	DW	48.310
DW	48.900	TW	37.430	DW	47.870	TW	35.160	DW	48.310	TW	37.010
Ww	3.390	Ws	11.470	Ww	3.810	Ws	12.710	Ww	3.440	Ws	11.300
	W =		29.56 %		W =		29.98 %		W =		30.44 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	A-75			No.	A-94			No.	T-50
WW	56.360	DW	52.270	WW	53.020	DW	49.120	WW	52.750	DW	49.180
DW	52.270	TW	39.140	DW	49.120	TW	36.890	DW	49.180	TW	38.210
Ww	4.090	Ws	13.130	Ww	3.900	Ws	12.230	Ww	3.570	Ws	10.970
	W =		31.15 %		W =		31.89 %		W =		32.54 %

PLASTIC LIMIT

1				2				3			
		No.	J-65			No.	T-19			No.	T-21
WW	50.220	DW	46.900	WW	51.920	DW	49.260	WW	51.100	DW	48.350
DW	46.900	TW	34.250	DW	49.260	TW	39.080	DW	48.350	TW	37.910
Ww	3.320	Ws	12.650	Ww	2.660	Ws	10.180	Ww	2.750	Ws	10.440
	W =		26.25 %		W =		26.13 %		W =		26.34 %



LIQUID LIMIT	=	30.90	%
PLASTIC LIMIT	=	26.24	%
PLASTICITY INDEX	=	4.66	%
FLOW INDEX	=	9.08	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		9.50 - 10.00

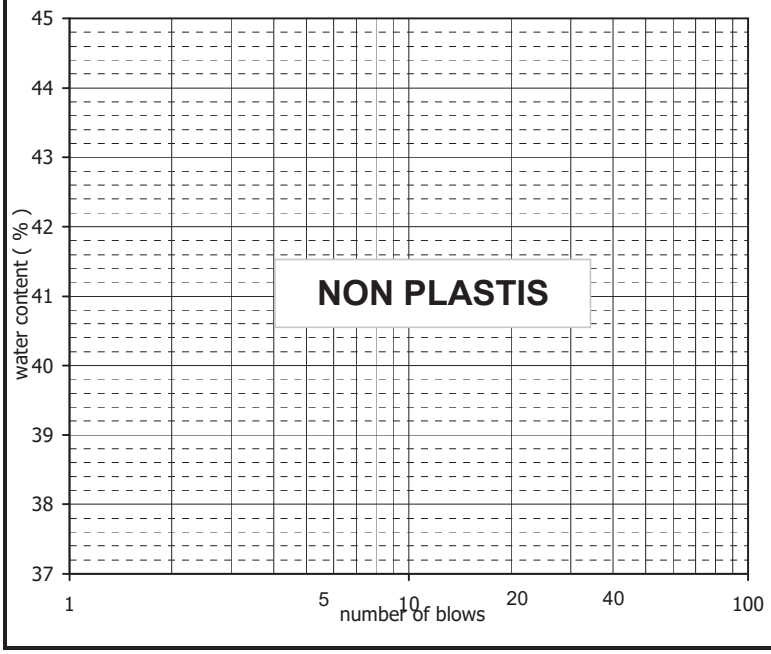
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		12.50 - 13.00

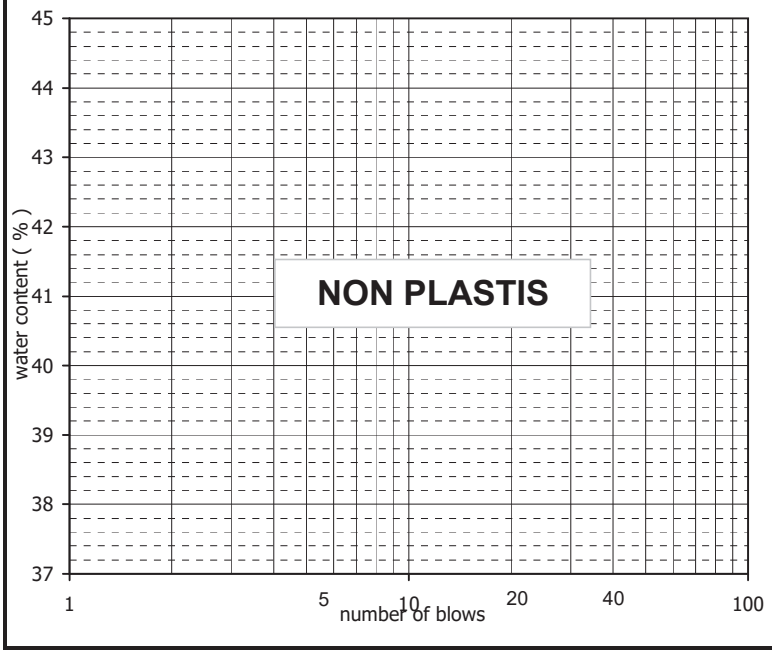
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		15.50 - 16.00

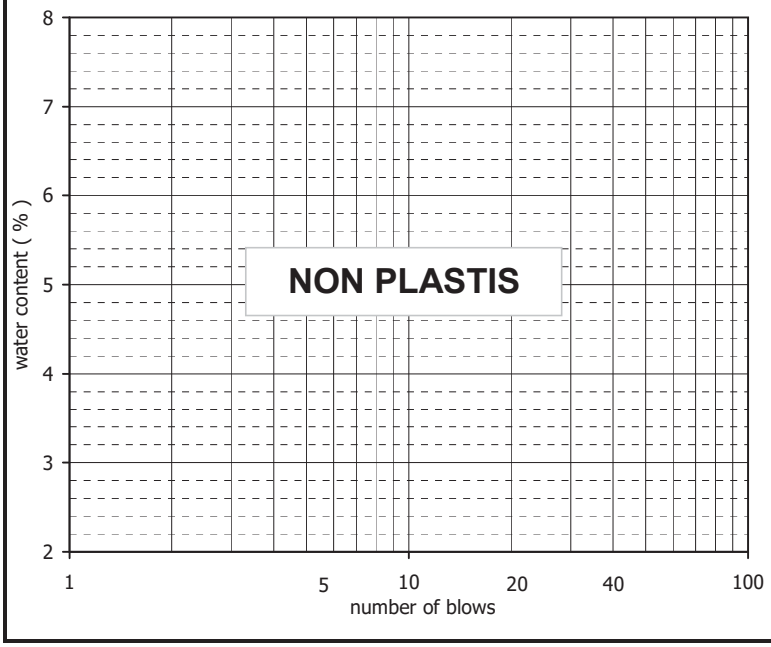
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	MAMBORO PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 13	DEPTH (m)		18.50 - 19.00

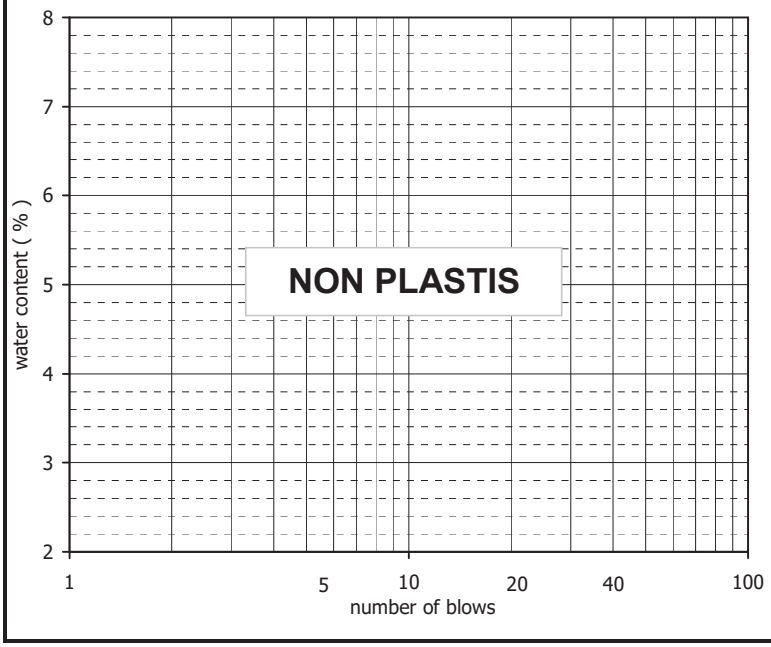
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**BAMBA - PALU**									
SAMPLE No			BAY - 14	BAY - 14	BAY - 14	BAY - 14	BAY - 14	BAY - 14	BAY - 14	BAY - 14	BAY - 14
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	5.94	6.00	15.04	9.57	10.81	15.58	22.11	25.09	21.47
	Specific gravity of soil	*Gs*	2.669	2.659	2.673	2.663	2.703	2.681	2.651	2.660	2.654
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	14.63	16.70	7.26	9.23	15.05	16.94	0.00	0.00	0.00
	Proportion — Sand part	(%)	55.01	61.56	72.56	67.60	51.35	42.30	66.47	42.07	38.26
	Proportion — Silt part	(%)	24.67	14.84	14.57	16.28	24.94	28.35	26.83	45.00	46.88
	Proportion — Clay part	(%)	5.69	6.91	5.60	6.90	8.66	12.41	6.69	12.94	14.86
	Max. diameter	(mm)	19.10	19.10	19.10	19.10	19.10	25.40	2.00	2.00	2.00
	90 % diameter	(mm)	9.2064	7.9576	3.1031	4.5246	8.0721	12.4072	0.4571	0.4716	0.2808
	60 % diameter	(mm)	0.4898	0.9379	0.6137	0.7266	0.7497	0.4926	0.1672	0.0819	0.0715
	50 % diameter	(mm)	0.2406	0.4521	0.4263	0.4699	0.3714	0.2083	0.1262	0.0546	0.0569
	30 % diameter	(mm)	0.0730	0.1340	0.1589	0.1379	0.0596	0.0340	0.0614	0.0181	0.0232
	10 % diameter	(mm)	0.0140	0.0177	0.0172	0.0116	0.0066	0.0034	0.0097	0.0037	0.0024
	Uniformity Coefficient		35.03	52.95	35.69	62.60	114.03	145.60	17.21	22.40	30.39
	Passing # 200		30.36	21.74	20.18	23.17	33.60	40.76	33.53	57.93	61.74
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	25.06
	Plastic limit	*PL* (%)									20.48
	Plasticity index	*PI* (%)									4.57
	Flow index										8.06
	Unified Classification										CL - ML

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**BAMBA - PALU**									
SAMPLE No			BAY - 14	BAY - 14	BAY - 14	BAY - 14					
DEPTH (m)			9.50 - 10.00	12.50 - 13.00	15.50 - 16.00	18.50 - 19.00					
PROPERTIES	Natural Water Content	(%)	23.80	22.22	7.00	7.15					
	Specific gravity of soil	*Gs*	2.663	2.652	2.686	2.657					
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	0.00	0.00	9.45	14.51					
	Proportion – Sand part	(%)	47.45	45.62	66.39	55.04					
	Proportion – Silt part	(%)	41.20	42.58	17.83	20.60					
	Proportion – Clay part	(%)	11.35	11.80	6.33	9.85					
	Max. diameter	(mm)	2.00	2.00	19.10	19.10					
	90 % diameter	(mm)	0.4690	0.6587	4.5433	7.4280					
	60 % diameter	(mm)	0.0895	0.0896	0.3782	0.6591					
	50 % diameter	(mm)	0.0688	0.0663	0.2465	0.2994					
	30 % diameter	(mm)	0.0287	0.0298	0.1032	0.0717					
	10 % diameter	(mm)	0.0043	0.0040	0.0145	0.0053					
	Uniformity Coefficient		20.67	22.53	26.11	125.46					
	Passing # 200		52.55	54.38	24.16	30.46					
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS					
	Plastic limit	*PL* (%)									
	Plasticity index	*PI* (%)									
	Flow index										
	Unified Classification										

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BUMN
Hadir untuk negeri

ISO 9001 CCBS-3117003
ISO 14001 CCBS-3118004
OHSAS 18001 CCBS-3118027

NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	BAMBA - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	A-63								No	T-32	
04/02	BAY - 14		WW	80.74	DW	78.45			04/02	BAY - 14		WW	136.69	DW	119.38		
2019	0.50 - 1.00	5.94	DW	78.45	TW	39.92			2019	8.50 - 9.00	21.47	DW	119.38	TW	38.76		
			Ww	2.29	Ws	38.53						Ww	17.31	Ws	80.62		
				WC	(%)	5.94							WC	(%)	21.47		
					No	T-37								No	T-47		
04/02	BAY - 14		WW	86.88	DW	84.24			04/02	BAY - 14		WW	104.98	DW	91.77		
2019	1.50 - 2.00	6.00	DW	84.24	TW	40.21			2019	9.50 - 10.00	23.80	DW	91.77	TW	36.27		
			Ww	2.64	Ws	44.03						Ww	13.21	Ws	55.50		
				WC	(%)	6.00							WC	(%)	23.80		
					No	T-65								No	L-32		
04/02	BAY - 14		WW	101.25	DW	92.45			04/02	BAY - 14		WW	110.94	DW	97.76		
2019	2.50 - 3.00	15.04	DW	92.45	TW	33.94			2019	12.50 - 13.00	22.22	DW	97.76	TW	38.44		
			Ww	8.80	Ws	58.51						Ww	13.18	Ws	59.32		
				WC	(%)	15.04							WC	(%)	22.22		
					No	J-52								No	J-70		
04/02	BAY - 14		WW	108.73	DW	102.44			04/02	BAY - 14		WW	92.73	DW	89.17		
2019	3.50 - 4.00	9.57	DW	102.44	TW	36.71			2019	15.50 - 16.00	7.00	DW	89.17	TW	38.31		
			Ww	6.29	Ws	65.73						Ww	3.56	Ws	50.86		
				WC	(%)	9.57							WC	(%)	7.00		
					No	L-48								No	T-41		
04/02	BAY - 14		WW	129.39	DW	120.27			04/02	BAY - 14		WW	90.26	DW	86.83		
2019	4.50 - 5.00	10.81	DW	120.27	TW	35.94			2019	18.50 - 19.00	7.15	DW	86.83	TW	38.83		
			Ww	9.12	Ws	84.33						Ww	3.43	Ws	48.00		
				WC	(%)	10.81							WC	(%)	7.15		
					No	A-57								No			
04/02	BAY - 14		WW	98.18	DW	90.33						WW		DW			
2019	5.50 - 6.00	15.58	DW	90.33	TW	39.96						DW		TW			
			Ww	7.85	Ws	50.37						Ww		Ws			
				WC	(%)	15.58							WC	(%)			
					No	T-76								No			
04/02	BAY - 14		WW	100.03	DW	88.68						WW		DW			
2019	6.50 - 7.00	22.11	DW	88.68	TW	37.34						DW		TW			
			Ww	11.35	Ws	51.34						Ww		Ws			
				WC	(%)	22.11							WC	(%)			
					No	J-22								No			
04/02	BAY - 14		WW	118.68	DW	102.70						WW		DW			
2019	7.50 - 8.00	25.09	DW	102.70	TW	39.01						DW		TW			
			Ww	15.98	Ws	63.69						Ww		Ws			
				WC	(%)	25.09							WC	(%)			

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				17	46	73	
Weight of Pycnometer		Wf	(gr)	64.940	39.280	34.550	
Weight of (Pycnometer + Water)		Wa	(gr)	169.440	140.310	135.120	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.240	152.990	147.730	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.190	37.980	37.900	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.410	20.200	20.120	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.4400	140.3100	135.1200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.610	7.520	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.682	2.686	2.679	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.668	2.672	2.665	
Average Specific Gravity at 20° C							**2.669**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				68	43	59	
Weight of Pycnometer		Wf	(gr)	34.650	40.060	33.640	
Weight of (Pycnometer + Water)		Wa	(gr)	134.460	142.260	144.580	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	147.150	154.850	157.310	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	37.910	38.110	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.130	20.330	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	134.4600	142.2600	144.5800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.580	7.540	7.600	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.674	2.670	2.675	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.660	2.656	2.661	
Average Specific Gravity at 20° C							**2.659**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				2	22	65	
Weight of Pycnometer		Wf	(gr)	66.900	39.710	34.080	
Weight of (Pycnometer + Water)		Wa	(gr)	168.750	145.030	134.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.410	157.950	146.890	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.970	38.330	37.890	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.190	20.550	20.110	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.7500	145.0300	134.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.630	7.490	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.681	2.693	2.685	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.667	2.679	2.671	
Average Specific Gravity at 20° C							**2.673**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				52	69	71	
Weight of Pycnometer		Wf	(gr)	52.420	36.570	39.800	
Weight of (Pycnometer + Water)		Wa	(gr)	153.990	137.650	140.220	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	166.700	150.290	152.860	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.070	37.990	37.930	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.290	20.210	20.150	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	153.9900	137.6500	140.2200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.580	7.570	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.677	2.670	2.683	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.663	2.656	2.669	
Average Specific Gravity at 20° C							**2.663**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				3	12	66	
Weight of Pycnometer		Wf	(gr)	63.340	67.220	36.290	
Weight of (Pycnometer + Water)		Wa	(gr)	166.670	169.330	136.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	179.870	182.100	149.020	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.650	38.000	37.950	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.870	20.220	20.170	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	166.6700	169.3300	136.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.670	7.450	7.430	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.721	2.714	2.715	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.707	2.700	2.701	
Average Specific Gravity at 20° C							**2.703**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 8, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				21	54	74	
Weight of Pycnometer		Wf	(gr)	40.730	51.250	38.550	
Weight of (Pycnometer + Water)		Wa	(gr)	145.610	151.310	138.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	158.640	164.110	151.500	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.490	38.150	38.230	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.710	20.370	20.450	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	145.6100	151.3100	138.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.680	7.570	7.580	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.697	2.691	2.698	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.683	2.677	2.684	
Average Specific Gravity at 20° C							**2.681**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				19	6	84	
Weight of Pycnometer		Wf	(gr)	66.300	65.150	36.950	
Weight of (Pycnometer + Water)		Wa	(gr)	167.700	167.850	136.980	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	180.770	180.810	149.900	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.680	38.550	38.460	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.900	20.770	20.680	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.7000	167.8500	136.9800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.830	7.810	7.760	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.669	2.659	2.665	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.655	2.646	2.651	
Average Specific Gravity at 20° C							**2.651**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				75	58	82	
Weight of Pycnometer		Wf	(gr)	35.700	35.070	37.300	
Weight of (Pycnometer + Water)		Wa	(gr)	135.380	145.730	137.000	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.000	158.370	149.690	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.960	37.950	38.050	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.180	20.170	20.270	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.3800	145.7300	137.0000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.560	7.530	7.580	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.669	2.679	2.674	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.656	2.665	2.660	
Average Specific Gravity at 20° C							**2.660**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				23	7	47	
Weight of Pycnometer		Wf	(gr)	43.180	68.750	40.660	
Weight of (Pycnometer + Water)		Wa	(gr)	146.380	169.400	142.080	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.280	181.950	154.660	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.410	37.840	37.920	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.630	20.060	20.140	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.3800	169.4000	142.0800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.730	7.510	7.560	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.669	2.671	2.664	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.655	2.657	2.650	
Average Specific Gravity at 20° C							**2.654**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				42	81	60	
Weight of Pycnometer		Wf	(gr)	39.190	36.910	43.180	
Weight of (Pycnometer + Water)		Wa	(gr)	142.220	135.890	146.610	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	154.900	148.500	159.270	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.040	37.890	37.990	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.260	20.110	20.210	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	142.2200	135.8900	146.6100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.580	7.500	7.550	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.673	2.681	2.677	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.659	2.668	2.663	
Average Specific Gravity at 20° C							**2.663**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	12.50 - 13.00

Determination No				1	2	3	4
No of Pycnometer				48	67	72	
Weight of Pycnometer		Wf	(gr)	37.760	36.820	33.250	
Weight of (Pycnometer + Water)		Wa	(gr)	139.170	137.620	133.800	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.780	150.360	146.470	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.990	38.140	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.210	20.360	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	139.1700	137.6200	133.8000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.600	7.620	7.610	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.659	2.672	2.665	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.646	2.658	2.651	
Average Specific Gravity at 20° C							**2.652**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 8, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	14.50 - 16.00

Determination No				1	2	3	4
No of Pycnometer				61	53	85	
Weight of Pycnometer		Wf	(gr)	37.700	52.280	38.870	
Weight of (Pycnometer + Water)		Wa	(gr)	146.520	153.170	138.670	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.280	165.950	151.350	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.030	38.120	37.900	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.250	20.340	20.120	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.5200	153.1700	138.6700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.490	7.560	7.440	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.704	2.690	2.704	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.690	2.677	2.690	
Average Specific Gravity at 20° C							**2.686**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 8, 2019
LOCATION	BAMBA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 14	DEPTH	18.50 - 19.00

Determination No				1	2	3	4
No of Pycnometer				70	51	83	
Weight of Pycnometer		Wf	(gr)	37.010	53.870	38.130	
Weight of (Pycnometer + Water)		Wa	(gr)	136.860	154.280	137.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.510	166.860	150.280	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	37.880	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.100	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.8600	154.2800	137.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.620	7.520	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.660	2.673	2.680	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.646	2.659	2.666	
Average Specific Gravity at 20° C							**2.657**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 265.2 gr
Wt. container No ..... = 47.21 gr
Wt. Of air dry soil W' = 218.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **218.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	68.30	47.21	21.09		9.67	90.33
4.75	79.10		31.89		14.63	85.37
2.00	91.60		44.39		20.36	79.64

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 122.94 gr — Specific Gravity : **2.669**

Wt. of container E-41 = 36.10 gr — Plasticity Index : %

Wt. Of air dry soil W' = 86.84 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 79.64 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-32			NO	A-49			NO	A-07		
WW	58.56	DW	57.85	WW	61.24	DW	60.54	WW	66.73	DW	65.97	Mean value	
DW	57.85	TW	36.04	DW	60.54	TW	39.46	DW	65.97	TW	42.09	w	
Ww	0.71	Ws	21.81	Ww	0.70	Ws	21.08	Ww	0.76	Ws	23.88	3.25	%
w	3.26	%		w	3.32	%		w	3.18	%			

$$W = \frac{100 \times W'}{100 + w} : 84.104 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.5	15.5	29	11.685	11.685	3.4183	0.01225	0.0419	12.50	23.77	18.93
2	12.0	13.0	29	12.315	6.158	2.4815	0.01225	0.0304	10.00	19.01	15.14
5	10.0	11.0	29	12.820	2.564	1.6012	0.01225	0.0196	8.00	15.21	12.11
15	8.0	9.0	29	13.325	0.888	0.9425	0.01225	0.0115	6.00	11.41	9.09
30	7.0	8.0	29	13.577	0.453	0.6727	0.01225	0.0082	5.00	9.51	7.57
60	6.0	7.0	29	13.829	0.230	0.4801	0.01225	0.0059	4.00	7.61	6.06
240	5.0	6.0	28	14.081	0.059	0.2422	0.01238	0.0030	3.00	5.70	4.54
1140	4.5	5.5	29	14.208	0.012	0.1116	0.01225	0.0014	2.50	4.75	3.79

P = 100/W = 1.189

$$Mx = \frac{G_s}{G_s - 1} = 1.5992$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	33.82	22.02	11.800		14.03	85.97	68.46
0.42	44.49		22.470		26.72	73.28	58.36
0.25	52.40		30.380		36.12	63.88	50.87
0.105	66.53		44.510		52.92	47.08	37.49
0.074	74.06		52.040		61.88	38.12	30.36

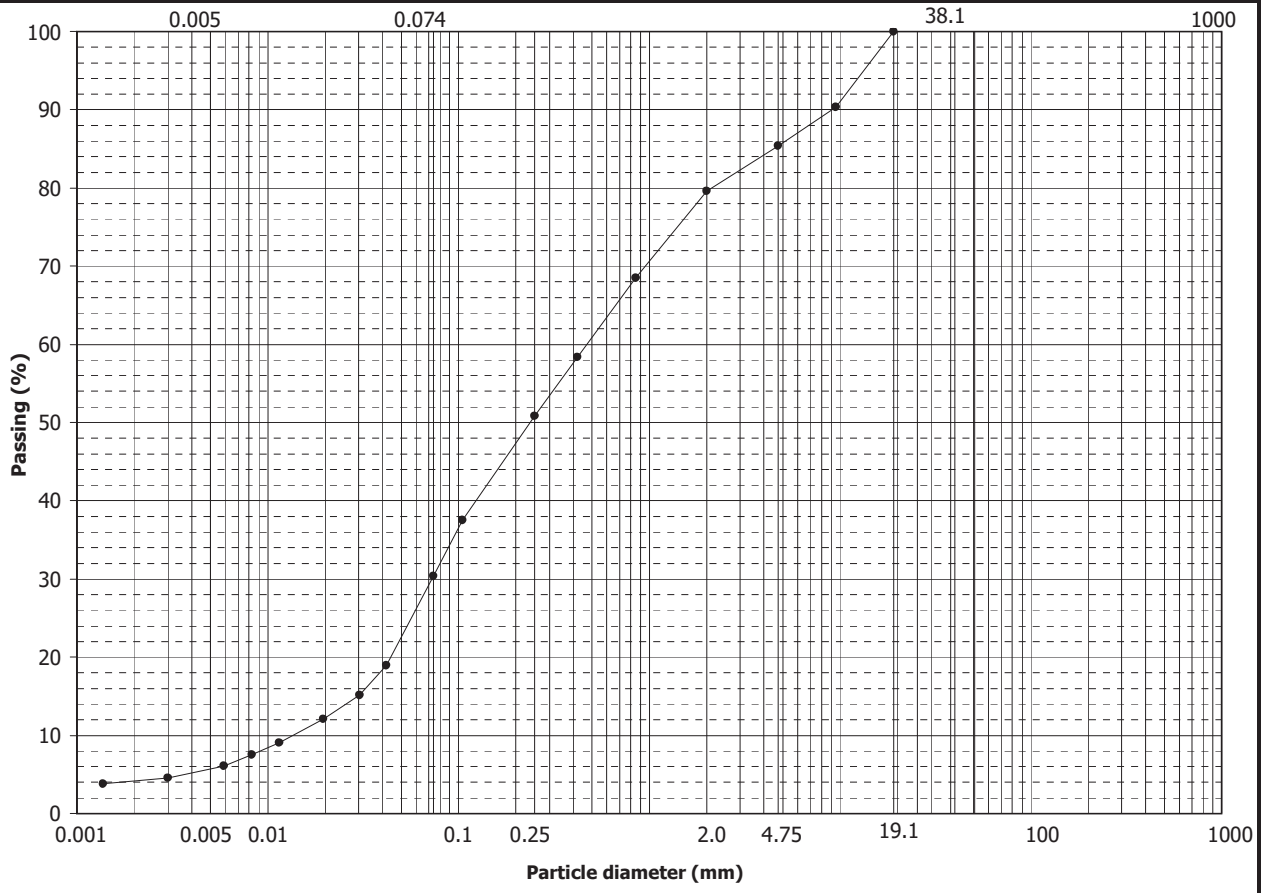
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.669**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
14.63	55.01	24.67	5.69	19.10	9.2064	0.4898	0.2406	0.0730	0.0140	35.03	79.64	58.36	30.36



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 231.8 gr
Wt. container No ..... = 35.05 gr
Wt. Of air dry soil W' = 196.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **196.70** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	48.30	35.05	13.25		6.74	93.26
4.75	67.90		32.85		16.70	83.30
2.00	94.10		59.05		30.02	69.98

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 122.21 gr — Specific Gravity : **2.659**

Wt. of container B-16 = 33.61 gr — Plasticity Index : %

Wt. Of air dry soil W' = 88.60 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 69.98 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-69			NO	A-71			NO	A-16		
WW	55.90	DW	55.16	WW	61.36	DW	60.64	WW	59.94	DW	59.20	Mean value	
DW	55.16	TW	33.11	DW	60.64	TW	39.47	DW	59.20	TW	37.79	w	
Ww	0.74	Ws	22.05	Ww	0.72	Ws	21.17	Ww	0.74	Ws	21.41	3.40	%
w	3.36	%		w	3.40	%		w	3.46	%			

$$W = \frac{100 \times W'}{100 + w} : 85.683 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	29	12.063	12.063	3.4732	0.01229	0.0427	11.00	20.58	14.40
2	11.5	12.5	29	12.442	6.221	2.4941	0.01229	0.0306	9.50	17.77	12.44
5	10.0	11.0	29	12.820	2.564	1.6012	0.01229	0.0197	8.00	14.96	10.47
15	8.5	9.5	29	13.198	0.880	0.9380	0.01229	0.0115	6.50	12.16	8.51
30	8.0	9.0	29	13.325	0.444	0.6664	0.01229	0.0082	6.00	11.22	7.85
60	7.5	8.5	29	13.451	0.224	0.4735	0.01229	0.0058	5.50	10.29	7.20
240	6.5	7.5	28	13.703	0.057	0.2389	0.01242	0.0030	4.50	8.42	5.89
1140	6.0	7.0	29	13.829	0.012	0.1101	0.01229	0.0014	4.00	7.48	5.24

P = 100/W = 1.1671

$$Mx = \frac{G_s}{G_s - 1} = 1.6028$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	35.25	22.02	13.230		15.44	84.56	59.17
0.42	47.39		25.370		29.61	70.39	49.26
0.25	58.41		36.390		42.47	57.53	40.26
0.105	74.11		52.090		60.79	39.21	27.44
0.074	81.08		59.060		68.93	31.07	21.74

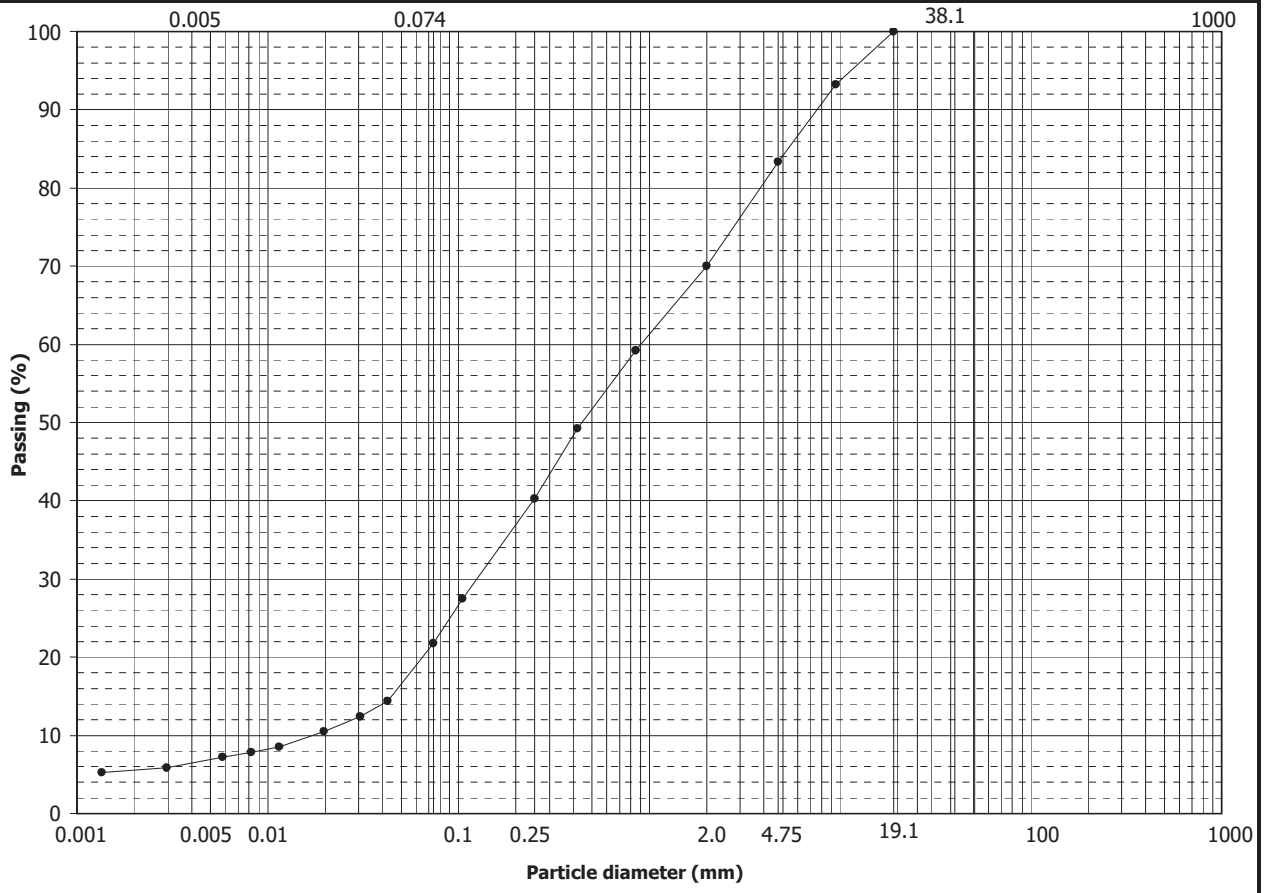
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.659**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
16.70	61.56	14.84	6.91	19.10	7.9576	0.9379	0.4521	0.1340	0.0177	52.95	69.98	49.26	21.74



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 236.1 gr
Wt. container No ..... = 39.42 gr
Wt. Of air dry soil W' = 196.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **196.70** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	49.40	39.42	9.98		5.07	94.93
4.75	53.70		14.28		7.26	92.74
2.00	62.70		23.28		11.84	88.16

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 143.55 gr — Specific Gravity : **2.673**

Wt. of container B-10 = 36.09 gr — Plasticity Index : %

Wt. Of air dry soil W' = 107.46 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 88.16 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-73			NO	A-18			NO	A-23		
WW	61.03	DW	60.39	WW	63.15	DW	62.50	WW	57.84	DW	57.18	Mean value	
DW	60.39	TW	38.84	DW	62.50	TW	40.87	DW	57.18	TW	35.78	w	
Ww	0.64	Ws	21.55	Ww	0.65	Ws	21.63	Ww	0.66	Ws	21.40	3.02	%
w	2.97	%		w	3.01	%		w	3.08	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : \quad 104.310 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	29	12.063	12.063	3.4732	0.01223	0.0425	11.00	16.85	14.85
2	11.5	12.5	29	12.442	6.221	2.4941	0.01223	0.0305	9.50	14.55	12.83
5	10.0	11.0	29	12.820	2.564	1.6012	0.01223	0.0196	8.00	12.25	10.80
15	8.0	9.0	29	13.325	0.888	0.9425	0.01223	0.0115	6.00	9.19	8.10
30	7.0	8.0	29	13.577	0.453	0.6727	0.01223	0.0082	5.00	7.66	6.75
60	6.5	7.5	29	13.703	0.228	0.4779	0.01223	0.0058	4.50	6.89	6.08
240	5.0	6.0	28	14.081	0.059	0.2422	0.01237	0.0030	3.00	4.60	4.05
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01223	0.0014	2.00	3.06	2.70

P = 100/W = 0.9587

$$Mx = \frac{G_s}{G_s - 1} = \quad 1.5977$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	40.42	22.02	18.400		17.64	82.36	72.61
0.42	67.57		45.550		43.67	56.33	49.67
0.25	81.27		59.250		56.80	43.20	38.09
0.105	96.50		74.480		71.40	28.60	25.21
0.074	102.46		80.440		77.12	22.88	20.18

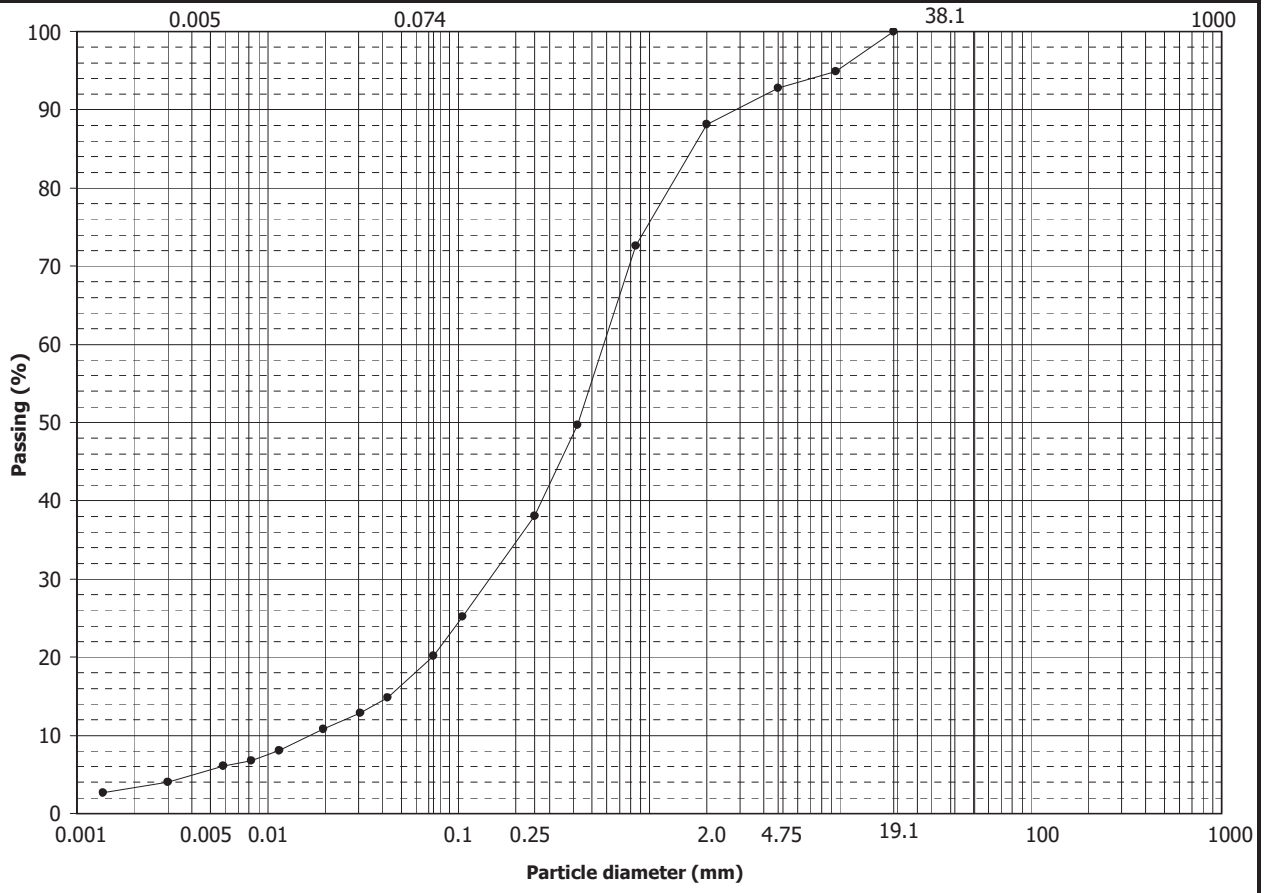
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.673**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
7.26	72.56	14.57	5.60	19.10	3.1031	0.6137	0.4263	0.1589	0.0172	35.69	88.16	49.67	20.18



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 274.7 gr
Wt. container No ..... = 66.70 gr
Wt. Of air dry soil W' = 208.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **207.98** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	75.20	66.70	8.50		4.09	95.91
4.75	85.90		19.20		9.23	90.77
2.00	105.40		38.70		18.61	81.39

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 144.49 gr — Specific Gravity : **2.663**

Wt. of container B-50 = 35.90 gr — Plasticity Index : %

Wt. Of air dry soil W' = 108.59 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 81.39 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-39			NO	A-75			NO	A-101			
WW	59.60	DW	58.91	WW	60.86	DW	60.17	WW	56.39	DW	55.68	Mean value		
DW	58.91	TW	37.42	DW	60.17	TW	39.14	DW	55.68	TW	34.68	w		
Ww	0.69	Ws	21.49	Ww	0.69	Ws	21.03	Ww	0.71	Ws	21.00	3.29	%	
w	3.21	%		w	3.28	%		w	3.38	%				

$$W = \frac{100 \text{ x } W'}{100 + w} : 105.130 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	29	11.306	11.306	3.3625	0.01227	0.0413	14.00	21.32	17.36
2	14.0	15.0	29	11.811	5.905	2.4301	0.01227	0.0298	12.00	18.28	14.88
5	12.0	13.0	29	12.315	2.463	1.5694	0.01227	0.0193	10.00	15.23	12.40
15	10.0	11.0	29	12.820	0.855	0.9245	0.01227	0.0113	8.00	12.19	9.92
30	9.0	10.0	29	13.072	0.436	0.6601	0.01227	0.0081	7.00	10.66	8.68
60	8.0	9.0	29	13.325	0.222	0.4712	0.01227	0.0058	6.00	9.14	7.44
240	6.0	7.0	28	13.829	0.058	0.2400	0.01241	0.0030	4.00	6.09	4.96
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01227	0.0014	2.00	3.05	2.48

P = 100/W = 0.9512

$$Mx = \frac{G_s}{G_s - 1} = 1.6013$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	43.44	22.02	21.420		20.37	79.63	64.81
0.42	65.08		43.060		40.96	59.04	48.06
0.25	78.61		56.590		53.83	46.17	37.58
0.105	91.28		69.260		65.88	34.12	27.77
0.074	97.22		75.200		71.53	28.47	23.17

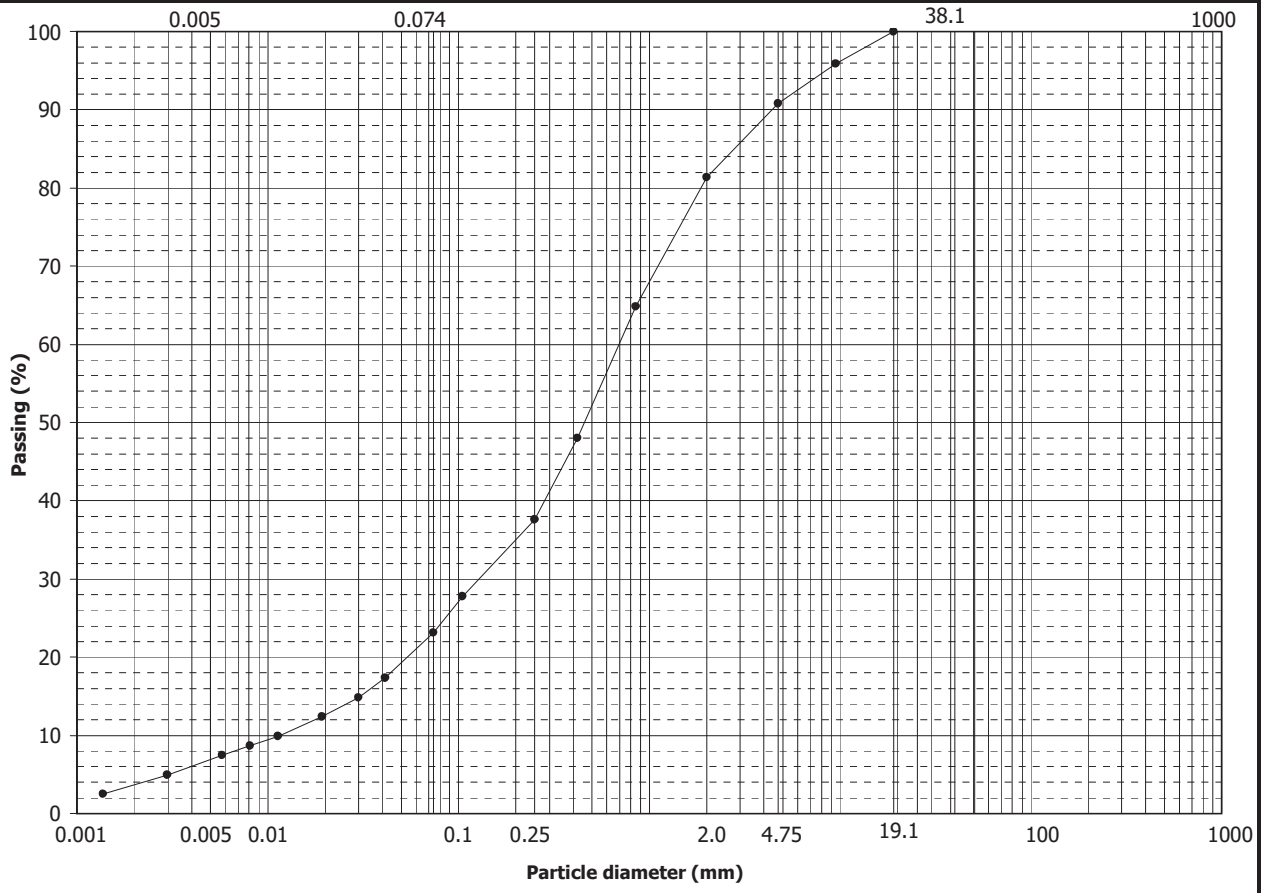
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.663**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
9.23	67.60	16.28	6.90	19.10	4.5246	0.7266	0.4699	0.1379	0.0116	62.60	81.39	48.06	23.17



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 397.0 gr
Wt. container No ..... = 46.90 gr
Wt. Of air dry soil W' = 350.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **350.10** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	74.20	46.90	27.30		7.80	92.20
4.75	99.60		52.70		15.05	84.95
2.00	133.10		86.20		24.62	75.38

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 138.25 gr — Specific Gravity : **2.703**

Wt. of container E-70 = 36.90 gr — Plasticity Index : %

Wt. Of air dry soil W' = 101.35 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 75.38 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-59			NO	A-100			NO	A-66		
WW	50.55	DW	50.12	WW	59.09	DW	58.19	WW	60.92	DW	60.05	Mean value	
DW	50.12	TW	39.51	DW	58.19	TW	36.78	DW	60.05	TW	38.52	w	
Ww	0.43	Ws	10.61	Ww	0.90	Ws	21.41	Ww	0.87	Ws	21.53	4.10	%
w	4.05	%		w	4.20	%		w	4.04	%			

$$W = \frac{100 \times W'}{100 + w} : 97.359 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	22.0	23.0	29	9.792	9.792	3.1293	0.01213	0.0379	20.00	32.61	24.58
2	19.0	20.0	29	10.549	5.275	2.2967	0.01213	0.0278	17.00	27.71	20.89
5	16.0	17.0	29	11.306	2.261	1.5037	0.01213	0.0182	14.00	22.82	17.20
15	13.0	14.0	29	12.063	0.804	0.8968	0.01213	0.0109	11.00	17.93	13.52
30	11.0	12.0	29	12.568	0.419	0.6472	0.01213	0.0078	9.00	14.67	11.06
60	9.5	10.5	29	12.946	0.216	0.4645	0.01213	0.0056	7.50	12.23	9.22
240	7.0	8.0	28	13.577	0.057	0.2378	0.01226	0.0029	5.00	8.15	6.14
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01213	0.0013	3.50	5.71	4.30

P = 100/W = 1.0271

$$Mx = \frac{G_s}{G_s - 1} = 1.5872$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	38.57	22.02	16.550		17.00	83.00	62.56
0.42	52.77		30.750		31.58	68.42	51.57
0.25	59.86		37.840		38.87	61.13	46.08
0.105	72.11		50.090		51.45	48.55	36.60
0.074	75.98		53.960		55.42	44.58	33.60

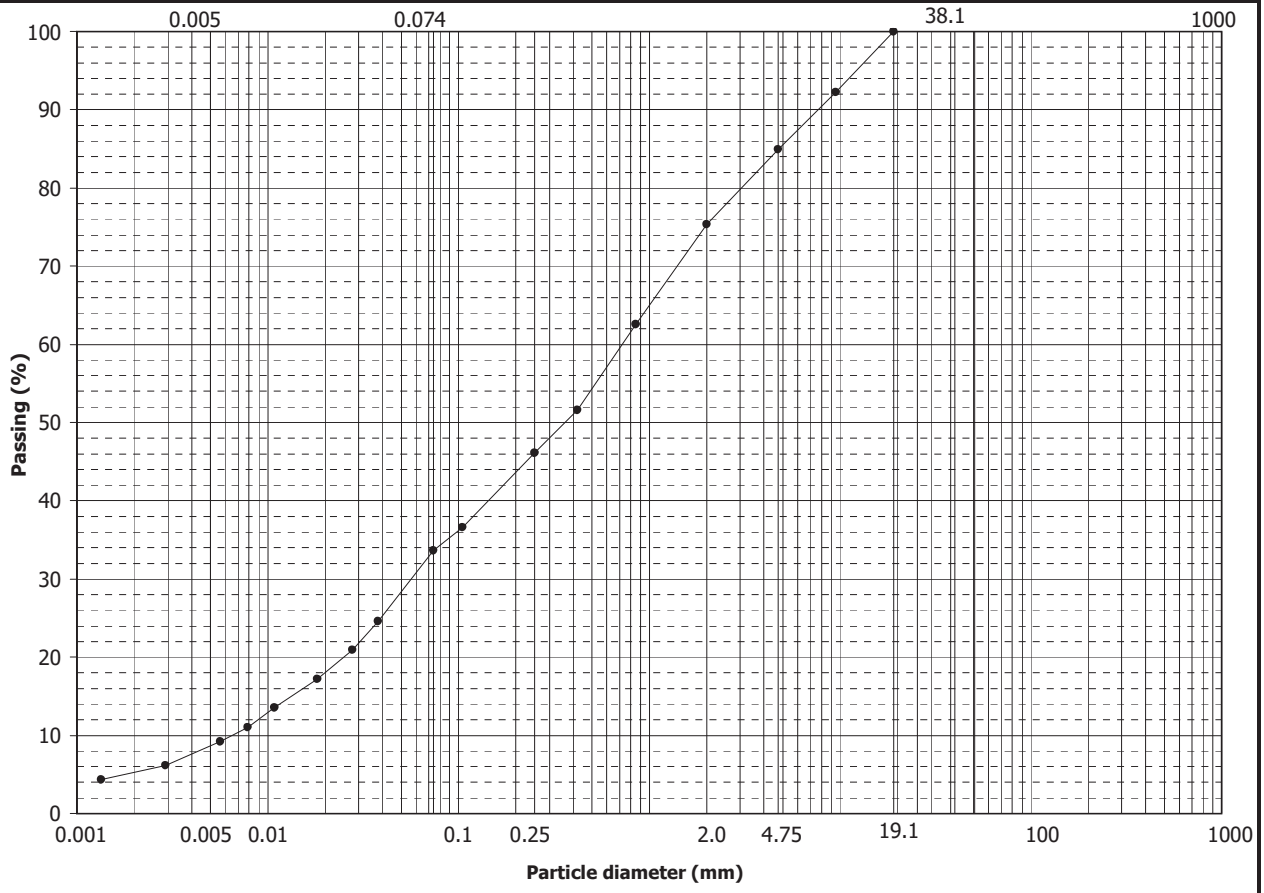
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.703**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
15.05	51.35	24.94	8.66	19.10	8.0721	0.7497	0.3714	0.0596	0.0066	114.03	75.38	51.57	33.60



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 548.3 gr
Wt. container No ..... = 46.63 gr
Wt. Of air dry soil W' = 501.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **501.64** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	68.50	46.63	21.87		4.36	95.64
9.52	109.00		62.37		12.43	87.57
4.75	131.60		84.97		16.94	83.06
2.00	162.10		115.47		23.02	76.98

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 108.43 gr — Specific Gravity : **2.681**

Wt. of container B-12 = 38.30 gr — Plasticity Index : %

Wt. Of air dry soil W' = 70.13 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 76.98 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-12			NO	A-31			NO	A-76		
WW	50.69	DW	49.87	WW	62.82	DW	61.28	WW	59.24	DW	57.61	Mean value	
DW	49.87	TW	38.51	DW	61.28	TW	40.31	DW	57.61	TW	35.16	w	
Ww	0.82	Ws	11.36	Ww	1.54	Ws	20.97	Ww	1.63	Ws	22.45	7.27	%
w	7.22	%		w	7.34	%		w	7.26	%			

$$W = \frac{100 \times W'}{100 + w} : 65.375 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	29	10.549	10.549	3.2480	0.01221	0.0396	17.00	41.47	31.93
2	17.0	18.0	29	11.054	5.527	2.3509	0.01221	0.0287	15.00	36.59	28.17
5	14.0	15.0	29	11.811	2.362	1.5369	0.01221	0.0188	12.00	29.28	22.54
15	11.5	12.5	29	12.442	0.829	0.9107	0.01221	0.0111	9.50	23.18	17.84
30	10.0	11.0	29	12.820	0.427	0.6537	0.01221	0.0080	8.00	19.52	15.02
60	9.0	10.0	29	13.072	0.218	0.4668	0.01221	0.0057	7.00	17.08	13.15
240	7.0	8.0	28	13.577	0.057	0.2378	0.01234	0.0029	5.00	12.20	9.39
1140	6.0	7.0	29	13.829	0.012	0.1101	0.01221	0.0013	4.00	9.76	7.51

P = 100/W = 1.5296

$$Mx = \frac{G_s}{G_s - 1} = 1.5949$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	30.98	22.02	8.960		13.71	86.29	66.43
0.42	37.55		15.530		23.76	76.24	58.69
0.25	43.05		21.030		32.17	67.83	52.22
0.105	49.60		27.580		42.19	57.81	44.50
0.074	52.78		30.760		47.05	52.95	40.76

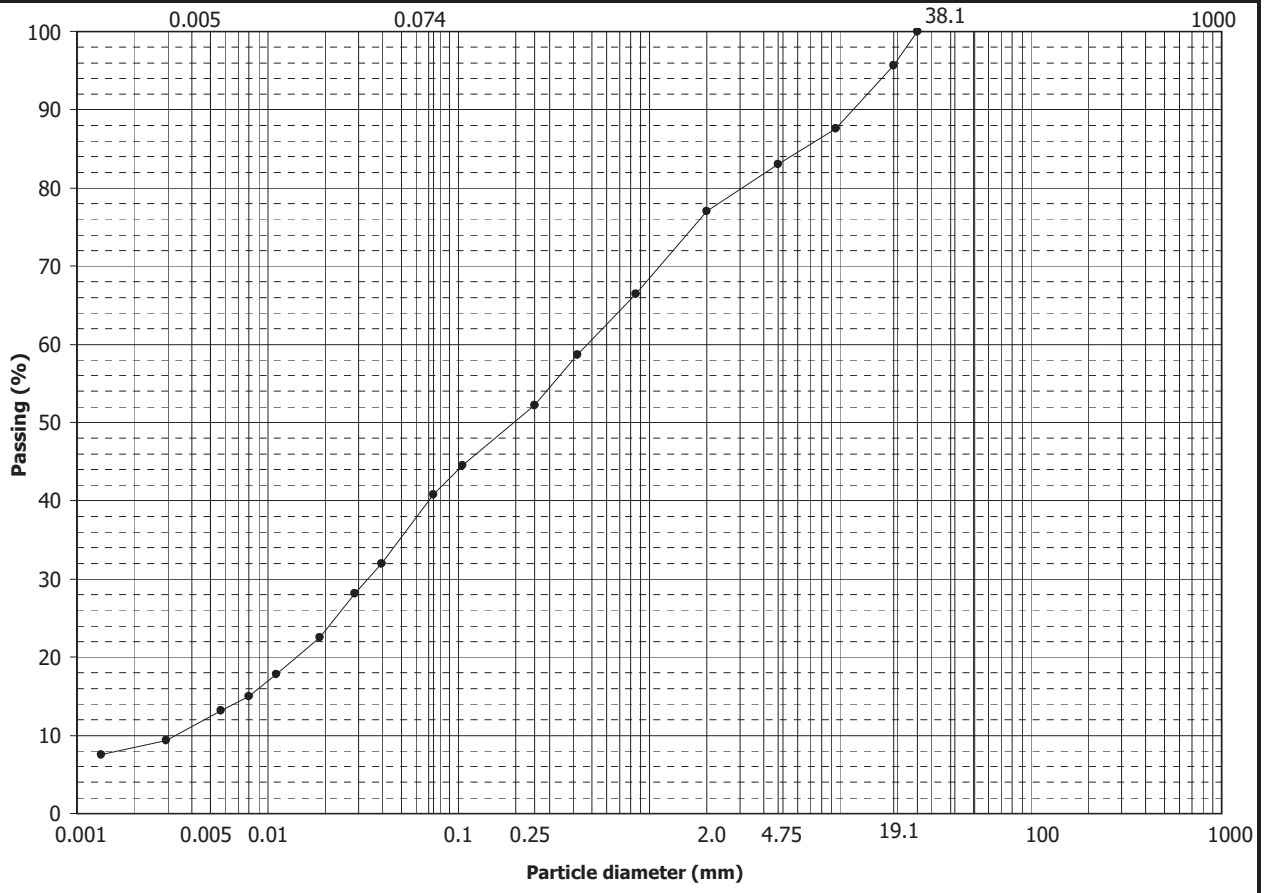
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.681**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
16.94	42.30	28.35	12.41	25.40	12.407	0.4926	0.2083	0.0340	0.0034	145.60	76.98	58.69	40.76



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = 0.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 139.13 gr — Specific Gravity : **2.651**

Wt. of container B-27 = 36.85 gr — Plasticity Index : %

Wt. Of air dry soil W' = 102.28 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-107			NO	A-68			NO	A-79		
WW	58.80	DW	58.12	WW	59.34	DW	58.69	WW	59.86	DW	59.20	Mean value	
DW	58.12	TW	36.07	DW	58.69	TW	37.01	DW	59.20	TW	38.84	w	
Ww	0.68	Ws	22.05	Ww	0.65	Ws	21.68	Ww	0.66	Ws	20.36	3.11	%
w	3.08	%		w	3.00	%		w	3.24	%			

$$W = \frac{100 \times W'}{100 + w} : 99.197 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	29	11.054	11.054	3.3247	0.01232	0.0409	15.00	24.28	24.28
2	15.0	16.0	29	11.558	5.779	2.4040	0.01232	0.0296	13.00	21.04	21.04
5	12.0	13.0	29	12.315	2.463	1.5694	0.01232	0.0193	10.00	16.19	16.19
15	9.0	10.0	29	13.072	0.871	0.9335	0.01232	0.0115	7.00	11.33	11.33
30	7.5	8.5	29	13.451	0.448	0.6696	0.01232	0.0082	5.50	8.90	8.90
60	6.5	7.5	29	13.703	0.228	0.4779	0.01232	0.0059	4.50	7.28	7.28
240	5.0	6.0	28	14.081	0.059	0.2422	0.01245	0.0030	3.00	4.86	4.86
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01232	0.0014	2.00	3.24	3.24

P = 100/W = 1.0081

$$Mx = \frac{G_s}{G_s - 1} = 1.6057$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	24.94	22.02	2.920		2.94	97.06	97.06
0.42	32.60		10.580		10.67	89.33	89.33
0.25	41.64		19.620		19.78	80.22	80.22
0.105	76.76		54.740		55.18	44.82	44.82
0.074	87.96		65.940		66.47	33.53	33.53

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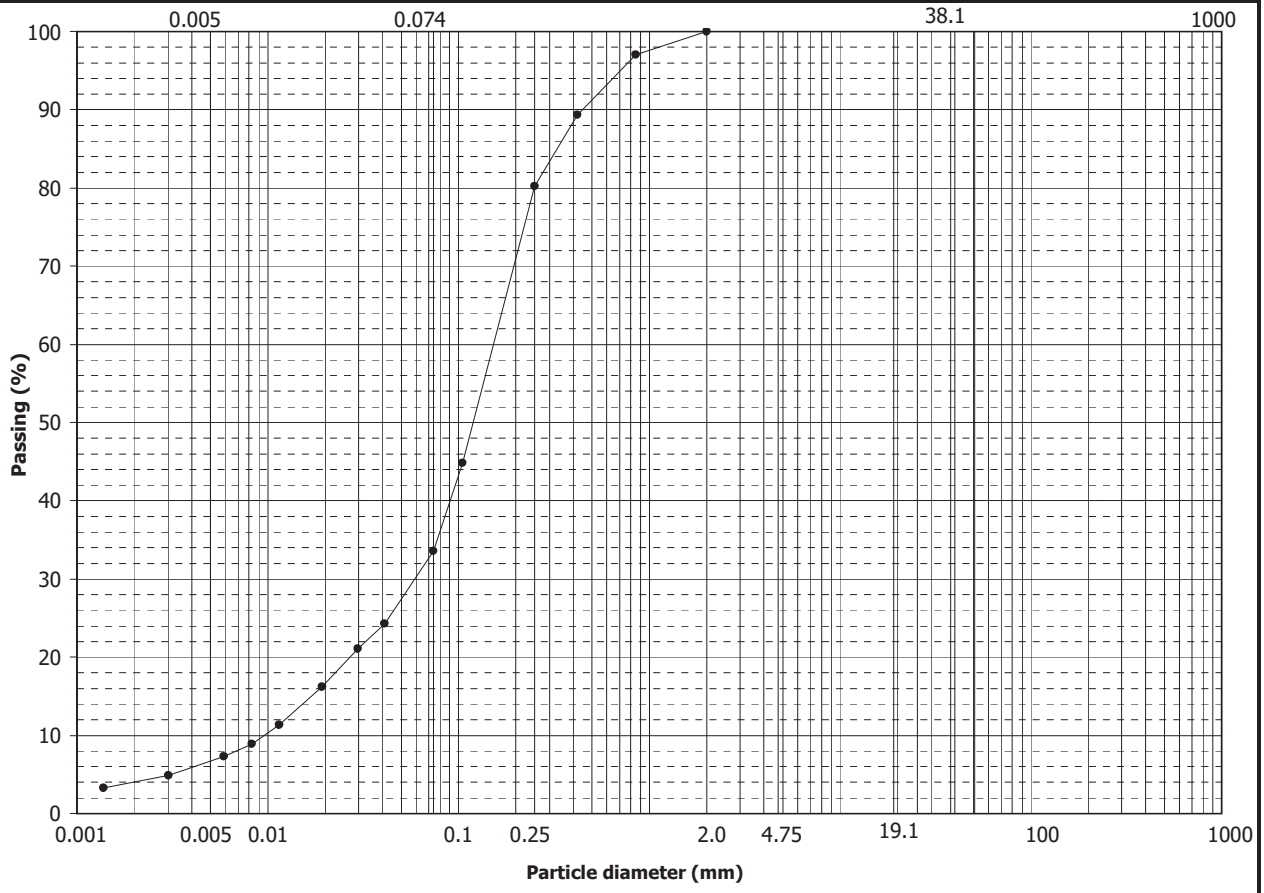
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.651**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	66.47	26.83	6.69	2.00	0.4571	0.1672	0.1262	0.0614	0.0097	17.21	100.00	89.33	33.53



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = 0.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 111.76 gr — Specific Gravity : **2.660**

Wt. of container B-11 = 33.76 gr — Plasticity Index : %

Wt. Of air dry soil W' = 78.00 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-27			NO	A-17			NO	A-77		
WW	62.74	DW	61.53	WW	58.18	DW	57.02	WW	55.48	DW	54.31	Mean value	
DW	61.53	TW	40.40	DW	57.02	TW	36.39	DW	54.31	TW	32.95	w	
Ww	1.21	Ws	21.13	Ww	1.16	Ws	20.63	Ww	1.17	Ws	21.36	5.61	%
w	5.73	%		w	5.62	%		w	5.48	%			

$$W = \frac{100 \times W'}{100 + w} : 73.857 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	22.0	23.0	29	9.792	9.792	3.1293	0.01228	0.0384	20.00	43.39	43.39
2	19.0	20.0	29	10.549	5.275	2.2967	0.01228	0.0282	17.00	36.88	36.88
5	16.0	17.0	29	11.306	2.261	1.5037	0.01228	0.0185	14.00	30.37	30.37
15	12.5	13.5	29	12.189	0.813	0.9015	0.01228	0.0111	10.52	22.82	22.82
30	10.0	11.0	29	12.820	0.427	0.6537	0.01228	0.0080	8.00	17.36	17.36
60	8.5	9.5	29	13.198	0.220	0.4690	0.01228	0.0058	6.50	14.10	14.10
240	6.0	7.0	28	13.829	0.058	0.2400	0.01242	0.0030	4.00	8.68	8.68
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01228	0.0014	2.00	4.34	4.34

P = 100/W = 1.354

$$Mx = \frac{G_s}{G_s - 1} = 1.6024$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	25.12	22.02	3.100		4.20	95.80	95.80
0.42	29.99		7.970		10.79	89.21	89.21
0.25	36.15		14.130		19.13	80.87	80.87
0.105	47.12		25.100		33.98	66.02	66.02
0.074	53.09		31.070		42.07	57.93	57.93

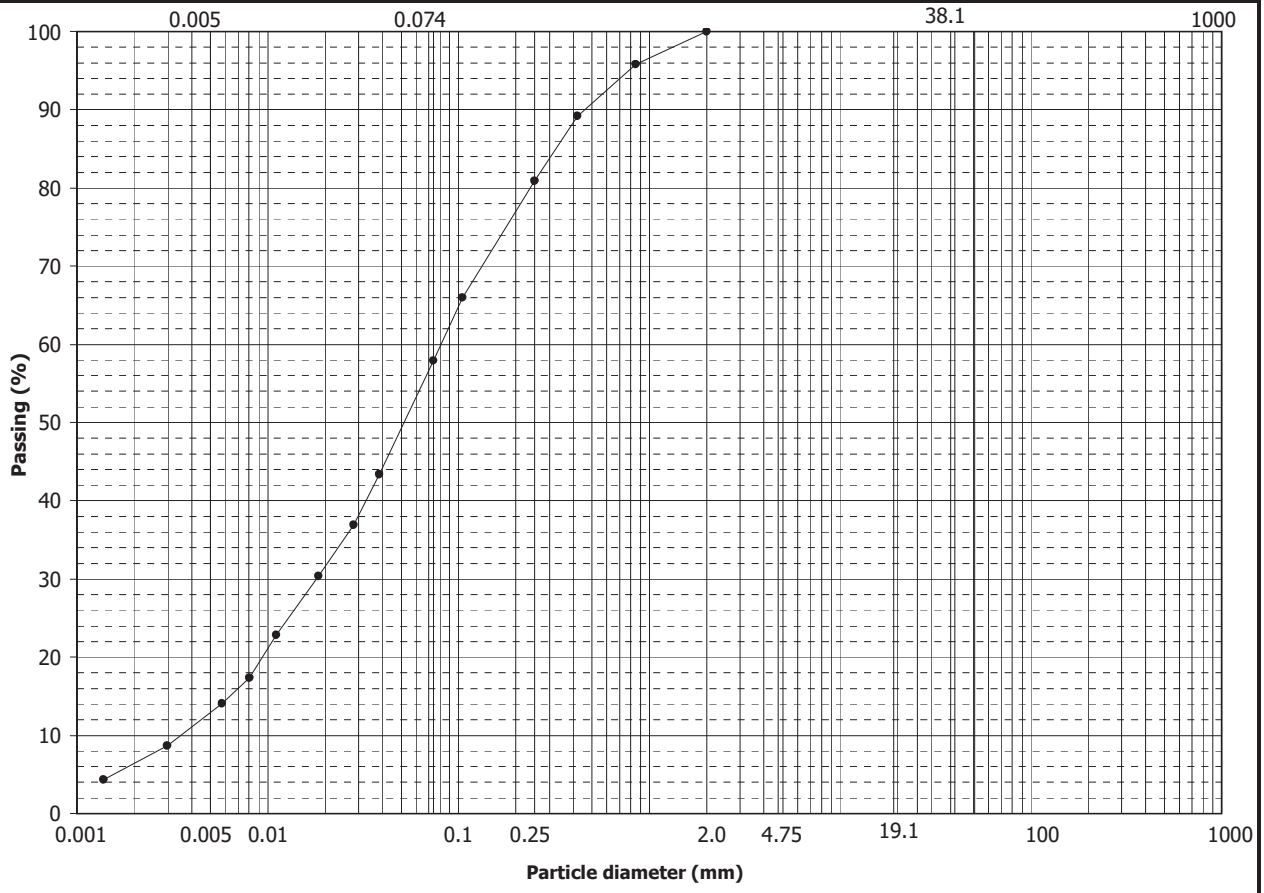
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.660**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	42.07	45.00	12.94	2.00	0.4716	0.0819	0.0546	0.0181	0.0037	22.40	100.00	89.21	57.93



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = 0.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 109.25 gr — Specific Gravity : **2.654**

Wt. of container B-2 = 33.74 gr — Plasticity Index : %

Wt. Of air dry soil W' = 75.51 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-34			NO	A-74			NO	A-64		
WW	58.91	DW	57.61	WW	58.43	DW	57.14	WW	57.49	DW	56.21	Mean value	
DW	57.61	TW	36.54	DW	57.14	TW	36.47	DW	56.21	TW	35.92	w	
Ww	1.30	Ws	21.07	Ww	1.29	Ws	20.67	Ww	1.28	Ws	20.29	6.24	%
w	6.17	%		w	6.24	%		w	6.31	%			

$$W = \frac{100 \times W'}{100 + w} : 71.075 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	29	10.549	10.549	3.2480	0.01230	0.0400	17.00	38.38	38.38
2	17.0	18.0	29	11.054	5.527	2.3509	0.01230	0.0289	15.00	33.86	33.86
5	14.0	15.0	29	11.811	2.362	1.5369	0.01230	0.0189	12.00	27.09	27.09
15	11.5	12.5	29	12.442	0.829	0.9107	0.01230	0.0112	9.50	21.45	21.45
30	10.0	11.0	29	12.820	0.427	0.6537	0.01230	0.0080	8.00	18.06	18.06
60	9.0	10.0	29	13.072	0.218	0.4668	0.01230	0.0057	7.00	15.80	15.80
240	7.0	8.0	28	13.577	0.057	0.2378	0.01244	0.0030	5.00	11.29	11.29
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01230	0.0014	3.50	7.90	7.90

P = 100/W = 1.407

$$Mx = \frac{G_s}{G_s - 1} = 1.6046$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.67	22.02	1.650		2.32	97.68	97.68
0.42	25.86		3.840		5.40	94.60	94.60
0.25	29.85		7.830		11.02	88.98	88.98
0.105	39.44		17.420		24.51	75.49	75.49
0.074	49.21		27.190		38.26	61.74	61.74

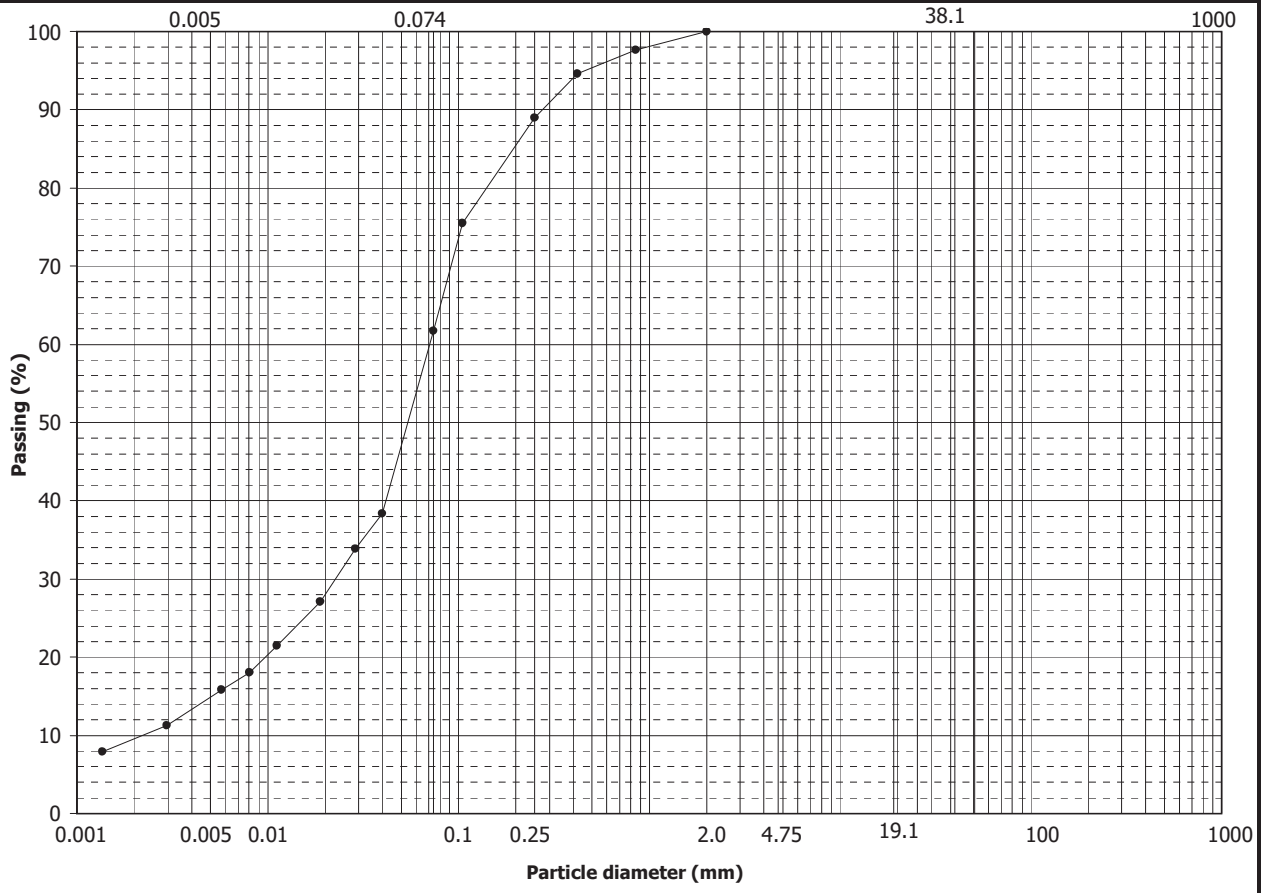
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.654**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	38.26	46.88	14.86	2.00	0.2808	0.0715	0.0569	0.0232	0.0024	30.39	100.00	94.60	61.74



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = 0.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 110.16 gr — Specific Gravity : **2.663**

Wt. of container B-90 = 34.36 gr — Plasticity Index : %

Wt. Of air dry soil W' = 75.80 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-11			NO	A-15			NO	A-33		
WW	62.70	DW	61.35	WW	62.43	DW	61.02	WW	59.85	DW	58.54	Mean value	
DW	61.35	TW	40.14	DW	61.02	TW	39.40	DW	58.54	TW	37.89	w	
Ww	1.35	Ws	21.21	Ww	1.41	Ws	21.62	Ww	1.31	Ws	20.65	6.41	%
w	6.36	%		w	6.52	%		w	6.34	%			

$$W = \frac{100 \times W'}{100 + w} : 71.234 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.0	19.0	29	10.802	10.802	3.2866	0.01227	0.0403	16.00	35.97	35.97
2	15.5	16.5	29	11.432	5.716	2.3909	0.01227	0.0293	13.50	30.35	30.35
5	13.0	14.0	29	12.063	2.413	1.5533	0.01227	0.0191	11.00	24.73	24.73
15	10.5	11.5	29	12.694	0.846	0.9199	0.01227	0.0113	8.50	19.11	19.11
30	9.0	10.0	29	13.072	0.436	0.6601	0.01227	0.0081	7.00	15.74	15.74
60	7.5	8.5	29	13.451	0.224	0.4735	0.01227	0.0058	5.50	12.36	12.36
240	5.5	6.5	28	13.955	0.058	0.2411	0.01241	0.0030	3.50	7.87	7.87
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01227	0.0014	2.00	4.50	4.50

P = 100/W = 1.4038

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6013$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	25.36	22.02	3.340		4.69	95.31	95.31
0.42	29.63		7.610		10.68	89.32	89.32
0.25	33.32		11.300		15.86	84.14	84.14
0.105	45.19		23.170		32.53	67.47	67.47
0.074	55.82		33.800		47.45	52.55	52.55

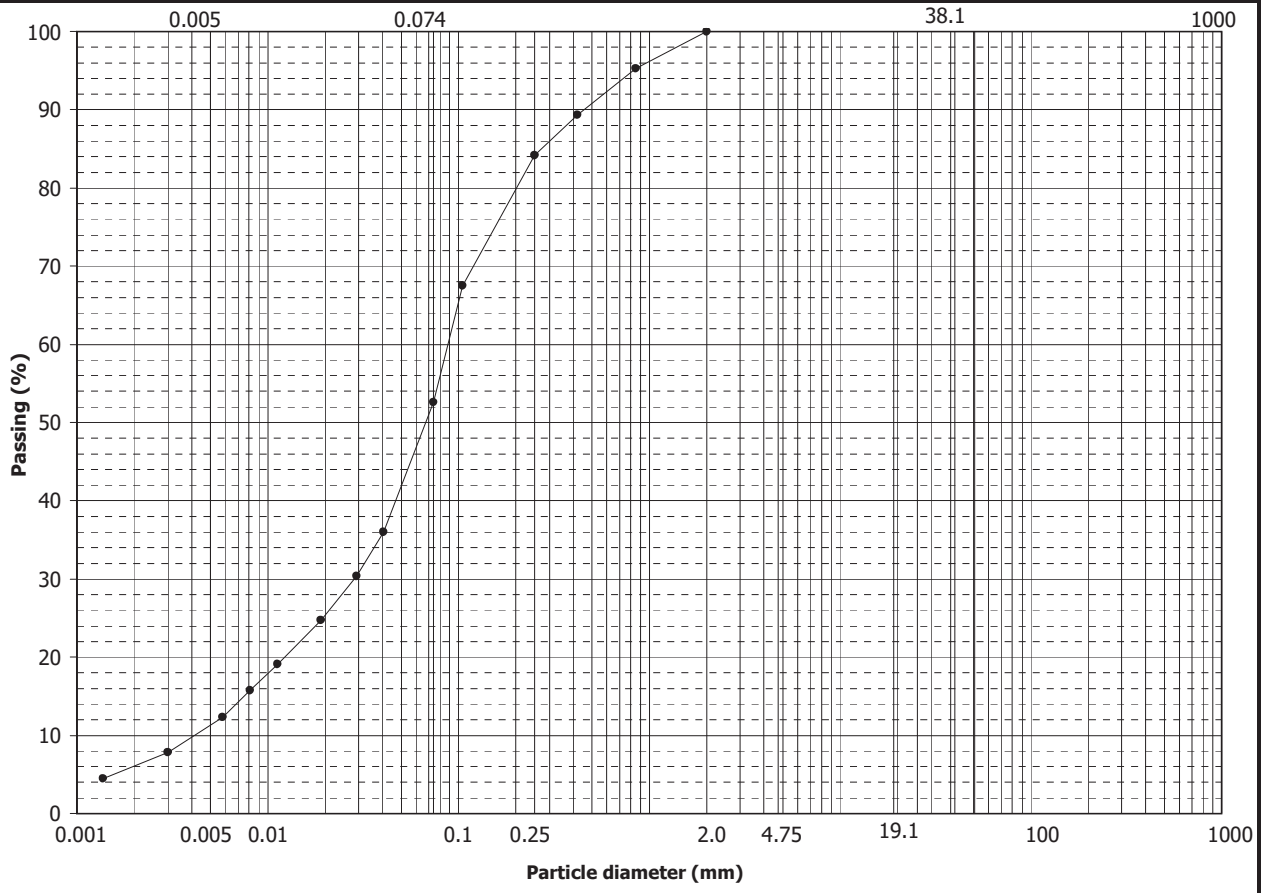
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.663**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	47.45	41.20	11.35	2.00	0.4690	0.0895	0.0688	0.0287	0.0043	20.67	100.00	89.32	52.55



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**12.50 - 13.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = 0.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	BAMBA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 14	DEPTH	12.50 - 13.00

Wt. (Air dry soil + container) = 113.02 gr — Specific Gravity : 2.652
Wt. of container B-96 = 34.87 gr — Plasticity Index : %
Wt. Of air dry soil W' = 78.15 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-108			NO	A-30			NO	A-55		
WW	56.41	DW	55.69	WW	61.01	DW	60.28	WW	63.91	DW	63.14	Mean value	
DW	55.69	TW	34.23	DW	60.28	TW	39.36	DW	63.14	TW	41.93	w	
Ww	0.72	Ws	21.46	Ww	0.73	Ws	20.92	Ww	0.77	Ws	21.21	3.49	%
w	3.36	%		w	3.49	%		w	3.63	%			

$$W = \frac{100 \times W'}{100 + w} : 75.513 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.5	19.5	29	10.675	10.675	3.2673	0.01231	0.0402	16.50	35.08	35.08
2	16.0	17.0	29	11.306	5.653	2.3776	0.01231	0.0293	14.00	29.76	29.76
5	13.0	14.0	29	12.063	2.413	1.5533	0.01231	0.0191	11.00	23.38	23.38
15	10.5	11.5	29	12.694	0.846	0.9199	0.01231	0.0113	8.50	18.07	18.07
30	9.0	10.0	29	13.072	0.436	0.6601	0.01231	0.0081	7.00	14.88	14.88
60	8.0	9.0	29	13.325	0.222	0.4712	0.01231	0.0058	6.00	12.76	12.76
240	6.0	7.0	28	13.829	0.058	0.2400	0.01245	0.0030	4.00	8.50	8.50
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01231	0.0014	2.00	4.25	4.25

P = 100/W = 1.3243

$$Mx = \frac{G_s}{G_s - 1} = 1.6053$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	27.12	22.02	5.100		6.75	93.25	93.25
0.42	32.63		10.610		14.05	85.95	85.95
0.25	37.91		15.890		21.04	78.96	78.96
0.105	48.06		26.040		34.48	65.52	65.52
0.074	56.47		34.450		45.62	54.38	54.38

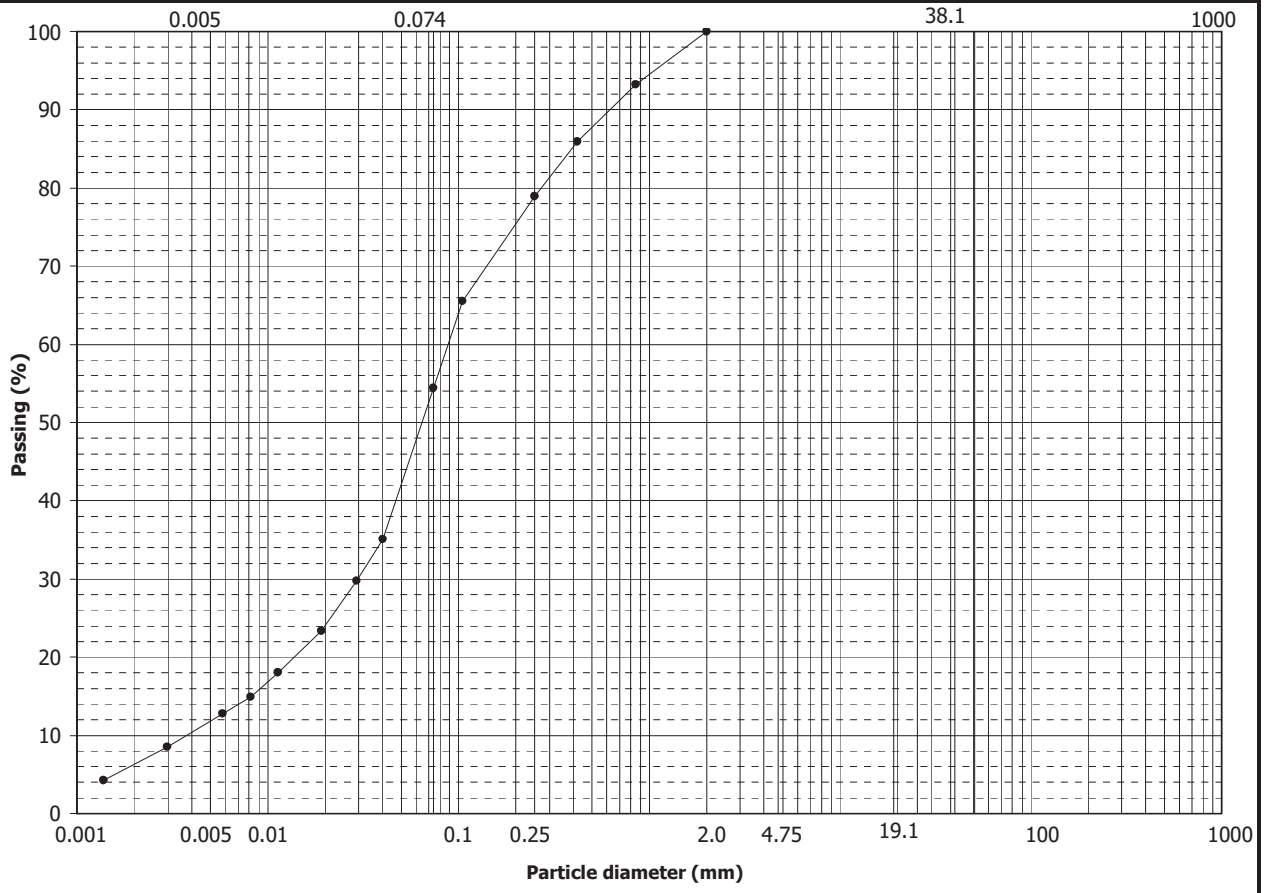
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**12.50 - 13.00**

SPECIFIC GRAVITY : **2.652**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	45.62	42.58	11.80	2.00	0.6587	0.0896	0.0663	0.0298	0.0040	22.53	100.00	85.95	54.38



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 266.6 gr
Wt. container No ..... = 35.71 gr
Wt. Of air dry soil W' = 230.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **230.90** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	45.40	35.71	9.69		4.20	95.80
4.75	57.54		21.83		9.45	90.55
2.00	74.30		38.59		16.71	83.29

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 153.44 gr — Specific Gravity : **2.686**

Wt. of container B-40 = 32.77 gr — Plasticity Index : %

Wt. Of air dry soil W' = 120.67 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 83.29 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-45			NO	A-10			NO	A-50		
WW	59.84	DW	59.18	WW	56.18	DW	55.50	WW	59.01	DW	58.36	Mean value	
DW	59.18	TW	38.37	DW	55.50	TW	33.38	DW	58.36	TW	37.43	w	
Ww	0.66	Ws	20.81	Ww	0.68	Ws	22.12	Ww	0.65	Ws	20.93	3.12	%
w	3.17	%		w	3.07	%		w	3.11	%			

$$W = \frac{100 \times W'}{100 + w} : 117.022 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	29	11.306	11.306	3.3625	0.01219	0.0410	14.00	19.06	15.87
2	14.0	15.0	29	11.811	5.905	2.4301	0.01219	0.0296	12.00	16.34	13.61
5	12.0	13.0	29	12.315	2.463	1.5694	0.01219	0.0191	10.00	13.61	11.34
15	10.0	11.0	29	12.820	0.855	0.9245	0.01219	0.0113	8.00	10.89	9.07
30	9.0	10.0	29	13.072	0.436	0.6601	0.01219	0.0080	7.00	9.53	7.94
60	8.0	9.0	29	13.325	0.222	0.4712	0.01219	0.0057	6.00	8.17	6.80
240	6.0	7.0	28	13.829	0.058	0.2400	0.01232	0.0030	4.00	5.45	4.54
1140	5.0	6.0	29	14.081	0.012	0.1111	0.01219	0.0014	3.00	4.08	3.40

P = 100/W = 0.8545

$$Mx = \frac{Gs}{Gs - 1} = 1.5931$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	36.51	22.02	14.490		12.38	87.62	72.97
0.42	50.38		28.360		24.23	75.77	63.10
0.25	68.11		46.090		39.39	60.61	50.48
0.105	96.39		74.370		63.55	36.45	30.36
0.074	105.10		83.080		71.00	29.00	24.16

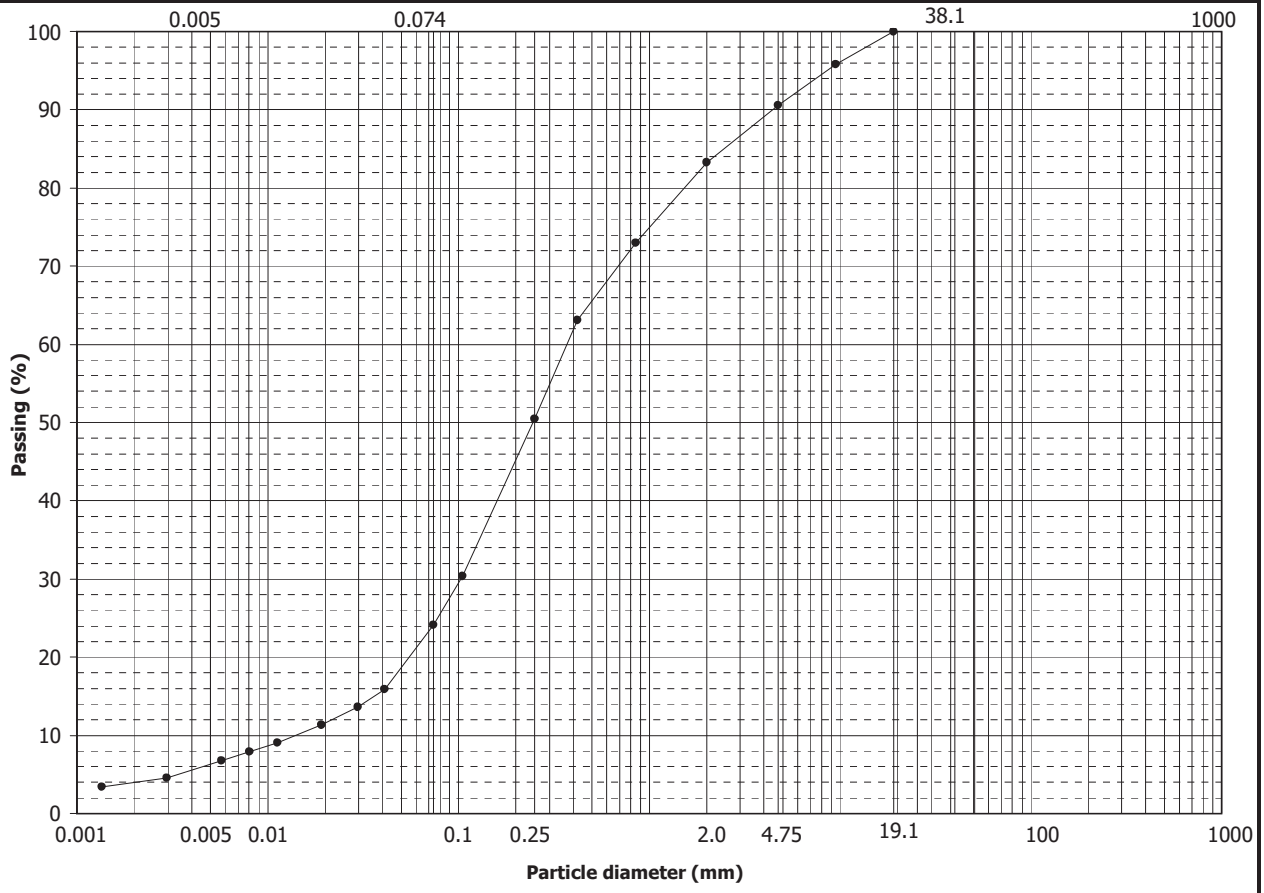
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**15.50 - 16.00**

SPECIFIC GRAVITY : **2.686**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
9.45	66.39	17.83	6.33	19.10	4.5433	0.3782	0.2465	0.1032	0.0145	26.11	83.29	63.10	24.16



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**18.50 - 19.00**

Wt. (Air dry soil + container) = 210.1 gr
Wt. container No ..... = 35.70 gr
Wt. Of air dry soil W' = 174.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **174.40** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	47.00	35.70	11.30		6.48	93.52
4.75	61.00		25.30		14.51	85.49
2.00	81.00		45.30		25.97	74.03
	.					

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**18.50 - 19.00**

Wt. (Air dry soil + container) = 142.57 gr — Specific Gravity : **2.657**

Wt. of container B-21 = 35.97 gr — Plasticity Index : %

Wt. Of air dry soil W' = 106.60 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 74.03 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-61			NO	A-37			NO	A-47		
WW	59.67	DW	58.69	WW	51.05	DW	50.11	WW	58.11	DW	57.18	Mean value	
DW	58.69	TW	37.03	DW	50.11	TW	30.17	DW	57.18	TW	36.86	w	
Ww	0.98	Ws	21.66	Ww	0.94	Ws	19.94	Ww	0.93	Ws	20.32	4.61	%
w	4.52	%		w	4.71	%		w	4.58	%			

$$W = \frac{100 \times W'}{100 + w} : 101.907 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	22.0	23.0	29	9.792	9.792	3.1293	0.01229	0.0385	20.00	31.47	23.30
2	20.0	21.0	29	10.297	5.148	2.2690	0.01229	0.0279	18.00	28.32	20.97
5	17.0	18.0	29	11.054	2.211	1.4869	0.01229	0.0183	15.00	23.60	17.47
15	14.5	15.5	29	11.685	0.779	0.8826	0.01229	0.0108	12.50	19.67	14.56
30	13.0	14.0	29	12.063	0.402	0.6341	0.01229	0.0078	11.00	17.31	12.81
60	11.0	12.0	29	12.568	0.209	0.4577	0.01229	0.0056	9.00	14.16	10.48
240	8.0	9.0	28	13.325	0.056	0.2356	0.01243	0.0029	6.00	9.44	6.99
1140	5.0	6.0	29	14.081	0.012	0.1111	0.01229	0.0014	3.00	4.72	3.49

P = 100/W = 0.9813

$$Mx = \frac{G_s}{G_s - 1} = 1.6035$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	36.00	22.02	13.980		13.72	86.28	63.87
0.42	48.00		25.980		25.49	74.51	55.15
0.25	58.00		35.980		35.31	64.69	47.89
0.105	75.00		52.980		51.99	48.01	35.54
0.074	82.00		59.980		58.86	41.14	30.46

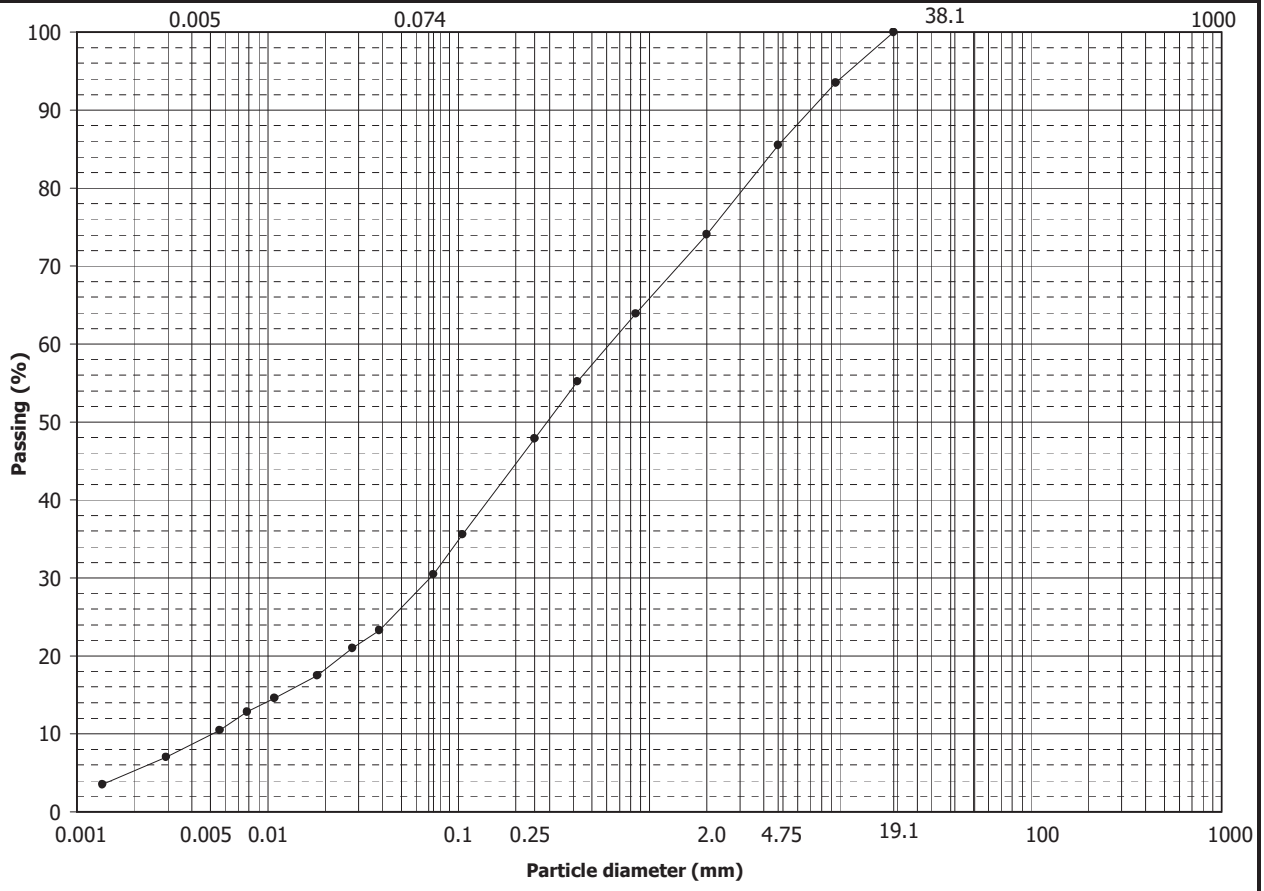
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 13, 2019
LOCATION	**BAMBA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 14**	DEPTH	**18.50 - 19.00**

SPECIFIC GRAVITY : **2.657**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
14.51	55.04	20.60	9.85	19.10	7.4280	0.6591	0.2994	0.0717	0.0053	125.46	74.03	55.15	30.46



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		0.50 - 1.00

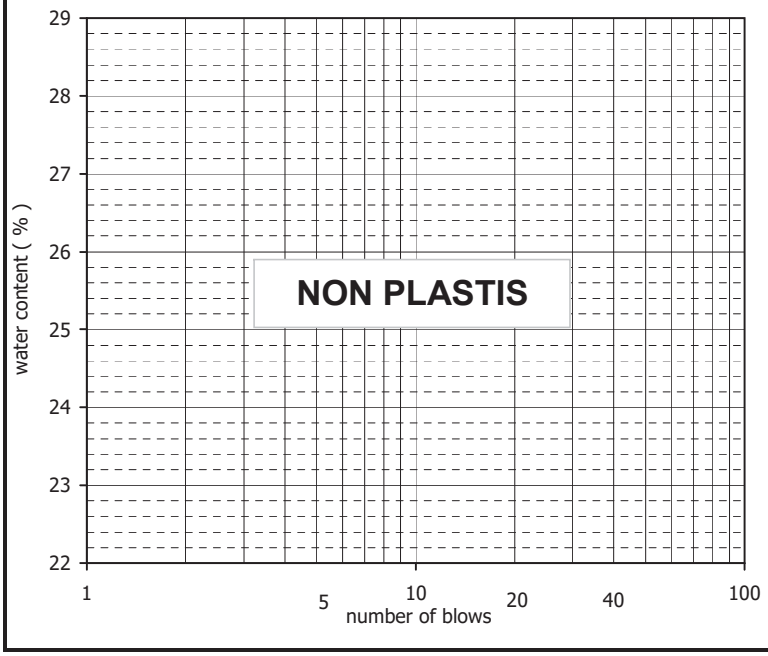
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		1.50 - 2.00

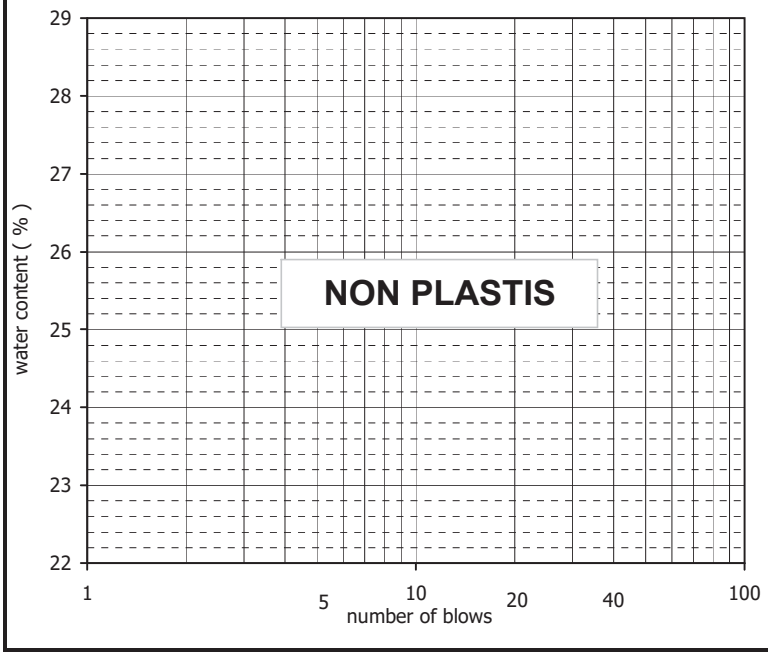
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		2.50 - 3.00

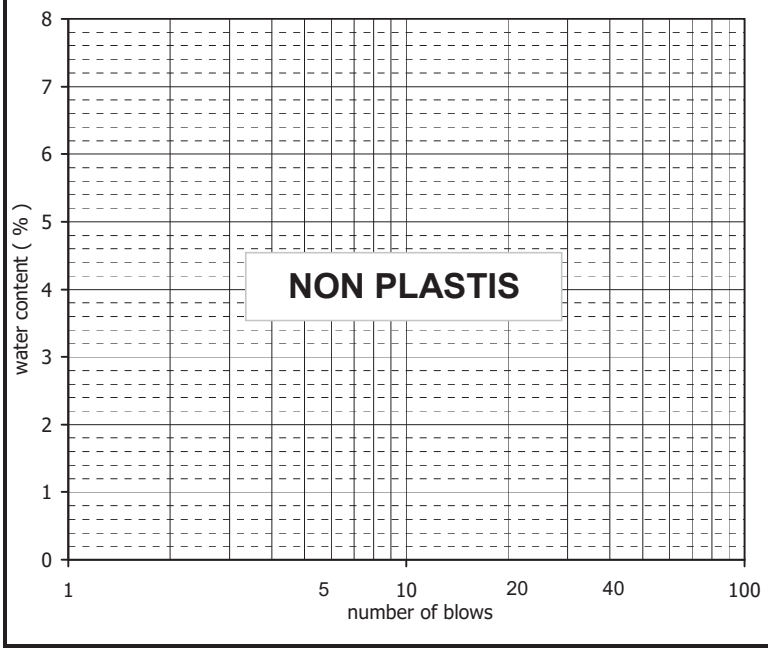
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		3.50 - 4.00

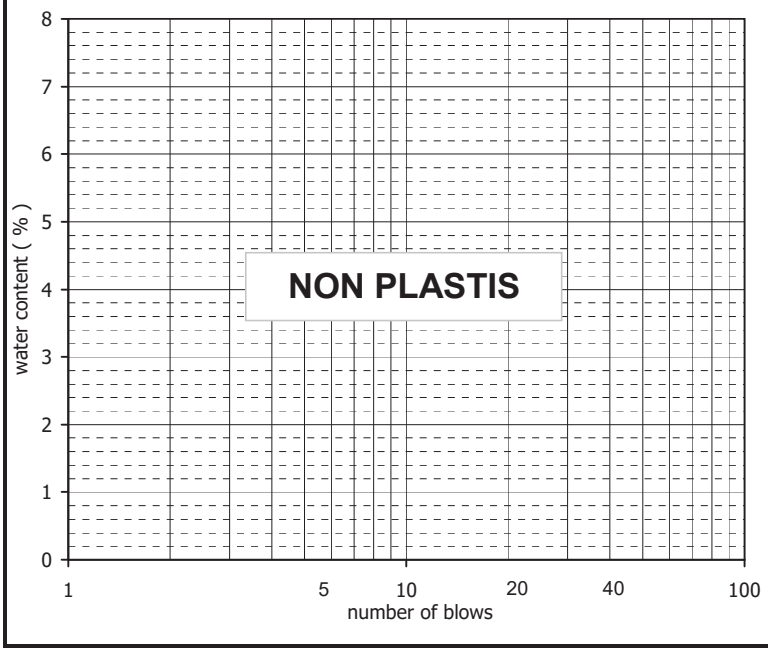
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		4.50 - 5.00

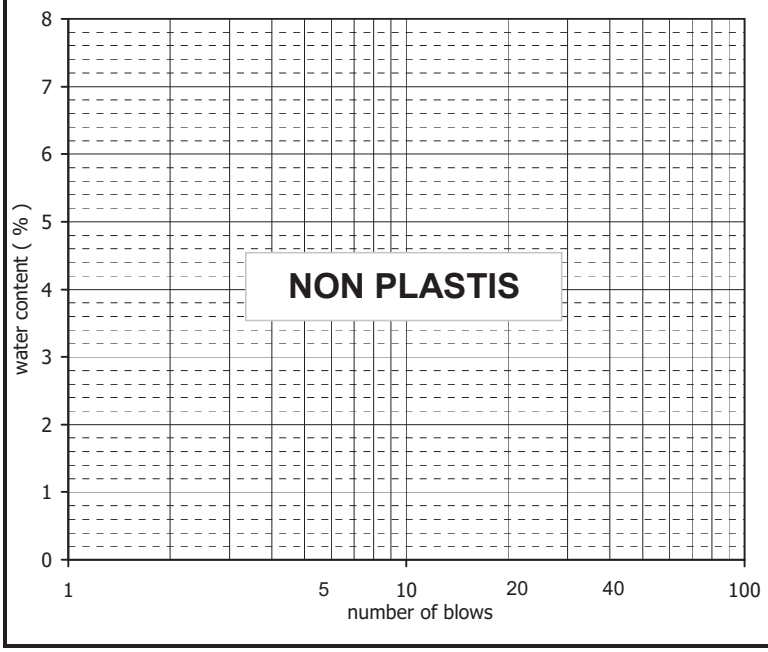
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		5.50 - 6.00

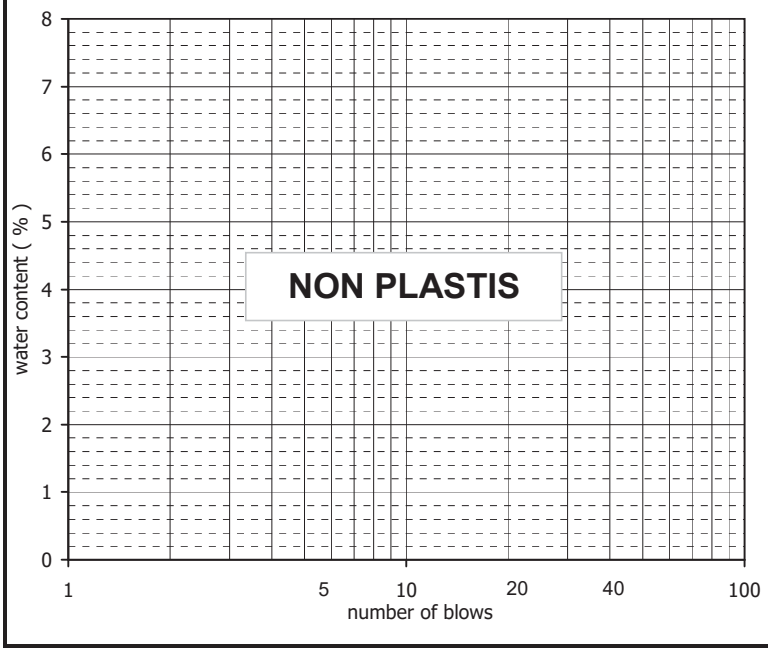
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		6.50 - 7.00

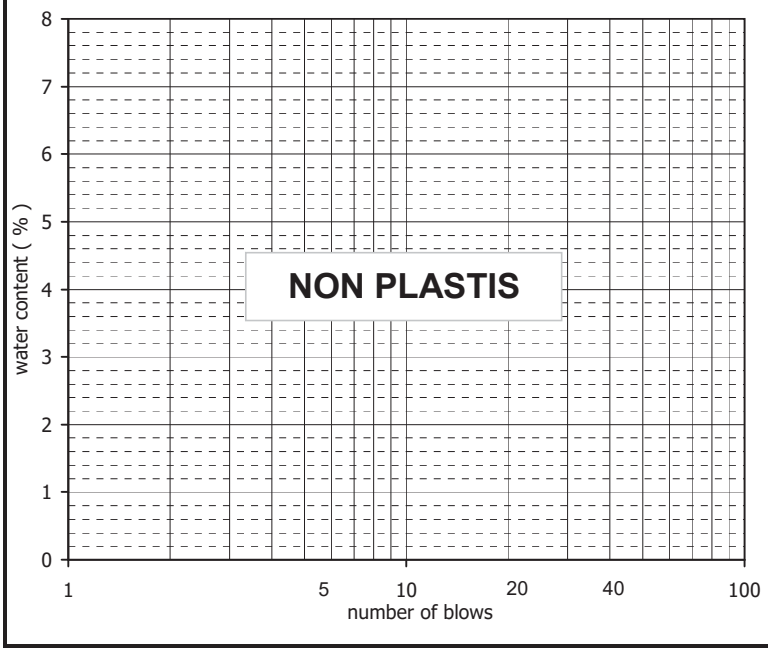
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		7.50 - 8.00

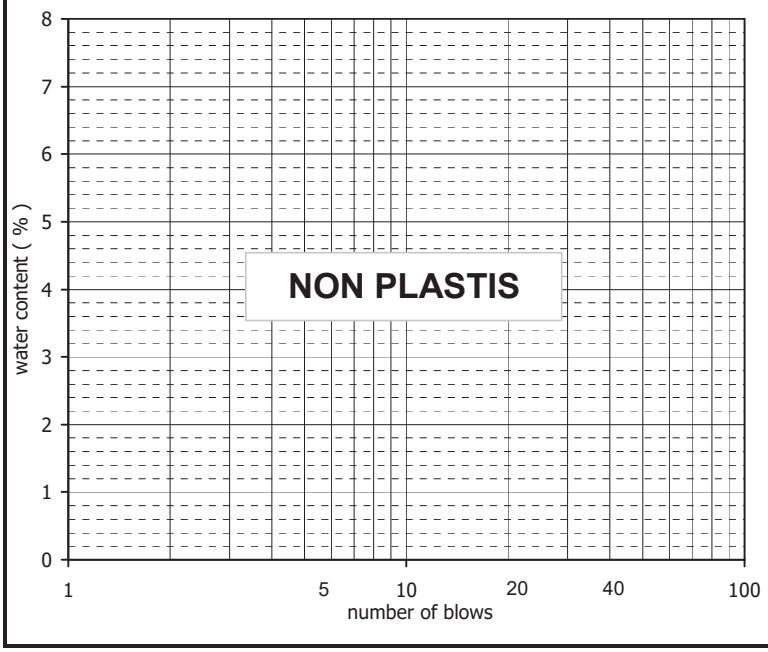
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 8, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		8.50 - 9.00

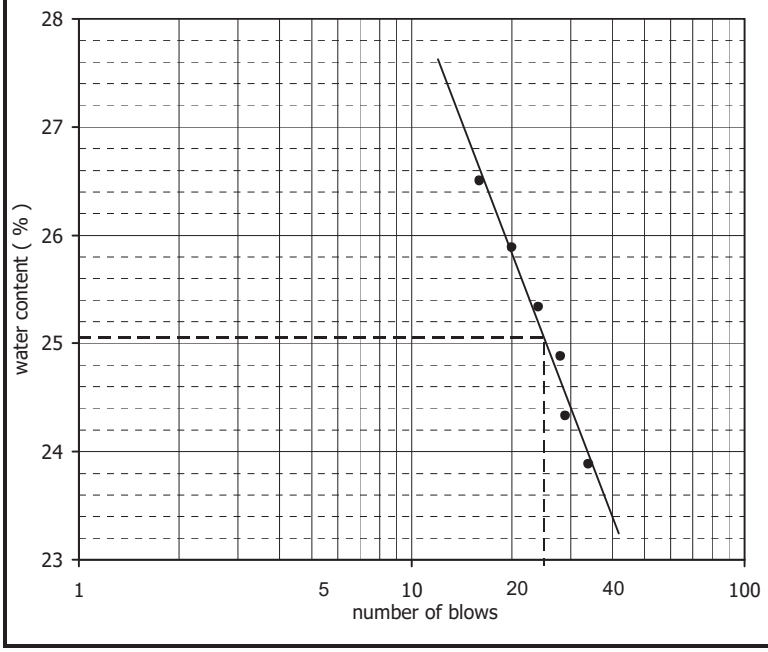
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			29 x	NO. OF BLOWS			28 x
		No.	A-09			No.	A-11			No.	T-22
WW	55.490	DW	52.590	WW	55.470	DW	52.470	WW	46.020	DW	44.430
DW	52.590	TW	40.450	DW	52.470	TW	40.140	DW	44.430	TW	38.040
Ww	2.900	Ws	12.140	Ww	3.000	Ws	12.330	Ww	1.590	Ws	6.390
	W =		23.89 %		W =		24.33 %		W =		24.88 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	J-65			No.	T-79			No.	A-05
WW	50.130	DW	46.920	WW	51.950	DW	48.880	WW	48.120	DW	46.140
DW	46.920	TW	34.250	DW	48.880	TW	37.020	DW	46.140	TW	38.670
Ww	3.210	Ws	12.670	Ww	3.070	Ws	11.860	Ww	1.980	Ws	7.470
	W =		25.34 %		W =		25.89 %		W =		26.51 %

PLASTIC LIMIT

1				2				3			
		No.	J-86			No.	A-75			No.	A-102
WW	52.230	DW	49.640	WW	56.280	DW	53.410	WW	55.620	DW	52.620
DW	49.640	TW	37.190	DW	53.410	TW	39.140	DW	52.620	TW	38.010
Ww	2.590	Ws	12.450	Ww	2.870	Ws	14.270	Ww	3.000	Ws	14.610
	W =		20.80 %		W =		20.11 %		W =		20.53 %



LIQUID LIMIT	=	25.06	%
PLASTIC LIMIT	=	20.48	%
PLASTICITY INDEX	=	4.57	%
FLOW INDEX	=	8.06	

REMARKS :

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		9.50 - 10.00

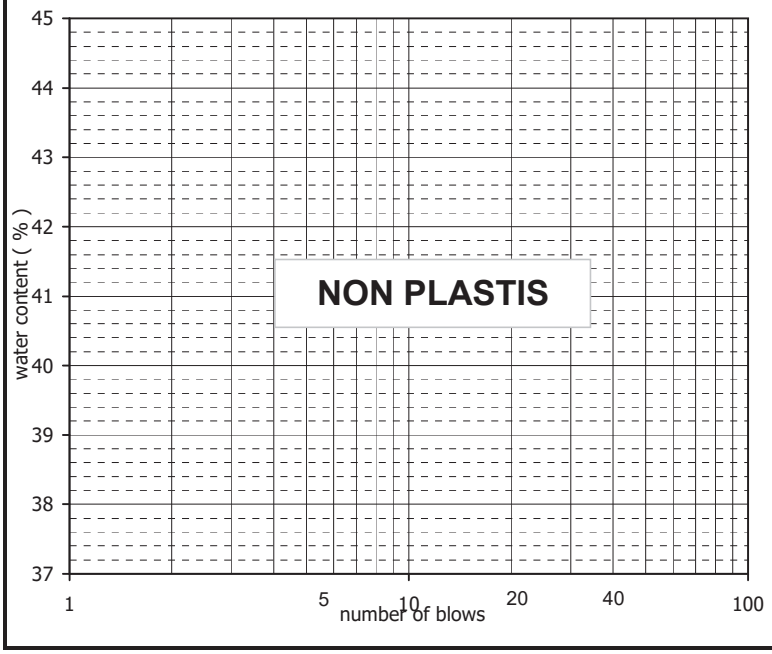
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		12.50 - 13.00

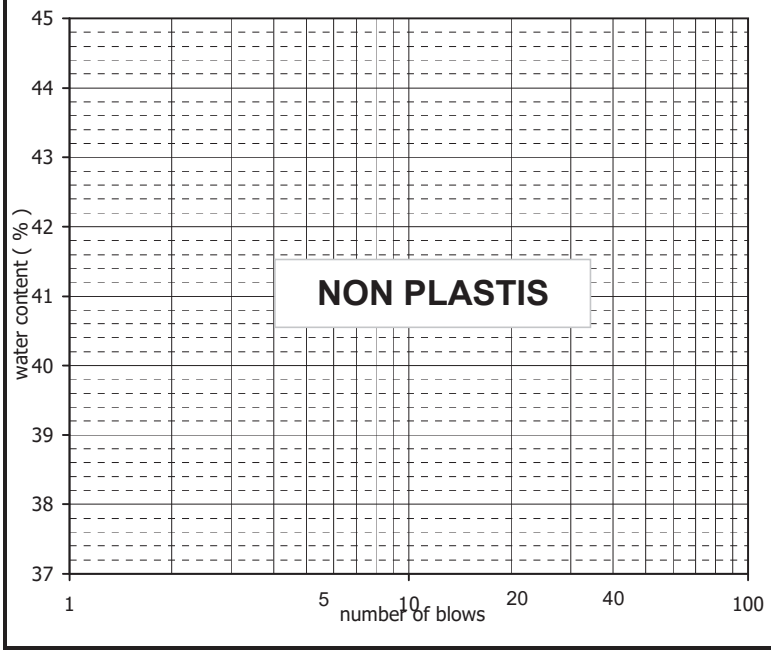
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

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TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		14.50 - 16.00

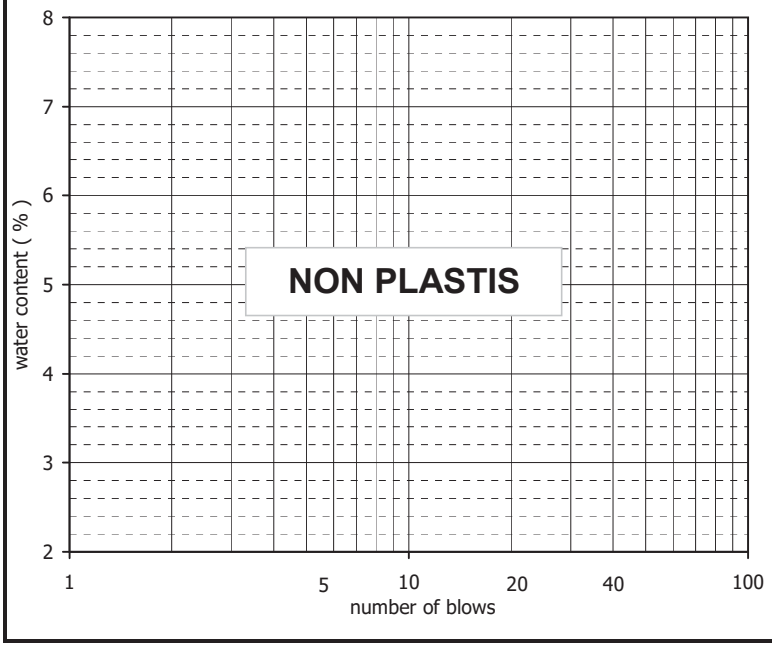
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 6, 2019
LOCATION	:	BAMBA PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 14	DEPTH (m)		18.50 - 19.00

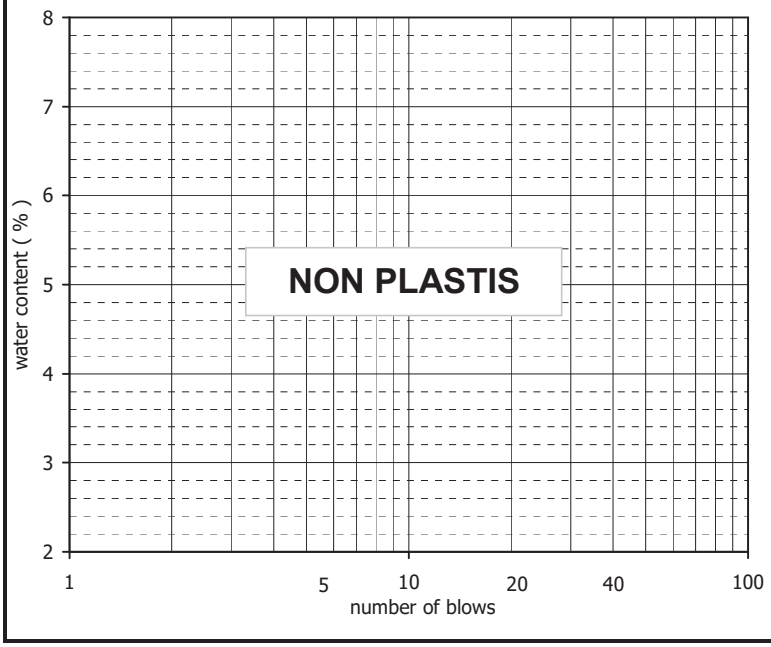
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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SUMMARY OF SOIL TEST

PROJECT			**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**								
LOCATION			**LERE INDUK - DONGGALA**								
SAMPLE No			BAY - 15	BAY - 15	BAY - 15	BAY - 15	BAY - 15	BAY - 15	BAY - 15	BAY - 15	BAY - 15
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	28.98	15.50	11.96	16.46	18.94	31.18	9.45	8.14	8.30
	Specific gravity of soil	*Gs*	2.602	2.636	2.625	2.636	2.628	2.653	2.664	2.663	2.668
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	0.00	12.48	12.32	8.42	1.50	0.00	40.90	45.75	42.23
	Proportion – Sand part	(%)	41.17	81.26	74.55	82.39	78.62	20.43	46.55	41.09	45.74
	Proportion – Silt part	(%)	39.63	4.62	10.28	7.26	16.36	66.41	8.66	7.59	8.22
	Proportion – Clay part	(%)	19.20	1.63	2.84	1.93	3.52	13.17	3.89	5.57	3.82
	Max. diameter	(mm)	4.75	25.40	19.10	25.40	19.10	4.75	25.40	25.40	25.40
	90 % diameter	(mm)	0.3374	9.4252	6.8585	4.0457	1.4219	0.1709	17.9925	17.5651	18.0802
	60 % diameter	(mm)	0.0783	1.0442	0.6544	0.6840	0.3960	0.0513	4.9854	6.3007	5.4051
	50 % diameter	(mm)	0.0478	0.7558	0.4173	0.5462	0.3090	0.0396	3.2736	3.9892	3.3434
	30 % diameter	(mm)	0.0134	0.4529	0.2236	0.3153	0.1332	0.0177	0.8198	1.0241	1.0892
	10 % diameter	(mm)	-	0.1514	0.0572	0.0831	0.0400	0.0034	0.0465	0.0346	0.0503
	Uniformity Coefficient		-	6.90	11.44	8.23	9.90	14.96	107.11	182.09	107.36
	Passing # 200		58.83	6.26	13.13	9.19	19.88	79.57	12.55	13.17	12.03
CONSISTENCY	Liquid limit	*LL* (%)	37.20	NON PLASTIK	NON PLASTIK	NON PLASTIK	NON PLASTIK	34.18	NON PLASTIK	NON PLASTIK	NON PLASTIK
	Plastic limit	*PL* (%)	24.66					23.94			
	Plasticity index	*PI* (%)	12.54					10.24			
	Flow index		10.18					10.23			
	Unified Classification		ML					ML			

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**LERE INDUK - DONGGALA**									
SAMPLE No			BAY - 15	BAY - 15	BAY - 15	BAY - 15	BAY - 15	BAY - 15			
DEPTH (m)			9.50 - 10.00	11.50 - 12.00	13.50 - 14.00	15.50 - 16.00	17.50 - 18.00	19.50 - 20.00			
PROPERTIES	Natural Water Content	(%)	11.57	12.25	11.50	14.81	7.10	6.40			
	Specific gravity of soil	*Gs*	2.628	2.632	2.641	2.643	2.661	2.654			
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	0.00	0.00	0.00	0.00	19.53	7.66			
	Proportion – Sand part	(%)	72.98	76.07	76.41	75.36	61.79	70.56			
	Proportion – Silt part	(%)	17.97	19.69	16.46	18.79	15.57	17.88			
	Proportion – Clay part	(%)	9.05	4.25	7.13	5.86	3.11	3.90			
	Max. diameter	(mm)	2.00	4.75	4.75	4.75	19.10	19.10			
	90 % diameter	(mm)	0.6406	1.4358	1.2044	0.8055	10.5697	3.9490			
	60 % diameter	(mm)	0.2014	0.4255	0.3496	0.3305	1.3427	0.6807			
	50 % diameter	(mm)	0.1636	0.3271	0.2617	0.2558	0.7642	0.4440			
	30 % diameter	(mm)	0.0864	0.1247	0.1189	0.1045	0.2708	0.1490			
	10 % diameter	(mm)	0.0064	0.0164	0.0099	0.0124	0.0276	0.0201			
	Uniformity Coefficient		31.23	25.94	35.17	26.64	48.58	33.80			
	Passing # 200		27.02	23.93	23.59	24.64	18.68	21.78			
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIK	NON PLASTIK	NON PLASTIK	NON PLASTIK	NON PLASTIK	NON PLASTIK			
	Plastic limit	*PL* (%)									
	Plasticity index	*PI* (%)									
	Flow index										
	Unified Classification										

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ISO 9001 CCBS-3117003
ISO 14001 CCBS-3118004
OHSAS 18001 CCBS-3118007

NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**
LOCATION	**LERE INDUK - DONGGALA**

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	J-46								No	L-14	
11/02	BAY - 15		WW	131.63	DW	110.35			11/02	BAY - 15		WW	126.12	DW	119.50		
2019	0.50 - 1.00	28.98	DW	110.35	TW	36.92			2019	8.50 - 9.00	8.30	DW	119.50	TW	39.74		
			Ww	21.28	Ws	73.43						Ww	6.62	Ws	79.76		
				WC	(%)	28.98							WC	(%)	8.30		
					No	A-72								No	L-17		
11/02	BAY - 15		WW	117.36	DW	106.52			11/02	BAY - 15		WW	122.52	DW	114.03		
2019	1.50 - 2.00	15.50	DW	106.52	TW	36.57			2019	9.50 - 10.00	11.57	DW	114.03	TW	40.64		
			Ww	10.84	Ws	69.95						Ww	8.49	Ws	73.39		
				WC	(%)	15.50							WC	(%)	11.57		
					No	J-35								No	T-16		
11/02	BAY - 15		WW	85.41	DW	79.96			11/02	BAY - 15		WW	123.93	DW	114.77		
2019	2.50 - 3.00	11.96	DW	79.96	TW	34.38			2019	11.50 - 12.00	12.25	DW	114.77	TW	40.00		
			Ww	5.45	Ws	45.58						Ww	9.16	Ws	74.77		
				WC	(%)	11.96							WC	(%)	12.25		
					No	L-11								No	J-89		
11/02	BAY - 15		WW	115.29	DW	104.88			11/02	BAY - 15		WW	121.24	DW	112.58		
2019	3.50 - 4.00	16.46	DW	104.88	TW	41.64			2019	13.50 - 14.00	11.50	DW	112.58	TW	37.25		
			Ww	10.41	Ws	63.24						Ww	8.66	Ws	75.33		
				WC	(%)	16.46							WC	(%)	11.50		
					No	J-83								No	T-83		
11/02	BAY - 15		WW	127.57	DW	113.33			11/02	BAY - 15		WW	77.69	DW	72.20		
2019	4.50 - 5.00	18.94	DW	113.33	TW	38.13			2019	15.50 - 16.00	14.81	DW	72.20	TW	35.14		
			Ww	14.24	Ws	75.20						Ww	5.49	Ws	37.06		
				WC	(%)	18.94							WC	(%)	14.81		
					No	J-09								No	M-96		
11/02	BAY - 15		WW	116.70	DW	98.50			11/02	BAY - 15		WW	216.70	DW	205.30		
2019	5.50 - 6.00	31.18	DW	98.50	TW	40.12			2019	17.50 - 18.00	7.10	DW	205.30	TW	44.69		
			Ww	18.20	Ws	58.38						Ww	11.40	Ws	160.61		
				WC	(%)	31.18							WC	(%)	7.10		
					No	M-48								No	M-08		
11/02	BAY - 15		WW	489.70	DW	451.40			11/02	BAY - 15		WW	199.80	DW	190.40		
2019	6.50 - 7.00	9.45	DW	451.40	TW	46.20			2019	19.50 - 20.00	6.40	DW	190.40	TW	43.53		
			Ww	38.30	Ws	405.20						Ww	9.40	Ws	146.87		
				WC	(%)	9.45							WC	(%)	6.40		
					No	M-82								No			
11/02	BAY - 15		WW	465.50	DW	433.90						WW		DW			
2019	7.50 - 8.00	8.14	DW	433.90	TW	45.64						DW		TW			
			Ww	31.60	Ws	388.26						Ww		Ws			
				WC	(%)	8.14							WC	(%)			

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				23	37	6	
Weight of Pycnometer		Wf	(gr)	43.180	50.940	65.150	
Weight of (Pycnometer + Water)		Wa	(gr)	146.380	151.200	167.850	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.210	163.670	180.350	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.580	37.940	38.020	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.800	20.160	20.240	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.3800	151.2000	167.8500	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.970	7.690	7.740	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.610	2.622	2.615	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.596	2.608	2.602	
Average Specific Gravity at 20° C							**2.602**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				72	56	54	
Weight of Pycnometer		Wf	(gr)	33.250	52.690	51.250	
Weight of (Pycnometer + Water)		Wa	(gr)	133.800	152.160	151.310	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	146.410	164.860	163.870	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.060	38.150	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.280	20.370	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	133.8000	152.1600	151.3100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.670	7.670	7.620	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.644	2.656	2.648	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.630	2.642	2.635	
Average Specific Gravity at 20° C							**2.636**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				29	70	57	
Weight of Pycnometer		Wf	(gr)	36.900	37.010	50.930	
Weight of (Pycnometer + Water)		Wa	(gr)	135.800	136.860	151.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.400	149.400	163.800	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.090	37.960	38.110	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.310	20.180	20.330	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8000	136.8600	151.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.710	7.640	7.700	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.634	2.641	2.640	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.621	2.628	2.627	
Average Specific Gravity at 20° C							**2.625**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				2	27	17	
Weight of Pycnometer		Wf	(gr)	66.900	39.750	64.940	
Weight of (Pycnometer + Water)		Wa	(gr)	168.750	140.000	169.440	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.390	152.840	182.050	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.080	38.390	38.050	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.300	20.610	20.270	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.7500	140.0000	169.4400	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.660	7.770	7.660	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.650	2.653	2.646	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.637	2.639	2.633	
Average Specific Gravity at 20° C							**2.636**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				28	15	10	
Weight of Pycnometer		Wf	(gr)	34.010	77.130	67.070	
Weight of (Pycnometer + Water)		Wa	(gr)	135.370	173.150	168.920	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.130	185.830	181.590	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.300	38.200	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.520	20.420	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.3700	173.1500	168.9200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.760	7.740	7.710	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.644	2.638	2.643	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.631	2.625	2.630	
Average Specific Gravity at 20° C							**2.628**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				5	14	13	
Weight of Pycnometer		Wf	(gr)	65.390	69.710	66.070	
Weight of (Pycnometer + Water)		Wa	(gr)	168.330	170.370	167.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.460	183.030	179.890	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.780	38.040	37.980	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	21.000	20.260	20.200	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.3300	170.3700	167.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.870	7.600	7.580	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.668	2.666	2.665	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.655	2.652	2.651	
Average Specific Gravity at 20° C							**2.653**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				3	35	8	
Weight of Pycnometer		Wf	(gr)	63.340	37.070	67.390	
Weight of (Pycnometer + Water)		Wa	(gr)	166.670	136.920	168.560	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	179.390	149.730	181.280	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.070	38.240	38.080	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.290	20.460	20.300	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	166.6700	136.9200	168.5600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.650	7.580	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.680	2.675	2.678	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.667	2.661	2.664	
Average Specific Gravity at 20° C							**2.664**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				19	26	18	
Weight of Pycnometer		Wf	(gr)	66.300	38.840	66.800	
Weight of (Pycnometer + Water)		Wa	(gr)	167.700	138.580	168.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	180.290	151.490	181.230	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.880	38.370	37.910	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.100	20.590	20.130	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.7000	138.5800	168.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.510	7.680	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.676	2.681	2.673	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.663	2.667	2.660	
Average Specific Gravity at 20° C							**2.663**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				76	38	51	
Weight of Pycnometer		Wf	(gr)	38.610	37.290	53.870	
Weight of (Pycnometer + Water)		Wa	(gr)	139.040	136.940	154.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.680	149.690	166.990	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.960	38.080	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.180	20.300	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	139.0400	136.9400	154.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.540	7.550	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.676	2.689	2.679	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.663	2.675	2.665	
Average Specific Gravity at 20° C							**2.668**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				64	62	11	
Weight of Pycnometer		Wf	(gr)	37.070	41.480	68.490	
Weight of (Pycnometer + Water)		Wa	(gr)	148.310	152.370	168.640	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	160.890	164.950	181.130	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.060	37.980	37.880	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.280	20.200	20.100	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	148.3100	152.3700	168.6400	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.700	7.620	7.610	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.634	2.651	2.641	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.620	2.637	2.628	
Average Specific Gravity at 20° C							**2.628**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	11.50 - 12.00

Determination No				1	2	3	4
No of Pycnometer				24	31	34	
Weight of Pycnometer		Wf	(gr)	38.140	34.630	52.710	
Weight of (Pycnometer + Water)		Wa	(gr)	137.560	134.510	152.200	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.460	147.090	164.830	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.520	38.000	38.090	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.740	20.220	20.310	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.5600	134.5100	152.2000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.840	7.640	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.645	2.647	2.645	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.632	2.633	2.631	
Average Specific Gravity at 20° C							**2.632**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	13.50 - 14.00

Determination No				1	2	3	4
No of Pycnometer				7	77	58	
Weight of Pycnometer		Wf	(gr)	68.750	39.760	35.070	
Weight of (Pycnometer + Water)		Wa	(gr)	169.400	139.850	145.730	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.950	152.500	158.330	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.960	38.040	37.990	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.180	20.260	20.210	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.4000	139.8500	145.7300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.630	7.610	7.610	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.645	2.662	2.656	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.631	2.649	2.642	
Average Specific Gravity at 20° C							**2.641**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	15.50 - 16.00

Determination No				1	2	3	4
No of Pycnometer				21	9	32	
Weight of Pycnometer		Wf	(gr)	40.730	65.320	51.260	
Weight of (Pycnometer + Water)		Wa	(gr)	145.610	167.290	151.350	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	158.310	179.880	164.020	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.140	37.980	38.100	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.360	20.200	20.320	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	145.6100	167.2900	151.3500	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.660	7.610	7.650	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.658	2.654	2.656	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.644	2.641	2.643	
Average Specific Gravity at 20° C							**2.643**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	17.50 - 18.00

Determination No				1	2	3	4
No of Pycnometer				66	68	25	
Weight of Pycnometer		Wf	(gr)	36.290	34.650	43.080	
Weight of (Pycnometer + Water)		Wa	(gr)	136.280	134.460	146.430	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.860	147.160	159.160	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.890	38.050	38.100	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.110	20.270	20.320	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.2800	134.4600	146.4300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.570	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.671	2.678	2.677	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.657	2.664	2.663	
Average Specific Gravity at 20° C							**2.661**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 15	DEPTH	19.50 - 20.00

Determination No				1	2	3	4
No of Pycnometer				86	59	73	
Weight of Pycnometer		Wf	(gr)	39.080	33.640	34.550	
Weight of (Pycnometer + Water)		Wa	(gr)	138.850	144.580	135.120	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.500	157.300	147.880	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.060	38.120	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.280	20.340	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.8500	144.5800	135.1200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.630	7.620	7.620	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.658	2.669	2.675	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.644	2.656	2.661	
Average Specific Gravity at 20° C							**2.654**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 630.4 gr
Wt. container No ..... = 41.75 gr
Wt. Of air dry soil W' = 588.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **588.65** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	44.41	41.75	2.66		0.45	99.55

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	0.50 - 1.00

Wt. (Air dry soil + container) = 112.86 gr — Specific Gravity : 2.602
Wt. of container B-63 = 35.73 gr — Plasticity Index : %
Wt. Of air dry soil W' = 77.13 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 99.55 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-05			NO	J-10			NO	J-20		
WW	51.24	DW	50.28	WW	53.48	DW	52.44	WW	54.61	DW	53.62	Mean value	
DW	50.28	TW	36.52	DW	52.44	TW	36.96	DW	53.62	TW	39.07	w	
Ww	0.96	Ws	13.76	Ww	1.04	Ws	15.48	Ww	0.99	Ws	14.55	6.83	%
w	6.98	%		w	6.72	%		w	6.80	%			

$$W = \frac{100 \times W'}{100 + w} : 72.197 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	23.0	24.0	28	9.540	9.540	3.0887	0.01264	0.0390	21.00	47.24	47.03
2	20.5	21.5	28	10.171	5.085	2.2551	0.01264	0.0285	18.50	41.62	41.43
5	17.5	18.5	28	10.928	2.186	1.4784	0.01264	0.0187	15.50	34.87	34.71
15	14.5	15.5	28	11.685	0.779	0.8826	0.01264	0.0112	12.50	28.12	27.99
30	12.5	13.5	28	12.189	0.406	0.6374	0.01264	0.0081	10.50	23.62	23.52
60	11.0	12.0	28	12.568	0.209	0.4577	0.01264	0.0058	9.00	20.25	20.16
240	9.0	10.0	29	13.072	0.054	0.2334	0.01250	0.0029	7.00	15.75	15.68
1140	8.0	9.0	28	13.325	0.012	0.1081	0.01264	0.0014	6.00	13.50	13.44

P = 100/W = 1.3851

$$Mx = \frac{G_s}{G_s - 1} = 1.6242$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.82	22.02	1.800		2.49	97.51	97.07
0.42	27.03		5.010		6.94	93.06	92.64
0.25	30.97		8.950		12.40	87.60	87.21
0.105	45.49		23.470		32.51	67.49	67.19
0.074	51.55		29.530		40.90	59.10	58.83

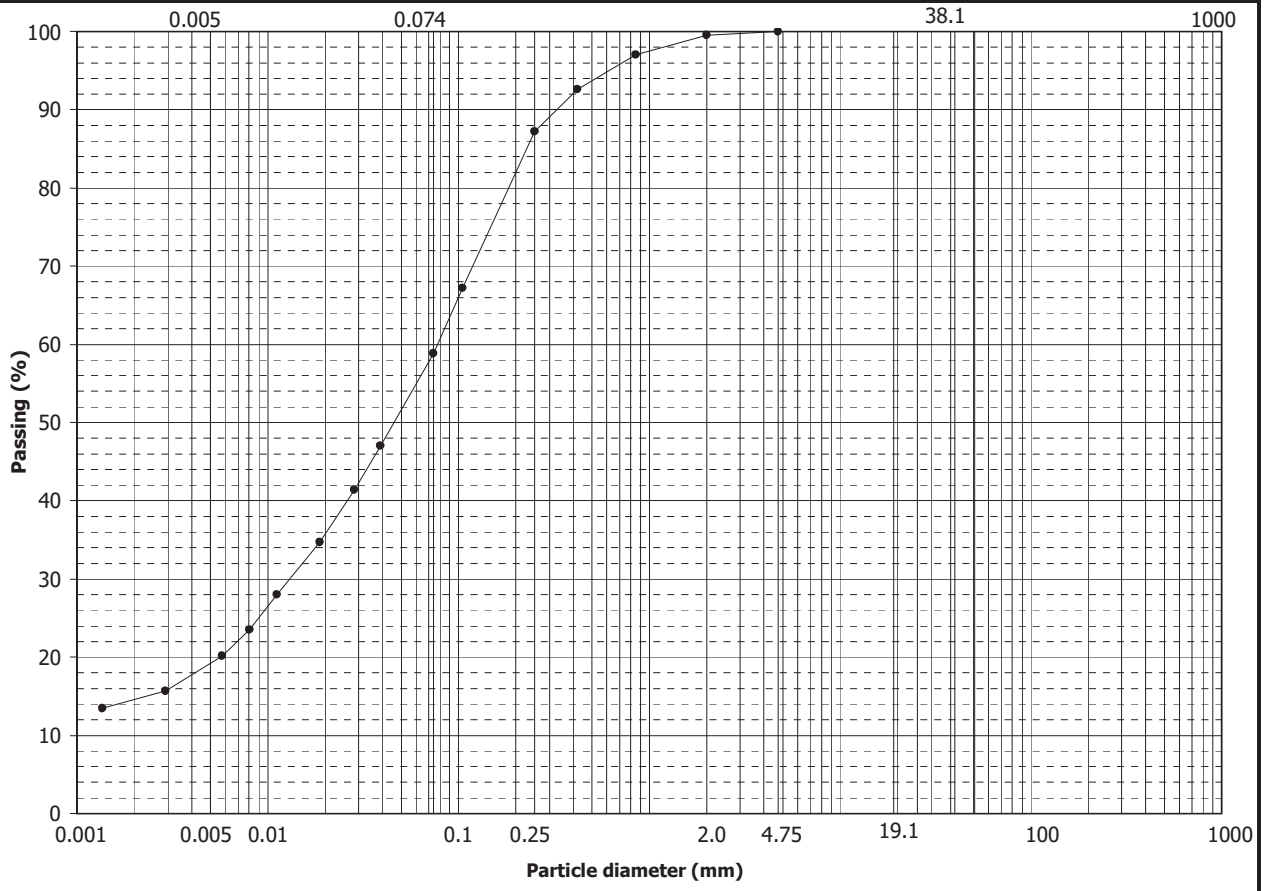
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.602**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	41.17	39.63	19.20	4.75	0.3374	0.0783	0.0478	0.0134	-	-	99.55	92.64	58.83



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 310.2 gr
Wt. container No ..... = 41.75 gr
Wt. Of air dry soil W' = 268.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **268.45** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	62.92	41.75	21.17		7.89	92.11
9.52	68.46		26.71		9.95	90.05
4.75	75.25		33.50		12.48	87.52
2.00	99.16		57.41		21.39	78.61

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	1.50 - 2.00

Wt. (Air dry soil + container) = 148.75 gr — Specific Gravity : 2.636
Wt. of container M-48 = 38.08 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.67 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 78.61 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-23			NO	J-32			NO	J-45		
WW	49.80	DW	49.08	WW	51.91	DW	51.28	WW	50.91	DW	50.27	Mean value	
DW	49.08	TW	36.20	DW	51.28	TW	39.90	DW	50.27	TW	38.22	w	
Ww	0.72	Ws	12.88	Ww	0.63	Ws	11.38	Ww	0.64	Ws	12.05	5.48	%
w	5.59	%		w	5.54	%		w	5.31	%			

$$W = \frac{100 \times W'}{100 + w} : 104.921 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	6.5	7.5	28	13.703	13.703	3.7018	0.01251	0.0463	4.50	6.91	5.43
2	6.0	7.0	28	13.829	6.915	2.6296	0.01251	0.0329	4.00	6.14	4.83
5	5.5	6.5	28	13.955	2.791	1.6706	0.01251	0.0209	3.50	5.37	4.23
15	4.5	5.5	28	14.208	0.947	0.9732	0.01251	0.0122	2.50	3.84	3.02
30	4.0	5.0	28	14.334	0.478	0.6912	0.01251	0.0086	2.00	3.07	2.41
60	3.5	4.5	28	14.460	0.241	0.4909	0.01251	0.0061	1.50	2.30	1.81
240	3.0	4.0	29	14.586	0.061	0.2465	0.01237	0.0030	1.00	1.54	1.21
1140	2.5	3.5	28	14.712	0.013	0.1136	0.01251	0.0014	0.50	0.77	0.60

P = 100/W = 0.9531

$$Mx = \frac{Gs}{Gs - 1} = 1.6112$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	51.91	22.02	29.890		28.49	71.51	56.22
0.42	89.80		67.780		64.60	35.40	27.83
0.25	106.67		84.650		80.68	19.32	15.19
0.105	116.85		94.830		90.38	9.62	7.56
0.074	118.59		96.570		92.04	7.96	6.26

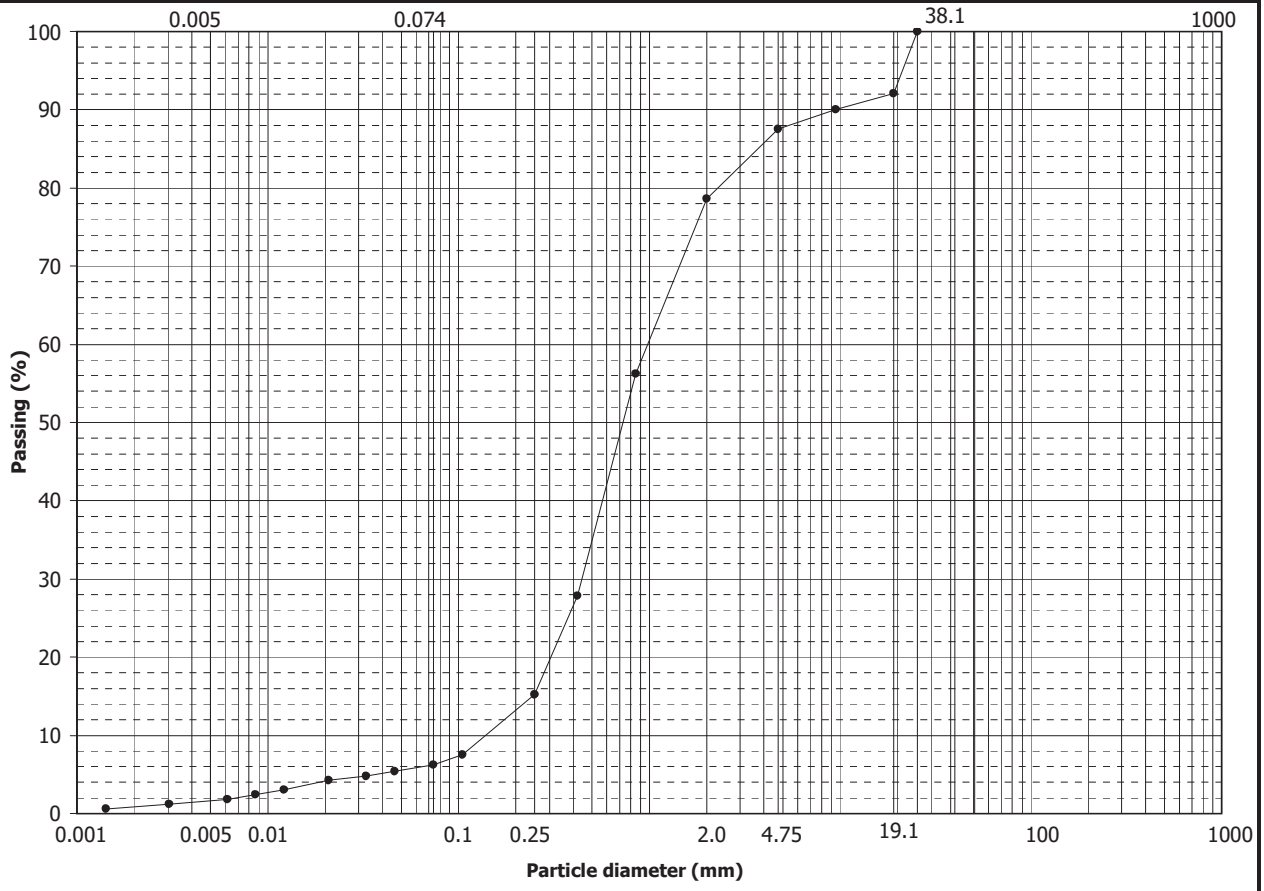
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.636**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
12.48	81.26	4.62	1.63	25.40	9.4252	1.0442	0.7558	0.4529	0.1514	6.90	78.61	27.83	6.26



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 281.1 gr
Wt. container No ..... = 39.95 gr
Wt. Of air dry soil W' = 241.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **241.15** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	56.99	39.95	17.04		7.07	92.93
4.75	69.67		29.72		12.32	87.68
2.00	88.42		48.47		20.10	79.90

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	2.50 - 3.00

Wt. (Air dry soil + container) = 150.02 gr — Specific Gravity : 2.625
Wt. of container M-25 = 36.75 gr — Plasticity Index : %
Wt. Of air dry soil W' = 113.27 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 79.90 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-25			NO	J-44			NO	J-54		
WW	49.79	DW	49.02	WW	50.99	DW	50.24	WW	50.40	DW	49.68	Mean value	
DW	49.02	TW	36.05	DW	50.24	TW	37.46	DW	49.68	TW	37.16	w	
Ww	0.77	Ws	12.97	Ww	0.75	Ws	12.78	Ww	0.72	Ws	12.52	5.85	%
w	5.94	%		w	5.87	%		w	5.75	%			

$$W = \frac{100 \times W'}{100 + w} : 107.008 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	8.5	9.5	28	13.198	13.198	3.6330	0.01255	0.0456	6.50	9.81	7.84
2	7.5	8.5	28	13.451	6.725	2.5933	0.01255	0.0325	5.50	8.30	6.63
5	6.5	7.5	28	13.703	2.741	1.6555	0.01255	0.0208	4.50	6.79	5.43
15	5.5	6.5	28	13.955	0.930	0.9645	0.01255	0.0121	3.50	5.28	4.22
30	5.0	6.0	28	14.081	0.469	0.6851	0.01255	0.0086	3.00	4.53	3.62
60	4.5	5.5	28	14.208	0.237	0.4866	0.01255	0.0061	2.50	3.77	3.02
240	4.0	5.0	29	14.334	0.060	0.2444	0.01241	0.0030	2.00	3.02	2.41
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01255	0.0014	1.50	2.26	1.81

P = 100/W = 0.9345

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6154$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	37.80	22.02	15.780		14.75	85.25	68.12
0.42	61.70		39.680		37.08	62.92	50.27
0.25	85.06		63.040		58.91	41.09	32.83
0.105	105.85		83.830		78.34	21.66	17.31
0.074	111.45		89.430		83.57	16.43	13.13

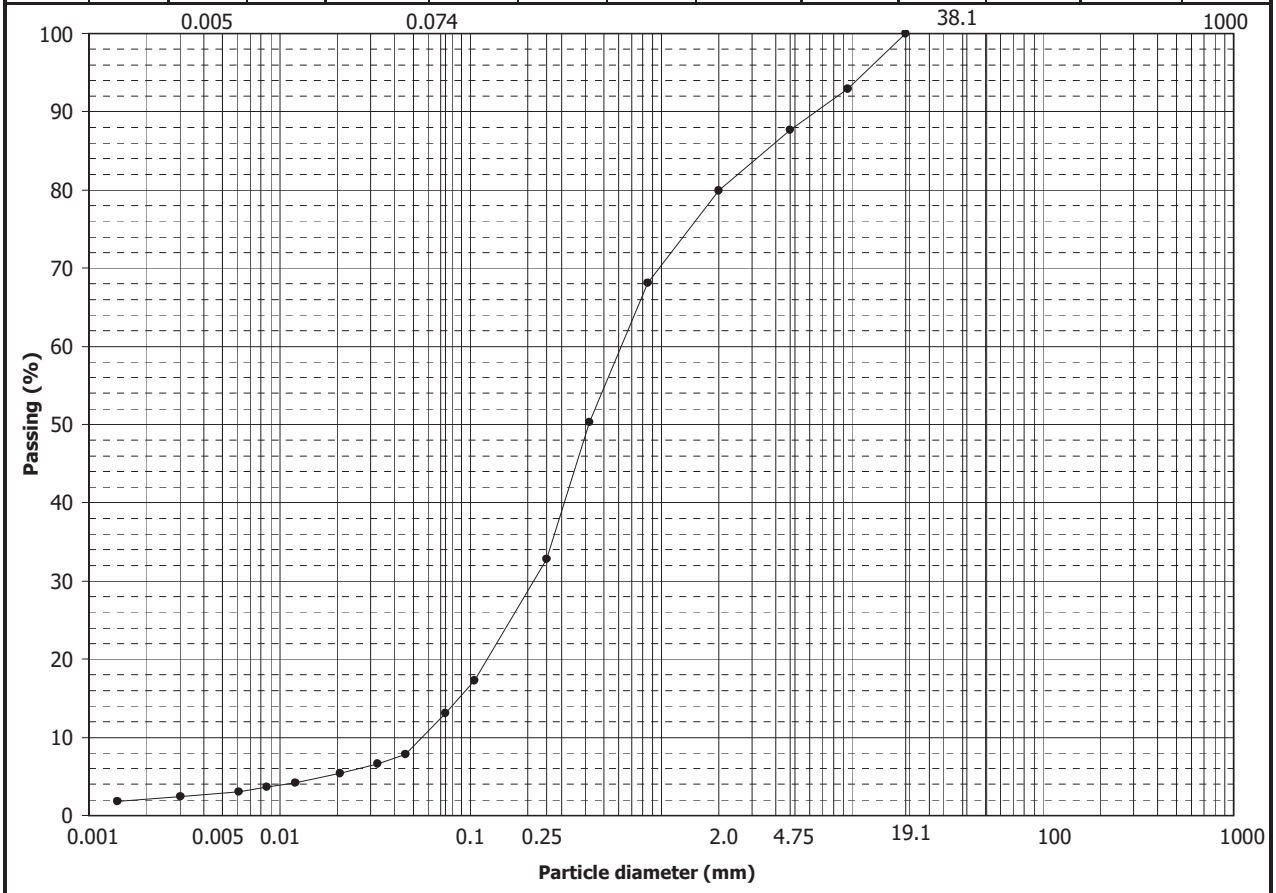
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.625**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
12.32	74.55	10.28	2.84	19.10	6.8585	0.6544	0.4173	0.2236	0.0572	11.44	79.90	50.27	13.13



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 382.9 gr
Wt. container No ..... = 42.34 gr
Wt. Of air dry soil W' = 340.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **340.56** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	54.70	42.34	12.36		3.63	96.37
9.52	64.40		22.06		6.48	93.52
4.75	71.00		28.66		8.42	91.58
2.00	92.07		49.73		14.60	85.40

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	3.50 - 4.00

Wt. (Air dry soil + container) = 138.54 gr — Specific Gravity : 2.636
Wt. of container B-15 = 36.39 gr — Plasticity Index : %
Wt. Of air dry soil W' = 102.15 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 85.40 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-03			NO	J-23			NO	J-31		
WW	50.12	DW	49.52	WW	52.08	DW	51.24	WW	52.41	DW	51.29	Mean value	
DW	49.52	TW	39.31	DW	51.24	TW	36.20	DW	51.29	TW	31.91	w	
Ww	0.60	Ws	10.21	Ww	0.84	Ws	15.04	Ww	1.12	Ws	19.38	5.75	%
w	5.88	%		w	5.59	%		w	5.78	%			

$$W = \frac{100 \times W'}{100 + w} : 96.598 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	6.5	7.5	28	13.703	13.703	3.7018	0.01251	0.0463	4.50	7.51	6.41
2	6.0	7.0	28	13.829	6.915	2.6296	0.01251	0.0329	4.00	6.67	5.70
5	5.5	6.5	28	13.955	2.791	1.6706	0.01251	0.0209	3.50	5.84	4.99
15	4.5	5.5	28	14.208	0.947	0.9732	0.01251	0.0122	2.50	4.17	3.56
30	4.0	5.0	28	14.334	0.478	0.6912	0.01251	0.0086	2.00	3.34	2.85
60	3.5	4.5	28	14.460	0.241	0.4909	0.01251	0.0061	1.50	2.50	2.14
240	3.0	4.0	29	14.586	0.061	0.2465	0.01237	0.0030	1.00	1.67	1.42
1140	2.5	3.5	28	14.712	0.013	0.1136	0.01251	0.0014	0.50	0.83	0.71

P = 100/W = 1.0352

$$Mx = \frac{G_s}{G_s - 1} = 1.6112$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	37.12	22.02	15.100		15.63	84.37	72.05
0.42	72.42		50.400		52.17	47.83	40.84
0.25	92.34		70.320		72.80	27.20	23.23
0.105	105.12		83.100		86.03	13.97	11.93
0.074	108.22		86.200		89.24	10.76	9.19

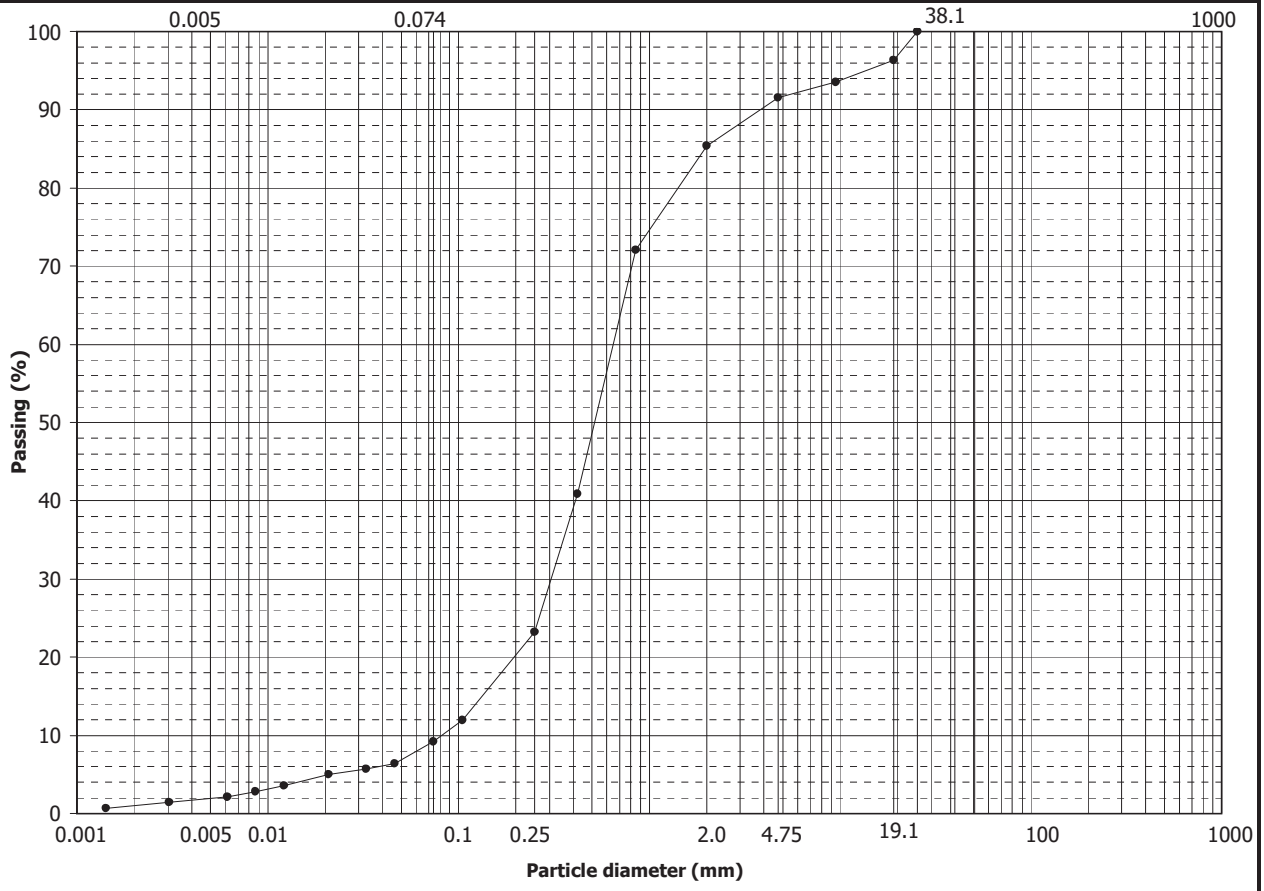
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.636**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
8.42	82.39	7.26	1.93	25.40	4.0457	0.6840	0.5462	0.3153	0.0831	8.23	85.40	40.84	9.19



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 440.1 gr
Wt. container No ..... = 41.41 gr
Wt. Of air dry soil W' = 398.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **398.69** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	42.50	41.41	1.09		0.27	99.73
4.75	47.40		5.99		1.50	98.50
2.00	60.90		19.49		4.89	95.11

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	4.50 - 5.00

Wt. (Air dry soil + container) = 137.70 gr — Specific Gravity : 2.628
Wt. of container B-20 = 32.49 gr — Plasticity Index : %
Wt. Of air dry soil W' = 105.21 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 95.11 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-49			NO	J-44			NO	J-40		
WW	58.28	DW	57.84	WW	57.46	DW	56.99	WW	57.28	DW	56.84	Mean value	
DW	57.84	TW	40.36	DW	56.99	TW	37.46	DW	56.84	TW	38.32	w	
Ww	0.44	Ws	17.48	Ww	0.47	Ws	19.53	Ww	0.44	Ws	18.52	2.43	%
w	2.52	%		w	2.41	%		w	2.38	%			

$$W = \frac{100 \times W'}{100 + w} : 102.711 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	9.5	10.5	28	12.946	12.946	3.5981	0.01254	0.0451	7.50	11.79	11.21
2	7.5	8.5	28	13.451	6.725	2.5933	0.01254	0.0325	5.50	8.64	8.22
5	6.5	7.5	28	13.703	2.741	1.6555	0.01254	0.0208	4.50	7.07	6.73
15	5.5	6.5	28	13.955	0.930	0.9645	0.01254	0.0121	3.50	5.50	5.23
30	5.0	6.0	28	14.081	0.469	0.6851	0.01254	0.0086	3.00	4.71	4.48
60	4.5	5.5	28	14.208	0.237	0.4866	0.01254	0.0061	2.50	3.93	3.74
240	4.0	5.0	29	14.334	0.060	0.2444	0.01240	0.0030	2.00	3.14	2.99
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01254	0.0014	1.50	2.36	2.24

P = 100/W = 0.9736

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6143$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	33.00	22.02	10.980		10.69	89.31	84.94
0.42	56.96		34.940		34.02	65.98	62.76
0.25	78.06		56.040		54.56	45.44	43.22
0.105	95.78		73.760		71.81	28.19	26.81
0.074	103.26		81.240		79.10	20.90	19.88

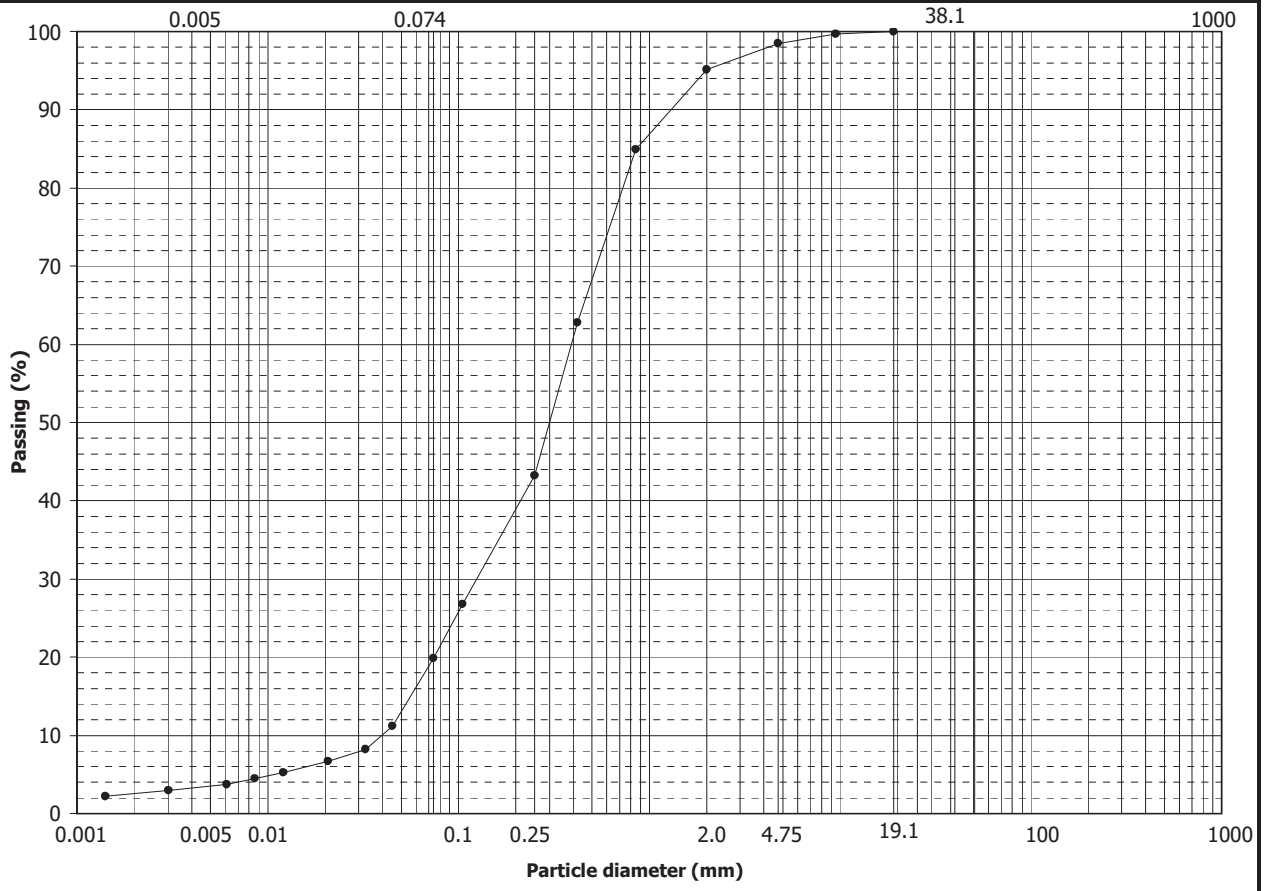
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.628**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
1.50	78.62	16.36	3.52	19.10	1.4219	0.3960	0.3090	0.1332	0.0400	9.90	95.11	62.76	19.88



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 450.1 gr
Wt. container No ..... = 35.55 gr
Wt. Of air dry soil W' = 414.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **414.55** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	36.38	35.55	0.83		0.20	99.80

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	5.50 - 6.00

Wt. (Air dry soil + container) = 100.94 gr — Specific Gravity : 2.653
Wt. of container B-25 = 35.56 gr — Plasticity Index : %
Wt. Of air dry soil W' = 65.38 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 99.80 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-12			NO	J-27			NO	J-33		
WW	50.51	DW	49.62	WW	50.04	DW	49.05	WW	49.90	DW	49.02	Mean value	
DW	49.62	TW	37.07	DW	49.05	TW	35.23	DW	49.02	TW	36.17	w	
Ww	0.89	Ws	12.55	Ww	0.99	Ws	13.82	Ww	0.88	Ws	12.85	7.03	%
w	7.09	%		w	7.16	%		w	6.85	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : \quad 61.083 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.0	22.0	28	10.045	10.045	3.1693	0.01244	0.0394	19.00	49.92	49.82
2	17.0	18.0	28	11.054	5.527	2.3509	0.01244	0.0293	15.00	39.41	39.33
5	14.0	15.0	28	11.811	2.362	1.5369	0.01244	0.0191	12.00	31.53	31.47
15	11.0	12.0	28	12.568	0.838	0.9153	0.01244	0.0114	9.00	23.65	23.60
30	9.0	10.0	28	13.072	0.436	0.6601	0.01244	0.0082	7.00	18.39	18.36
60	7.5	8.5	28	13.451	0.224	0.4735	0.01244	0.0059	5.50	14.45	14.42
240	5.5	6.5	29	13.955	0.058	0.2411	0.01231	0.0030	3.50	9.20	9.18
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01244	0.0014	2.50	6.57	6.56

P = 100/W = 1.6371

$$Mx = \frac{G_s}{G_s - 1} = 1.6050$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.76	22.02	0.740		1.21	98.79	98.59
0.42	23.89		1.870		3.06	96.94	96.74
0.25	25.34		3.320		5.44	94.56	94.38
0.105	30.25		8.230		13.47	86.53	86.35
0.074	34.40		12.380		20.27	79.73	79.57

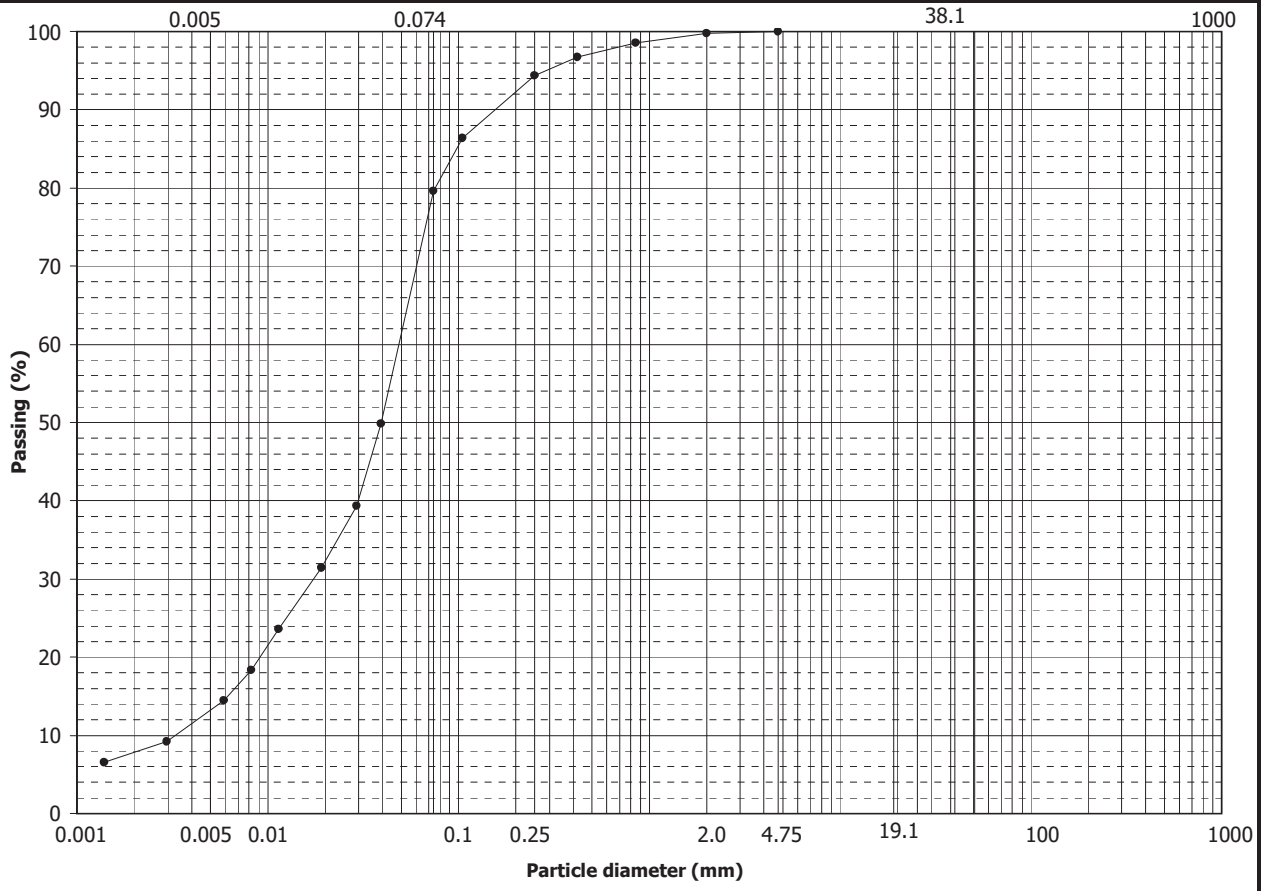
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.653**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	20.43	66.41	13.17	4.75	0.1709	0.0513	0.0396	0.0177	0.0034	14.96	99.80	96.74	79.57



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 462.1 gr
Wt. container No ..... = 46.20 gr
Wt. Of air dry soil W' = 415.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **415.90** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	80.90	46.20	34.70		8.34	91.66
9.52	140.50		94.30		22.67	77.33
4.75	216.30		170.10		40.90	59.10
2.00	286.80		240.60		57.85	42.15

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	6.50 - 7.00

Wt. (Air dry soil + container) = 139.02 gr — Specific Gravity : 2.664
Wt. of container M-73 = 44.95 gr — Plasticity Index : %
Wt. Of air dry soil W' = 94.07 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 42.15 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-49			NO	J-44			NO	J-40		
WW	56.31	DW	55.85	WW	54.66	DW	54.19	WW	55.98	DW	55.49	Mean value	
DW	55.85	TW	40.36	DW	54.19	TW	37.46	DW	55.49	TW	38.32	w	
Ww	0.46	Ws	15.49	Ww	0.47	Ws	16.73	Ww	0.49	Ws	17.17	2.88	%
w	2.97	%		w	2.81	%		w	2.85	%			

$$W = \frac{100 \times W'}{100 + w} : 91.439 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01240	0.0422	13.00	22.76	9.59
2	13.0	14.0	28	12.063	6.032	2.4559	0.01240	0.0305	11.00	19.26	8.12
5	11.0	12.0	28	12.568	2.514	1.5854	0.01240	0.0197	9.00	15.76	6.64
15	9.5	10.5	28	12.946	0.863	0.9290	0.01240	0.0115	7.50	13.13	5.53
30	8.5	9.5	28	13.198	0.440	0.6633	0.01240	0.0082	6.50	11.38	4.80
60	7.5	8.5	28	13.451	0.224	0.4735	0.01240	0.0059	5.50	9.63	4.06
240	6.5	7.5	29	13.703	0.057	0.2389	0.01227	0.0029	4.50	7.88	3.32
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01240	0.0014	4.00	7.00	2.95

P = 100/W = 1.0936

$$Mx = \frac{Gs}{Gs - 1} = 1.6010$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	47.23	22.02	25.210		27.57	72.43	30.53
0.42	63.55		41.530		45.42	54.58	23.01
0.25	70.75		48.730		53.29	46.71	19.69
0.105	81.88		59.860		65.46	34.54	14.56
0.074	86.24		64.220		70.23	29.77	12.55

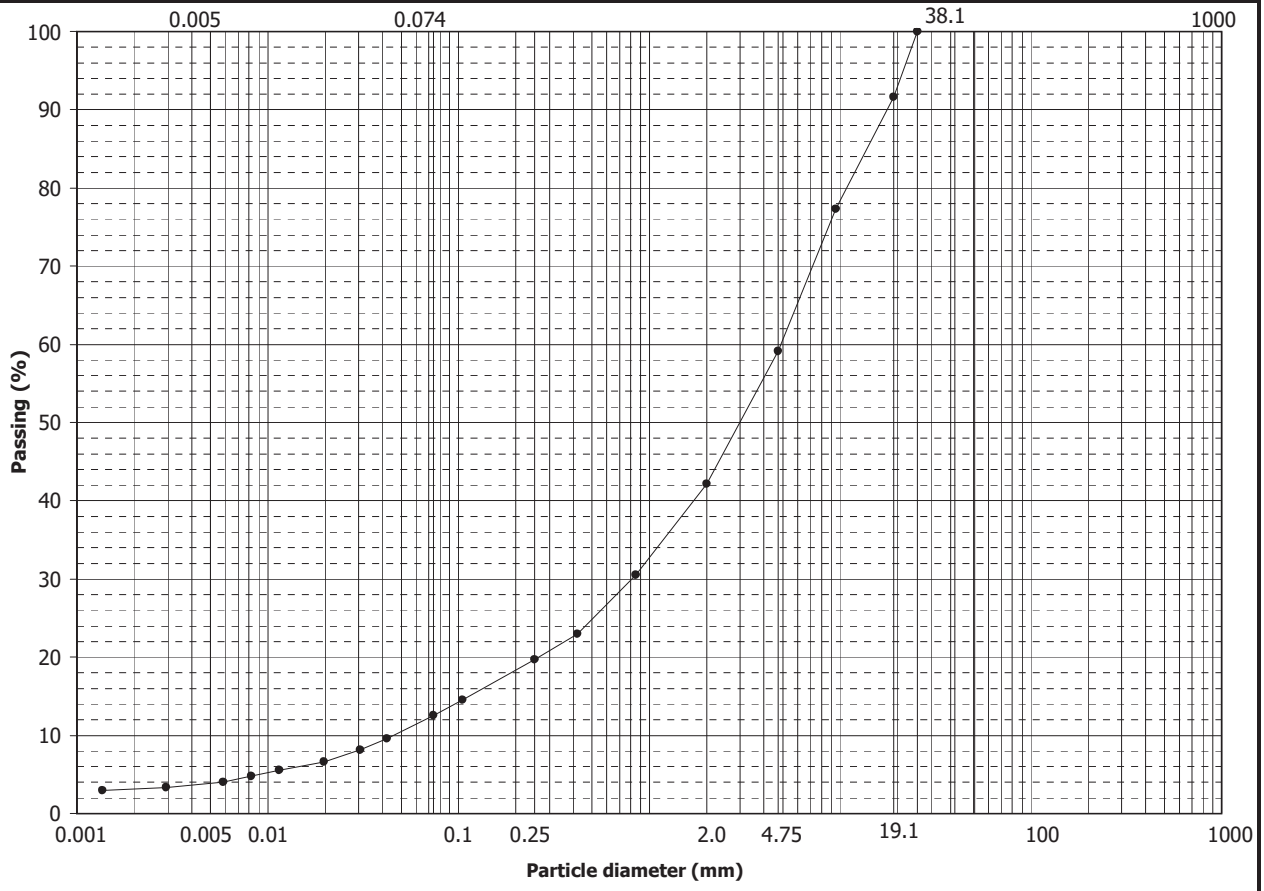
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.664**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
40.90	46.55	8.66	3.89	25.40	17.993	4.9854	3.2736	0.8198	0.0465	107.11	42.15	23.01	12.55



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 428.1 gr
Wt. container No ..... = 45.64 gr
Wt. Of air dry soil W' = 382.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **382.46** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	70.70	45.64	25.06		6.55	93.45
9.52	153.00		107.36		28.07	71.93
4.75	220.60		174.96		45.75	54.25
2.00	279.41		233.77		61.12	38.88

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	7.50 - 8.00

Wt. (Air dry soil + container) = 139.77 gr — Specific Gravity : 2.663
Wt. of container M-81 = 44.13 gr — Plasticity Index : %
Wt. Of air dry soil W' = 95.64 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 38.88 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-50			NO	J-52			NO	J-47		
WW	57.52	DW	56.94	WW	56.46	DW	55.88	WW	58.42	DW	57.82	Mean value	
DW	56.94	TW	38.24	DW	55.88	TW	36.71	DW	57.82	TW	38.23	w	
Ww	0.58	Ws	18.70	Ww	0.58	Ws	19.17	Ww	0.60	Ws	19.59	3.06	%
w	3.10	%		w	3.03	%		w	3.06	%			

$$W = \frac{100 \times W'}{100 + w} : 92.797 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.0	19.0	28	10.802	10.802	3.2866	0.01241	0.0408	16.00	27.61	10.73
2	16.0	17.0	28	11.306	5.653	2.3776	0.01241	0.0295	14.00	24.16	9.39
5	14.0	15.0	28	11.811	2.362	1.5369	0.01241	0.0191	12.00	20.71	8.05
15	12.5	13.5	28	12.189	0.813	0.9015	0.01241	0.0112	10.50	18.12	7.04
30	11.5	12.5	28	12.442	0.415	0.6440	0.01241	0.0080	9.50	16.39	6.37
60	10.5	11.5	28	12.694	0.212	0.4600	0.01241	0.0057	8.50	14.67	5.70
240	9.5	10.5	29	12.946	0.054	0.2323	0.01227	0.0028	7.50	12.94	5.03
1140	9.0	10.0	28	13.072	0.011	0.1071	0.01241	0.0013	7.00	12.08	4.70

P = 100/W = 1.0776

$$Mx = \frac{G_s}{G_s - 1} = 1.6013$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	46.99	22.02	24.970		26.91	73.09	28.42
0.42	62.42		40.400		43.54	56.46	21.95
0.25	72.64		50.620		54.55	45.45	17.67
0.105	80.11		58.090		62.60	37.40	14.54
0.074	83.39		61.370		66.13	33.87	13.17

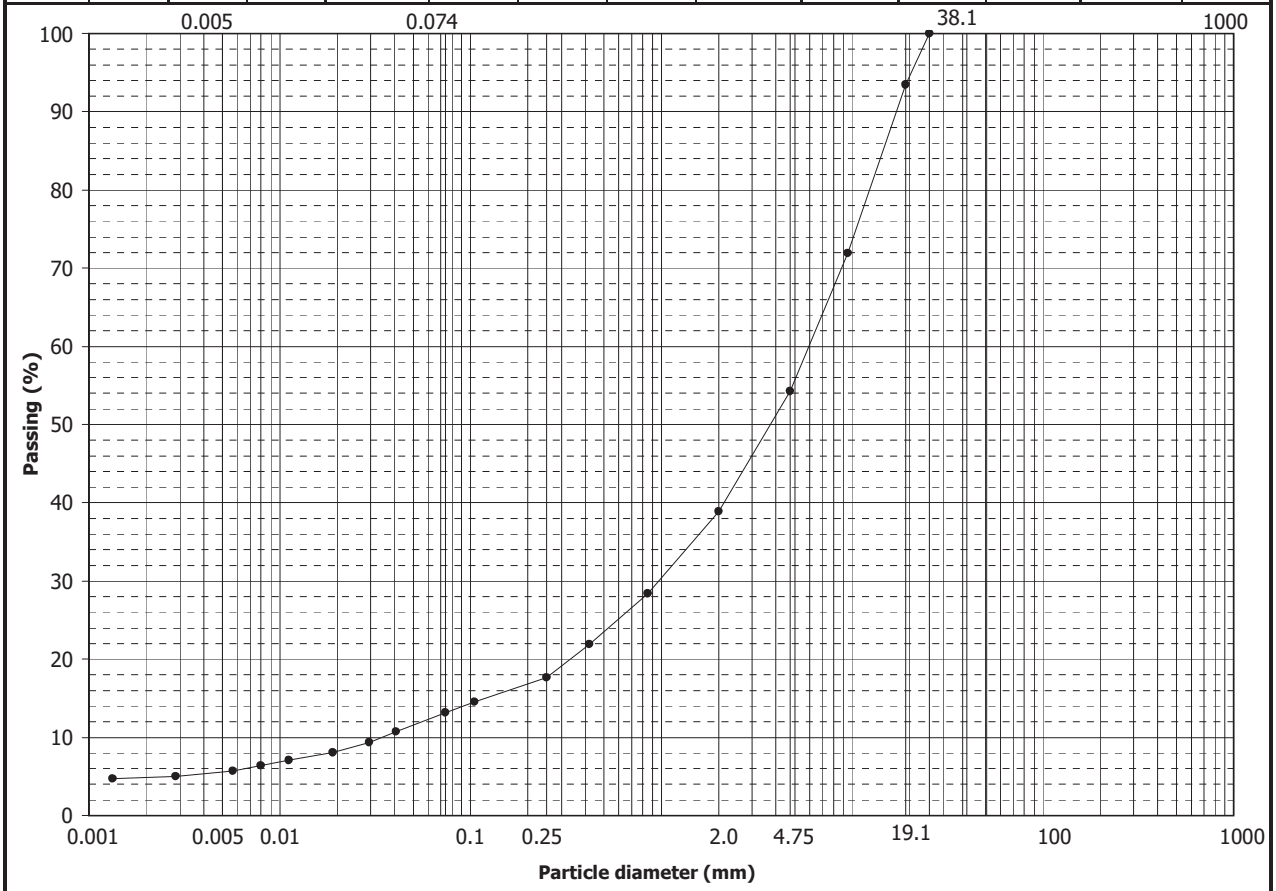
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.663**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
45.75	41.09	7.59	5.57	25.40	17.565	6.3007	3.9892	1.0241	0.0346	182.09	38.88	21.95	13.17



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 318.8 gr
Wt. container No ..... = 46.35 gr
Wt. Of air dry soil W' = 272.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **272.45** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	68.40	46.35	22.05		8.09	91.91
9.52	117.20		70.85		26.00	74.00
4.75	161.40		115.05		42.23	57.77
2.00	202.80		156.45		57.42	42.58

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	8.50 - 9.00

Wt. (Air dry soil + container) = 148.62 gr — Specific Gravity : 2.668
Wt. of container M-06 = 42.75 gr — Plasticity Index : %
Wt. Of air dry soil W' = 105.87 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 42.58 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-64			NO	J-34			NO	J-66		
WW	52.65	DW	52.24	WW	54.32	DW	53.93	WW	53.43	DW	53.02	Mean value	
DW	52.24	TW	36.99	DW	53.93	TW	40.29	DW	53.02	TW	37.71	w	
Ww	0.41	Ws	15.25	Ww	0.39	Ws	13.64	Ww	0.41	Ws	15.31	2.74	%
w	2.69	%		w	2.86	%		w	2.68	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 103.044 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	28	11.306	11.306	3.3625	0.01239	0.0416	14.00	21.73	9.25
2	14.0	15.0	28	11.811	5.905	2.4301	0.01239	0.0301	12.00	18.63	7.93
5	12.0	13.0	28	12.315	2.463	1.5694	0.01239	0.0194	10.00	15.52	6.61
15	10.0	11.0	28	12.820	0.855	0.9245	0.01239	0.0115	8.00	12.42	5.29
30	9.0	10.0	28	13.072	0.436	0.6601	0.01239	0.0082	7.00	10.87	4.63
60	8.0	9.0	28	13.325	0.222	0.4712	0.01239	0.0058	6.00	9.31	3.97
240	7.0	8.0	29	13.577	0.057	0.2378	0.01225	0.0029	5.00	7.76	3.30
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01239	0.0014	4.00	6.21	2.64

P = 100/W = 0.9705

$$Mx = \frac{G_s}{G_s - 1} = 1.5995$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	60.45	22.02	38.430		37.29	62.71	26.70
0.42	75.18		53.160		51.59	48.41	20.61
0.25	83.22		61.200		59.39	40.61	17.29
0.105	93.02		71.000		68.90	31.10	13.24
0.074	95.94		73.920		71.74	28.26	12.03

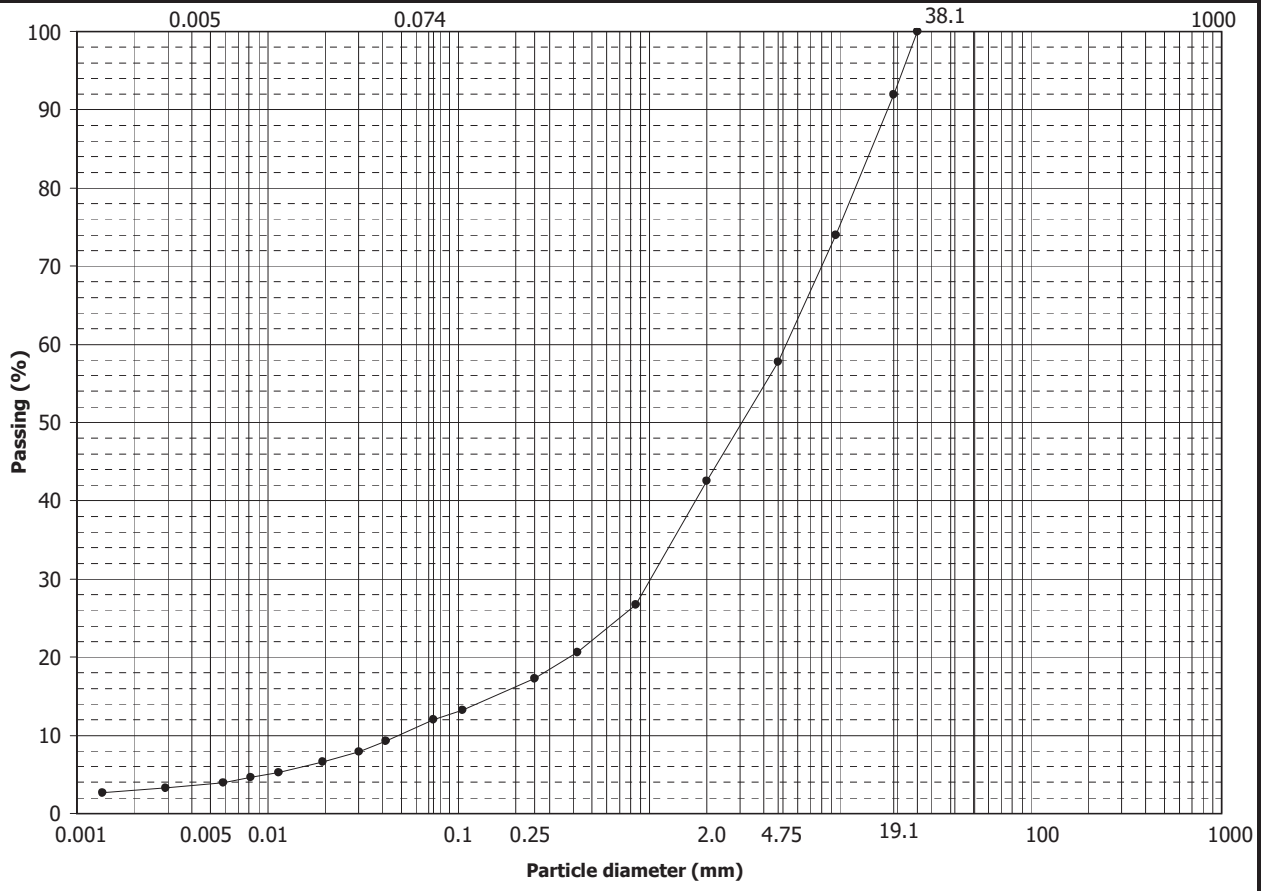
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.668**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
42.23	45.74	8.22	3.82	25.40	18.080	5.4051	3.3434	1.0892	0.0503	107.36	42.58	20.61	12.03



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	9.50 - 10.00

Wt. (Air dry soil + container) = 142.75 gr — Specific Gravity : 2.628
Wt. of container M-19 = 34.89 gr — Plasticity Index : %
Wt. Of air dry soil W' = 107.86 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-04			NO	J-58			NO	J-62		
WW	49.95	DW	49.06	WW	53.41	DW	52.48	WW	51.24	DW	50.27	Mean value	
DW	49.06	TW	36.65	DW	52.48	TW	39.57	DW	50.27	TW	37.29	w	
Ww	0.89	Ws	12.41	Ww	0.93	Ws	12.91	Ww	0.97	Ws	12.98	7.28	%
w	7.17	%		w	7.20	%		w	7.47	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 100.538 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.5	16.5	28	11.432	11.432	3.3812	0.01254	0.0424	13.50	21.68	21.68
2	14.0	15.0	28	11.811	5.905	2.4301	0.01254	0.0305	12.00	19.27	19.27
5	12.0	13.0	28	12.315	2.463	1.5694	0.01254	0.0197	10.00	16.06	16.06
15	10.0	11.0	28	12.820	0.855	0.9245	0.01254	0.0116	8.00	12.84	12.84
30	9.0	10.0	28	13.072	0.436	0.6601	0.01254	0.0083	7.00	11.24	11.24
60	8.0	9.0	28	13.325	0.222	0.4712	0.01254	0.0059	6.00	9.63	9.63
240	6.5	7.5	29	13.703	0.057	0.2389	0.01240	0.0030	4.50	7.23	7.23
1140	5.5	6.5	28	13.955	0.012	0.1106	0.01254	0.0014	3.50	5.62	5.62

P = 100/W = 0.9946

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6143$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	27.16	22.02	5.140		5.11	94.89	94.89
0.42	37.25		15.230		15.15	84.85	84.85
0.25	49.31		27.290		27.14	72.86	72.86
0.105	87.89		65.870		65.52	34.48	34.48
0.074	95.39		73.370		72.98	27.02	27.02

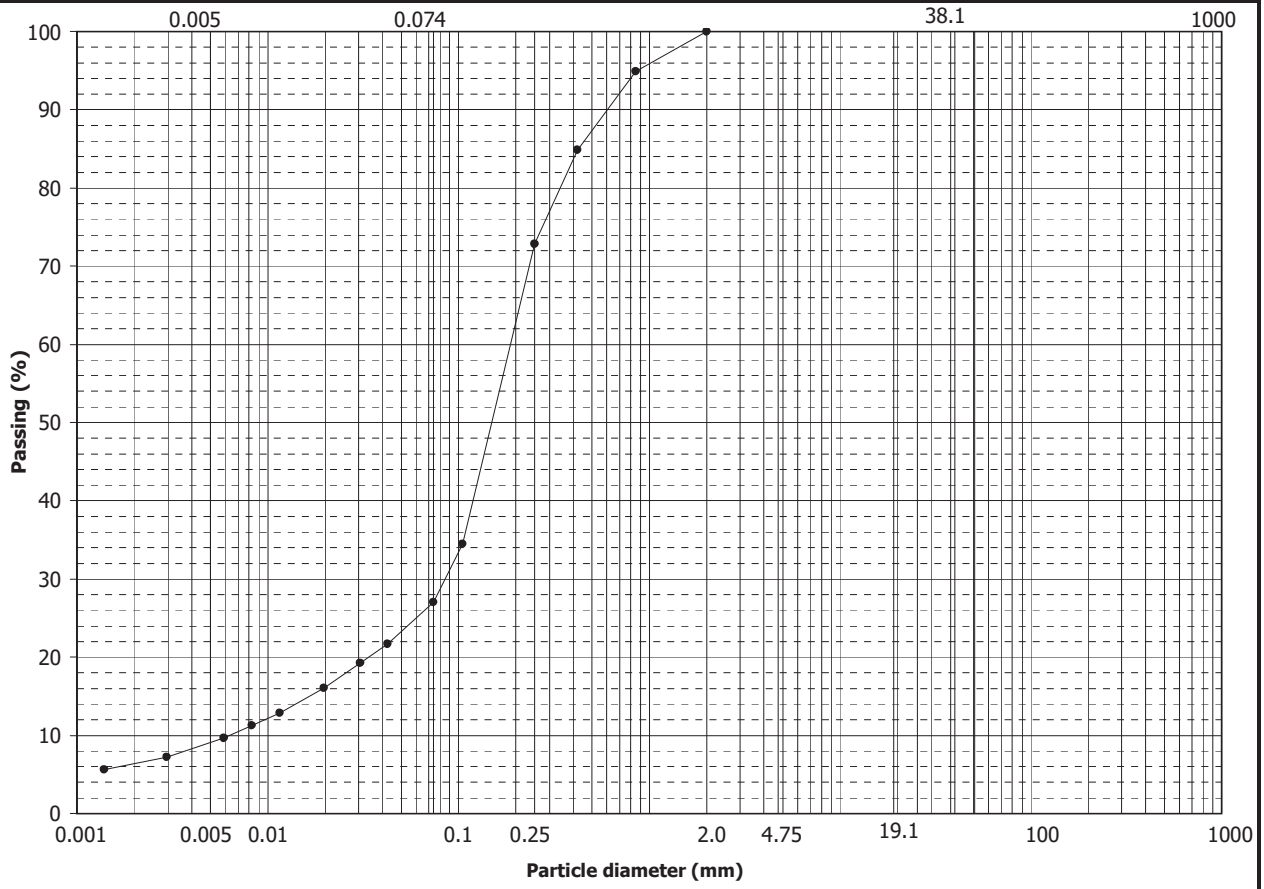
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.628**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	72.98	17.97	9.05	2.00	0.6406	0.2014	0.1636	0.0864	0.0064	31.23	100.00	84.85	27.02



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = 430.9 gr
Wt. container No ..... = 35.89 gr
Wt. Of air dry soil W' = 395.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **395.01** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	47.31	35.89	11.42		2.89	97.11

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	11.50 - 12.00

Wt. (Air dry soil + container) = 135.56 gr — Specific Gravity : 2.632
Wt. of container B-49 = 35.90 gr — Plasticity Index : %
Wt. Of air dry soil W' = 99.66 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 97.11 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-19			NO	J-02			NO	J-11		
WW	55.59	DW	54.75	WW	55.72	DW	55.02	WW	54.38	DW	53.74	Mean value	
DW	54.75	TW	37.77	DW	55.02	TW	40.30	DW	53.74	TW	39.43	w	
Ww	0.84	Ws	16.98	Ww	0.70	Ws	14.72	Ww	0.64	Ws	14.31	4.73	%
w	4.95	%		w	4.76	%		w	4.47	%			

$$W = \frac{100 \times W'}{100 + w} : 95.163 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	28	12.063	12.063	3.4732	0.01252	0.0435	11.00	18.64	18.10
2	11.0	12.0	28	12.568	6.284	2.5068	0.01252	0.0314	9.00	15.25	14.81
5	9.0	10.0	28	13.072	2.614	1.6169	0.01252	0.0202	7.00	11.86	11.52
15	7.0	8.0	28	13.577	0.905	0.9514	0.01252	0.0119	5.00	8.47	8.23
30	6.0	7.0	28	13.829	0.461	0.6789	0.01252	0.0085	4.00	6.78	6.58
60	5.0	6.0	28	14.081	0.235	0.4844	0.01252	0.0061	3.00	5.08	4.94
240	3.5	4.5	29	14.460	0.060	0.2455	0.01239	0.0030	1.50	2.54	2.47
1140	2.5	3.5	28	14.712	0.013	0.1136	0.01252	0.0014	0.50	0.85	0.82

P = 100/W = 1.0508

$$Mx = \frac{G_s}{G_s - 1} = 1.6127$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	36.22	22.02	14.200		14.92	85.08	82.62
0.42	58.67		36.650		38.51	61.49	59.71
0.25	76.09		54.070		56.82	43.18	41.93
0.105	89.62		67.600		71.04	28.96	28.13
0.074	93.73		71.710		75.35	24.65	23.93

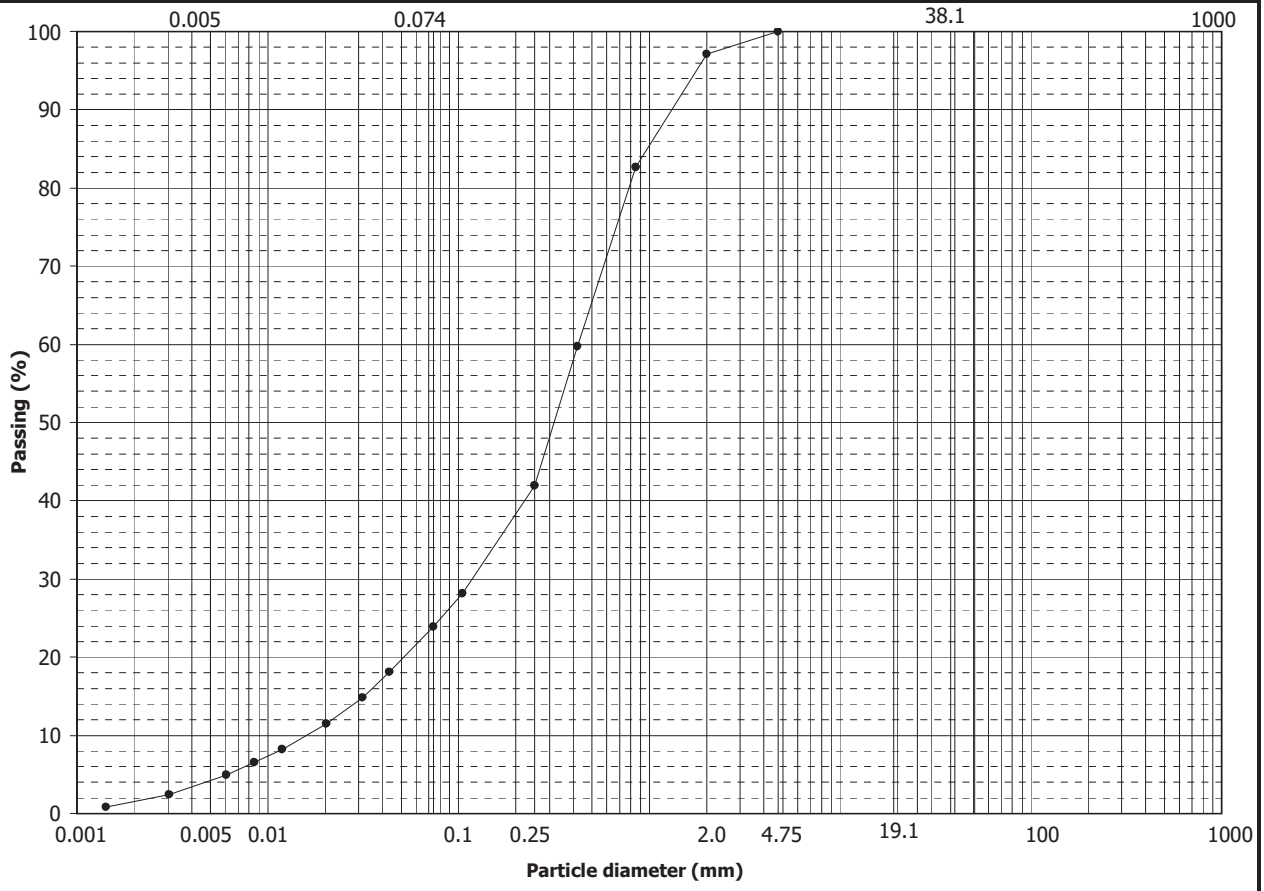
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**11.50 - 12.00**

SPECIFIC GRAVITY : **2.632**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	76.07	19.69	4.25	4.75	1.4358	0.4255	0.3271	0.1247	0.0164	25.94	97.11	59.71	23.93



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = 349.6 gr
Wt. container No ..... = 40.47 gr
Wt. Of air dry soil W' = 309.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **309.13** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	44.89	40.47	4.42		1.43	98.57

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	13.50 - 14.00

Wt. (Air dry soil + container) = 148.85 gr — Specific Gravity : 2.641
Wt. of container M-36 = 42.75 gr — Plasticity Index : %
Wt. Of air dry soil W' = 106.10 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 98.57 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-55			NO	J-08			NO	J-65		
WW	54.11	DW	53.66	WW	54.42	DW	54.02	WW	49.43	DW	48.99	Mean value	
DW	53.66	TW	39.94	DW	54.02	TW	41.21	DW	48.99	TW	34.25	w	
Ww	0.45	Ws	13.72	Ww	0.40	Ws	12.81	Ww	0.44	Ws	14.74	3.13	%
w	3.28	%		w	3.12	%		w	2.99	%			

$$W = \frac{100 \times W'}{100 + w} : 102.881 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.0	15.0	28	11.811	11.811	3.4367	0.01249	0.0429	12.00	18.77	18.50
2	12.5	13.5	28	12.189	6.095	2.4687	0.01249	0.0308	10.50	16.43	16.19
5	11.0	12.0	28	12.568	2.514	1.5854	0.01249	0.0198	9.00	14.08	13.88
15	9.0	10.0	28	13.072	0.871	0.9335	0.01249	0.0117	7.00	10.95	10.79
30	8.0	9.0	28	13.325	0.444	0.6664	0.01249	0.0083	6.00	9.39	9.25
60	7.0	8.0	28	13.577	0.226	0.4757	0.01249	0.0059	5.00	7.82	7.71
240	5.5	6.5	29	13.955	0.058	0.2411	0.01235	0.0030	3.50	5.48	5.40
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01249	0.0014	2.50	3.91	3.85

P = 100/W = 0.972

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6094$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	34.95	22.02	12.930		12.57	87.43	86.18
0.42	53.91		31.890		31.00	69.00	68.02
0.25	74.11		52.090		50.63	49.37	48.66
0.105	95.65		73.630		71.57	28.43	28.03
0.074	100.28		78.260		76.07	23.93	23.59

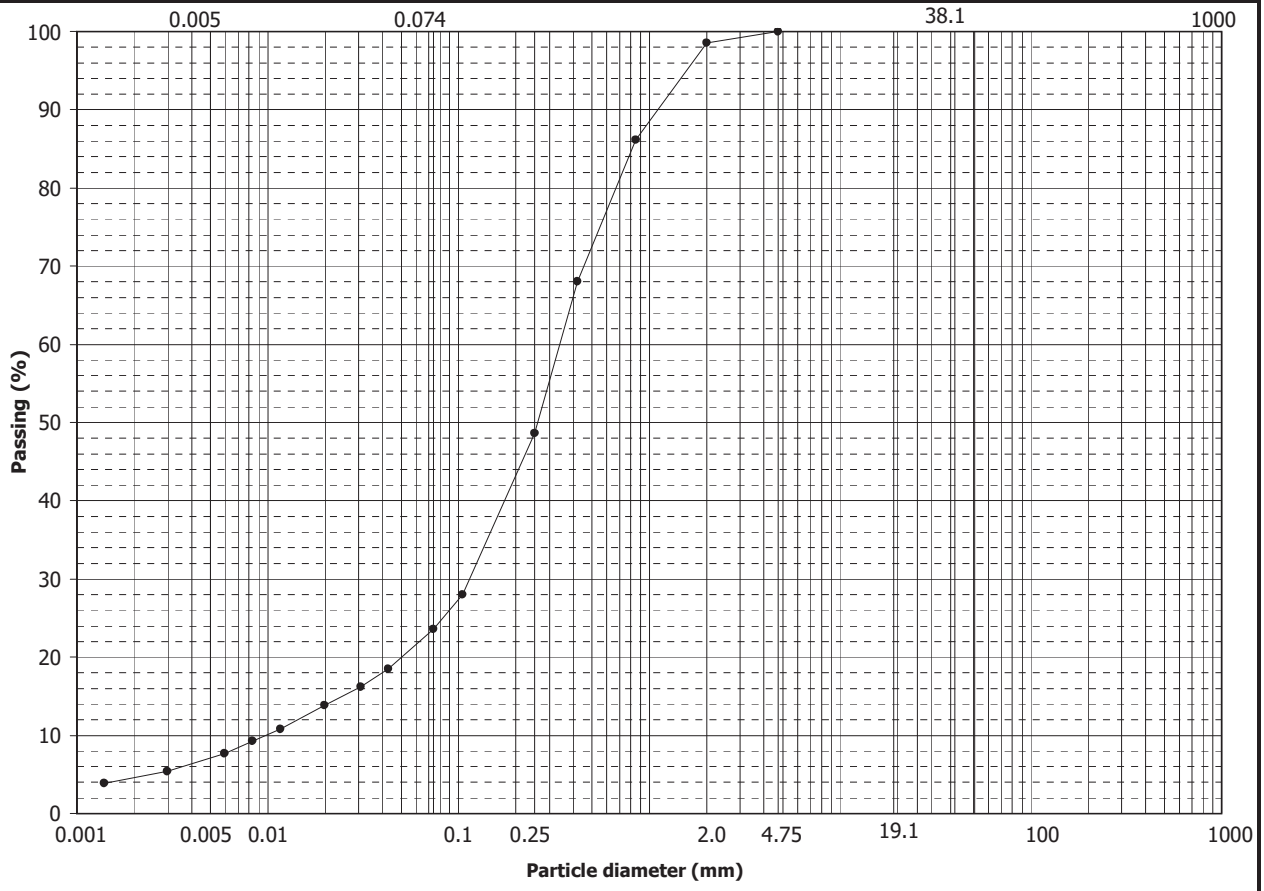
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**13.50 - 14.00**

SPECIFIC GRAVITY : **2.641**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	76.41	16.46	7.13	4.75	1.2044	0.3496	0.2617	0.1189	0.0099	35.17	98.57	68.02	23.59



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 236.1 gr
Wt. container No ..... = 34.90 gr
Wt. Of air dry soil W' = 201.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **201.20** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	35.32	34.90	0.42		0.21	99.79

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	15.50 - 16.00

Wt. (Air dry soil + container) = 136.81 gr — Specific Gravity : 2.643
Wt. of container B-19 = 34.89 gr — Plasticity Index : %
Wt. Of air dry soil W' = 101.92 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 99.79 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-68			NO	J-06			NO	J-39		
WW	49.80	DW	49.36	WW	53.12	DW	52.75	WW	49.77	DW	49.38	Mean value	
DW	49.36	TW	35.44	DW	52.75	TW	40.48	DW	49.38	TW	37.11	w	
Ww	0.44	Ws	13.92	Ww	0.37	Ws	12.27	Ww	0.39	Ws	12.27	3.12	%
w	3.16	%		w	3.02	%		w	3.18	%			

$$W = \frac{100 \times W'}{100 + w} : 98.838 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.5	14.5	28	11.937	11.937	3.4550	0.01248	0.0431	11.50	18.72	18.68
2	12.0	13.0	28	12.315	6.158	2.4815	0.01248	0.0310	10.00	16.28	16.24
5	10.0	11.0	28	12.820	2.564	1.6012	0.01248	0.0200	8.00	13.02	12.99
15	8.0	9.0	28	13.325	0.888	0.9425	0.01248	0.0118	6.00	9.77	9.74
30	7.0	8.0	28	13.577	0.453	0.6727	0.01248	0.0084	5.00	8.14	8.12
60	6.0	7.0	28	13.829	0.230	0.4801	0.01248	0.0060	4.00	6.51	6.50
240	4.5	5.5	29	14.208	0.059	0.2433	0.01235	0.0030	2.50	4.07	4.06
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01248	0.0014	1.50	2.44	2.44

P = 100/W = 1.0118

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6086$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	29.66	22.02	7.640		7.73	92.27	92.08
0.42	49.56		27.540		27.86	72.14	71.99
0.25	72.11		50.090		50.68	49.32	49.22
0.105	91.05		69.030		69.84	30.16	30.10
0.074	96.45		74.430		75.30	24.70	24.64

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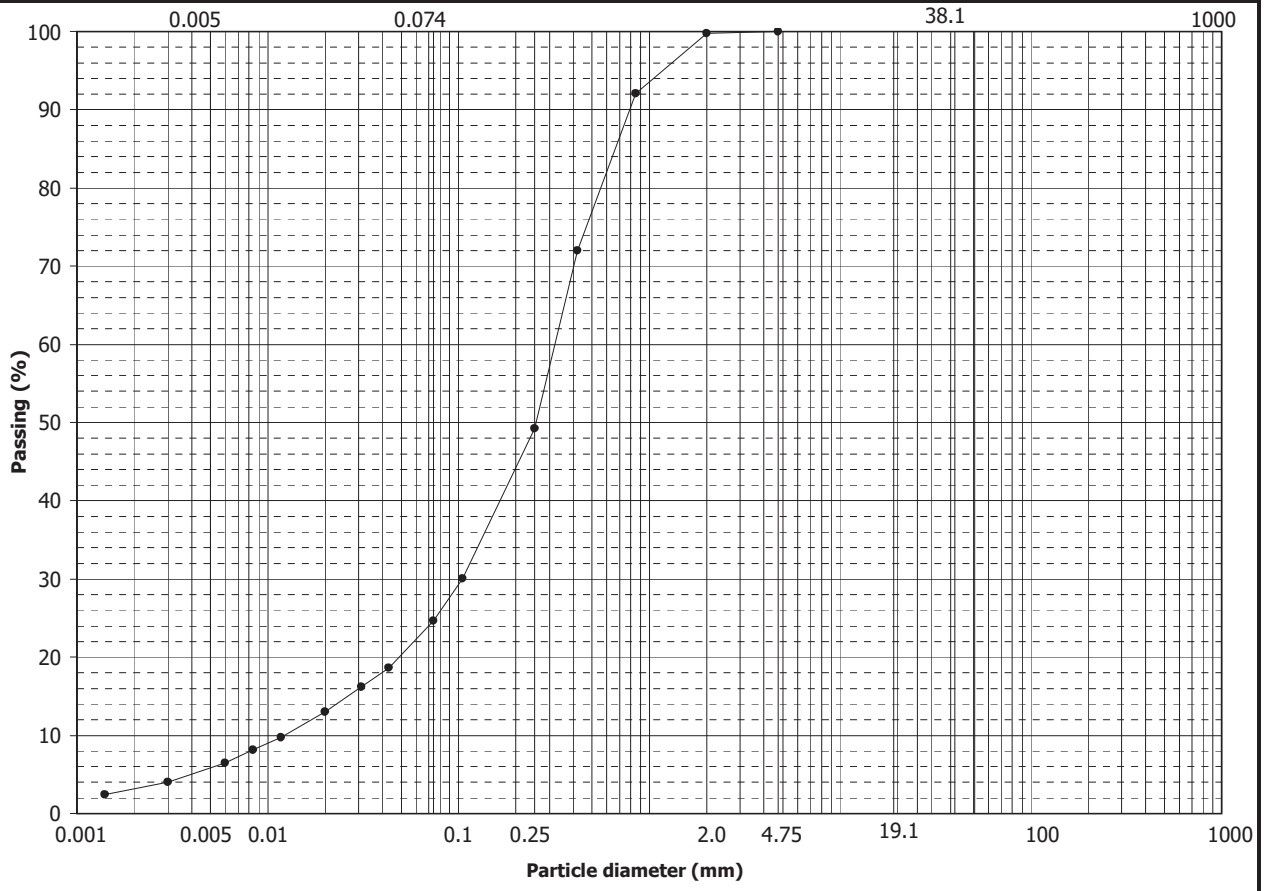
BUMN
Hadir untuk negeri

RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**15.50 - 16.00**

SPECIFIC GRAVITY : **2.643**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	75.36	18.79	5.86	4.75	0.8055	0.3305	0.2558	0.1045	0.0124	26.64	99.79	71.99	24.64



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**17.50 - 18.00**

Wt. (Air dry soil + container) = 191.7 gr
Wt. container No ..... = 44.69 gr
Wt. Of air dry soil W' = 147.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **147.01** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	61.20	44.69	16.51		11.23	88.77
4.75	73.40		28.71		19.53	80.47
2.00	88.93		44.24		30.09	69.91

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	17.50 - 18.00

Wt. (Air dry soil + container) = 137.25 gr — Specific Gravity : 2.661
Wt. of container M-53 = 41.84 gr — Plasticity Index : %
Wt. Of air dry soil W' = 95.41 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 69.91 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-60			NO	J-21			NO	J-56		
WW	55.07	DW	54.74	WW	54.25	DW	53.96	WW	54.70	DW	54.44	Mean value	
DW	54.74	TW	37.82	DW	53.96	TW	36.56	DW	54.44	TW	39.44	w	
Ww	0.33	Ws	16.92	Ww	0.29	Ws	17.40	Ww	0.26	Ws	15.00	1.78	%
w	1.95	%		w	1.67	%		w	1.73	%			

$$W = \frac{100 \times W'}{100 + w} : 93.738 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	28	12.063	12.063	3.4732	0.01241	0.0431	11.00	18.80	13.14
2	11.0	12.0	28	12.568	6.284	2.5068	0.01241	0.0311	9.00	15.38	10.75
5	9.0	10.0	28	13.072	2.614	1.6169	0.01241	0.0201	7.00	11.96	8.36
15	7.0	8.0	28	13.577	0.905	0.9514	0.01241	0.0118	5.00	8.55	5.97
30	6.0	7.0	28	13.829	0.461	0.6789	0.01241	0.0084	4.00	6.84	4.78
60	5.0	6.0	28	14.081	0.235	0.4844	0.01241	0.0060	3.00	5.13	3.58
240	3.5	4.5	29	14.460	0.060	0.2455	0.01228	0.0030	1.50	2.56	1.79
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01241	0.0014	1.00	1.71	1.19

P = 100/W = 1.0668

$$Mx = \frac{Gs}{Gs - 1} = 1.6020$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	45.26	22.02	23.240		24.79	75.21	52.58
0.42	62.57		40.550		43.26	56.74	39.67
0.25	77.34		55.320		59.02	40.98	28.65
0.105	88.03		66.010		70.42	29.58	20.68
0.074	90.71		68.690		73.28	26.72	18.68

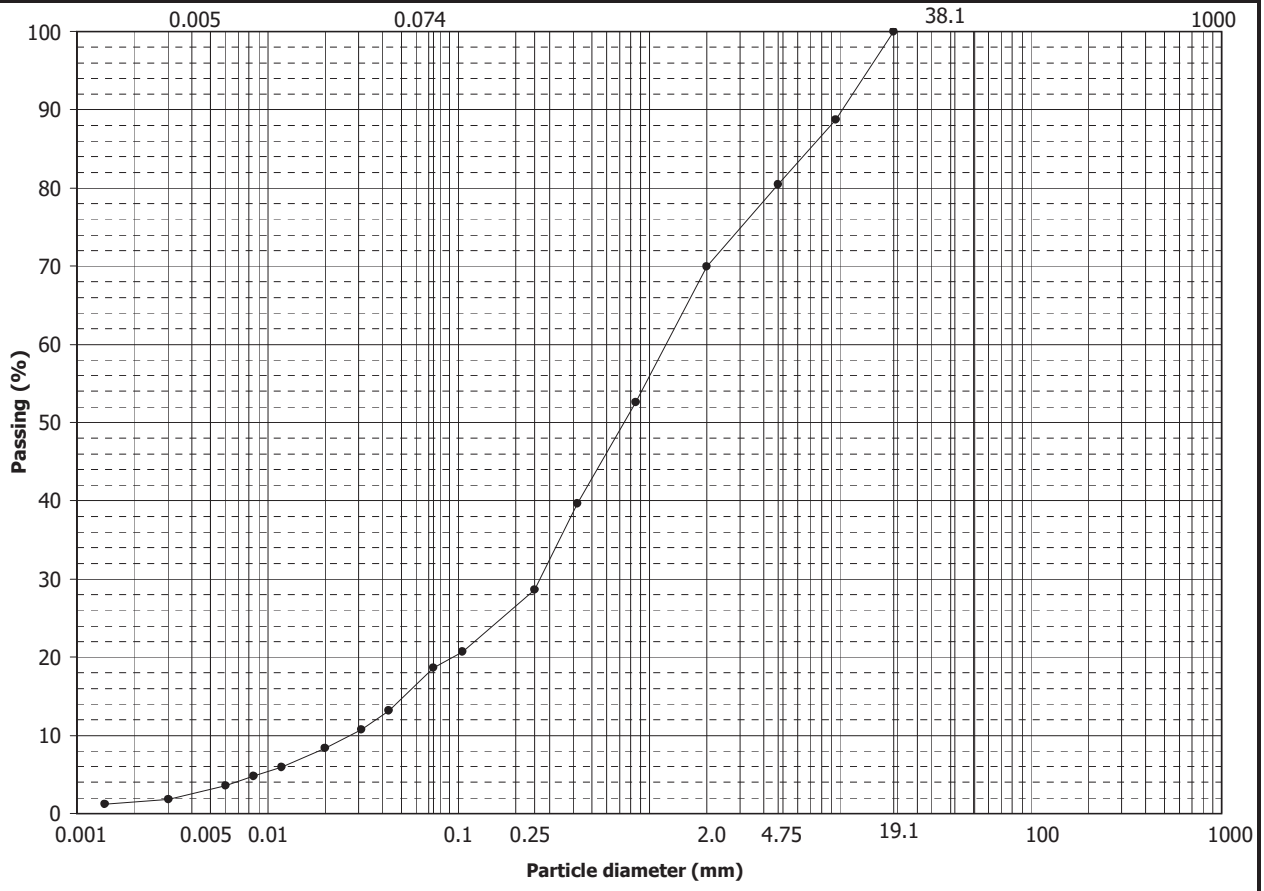
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**17.50 - 18.00**

SPECIFIC GRAVITY : **2.661**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
19.53	61.79	15.57	3.11	19.10	10.570	1.3427	0.7642	0.2708	0.0276	48.58	69.91	39.67	18.68



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = 209.0 gr
Wt. container No ..... = 43.53 gr
Wt. Of air dry soil W' = 165.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **165.47** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	47.10	43.53	3.57		2.16	97.84
4.75	56.20		12.67		7.66	92.34
2.00	69.51		25.98		15.70	84.30

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	LERE INDUK - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 15	DEPTH	19.50 - 20.00

Wt. (Air dry soil + container) = 145.02 gr — Specific Gravity : 2.654
Wt. of container M-04 = 48.16 gr — Plasticity Index : %
Wt. Of air dry soil W' = 96.86 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 84.30 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-19			NO	J-42			NO	J-53		
WW	50.53	DW	50.24	WW	51.56	DW	51.29	WW	51.97	DW	51.69	Mean value	
DW	50.24	TW	37.77	DW	51.29	TW	39.10	DW	51.69	TW	38.74	w	
Ww	0.29	Ws	12.47	Ww	0.27	Ws	12.19	Ww	0.28	Ws	12.95	2.23	%
w	2.33	%		w	2.21	%		w	2.16	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 94.743 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	28	12.063	12.063	3.4732	0.01244	0.0432	11.00	18.63	15.70
2	11.0	12.0	28	12.568	6.284	2.5068	0.01244	0.0312	9.00	15.24	12.85
5	9.0	10.0	28	13.072	2.614	1.6169	0.01244	0.0201	7.00	11.86	9.99
15	7.0	8.0	28	13.577	0.905	0.9514	0.01244	0.0118	5.00	8.47	7.14
30	6.0	7.0	28	13.829	0.461	0.6789	0.01244	0.0084	4.00	6.77	5.71
60	5.0	6.0	28	14.081	0.235	0.4844	0.01244	0.0060	3.00	5.08	4.28
240	4.0	5.0	29	14.334	0.060	0.2444	0.01230	0.0030	2.00	3.39	2.86
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01244	0.0014	1.00	1.69	1.43

P = 100/W = 1.0555

$$Mx = \frac{G_s}{G_s - 1} = 1.6046$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	41.29	22.02	19.270		20.34	79.66	67.15
0.42	61.71		39.690		41.89	58.11	48.98
0.25	73.18		51.160		54.00	46.00	38.78
0.105	87.35		65.330		68.95	31.05	26.17
0.074	92.28		70.260		74.16	25.84	21.78

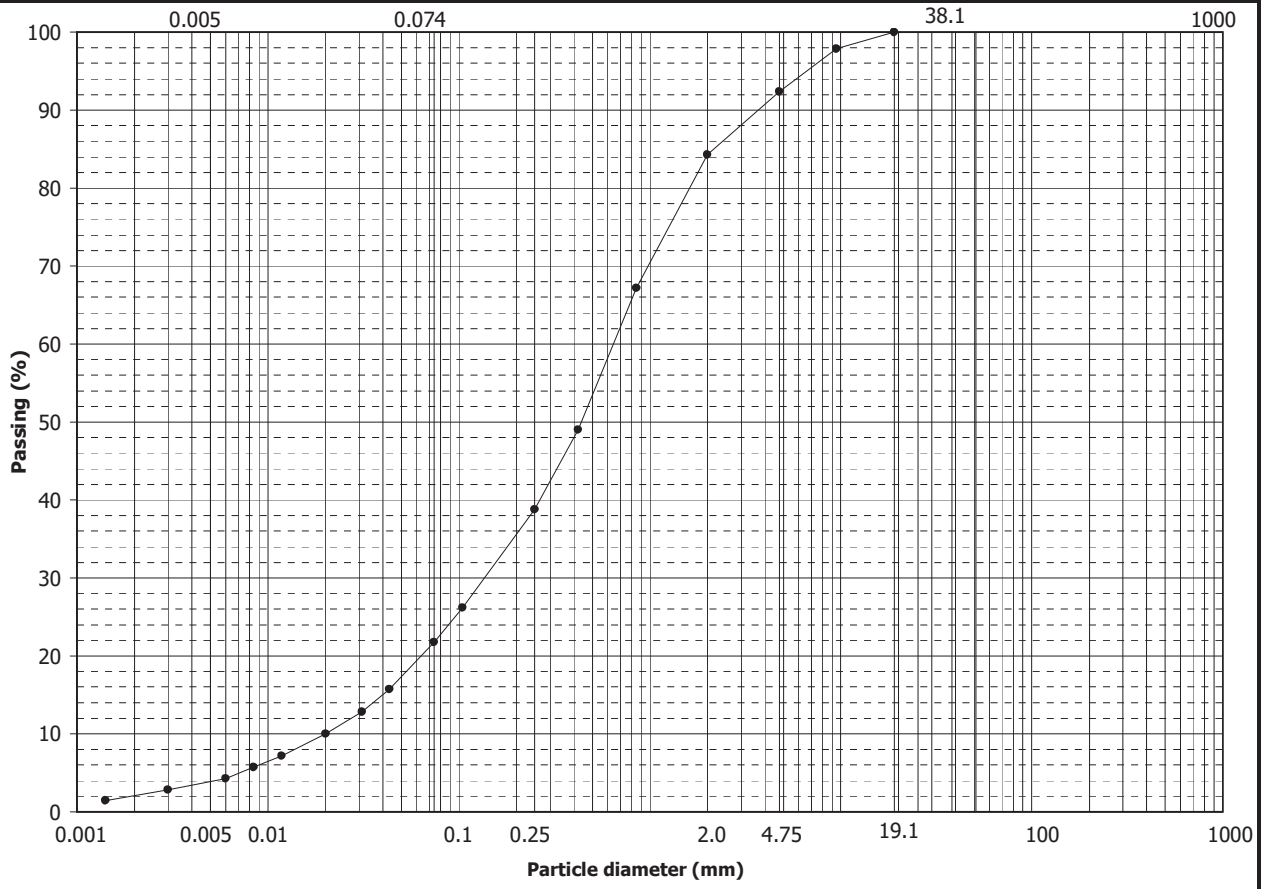
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 19, 2019
LOCATION	**LERE INDUK - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 15**	DEPTH	**19.50 - 20.00**

SPECIFIC GRAVITY : **2.654**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
7.66	70.56	17.88	3.90	19.10	3.9490	0.6807	0.4440	0.1490	0.0201	33.80	84.30	48.98	21.78



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

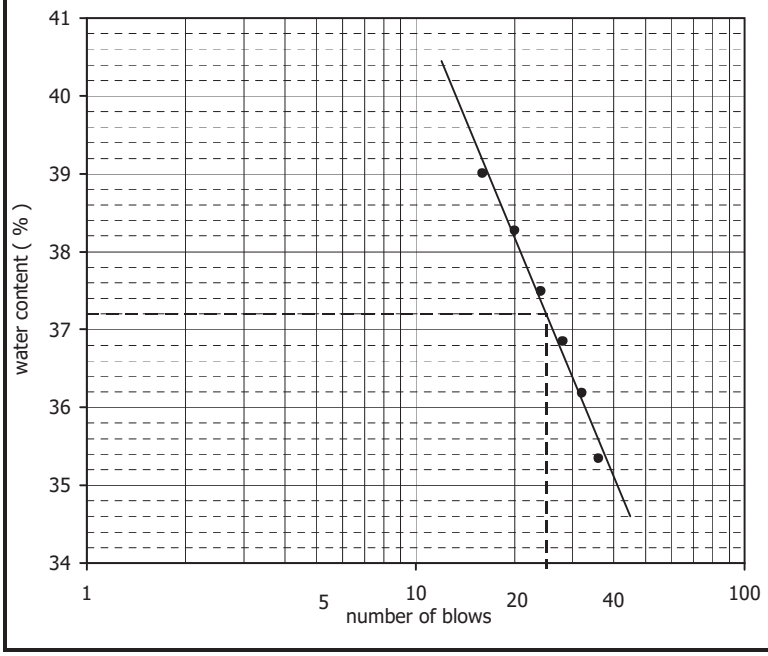
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		0.50 - 1.00

LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	T-34			No.	J-54			No.	T-40
WW	54.760	DW	50.130	WW	53.080	DW	48.850	WW	54.860	DW	50.670
DW	50.130	TW	37.030	DW	48.850	TW	37.160	DW	50.670	TW	39.300
Ww	4.630	Ws	13.100	Ww	4.230	Ws	11.690	Ww	4.190	Ws	11.370
	W =		35.34 %		W =		36.18 %		W =		36.85 %
4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	T-80			No.	J-88			No.	A-57
WW	56.700	DW	51.920	WW	52.290	DW	47.160	WW	60.630	DW	54.830
DW	51.920	TW	39.170	DW	47.160	TW	33.755	DW	54.830	TW	39.960
Ww	4.780	Ws	12.750	Ww	5.130	Ws	13.405	Ww	5.800	Ws	14.870
	W =		37.49 %		W =		38.27 %		W =		39.00 %

PLASTIC LIMIT

1				2				3			
		No.	A-18			No.	T-32			No.	A-103
WW	58.350	DW	54.930	WW	57.060	DW	53.390	WW	56.890	DW	53.210
DW	54.930	TW	40.870	DW	53.390	TW	38.760	DW	53.210	TW	38.230
Ww	3.420	Ws	14.060	Ww	3.670	Ws	14.630	Ww	3.680	Ws	14.980
	W =		24.32 %		W =		25.09 %		W =		24.57 %



LIQUID LIMIT	=	37.20	%
PLASTIC LIMIT	=	24.66	%
PLASTICITY INDEX	=	12.54	%
FLOW INDEX	=	10.18	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		1.50 - 2.00

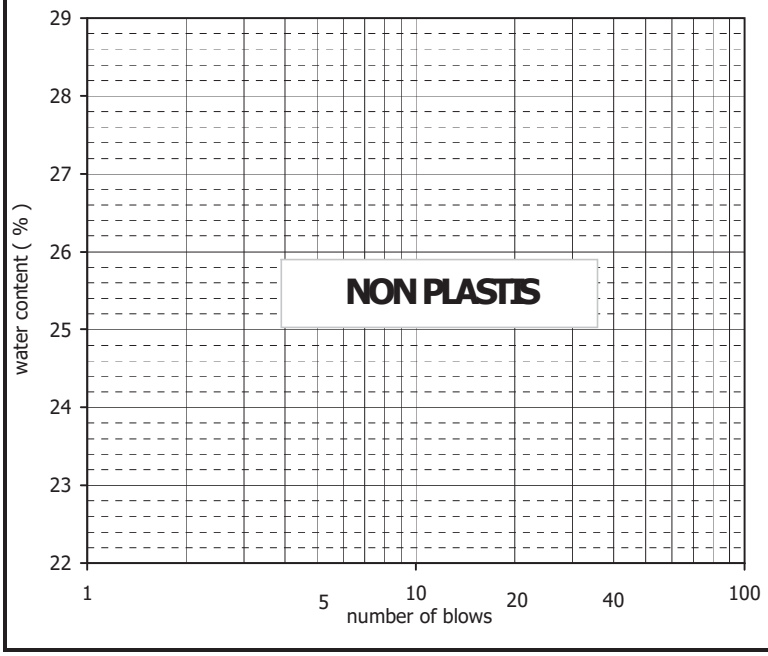
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

PT INDRA KARYA (PERSERO)
ENGINEERING, DEVELOPER and INDUSTRY
TRUST and KNOWLEDGE
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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		2.50 - 3.00

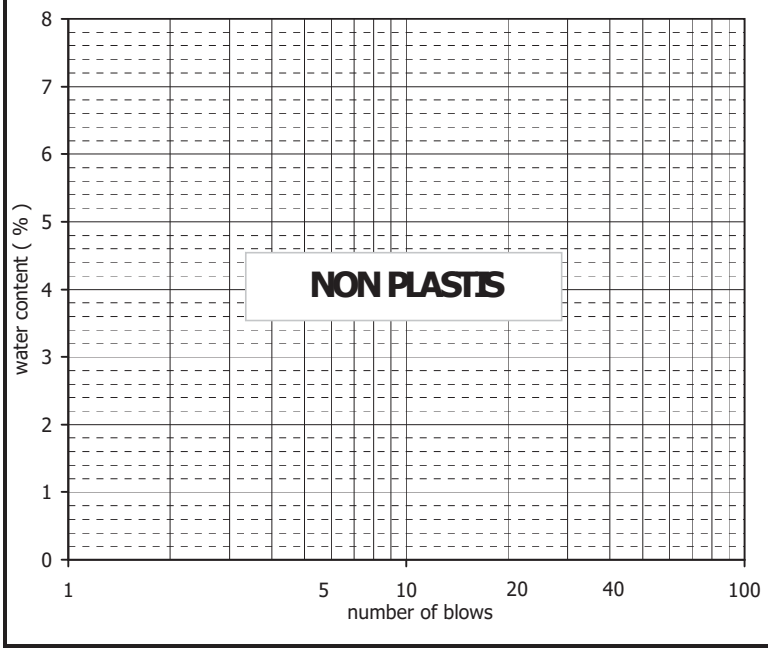
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		3.50 - 4.00

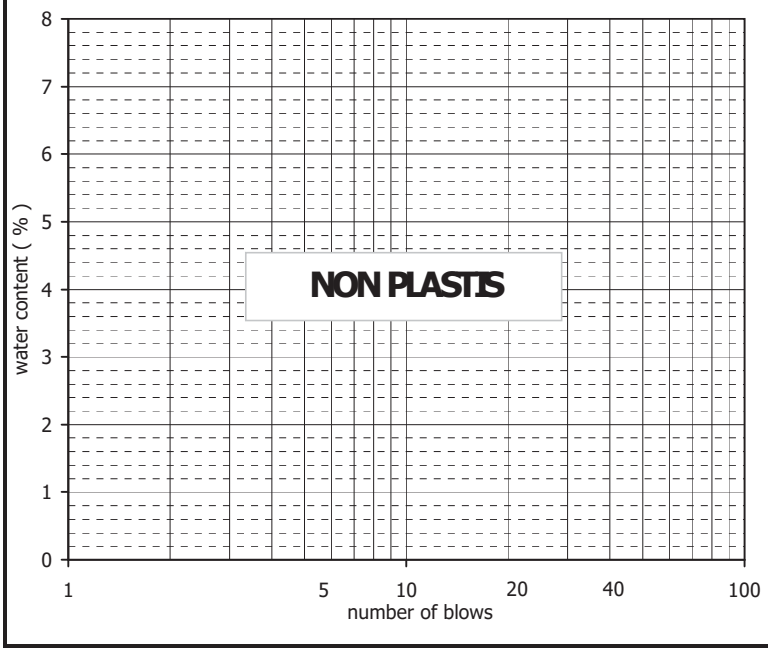
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		4.50 - 5.00

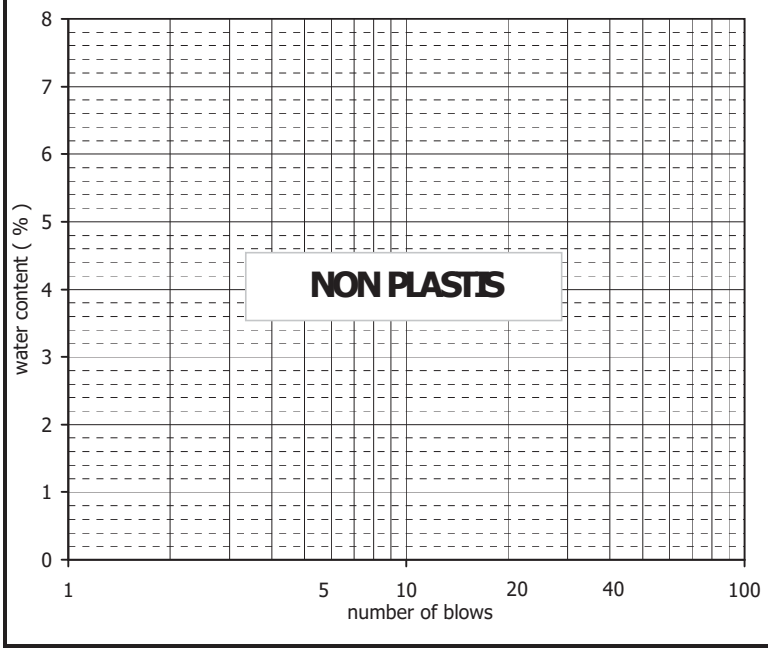
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		5.50 - 6.00

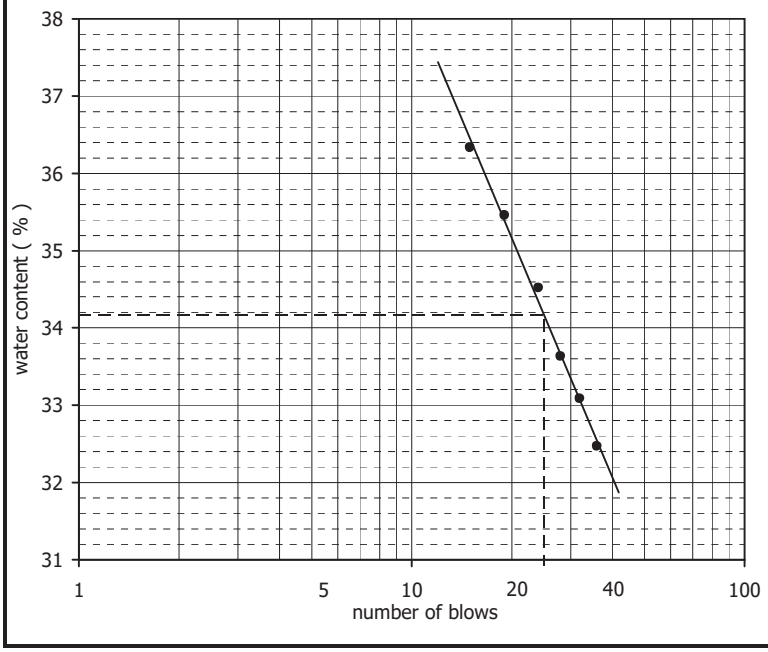
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	J-74			No.	T-41			No.	A-66
WW	56.280	DW	51.900	WW	56.970	DW	52.460	WW	53.380	DW	49.640
DW	51.900	TW	38.410	DW	52.460	TW	38.830	DW	49.640	TW	38.520
Ww	4.380	Ws	13.490	Ww	4.510	Ws	13.630	Ww	3.740	Ws	11.120
	W =		32.47 %		W =		33.09 %		W =		33.63 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	A-08			No.	A-78			No.	L-16
WW	56.150	DW	51.700	WW	54.300	DW	50.130	WW	55.690	DW	51.330
DW	51.700	TW	38.810	DW	50.130	TW	38.370	DW	51.330	TW	39.330
Ww	4.450	Ws	12.890	Ww	4.170	Ws	11.760	Ww	4.360	Ws	12.000
	W =		34.52 %		W =		35.46 %		W =		36.33 %

PLASTIC LIMIT

1				2				3			
		No.	T-22			No.	T-67			No.	T-21
WW	55.120	DW	51.820	WW	51.950	DW	48.870	WW	54.930	DW	51.670
DW	51.820	TW	38.040	DW	48.870	TW	36.130	DW	51.670	TW	37.910
Ww	3.300	Ws	13.780	Ww	3.080	Ws	12.740	Ww	3.260	Ws	13.760
	W =		23.95 %		W =		24.18 %		W =		23.69 %



LIQUID LIMIT	=	34.18	%
PLASTIC LIMIT	=	23.94	%
PLASTICITY INDEX	=	10.24	%
FLOW INDEX	=	10.23	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		7.50 - 8.00

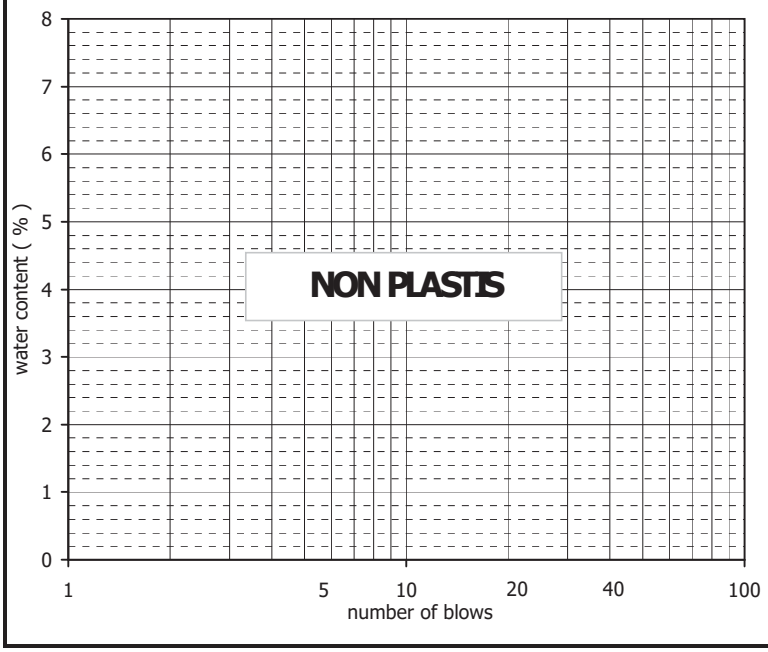
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		7.50 - 8.00

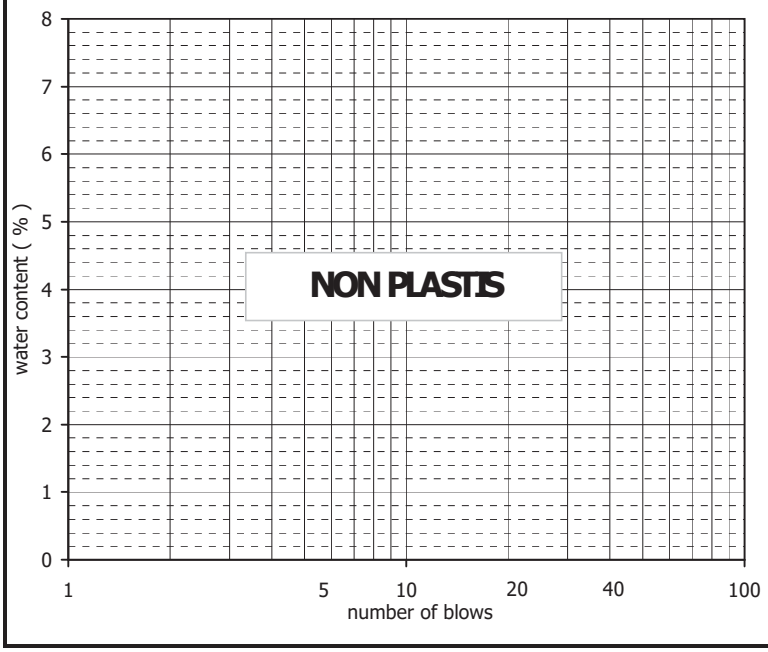
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		8.50 - 9.00

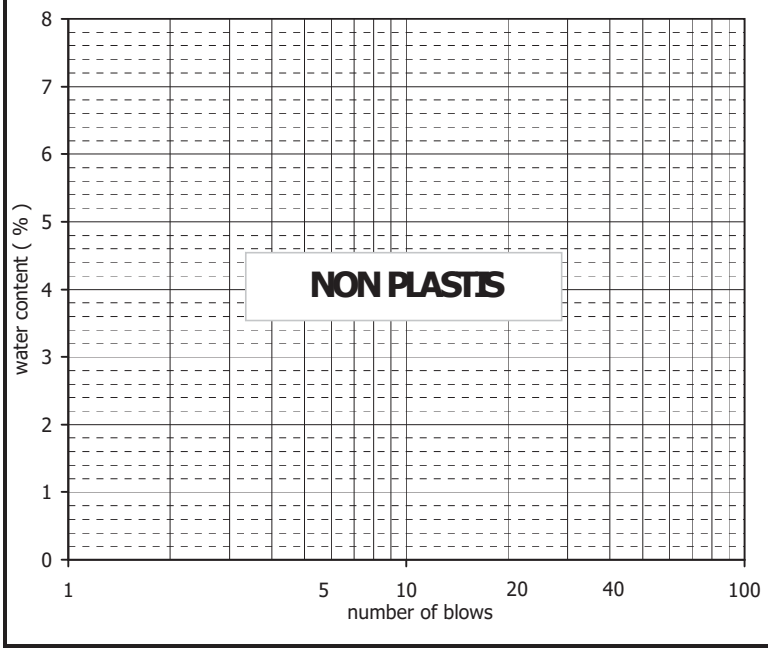
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		9.50 - 10.00

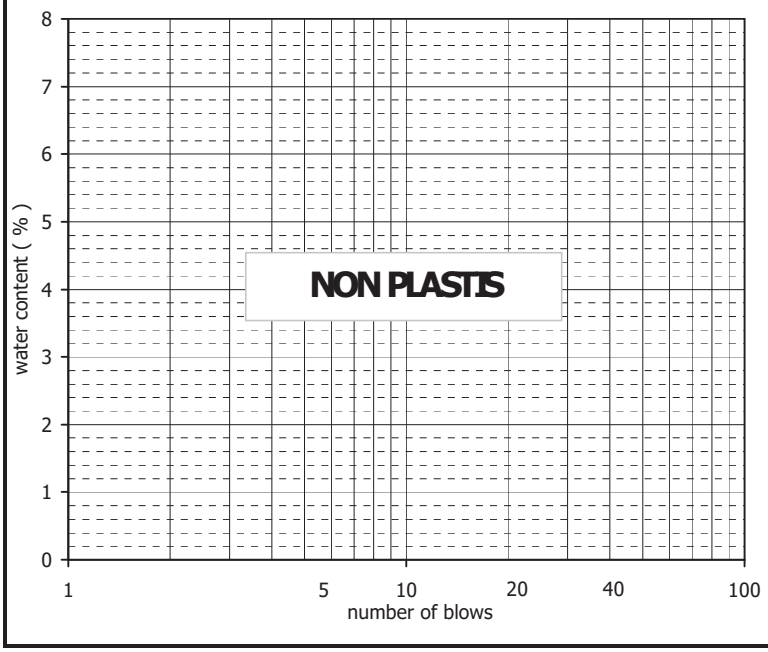
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		11.50 - 12.00

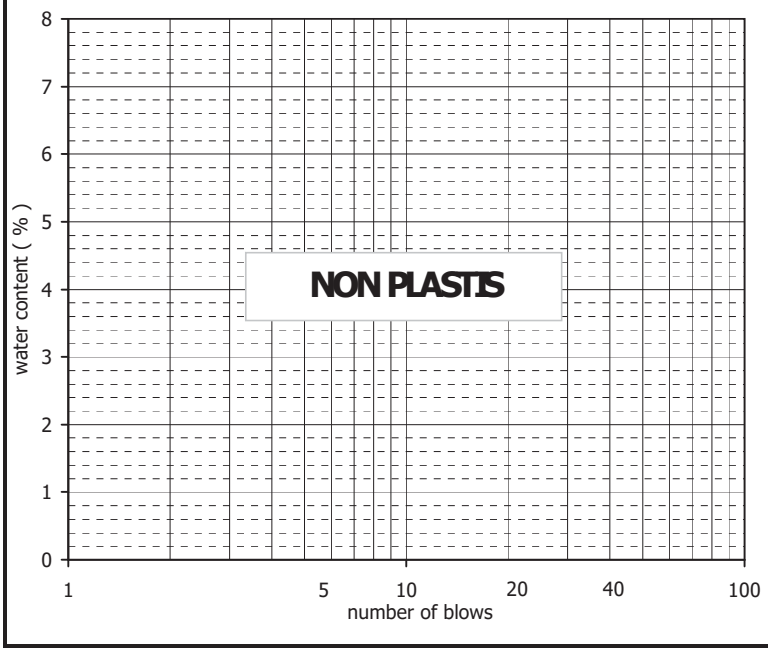
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		13.50 - 14.00

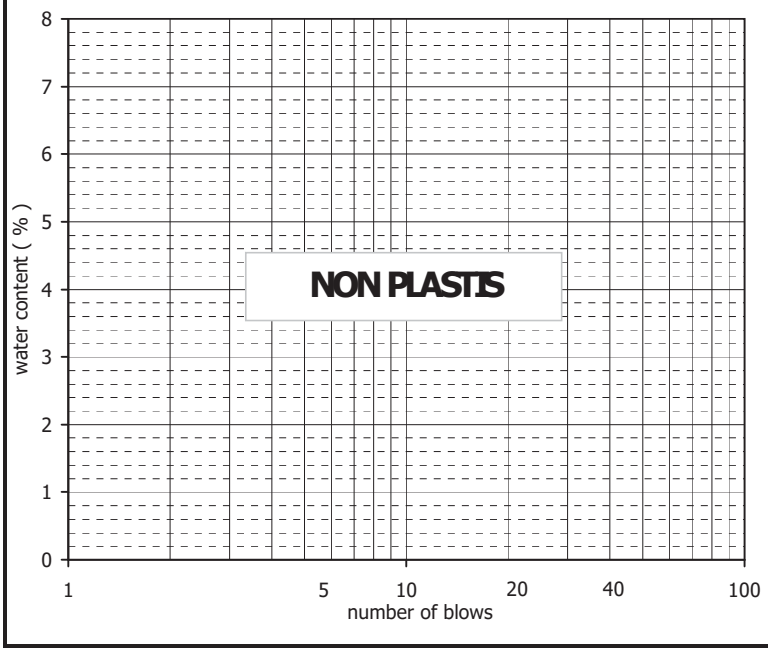
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		15.50 - 16.00

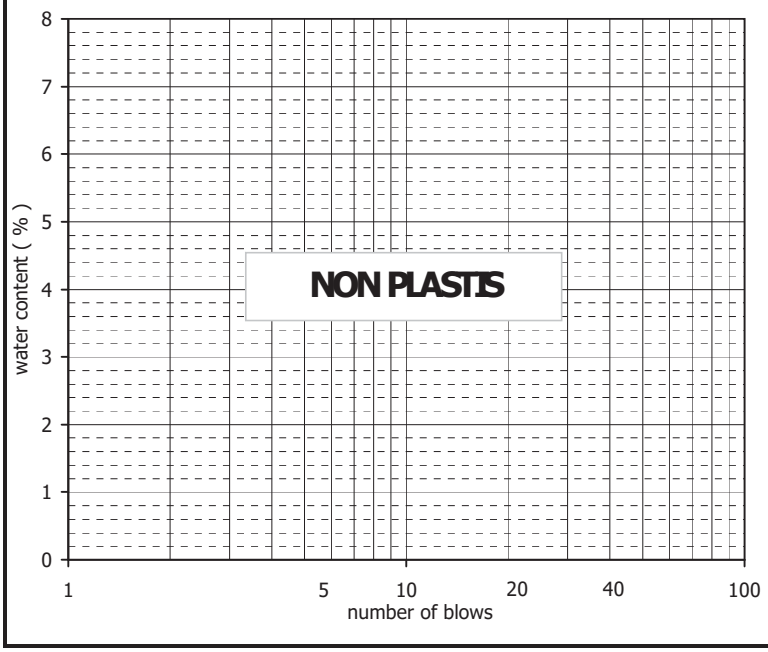
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		17.50 - 18.00

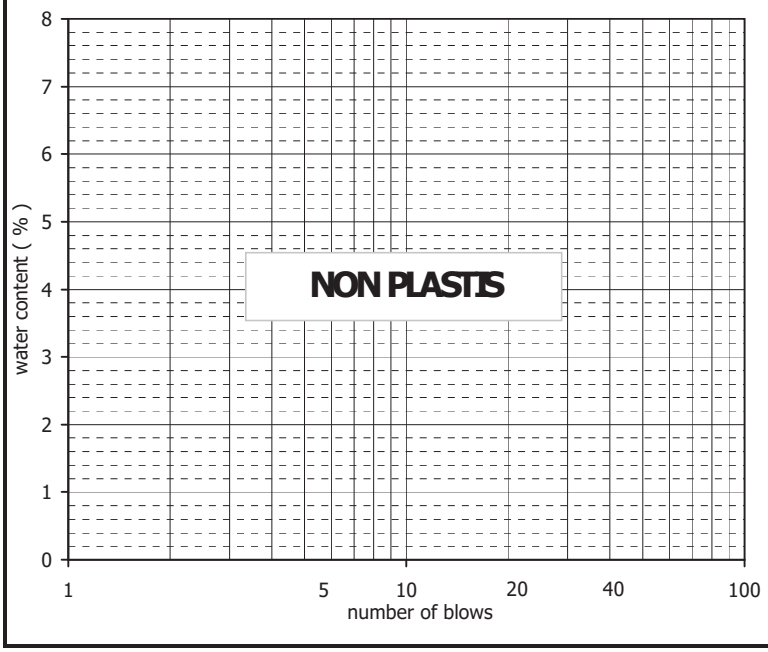
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 14, 2019
LOCATION	:	LERE INDUK - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 15	DEPTH (m)		19.50 - 20.00

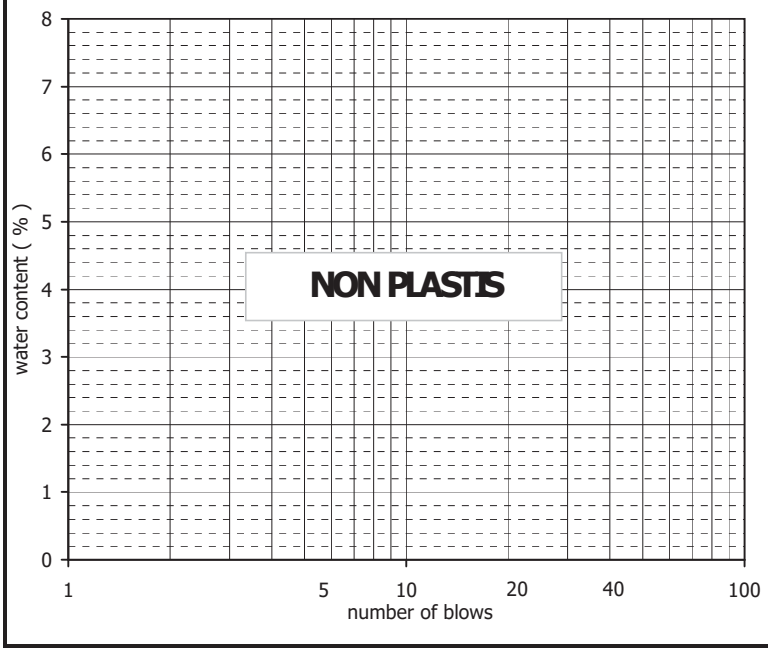
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**LABUAN - DONGGALA**									
SAMPLE No			BAY - 16	BAY - 16	BAY - 16	BAY - 16	BAY - 16	BAY - 16	BAY - 16	BAY - 16	BAY - 16
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	8.50 - 9.00	9.50 - 10.00
PROPERTIES	Natural Water Content	(%)	6.25	29.69	6.66	16.02	26.32	26.57	8.04	8.18	8.63
	Specific gravity of soil	*Gs*	2.697	2.680	2.706	2.673	2.675	2.667	2.719	2.711	2.705
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	31.31	9.24	25.40	26.03	7.51	8.86	33.67	31.21	28.81
	Proportion – Sand part	(%)	50.38	50.91	51.29	54.15	41.88	56.05	59.06	55.10	55.12
	Proportion – Silt part	(%)	14.82	29.61	16.77	14.89	30.85	26.89	5.56	8.88	10.58
	Proportion – Clay part	(%)	3.48	10.24	6.54	4.92	19.75	8.20	1.70	4.81	5.49
	Max. diameter	(mm)	19.10	19.10	19.10	19.10	19.10	25.40	19.10	19.10	19.10
	90 % diameter	(mm)	13.2488	4.1566	9.8005	11.1232	1.8626	3.9480	13.0789	12.2226	10.0073
	60 % diameter	(mm)	2.6359	0.1964	1.6309	1.4957	0.1035	0.1832	3.9197	3.5717	2.8426
	50 % diameter	(mm)	1.2184	0.1270	0.7720	0.5567	0.0725	0.1076	2.6071	2.2316	1.6322
	30 % diameter	(mm)	0.3001	0.0362	0.1806	0.1476	0.0250	0.0584	1.0604	0.7758	0.4757
	10 % diameter	(mm)	0.0227	0.0050	0.0141	0.0336	-	0.0077	0.1440	0.0361	0.0232
	Uniformity Coefficient		115.97	39.67	116.06	44.50	-	23.93	27.22	98.88	122.63
	Passing # 200		18.31	39.84	23.31	19.82	50.61	35.09	7.26	13.69	16.06
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	27.47	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS
	Plastic limit	*PL* (%)					21.55				
	Plasticity index	*PI* (%)					5.92				
	Flow index						9.02				
	Unified Classification						CL - ML				

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**LABUAN - DONGGALA**									
SAMPLE No			BAY - 16	BAY - 16	BAY - 16	BAY - 16	BAY - 16				
DEPTH (m)			10.50 - 11.00	13.50 - 14.00	14.50 - 15.00	16.50 - 17.00	19.50 - 20.00				
PROPERTIES	Natural Water Content	(%)	9.01	7.13	12.98	8.93	8.88				
	Specific gravity of soil	*Gs*	2.701	2.720	2.686	2.698	2.689				
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	9.96	39.21	11.78	16.22	9.68				
	Proportion – Sand part	(%)	67.73	46.31	68.35	57.06	63.00				
	Proportion – Silt part	(%)	15.82	8.42	14.77	15.85	15.54				
	Proportion – Clay part	(%)	6.49	6.06	5.10	10.88	11.79				
	Max. diameter	(mm)	19.10	19.10	19.10	19.10	19.10				
	90 % diameter	(mm)	4.7167	12.8486	6.3441	8.6414	4.6286				
	60 % diameter	(mm)	0.3720	4.6070	0.4170	1.2347	0.5506				
	50 % diameter	(mm)	0.2748	2.7900	0.3207	0.7060	0.3617				
	30 % diameter	(mm)	0.1266	0.7532	0.1510	0.1222	0.1065				
	10 % diameter	(mm)	0.0134	0.0287	0.0191	0.0043	0.0035				
	Uniformity Coefficient		27.74	160.33	21.84	287.77	155.69				
	Passing # 200		22.31	14.48	19.87	26.72	27.32				
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS				
	Plastic limit	*PL* (%)									
	Plasticity index	*PI* (%)									
	Flow index										
	Unified Classification										

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BUMN
Hadir untuk negeri

ISO 9001 CCBS-3417003
ISO 14001 CCBS-3418004
OHSAS 18001 CCBS-3418007

NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	LABUAN - DONGGALA

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	T-65								No	M-57	
11/02	BAY - 16		WW	66.26	DW	64.36			11/02	BAY - 16		WW	392.60	DW	364.70		
2019	0.50 - 1.00	6.25	DW	64.36	TW	33.94			2019	9.50 - 10.00	8.63	DW	364.70	TW	41.33		
			Ww	1.90	Ws	30.42						Ww	27.90	Ws	323.37		
				WC	(%)	6.25							WC	(%)	8.63		
					No	A-63								No	J-64		
11/02	BAY - 16		WW	108.55	DW	92.84			11/02	BAY - 16		WW	99.45	DW	94.29		
2019	1.50 - 2.00	29.69	DW	92.84	TW	39.92			2019	10.50 - 11.00	9.01	DW	94.29	TW	36.99		
			Ww	15.71	Ws	52.92						Ww	5.16	Ws	57.30		
				WC	(%)	29.69							WC	(%)	9.01		
					No	J-48								No	M-89		
11/02	BAY - 16		WW	90.46	DW	87.13			11/02	BAY - 16		WW	424.00	DW	398.90		
2019	2.50 - 3.00	6.66	DW	87.13	TW	37.11			2019	13.50 - 14.00	7.13	DW	398.90	TW	46.77		
			Ww	3.33	Ws	50.02						Ww	25.10	Ws	352.13		
				WC	(%)	6.66							WC	(%)	7.13		
					No	J-29								No	J-37		
11/02	BAY - 16		WW	107.40	DW	97.75			11/02	BAY - 16		WW	131.36	DW	120.40		
2019	3.50 - 4.00	16.02	DW	97.75	TW	37.51			2019	14.50 - 15.00	12.98	DW	120.40	TW	35.98		
			Ww	9.65	Ws	60.24						Ww	10.96	Ws	84.42		
				WC	(%)	16.02							WC	(%)	12.98		
					No	T-44								No	L-48		
11/02	BAY - 16		WW	103.12	DW	89.43			11/02	BAY - 16		WW	130.61	DW	122.85		
2019	4.50 - 5.00	26.32	DW	89.43	TW	37.41			2019	16.50 - 17.00	8.93	DW	122.85	TW	35.94		
			Ww	13.69	Ws	52.02						Ww	7.76	Ws	86.91		
				WC	(%)	26.32							WC	(%)	8.93		
					No	T-76								No	J-38		
11/02	BAY - 16		WW	103.18	DW	89.36			11/02	BAY - 16		WW	94.35	DW	89.72		
2019	5.50 - 6.00	26.57	DW	89.36	TW	37.34			2019	19.50 - 20.00	8.88	DW	89.72	TW	37.58		
			Ww	13.82	Ws	52.02						Ww	4.63	Ws	52.14		
				WC	(%)	26.57							WC	(%)	8.88		
					No	M-14								No			
11/02	BAY - 16		WW	440.90	DW	411.30						WW		DW			
2019	6.50 - 7.00	8.04	DW	411.30	TW	43.12						DW		TW			
			Ww	29.60	Ws	368.18						Ww		Ws			
				WC	(%)	8.04							WC	(%)			
					No	M-38								No			
11/02	BAY - 16		WW	348.90	DW	326.00						WW		DW			
2019	8.50 - 9.00	8.18	DW	326.00	TW	45.88						DW		TW			
			Ww	22.90	Ws	280.12						Ww		Ws			
				WC	(%)	8.18							WC	(%)			

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				50	26	51	
Weight of Pycnometer		Wf	(gr)	52.650	38.840	53.870	
Weight of (Pycnometer + Water)		Wa	(gr)	154.080	138.580	154.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	166.850	151.300	167.130	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.020	37.960	38.110	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.240	20.180	20.330	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	154.0800	138.5800	154.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.470	7.460	7.480	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.710	2.705	2.718	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.696	2.691	2.704	
Average Specific Gravity at 20° C							**2.697**

Remarks

PT INDRA KARYA (PERSERO)
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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				4	16	61	
Weight of Pycnometer		Wf	(gr)	65.900	66.000	37.700	
Weight of (Pycnometer + Water)		Wa	(gr)	167.100	169.300	146.520	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	179.840	182.280	159.330	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	38.400	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.620	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.1000	169.3000	146.5200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.640	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.692	2.699	2.692	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.678	2.685	2.678	
Average Specific Gravity at 20° C							**2.680**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				14	62	65	
Weight of Pycnometer		Wf	(gr)	69.710	41.480	34.080	
Weight of (Pycnometer + Water)		Wa	(gr)	170.370	152.370	134.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	183.470	165.250	147.190	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.490	38.160	38.210	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.710	20.380	20.430	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	170.3700	152.3700	134.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.610	7.500	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.721	2.717	2.720	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.707	2.703	2.706	
Average Specific Gravity at 20° C							**2.706**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				10	42	74	
Weight of Pycnometer		Wf	(gr)	67.070	39.190	38.550	
Weight of (Pycnometer + Water)		Wa	(gr)	168.920	142.220	138.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.720	154.930	151.300	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.150	38.050	37.950	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.370	20.270	20.170	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.9200	142.2200	138.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.560	7.500	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.691	2.681	2.689	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.677	2.667	2.676	
Average Specific Gravity at 20° C							**2.673**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				34	17	66	
Weight of Pycnometer		Wf	(gr)	52.710	64.940	36.290	
Weight of (Pycnometer + Water)		Wa	(gr)	152.200	169.440	136.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.850	182.250	148.900	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.910	38.180	37.880	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.130	20.400	20.100	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	152.2000	169.4400	136.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.480	7.590	7.480	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.691	2.688	2.687	
Coefficient for Temperature Correction K				0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.677	2.674	2.673	
Average Specific Gravity at 20° C							**2.675**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				40	8	48	
Weight of Pycnometer		Wf	(gr)	52.250	67.390	37.760	
Weight of (Pycnometer + Water)		Wa	(gr)	153.170	168.560	139.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	166.030	181.440	151.880	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.290	38.320	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.510	20.540	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	153.1700	168.5600	139.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.660	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.681	2.681	2.679	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.667	2.668	2.665	
Average Specific Gravity at 20° C							**2.667**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				38	6	28	
Weight of Pycnometer		Wf	(gr)	37.290	65.150	34.010	
Weight of (Pycnometer + Water)		Wa	(gr)	136.940	167.850	135.370	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.780	181.010	148.100	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.990	38.570	37.860	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.210	20.790	20.080	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9400	167.8500	135.3700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.370	7.630	7.350	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.742	2.725	2.732	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.728	2.711	2.718	
Average Specific Gravity at 20° C							**2.719**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				5	35	77	
Weight of Pycnometer		Wf	(gr)	65.390	37.070	39.760	
Weight of (Pycnometer + Water)		Wa	(gr)	168.330	136.920	139.850	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.200	149.620	152.670	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.080	37.880	38.020	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.300	20.100	20.240	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.3300	136.9200	139.8500	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.430	7.400	7.420	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.732	2.716	2.728	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.718	2.702	2.714	
Average Specific Gravity at 20° C							**2.711**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				33	39	9	
Weight of Pycnometer		Wf	(gr)	37.510	36.940	65.320	
Weight of (Pycnometer + Water)		Wa	(gr)	138.180	136.930	167.290	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.310	149.630	180.120	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.550	37.850	38.090	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.770	20.070	20.310	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1800	136.9300	167.2900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.640	7.370	7.480	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.719	2.723	2.715	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.705	2.709	2.701	
Average Specific Gravity at 20° C							**2.705**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	10.50 - 11.00

Determination No				1	2	3	4
No of Pycnometer				24	31	34	
Weight of Pycnometer		Wf	(gr)	38.140	34.630	52.710	
Weight of (Pycnometer + Water)		Wa	(gr)	137.560	134.510	152.200	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.390	147.280	164.900	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.120	37.960	37.890	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.340	20.180	20.110	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.5600	134.5100	152.2000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.510	7.410	7.410	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.708	2.723	2.714	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.694	2.709	2.700	
Average Specific Gravity at 20° C							**2.701**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	13.50 - 14.00

Determination No				1	2	3	4
No of Pycnometer				30	25	52	
Weight of Pycnometer		Wf	(gr)	38.460	43.080	52.420	
Weight of (Pycnometer + Water)		Wa	(gr)	138.140	146.430	153.990	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.920	159.400	166.880	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.930	38.210	38.120	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.150	20.430	20.340	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1400	146.4300	153.9900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.370	7.460	7.450	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.734	2.739	2.730	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.720	2.725	2.716	
Average Specific Gravity at 20° C							**2.720**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	14.50 - 15.00

Determination No				1	2	3	4
No of Pycnometer				29	12	53	
Weight of Pycnometer		Wf	(gr)	36.900	67.220	52.280	
Weight of (Pycnometer + Water)		Wa	(gr)	135.800	169.330	153.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.640	182.240	166.000	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.150	38.310	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.370	20.530	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8000	169.3300	153.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.620	7.550	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.705	2.694	2.699	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.691	2.680	2.685	
Average Specific Gravity at 20° C							**2.686**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	16.50 - 17.00

Determination No				1	2	3	4
No of Pycnometer				20	1	44	
Weight of Pycnometer		Wf	(gr)	68.510	62.150	38.880	
Weight of (Pycnometer + Water)		Wa	(gr)	168.600	165.770	139.990	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.640	178.500	152.870	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.420	37.960	38.180	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.640	20.180	20.400	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.6000	165.7700	139.9900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.600	7.450	7.520	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.716	2.709	2.713	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.702	2.695	2.699	
Average Specific Gravity at 20° C							**2.698**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 16	DEPTH	19.50 - 20.00

Determination No				1	2	3	4
No of Pycnometer				32	7	85	
Weight of Pycnometer		Wf	(gr)	51.260	68.750	38.870	
Weight of (Pycnometer + Water)		Wa	(gr)	151.350	169.400	138.670	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	163.980	182.320	151.390	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.810	38.320	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.030	20.540	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.3500	169.4000	138.6700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.400	7.620	7.460	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.707	2.696	2.705	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.693	2.682	2.691	
Average Specific Gravity at 20° C							**2.689**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 224.6 gr
Wt. container No ..... = 43.20 gr
Wt. Of air dry soil W' = 181.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **181.40** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	72.90	43.20	29.70		16.37	83.63
4.75	100.00		56.80		31.31	68.69
2.00	120.50		77.30		42.61	57.39

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	0.50 - 1.00

Wt. (Air dry soil + container) = 105.44 gr — Specific Gravity : 2.697
Wt. of container B-95 = 35.17 gr — Plasticity Index : %
Wt. Of air dry soil W' = 70.27 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 57.39 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-27			NO	J-37			NO	J-47		
WW	49.35	DW	49.01	WW	49.28	DW	48.99	WW	49.96	DW	49.68	Mean value	
DW	49.01	TW	35.23	DW	48.99	TW	35.98	DW	49.68	TW	38.23	w	
Ww	0.34	Ws	13.78	Ww	0.29	Ws	13.01	Ww	0.28	Ws	11.45	2.38	%
w	2.47	%		w	2.23	%		w	2.45	%			

$$W = \frac{100 \times W'}{100 + w} : 68.636 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	28	12.063	12.063	3.4732	0.01228	0.0427	11.00	25.47	14.62
2	11.0	12.0	28	12.568	6.284	2.5068	0.01228	0.0308	9.00	20.84	11.96
5	9.0	10.0	28	13.072	2.614	1.6169	0.01228	0.0199	7.00	16.21	9.30
15	7.0	8.0	28	13.577	0.905	0.9514	0.01228	0.0117	5.00	11.58	6.64
30	6.0	7.0	28	13.829	0.461	0.6789	0.01228	0.0083	4.00	9.26	5.32
60	5.0	6.0	28	14.081	0.235	0.4844	0.01228	0.0059	3.00	6.95	3.99
240	3.5	4.5	29	14.460	0.060	0.2455	0.01215	0.0030	1.50	3.47	1.99
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01228	0.0014	1.00	2.32	1.33

P = 100/W = 1.457

$$Mx = \frac{G_s}{G_s - 1} = 1.5893$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	35.02	22.02	13.000		18.94	81.06	46.52
0.42	48.33		26.310		38.33	61.67	35.39
0.25	57.47		35.450		51.65	48.35	27.75
0.105	66.56		44.540		64.89	35.11	20.15
0.074	68.76		46.740		68.10	31.90	18.31

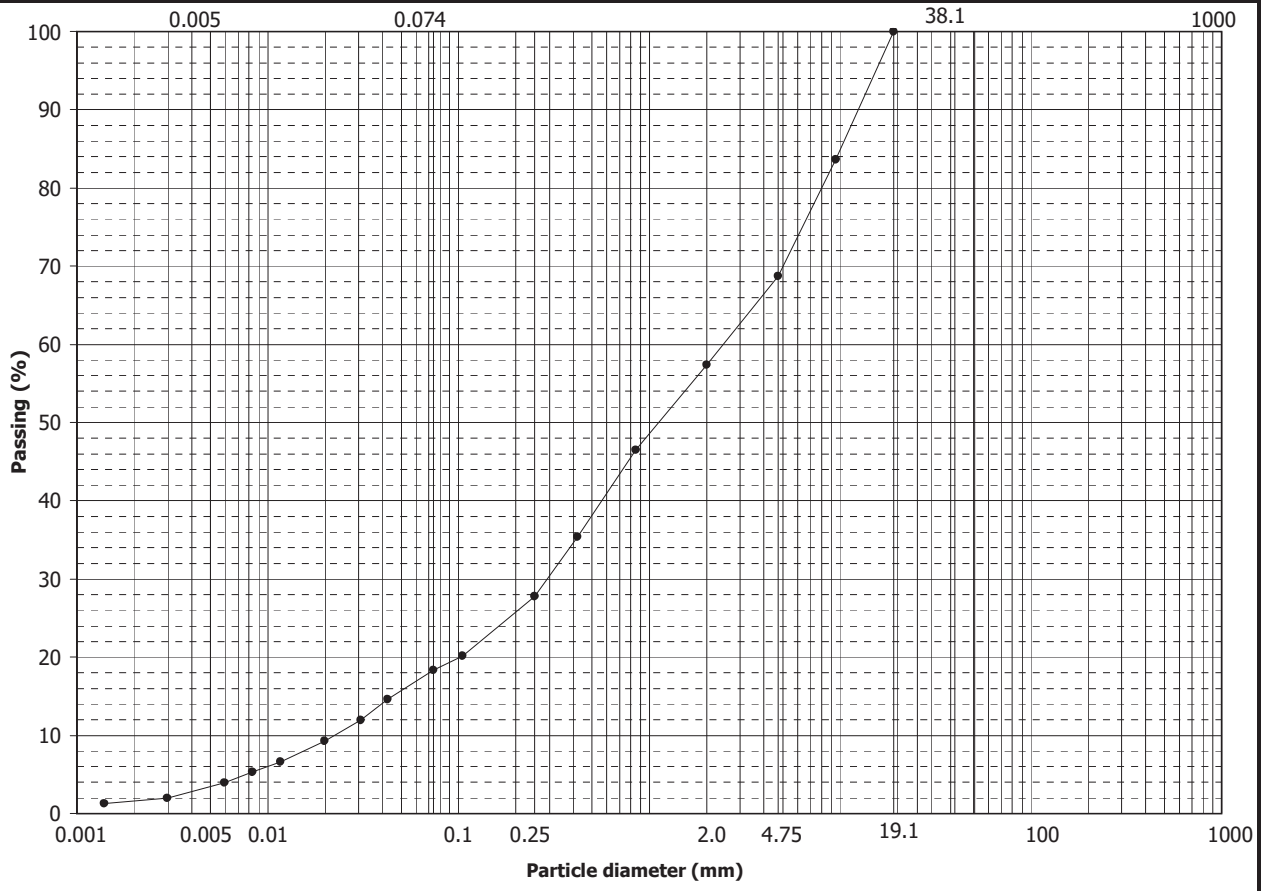
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.697**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
31.31	50.38	14.82	3.48	19.10	13.249	2.6359	1.2184	0.3001	0.0227	115.97	57.39	35.39	18.31



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 466.4 gr
Wt. container No ..... = 47.48 gr
Wt. Of air dry soil W' = 418.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **418.92** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	67.10	47.48	19.62		4.68	95.32
4.75	86.20		38.72		9.24	90.76
2.00	100.90		53.42		12.75	87.25

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	1.50 - 2.00

Wt. (Air dry soil + container) = 130.49 gr — Specific Gravity : 2.680
Wt. of container E-84 = 38.10 gr — Plasticity Index : %
Wt. Of air dry soil W' = 92.39 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 87.25 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-24			NO	J-38			NO	J-01		
WW	50.08	DW	49.56	WW	50.65	DW	50.23	WW	50.62	DW	50.27	Mean value	
DW	49.56	TW	33.27	DW	50.23	TW	37.58	DW	50.27	TW	38.73	w	
Ww	0.52	Ws	16.29	Ww	0.42	Ws	12.65	Ww	0.35	Ws	11.54	3.18	%
w	3.19	%		w	3.32	%		w	3.03	%			

$$W = \frac{100 \times W'}{100 + w} : 89.541 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	22.0	23.0	28	9.792	9.792	3.1293	0.01234	0.0386	20.00	35.63	31.09
2	19.0	20.0	28	10.549	5.275	2.2967	0.01234	0.0283	17.00	30.29	26.42
5	16.0	17.0	28	11.306	2.261	1.5037	0.01234	0.0186	14.00	24.94	21.76
15	13.0	14.0	28	12.063	0.804	0.8968	0.01234	0.0111	11.00	19.60	17.10
30	11.0	12.0	28	12.568	0.419	0.6472	0.01234	0.0080	9.00	16.03	13.99
60	9.0	10.0	28	13.072	0.218	0.4668	0.01234	0.0058	7.00	12.47	10.88
240	7.0	8.0	29	13.577	0.057	0.2378	0.01221	0.0029	5.00	8.91	7.77
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01234	0.0014	4.00	7.13	6.22

P = 100/W = 1.1168

$$Mx = \frac{G_s}{G_s - 1} = 1.5952$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	25.70	22.02	3.680		4.11	95.89	83.66
0.42	32.13		10.110		11.29	88.71	77.40
0.25	42.06		20.040		22.38	77.62	67.72
0.105	63.50		41.480		46.33	53.67	46.83
0.074	70.67		48.650		54.33	45.67	39.84

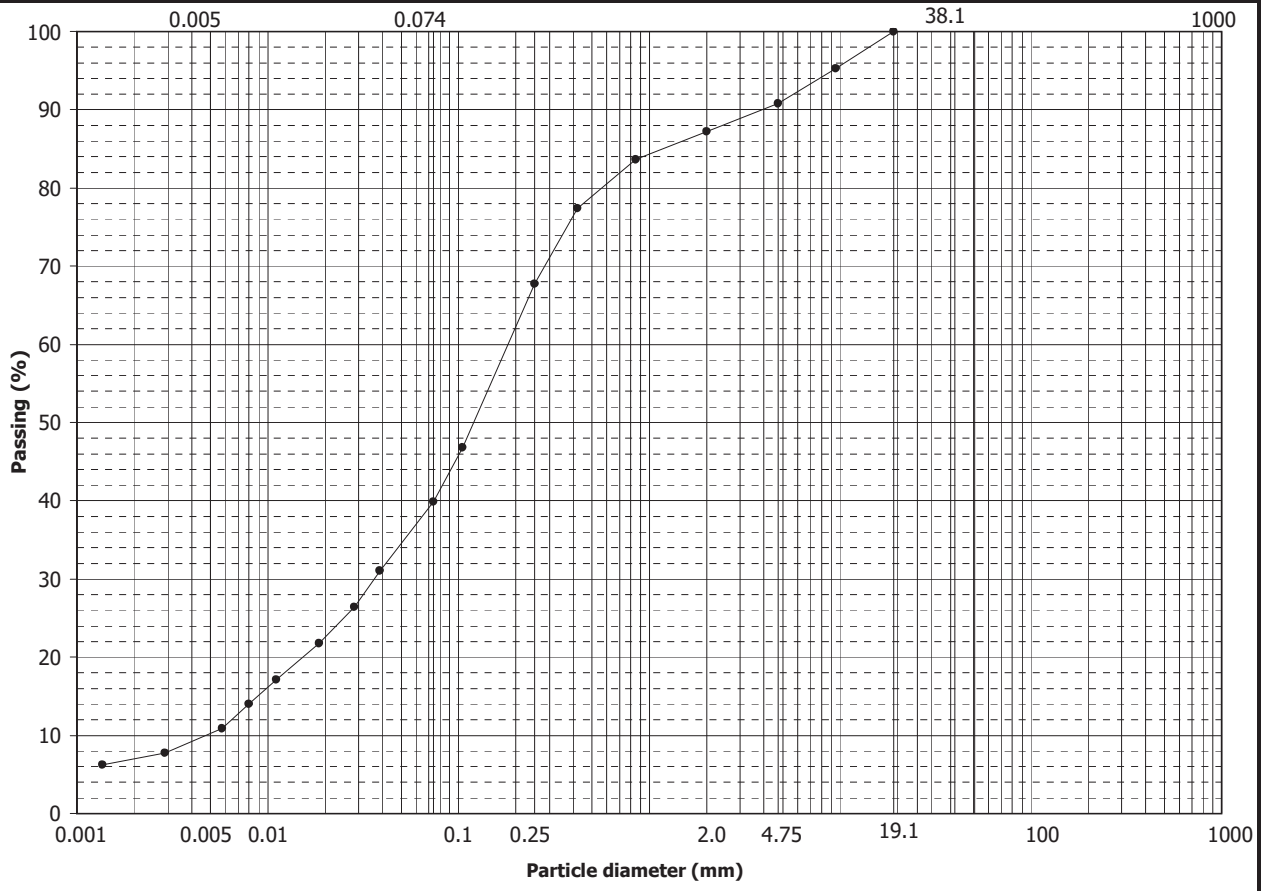
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.680**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
9.24	50.91	29.61	10.24	19.10	4.1566	0.1964	0.1270	0.0362	0.0050	39.67	87.25	77.40	39.84



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 299.4 gr
Wt. container No ..... = 41.09 gr
Wt. Of air dry soil W' = 258.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **258.31** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	67.70	41.09	26.61		10.30	89.70
4.75	106.70		65.61		25.40	74.60
2.00	134.40		93.31		36.12	63.88

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	2.50 - 3.00

Wt. (Air dry soil + container) = 122.32 gr — Specific Gravity : 2.706
Wt. of container B-76 = 33.19 gr — Plasticity Index : %
Wt. Of air dry soil W' = 89.13 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 63.88 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-11			NO	J-28			NO	J-09		
WW	51.64	DW	51.47	WW	49.18	DW	49.03	WW	52.20	DW	52.07	Mean value	
DW	51.47	TW	39.43	DW	49.03	TW	36.12	DW	52.07	TW	40.12	w	
Ww	0.17	Ws	12.04	Ww	0.15	Ws	12.91	Ww	0.13	Ws	11.95	1.22	%
w	1.41	%		w	1.16	%		w	1.09	%			

$$W = \frac{100 \times W'}{100 + w} : 88.055 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	28	11.054	11.054	3.3247	0.01225	0.0407	15.00	27.02	17.26
2	15.0	16.0	28	11.558	5.779	2.4040	0.01225	0.0294	13.00	23.42	14.96
5	12.0	13.0	28	12.315	2.463	1.5694	0.01225	0.0192	10.00	18.01	11.51
15	10.0	11.0	28	12.820	0.855	0.9245	0.01225	0.0113	8.00	14.41	9.21
30	9.0	10.0	28	13.072	0.436	0.6601	0.01225	0.0081	7.00	12.61	8.05
60	8.0	9.0	28	13.325	0.222	0.4712	0.01225	0.0058	6.00	10.81	6.90
240	6.5	7.5	29	13.703	0.057	0.2389	0.01212	0.0029	4.50	8.11	5.18
1140	5.5	6.5	28	13.955	0.012	0.1106	0.01225	0.0014	3.50	6.30	4.03

P = 100/W = 1.1357

$$Mx = \frac{G_s}{G_s - 1} = 1.5862$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	38.67	22.02	16.650		18.91	81.09	51.80
0.42	52.33		30.310		34.42	65.58	41.89
0.25	63.51		41.490		47.12	52.88	33.78
0.105	74.39		52.370		59.47	40.53	25.89
0.074	77.94		55.920		63.51	36.49	23.31

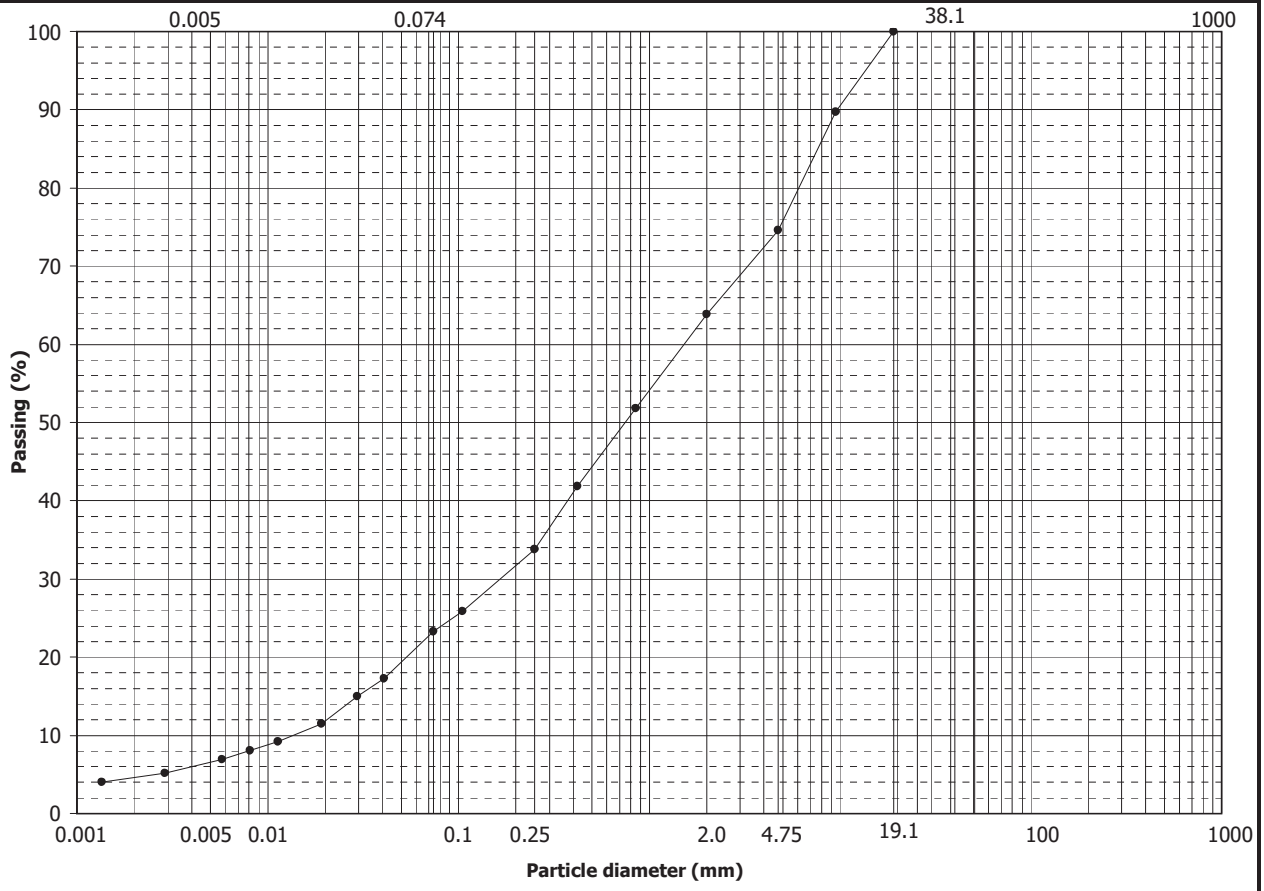
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.706**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
25.40	51.29	16.77	6.54	19.10	9.8005	1.6309	0.7720	0.1806	0.0141	116.06	63.88	41.89	23.31



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 374.4 gr
Wt. container No ..... = 42.09 gr
Wt. Of air dry soil W' = 332.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **332.31** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	82.00	42.09	39.91		12.01	87.99
4.75	128.60		86.51		26.03	73.97
2.00	162.42		120.33		36.21	63.79

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	3.50 - 4.00

Wt. (Air dry soil + container) = 138.26 gr — Specific Gravity : 2.673
Wt. of container E-56 = 36.50 gr — Plasticity Index : %
Wt. Of air dry soil W' = 101.76 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 63.79 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-21			NO	J-01			NO	J-31		
WW	53.67	DW	52.74	WW	54.82	DW	53.91	WW	49.61	DW	48.66	Mean value	
DW	52.74	TW	36.56	DW	53.91	TW	38.73	DW	48.66	TW	31.91	w	
Ww	0.93	Ws	16.18	Ww	0.91	Ws	15.18	Ww	0.95	Ws	16.75	5.80	%
w	5.75	%		w	6.00	%		w	5.67	%			

$$W = \frac{100 \times W'}{100 + w} : 96.177 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	28	12.063	12.063	3.4732	0.01237	0.0430	11.00	18.27	11.66
2	11.0	12.0	28	12.568	6.284	2.5068	0.01237	0.0310	9.00	14.95	9.54
5	9.0	10.0	28	13.072	2.614	1.6169	0.01237	0.0200	7.00	11.63	7.42
15	8.0	9.0	28	13.325	0.888	0.9425	0.01237	0.0117	6.00	9.97	6.36
30	7.5	8.5	28	13.451	0.448	0.6696	0.01237	0.0083	5.50	9.14	5.83
60	7.0	8.0	28	13.577	0.226	0.4757	0.01237	0.0059	5.00	8.31	5.30
240	5.5	6.5	29	13.955	0.058	0.2411	0.01223	0.0030	3.50	5.81	3.71
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01237	0.0014	2.50	4.15	2.65

P = 100/W = 1.0397

$$Mx = \frac{G_s}{G_s - 1} = 1.5977$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	35.05	22.02	13.030		13.55	86.45	55.15
0.42	46.43		24.410		25.38	74.62	47.60
0.25	58.07		36.050		37.48	62.52	39.88
0.105	79.16		57.140		59.41	40.59	25.89
0.074	88.32		66.300		68.94	31.06	19.82

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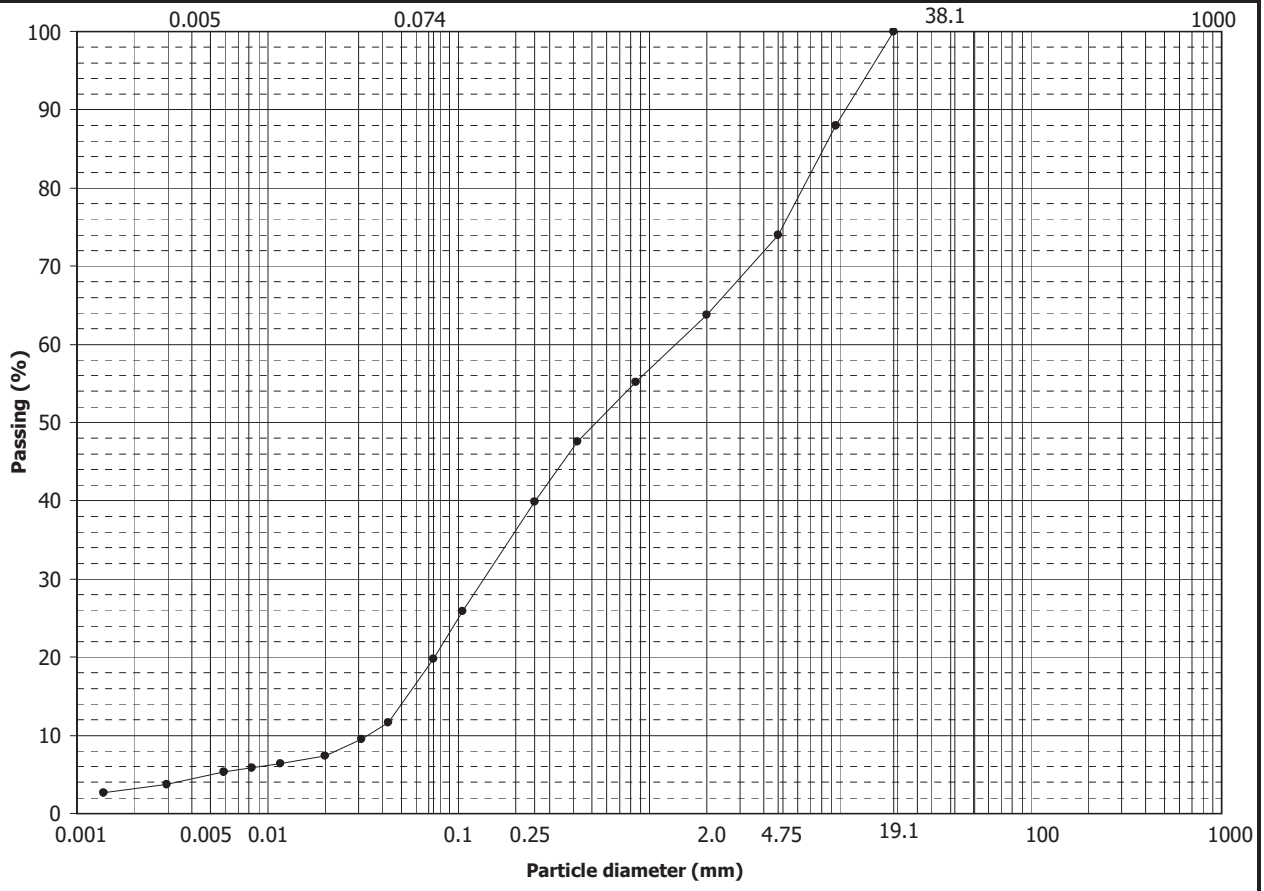
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.673**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
26.03	54.15	14.89	4.92	19.10	11.123	1.4957	0.5567	0.1476	0.0336	44.50	63.79	47.60	19.82



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 515.3 gr
Wt. container No ..... = 34.36 gr
Wt. Of air dry soil W' = 480.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **480.94** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	50.70	34.36	16.34		3.40	96.60
4.75	70.50		36.14		7.51	92.49
2.00	80.18		45.82		9.53	90.47

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	4.50 - 5.00

Wt. (Air dry soil + container) = 99.48 gr — Specific Gravity : 2.675
Wt. of container B-34 = 35.23 gr — Plasticity Index : %
Wt. Of air dry soil W' = 64.25 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 90.47 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-42			NO	J-22			NO	J-32		
WW	50.52	DW	49.95	WW	50.36	DW	49.77	WW	53.66	DW	52.86	Mean value	
DW	49.95	TW	39.10	DW	49.77	TW	39.01	DW	52.86	TW	39.90	w	
Ww	0.57	Ws	10.85	Ww	0.59	Ws	10.76	Ww	0.80	Ws	12.96	5.64	%
w	5.25	%		w	5.48	%		w	6.17	%			

$$W = \frac{100 \times W'}{100 + w} : 60.822 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.5	18.5	28	10.928	10.928	3.3057	0.01236	0.0409	15.50	40.70	36.82
2	15.5	16.5	28	11.432	5.716	2.3909	0.01236	0.0296	13.50	35.45	32.07
5	13.5	14.5	28	11.937	2.387	1.5451	0.01236	0.0191	11.50	30.20	27.32
15	12.0	13.0	28	12.315	0.821	0.9061	0.01236	0.0112	10.00	26.26	23.76
30	11.0	12.0	28	12.568	0.419	0.6472	0.01236	0.0080	9.00	23.63	21.38
60	10.5	11.5	28	12.694	0.212	0.4600	0.01236	0.0057	8.50	22.32	20.19
240	9.5	10.5	29	12.946	0.054	0.2323	0.01223	0.0028	7.50	19.69	17.82
1140	8.5	9.5	28	13.198	0.012	0.1076	0.01236	0.0013	6.50	17.07	15.44

P = 100/W = 1.6441

$$Mx = \frac{G_s}{G_s - 1} = 1.5970$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	24.68	22.02	2.660		4.37	95.63	86.52
0.42	27.91		5.890		9.68	90.32	81.71
0.25	32.76		10.740		17.66	82.34	74.50
0.105	42.18		20.160		33.15	66.85	60.48
0.074	48.82		26.800		44.06	55.94	50.61

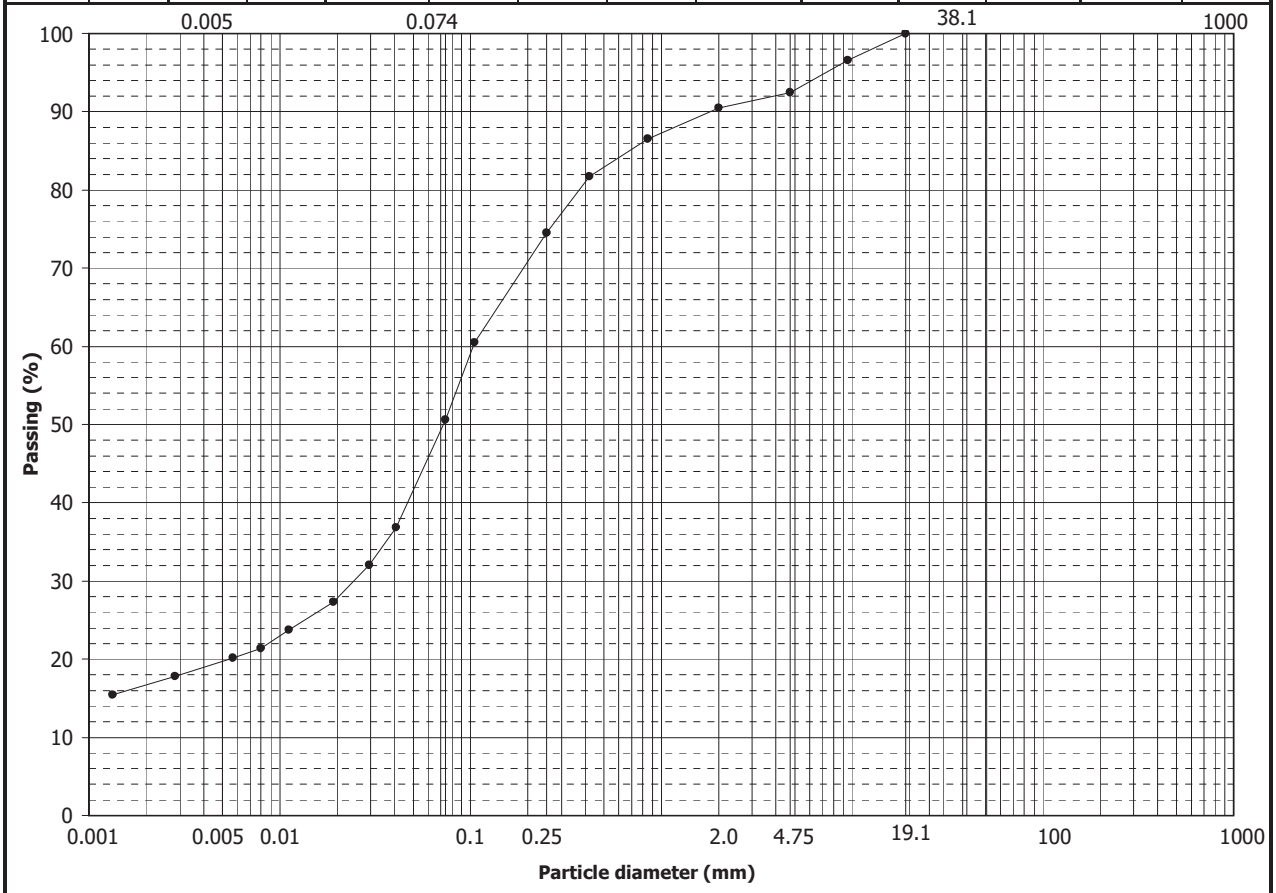
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.675**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
7.51	41.88	30.85	19.75	19.10	1.8626	0.1035	0.0725	0.0250	-	-	90.47	81.71	50.61



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 507.8 gr
Wt. container No ..... = 46.95 gr
Wt. Of air dry soil W' = 460.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **460.85** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	62.60	46.95	15.65		3.40	96.60
9.52	75.20		28.25		6.13	93.87
4.75	87.80		40.85		8.86	91.14
2.00	105.75		58.80		12.76	87.24

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 135.01 gr — Specific Gravity : **2.667**

Wt. of container B-21 = 35.97 gr — Plasticity Index : %

Wt. Of air dry soil W' = 99.04 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 87.24 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-40			NO	J-51			NO	J-60		
WW	52.01	DW	51.04	WW	49.95	DW	49.01	WW	51.16	DW	50.24	Mean value	
DW	51.04	TW	38.32	DW	49.01	TW	36.07	DW	50.24	TW	37.82	w	
Ww	0.97	Ws	12.72	Ww	0.94	Ws	12.94	Ww	0.92	Ws	12.42	7.43	%
w	7.63	%		w	7.26	%		w	7.41	%			

$$W = \frac{100 \times W'}{100 + w} : 92.188 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.0	19.0	28	10.802	10.802	3.2866	0.01239	0.0407	16.00	27.77	24.22
2	15.5	16.5	28	11.432	5.716	2.3909	0.01239	0.0296	13.50	23.43	20.44
5	13.0	14.0	28	12.063	2.413	1.5533	0.01239	0.0192	11.00	19.09	16.65
15	10.0	11.0	28	12.820	0.855	0.9245	0.01239	0.0115	8.00	13.88	12.11
30	9.0	10.0	28	13.072	0.436	0.6601	0.01239	0.0082	7.00	12.15	10.60
60	8.0	9.0	28	13.325	0.222	0.4712	0.01239	0.0058	6.00	10.41	9.08
240	6.0	7.0	29	13.829	0.058	0.2400	0.01226	0.0029	4.00	6.94	6.06
1140	5.0	6.0	28	14.081	0.012	0.1111	0.01239	0.0014	3.00	5.21	4.54

P = 100/W = 1.0847

$$Mx = \frac{G_s}{G_s - 1} = 1.5999$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	29.36	22.02	7.340		7.96	92.04	80.29
0.42	34.27		12.250		13.29	86.71	75.65
0.25	41.46		19.440		21.09	78.91	68.84
0.105	61.74		39.720		43.09	56.91	49.65
0.074	77.13		55.110		59.78	40.22	35.09

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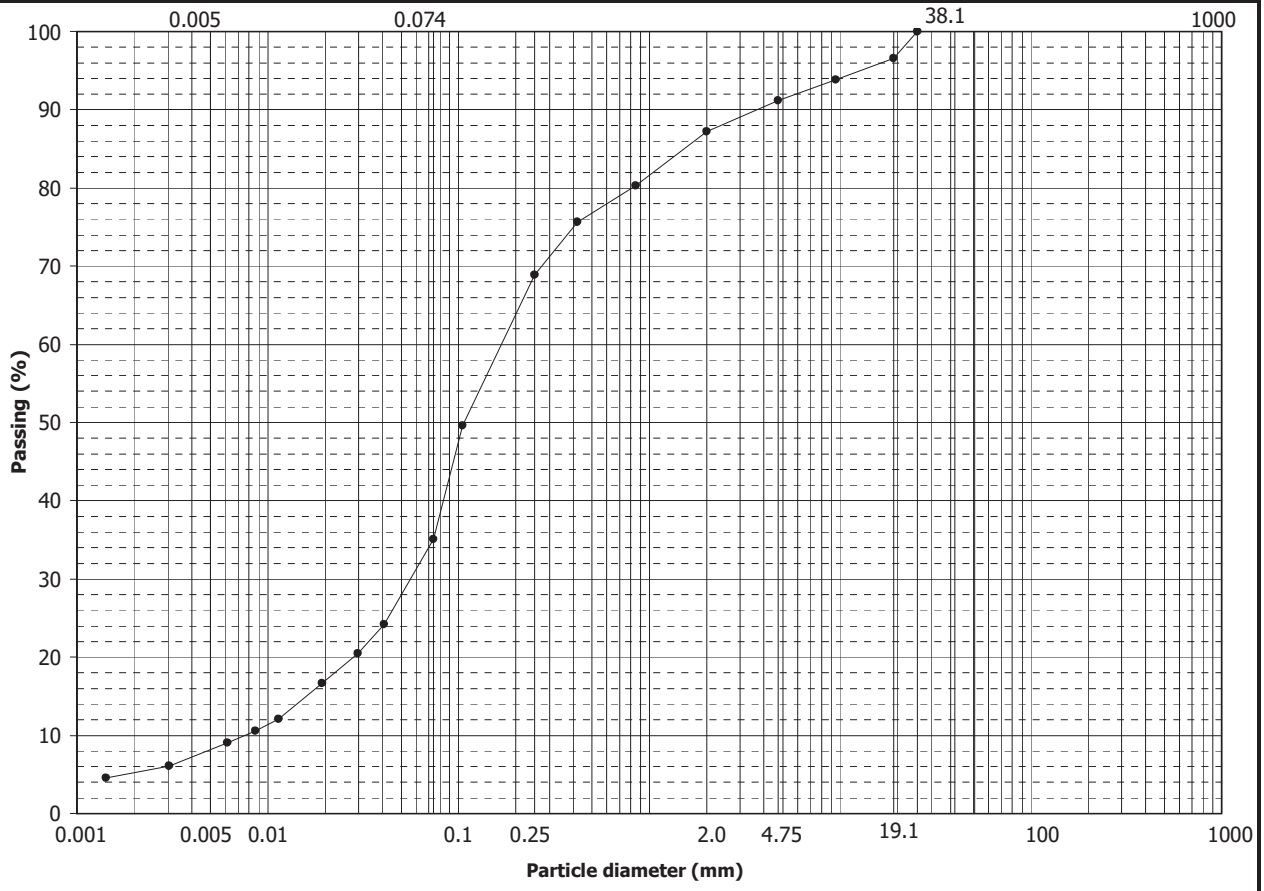
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.636**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
8.86	56.05	26.89	8.20	25.40	3.9480	0.1832	0.1076	0.0584	0.0077	23.93	87.24	75.65	35.09



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 411.3 gr
Wt. container No ..... = 43.12 gr
Wt. Of air dry soil W' = 368.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **368.18** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	101.70	43.12	58.58		15.91	84.09
4.75	167.10		123.98		33.67	66.33
2.00	244.24		201.12		54.63	45.37

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	6.50 - 7.00

Wt. (Air dry soil + container) = 122.95 gr — Specific Gravity : 2.719
Wt. of container M-41 = 39.77 gr — Plasticity Index : %
Wt. Of air dry soil W' = 83.18 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 45.37 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-48			NO	J-28			NO	J-50		
WW	53.42	DW	52.62	WW	52.57	DW	51.74	WW	53.83	DW	53.03	Mean value	
DW	52.62	TW	37.11	DW	51.74	TW	36.12	DW	53.03	TW	38.24	w	
Ww	0.80	Ws	15.51	Ww	0.83	Ws	15.62	Ww	0.80	Ws	14.79	5.29	%
w	5.16	%		w	5.31	%		w	5.41	%			

$$W = \frac{100 \times W'}{100 + w} : 78.998 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	8.0	9.0	28	13.325	13.325	3.6503	0.01220	0.0445	6.00	12.01	5.45
2	7.0	8.0	28	13.577	6.788	2.6055	0.01220	0.0318	5.00	10.01	4.54
5	6.0	7.0	28	13.829	2.766	1.6631	0.01220	0.0203	4.00	8.01	3.63
15	5.5	6.5	28	13.955	0.930	0.9645	0.01220	0.0118	3.50	7.01	3.18
30	5.0	6.0	28	14.081	0.469	0.6851	0.01220	0.0084	3.00	6.01	2.73
60	4.0	5.0	28	14.334	0.239	0.4888	0.01220	0.0060	2.00	4.00	1.82
240	3.5	4.5	29	14.460	0.060	0.2455	0.01207	0.0030	1.50	3.00	1.36
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01220	0.0014	1.00	2.00	0.91

P = 100/W = 1.2658

$$Mx = \frac{G_s}{G_s - 1} = 1.5817$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	54.78	22.02	32.760		41.47	58.53	26.56
0.42	68.34		46.320		58.63	41.37	18.77
0.25	77.35		55.330		70.04	29.96	13.59
0.105	85.91		63.890		80.88	19.12	8.68
0.074	88.37		66.350		83.99	16.01	7.26

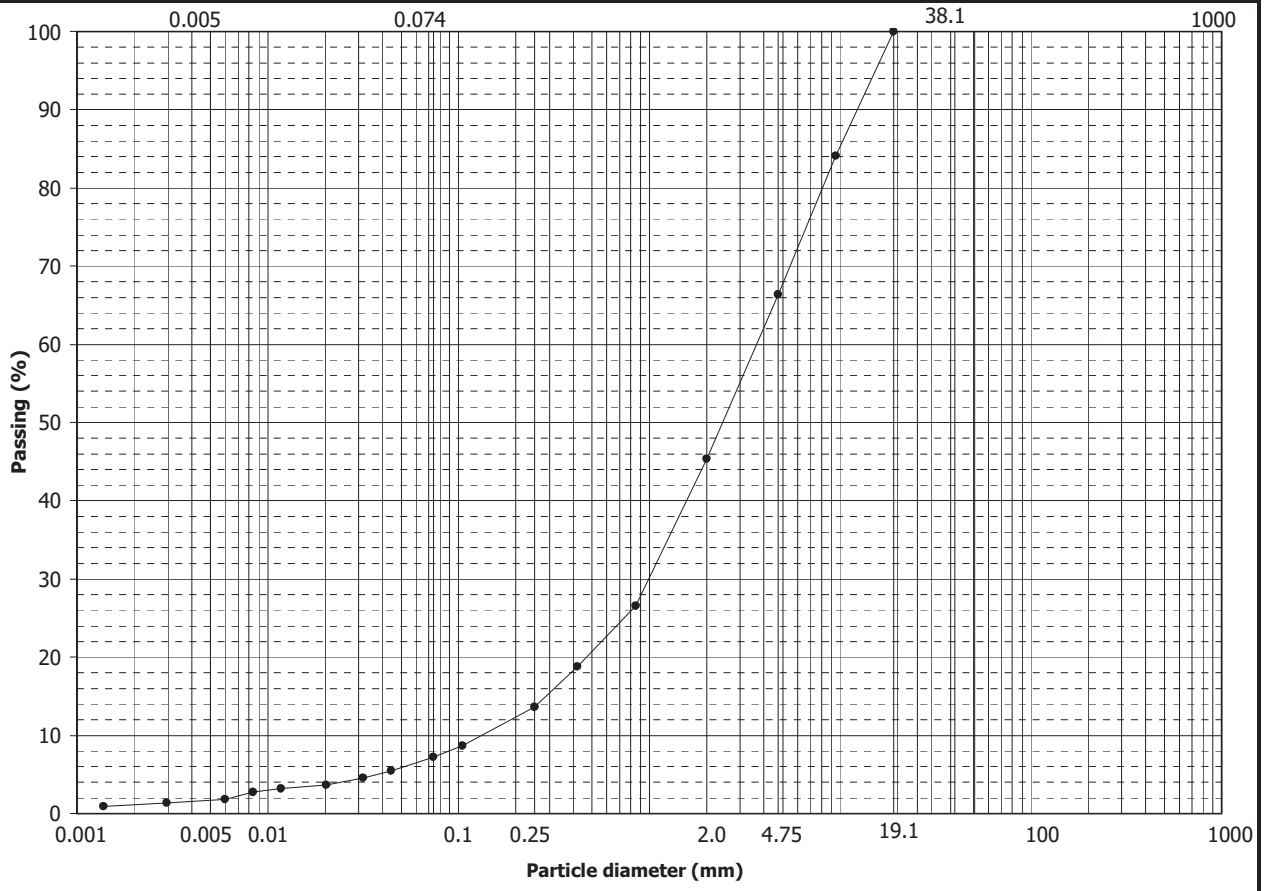
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.719**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
33.67	59.06	5.56	1.70	19.10	13.079	3.9197	2.6071	1.0604	0.1440	27.22	45.37	18.77	7.26



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 326.0 gr
Wt. container No ..... = 45.88 gr
Wt. Of air dry soil W' = 280.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **280.12** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	84.90	45.88	39.02		13.93	86.07
4.75	133.30		87.42		31.21	68.79
2.00	190.78		144.90		51.73	48.27

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 145.06 gr — Specific Gravity : **2.711**

Wt. of container M-03 = 50.68 gr — Plasticity Index : %

Wt. Of air dry soil W' = 94.38 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 48.27 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-30			NO	J-45			NO	J-54		
WW	50.64	DW	50.32	WW	50.55	DW	50.28	WW	49.80	DW	49.51	Mean value	
DW	50.32	TW	37.61	DW	50.28	TW	38.22	DW	49.51	TW	37.16	w	
Ww	0.32	Ws	12.71	Ww	0.27	Ws	12.06	Ww	0.29	Ws	12.35	2.37	%
w	2.52	%		w	2.24	%		w	2.35	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 92.196 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01223	0.0416	13.00	22.34	10.78
2	13.0	14.0	28	12.063	6.032	2.4559	0.01223	0.0300	11.00	18.90	9.13
5	11.5	12.5	28	12.442	2.488	1.5774	0.01223	0.0193	9.50	16.33	7.88
15	10.0	11.0	28	12.820	0.855	0.9245	0.01223	0.0113	8.00	13.75	6.64
30	9.0	10.0	28	13.072	0.436	0.6601	0.01223	0.0081	7.00	12.03	5.81
60	8.0	9.0	28	13.325	0.222	0.4712	0.01223	0.0058	6.00	10.31	4.98
240	7.0	8.0	29	13.577	0.057	0.2378	0.01210	0.0029	5.00	8.59	4.15
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01223	0.0013	4.00	6.87	3.32

P = 100/W = 1.0846

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5845$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	54.48	22.02	32.460		35.21	64.79	31.28
0.42	68.61		46.590		50.53	49.47	23.88
0.25	77.58		55.560		60.26	39.74	19.18
0.105	84.95		62.930		68.26	31.74	15.32
0.074	88.07		66.050		71.64	28.36	13.69

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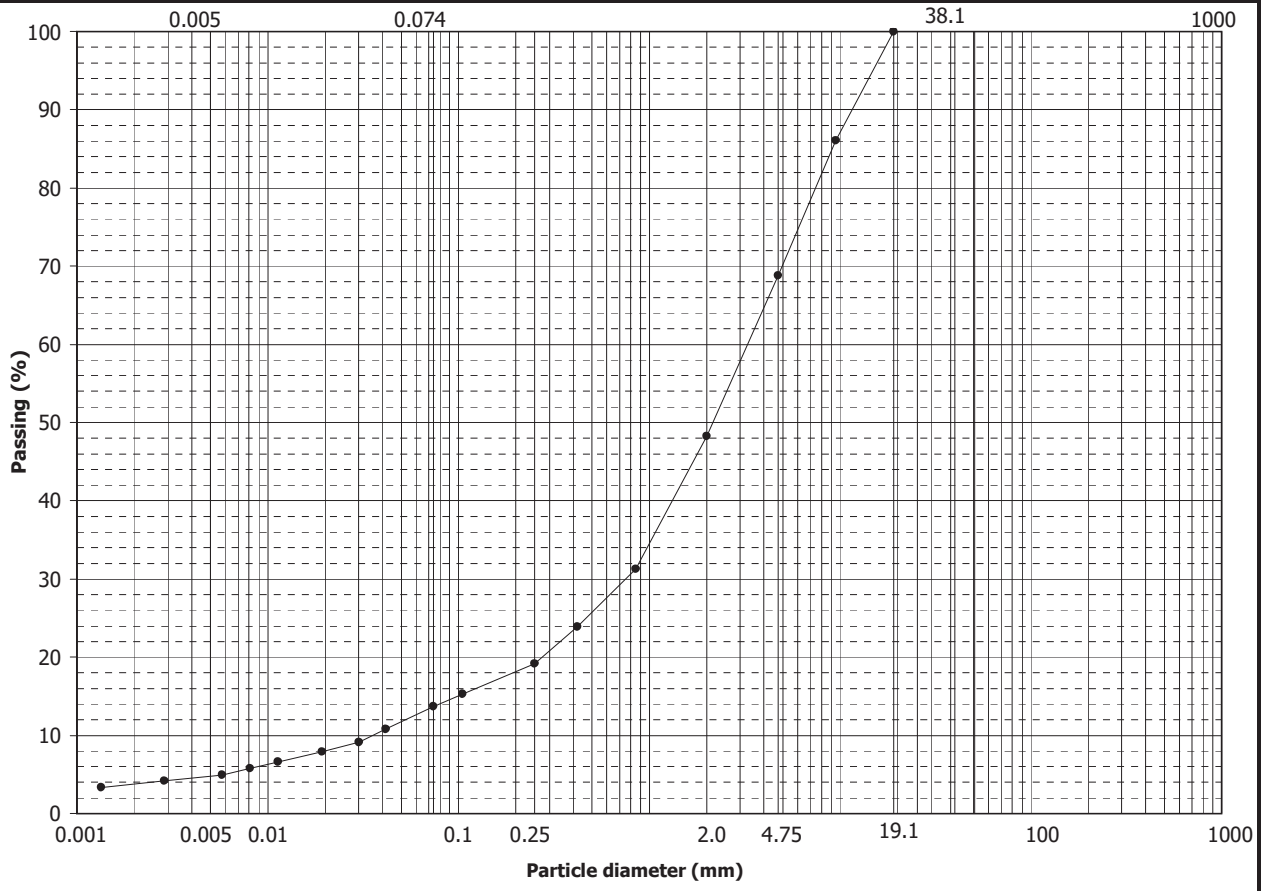
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.711**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
31.21	55.10	8.88	4.81	19.10	12.223	3.5717	2.2316	0.7758	0.0361	98.88	48.27	23.88	13.69



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 364.7 gr
Wt. container No ..... = 41.33 gr
Wt. Of air dry soil W' = 323.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **323.37** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	75.40	41.33	34.07		10.54	89.46
4.75	134.50		93.17		28.81	71.19
2.00	186.66		145.33		44.94	55.06

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	9.50 - 10.00

Wt. (Air dry soil + container) = 138.85 gr — Specific Gravity : 2.705
Wt. of container M-21 = 44.49 gr — Plasticity Index : %
Wt. Of air dry soil W' = 94.36 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 55.06 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-55			NO	J-39			NO	J-57		
WW	53.70	DW	53.37	WW	54.38	DW	54.01	WW	54.24	DW	53.85	Mean value	
DW	53.37	TW	39.94	DW	54.01	TW	37.11	DW	53.85	TW	37.75	w	
Ww	0.33	Ws	13.43	Ww	0.37	Ws	16.90	Ww	0.39	Ws	16.10	2.36	%
w	2.46	%		w	2.19	%		w	2.42	%			

$$W = \frac{100 \times W'}{100 + w} : 92.188 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01225	0.0417	13.00	22.37	12.32
2	13.5	14.5	28	11.937	5.968	2.4430	0.01225	0.0299	11.50	19.79	10.90
5	12.0	13.0	28	12.315	2.463	1.5694	0.01225	0.0192	10.00	17.21	9.48
15	10.0	11.0	28	12.820	0.855	0.9245	0.01225	0.0113	8.00	13.77	7.58
30	9.0	10.0	28	13.072	0.436	0.6601	0.01225	0.0081	7.00	12.05	6.63
60	8.0	9.0	28	13.325	0.222	0.4712	0.01225	0.0058	6.00	10.33	5.69
240	7.0	8.0	29	13.577	0.057	0.2378	0.01212	0.0029	5.00	8.60	4.74
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01225	0.0013	4.00	6.88	3.79

P = 100/W = 1.0847

$$Mx = \frac{G_s}{G_s - 1} = 1.5865$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	48.50	22.02	26.480		28.72	71.28	39.24
0.42	66.28		44.260		48.01	51.99	28.62
0.25	77.35		55.330		60.02	39.98	22.01
0.105	84.64		62.620		67.93	32.07	17.66
0.074	87.31		65.290		70.82	29.18	16.06

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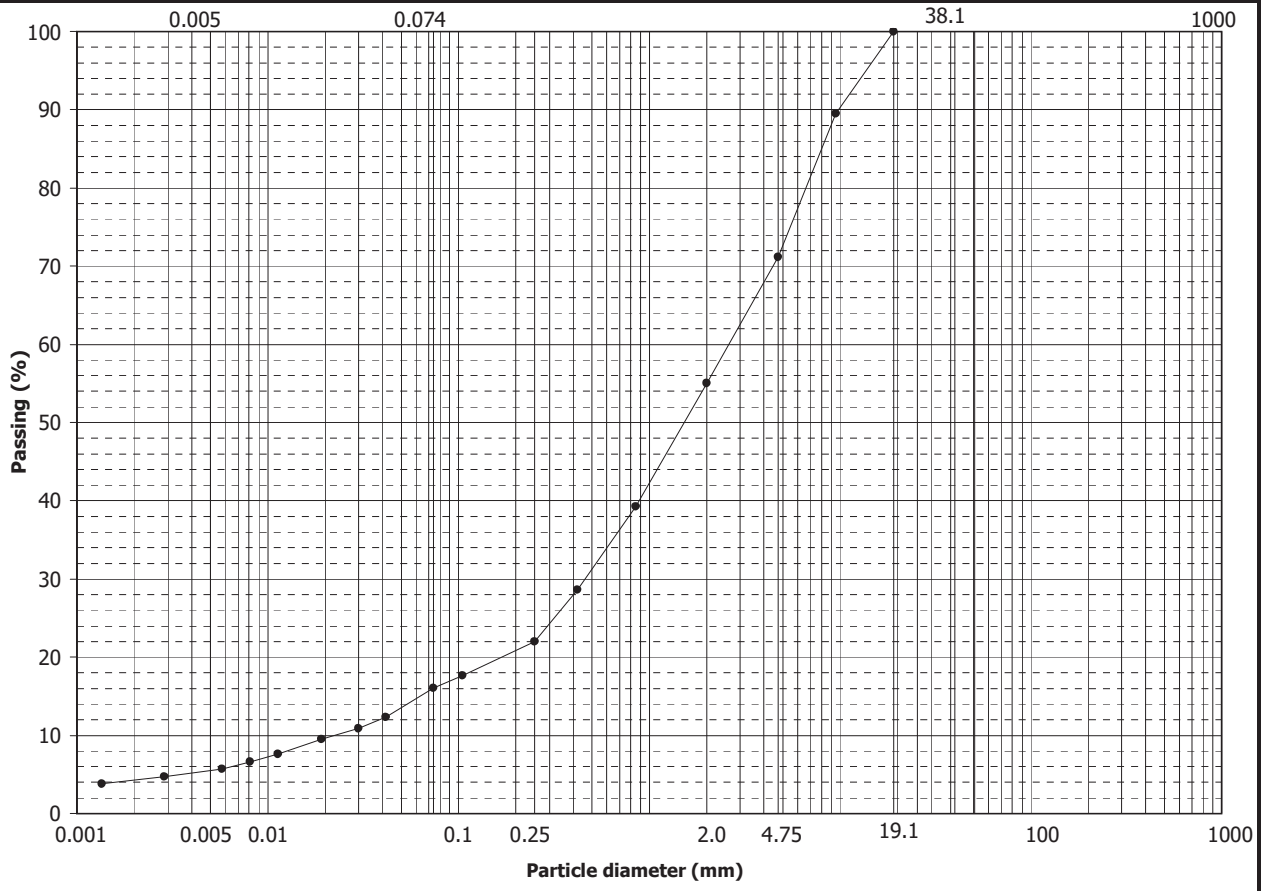
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.705**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
28.81	55.12	10.58	5.49	19.10	10.007	2.8426	1.6322	0.4757	0.0232	122.63	55.06	28.62	16.06



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**10.50 - 11.00**

Wt. (Air dry soil + container) = 382.4 gr
Wt. container No ..... = 40.15 gr
Wt. Of air dry soil W' = 342.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **342.25** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	55.35	40.15	15.20		4.44	95.56
4.75	74.24		34.09		9.96	90.04
2.00	85.40		45.25		13.22	86.78

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	10.50 - 11.00

Wt. (Air dry soil + container) = 147.75 gr — Specific Gravity : 2.701
Wt. of container M-26 = 42.85 gr — Plasticity Index : %
Wt. Of air dry soil W' = 104.90 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 86.78 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-06			NO	J-16			NO	J-45		
WW	53.77	DW	53.35	WW	53.32	DW	52.85	WW	51.44	DW	51.01	Mean value	
DW	53.35	TW	40.48	DW	52.85	TW	39.56	DW	51.01	TW	38.22	w	
Ww	0.42	Ws	12.87	Ww	0.47	Ws	13.29	Ww	0.43	Ws	12.79	3.39	%
w	3.26	%		w	3.54	%		w	3.36	%			

$$W = \frac{100 \times W'}{100 + w} : 101.463 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.0	15.0	28	11.811	11.811	3.4367	0.01227	0.0422	12.00	18.78	16.30
2	12.0	13.0	28	12.315	6.158	2.4815	0.01227	0.0304	10.00	15.65	13.58
5	10.5	11.5	28	12.694	2.539	1.5934	0.01227	0.0195	8.50	13.30	11.54
15	9.0	10.0	28	13.072	0.871	0.9335	0.01227	0.0115	7.00	10.95	9.51
30	8.0	9.0	28	13.325	0.444	0.6664	0.01227	0.0082	6.00	9.39	8.15
60	7.0	8.0	28	13.577	0.226	0.4757	0.01227	0.0058	5.00	7.82	6.79
240	6.0	7.0	29	13.829	0.058	0.2400	0.01213	0.0029	4.00	6.26	5.43
1140	5.0	6.0	28	14.081	0.012	0.1111	0.01227	0.0014	3.00	4.69	4.07

P = 100/W = 0.9856

$$Mx = \frac{G_s}{G_s - 1} = 1.5879$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	30.34	22.02	8.320		8.20	91.80	79.66
0.42	47.55		25.530		25.16	74.84	64.94
0.25	68.01		45.990		45.33	54.67	47.44
0.105	91.98		69.960		68.95	31.05	26.94
0.074	97.40		75.380		74.29	25.71	22.31

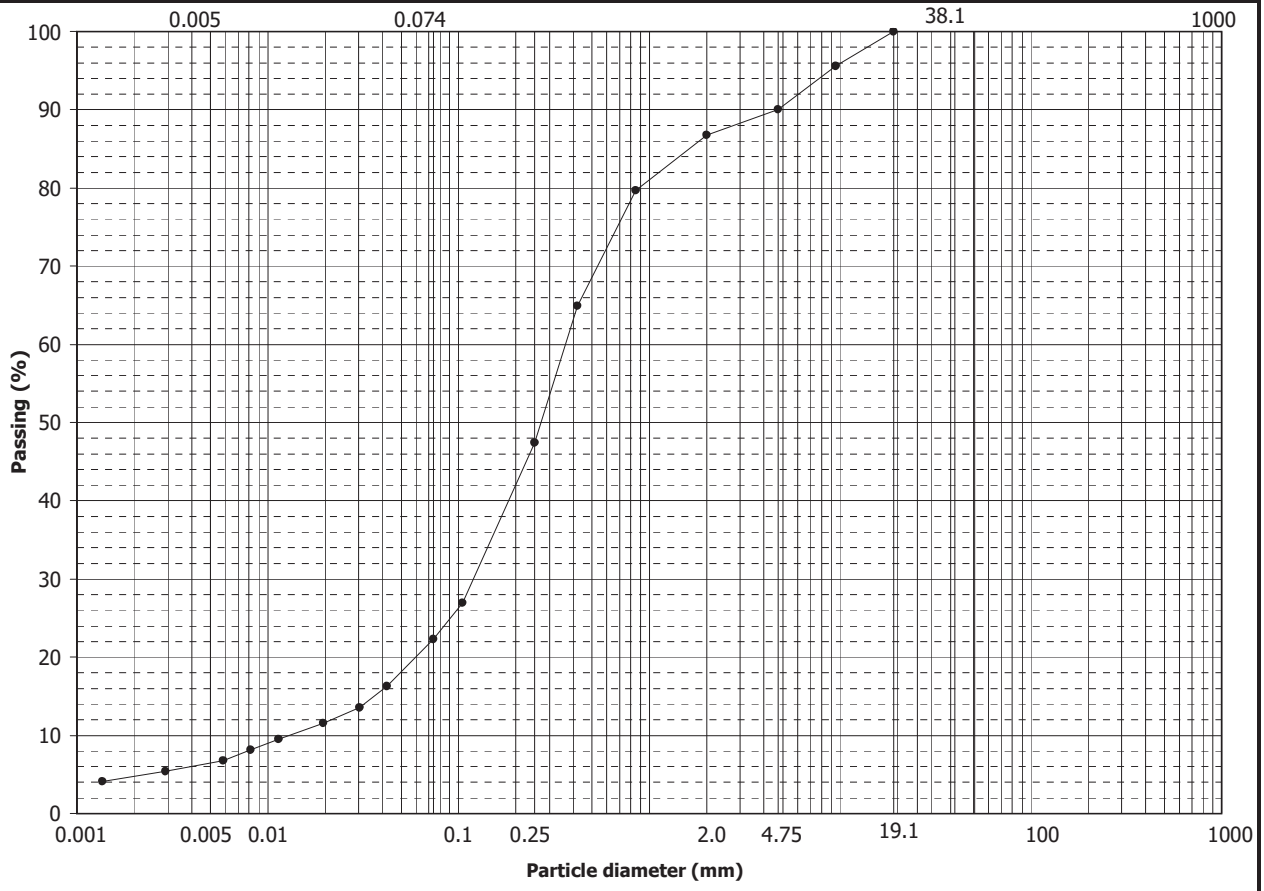
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**10.50 - 11.00**

SPECIFIC GRAVITY : **2.701**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
9.96	67.73	15.82	6.49	19.10	4.717	0.3720	0.2748	0.1266	0.0134	27.74	86.78	64.94	22.31



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = 398.9 gr
Wt. container No ..... = 46.85 gr
Wt. Of air dry soil W' = 352.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **352.05** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	100.80	46.85	53.95		15.32	84.68
4.75	184.90		138.05		39.21	60.79
2.00	238.18		191.33		54.35	45.65

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	13.50 - 14.00

Wt. (Air dry soil + container) = 138.40 gr — Specific Gravity : 2.720
Wt. of container M-23 = 42.73 gr — Plasticity Index : %
Wt. Of air dry soil W' = 95.67 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 45.65 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-15			NO	J-02			NO	J-41		
WW	54.35	DW	53.92	WW	56.43	DW	56.04	WW	53.27	DW	52.85	Mean value	
DW	53.92	TW	37.95	DW	56.04	TW	40.30	DW	52.85	TW	36.92	w	
Ww	0.43	Ws	15.97	Ww	0.39	Ws	15.74	Ww	0.42	Ws	15.93	2.60	%
w	2.69	%		w	2.48	%		w	2.64	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 93.243 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	28	11.054	11.054	3.3247	0.01220	0.0406	15.00	25.44	11.61
2	15.0	16.0	28	11.558	5.779	2.4040	0.01220	0.0293	13.00	22.05	10.07
5	13.5	14.5	28	11.937	2.387	1.5451	0.01220	0.0188	11.50	19.50	8.90
15	12.0	13.0	28	12.315	0.821	0.9061	0.01220	0.0111	10.00	16.96	7.74
30	11.0	12.0	28	12.568	0.419	0.6472	0.01220	0.0079	9.00	15.26	6.97
60	10.0	11.0	28	12.820	0.214	0.4622	0.01220	0.0056	8.00	13.57	6.19
240	9.0	10.0	29	13.072	0.054	0.2334	0.01207	0.0028	7.00	11.87	5.42
1140	8.0	9.0	28	13.325	0.012	0.1081	0.01220	0.0013	6.00	10.18	4.65

P = 100/W = 1.0725

$$Mx = \frac{G_s}{G_s - 1} = 1.5814$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	50.50	22.02	28.480		30.54	69.46	31.71
0.42	66.00		43.980		47.17	52.83	24.12
0.25	75.66		53.640		57.53	42.47	19.39
0.105	82.89		60.870		65.28	34.72	15.85
0.074	85.69		63.670		68.28	31.72	14.48

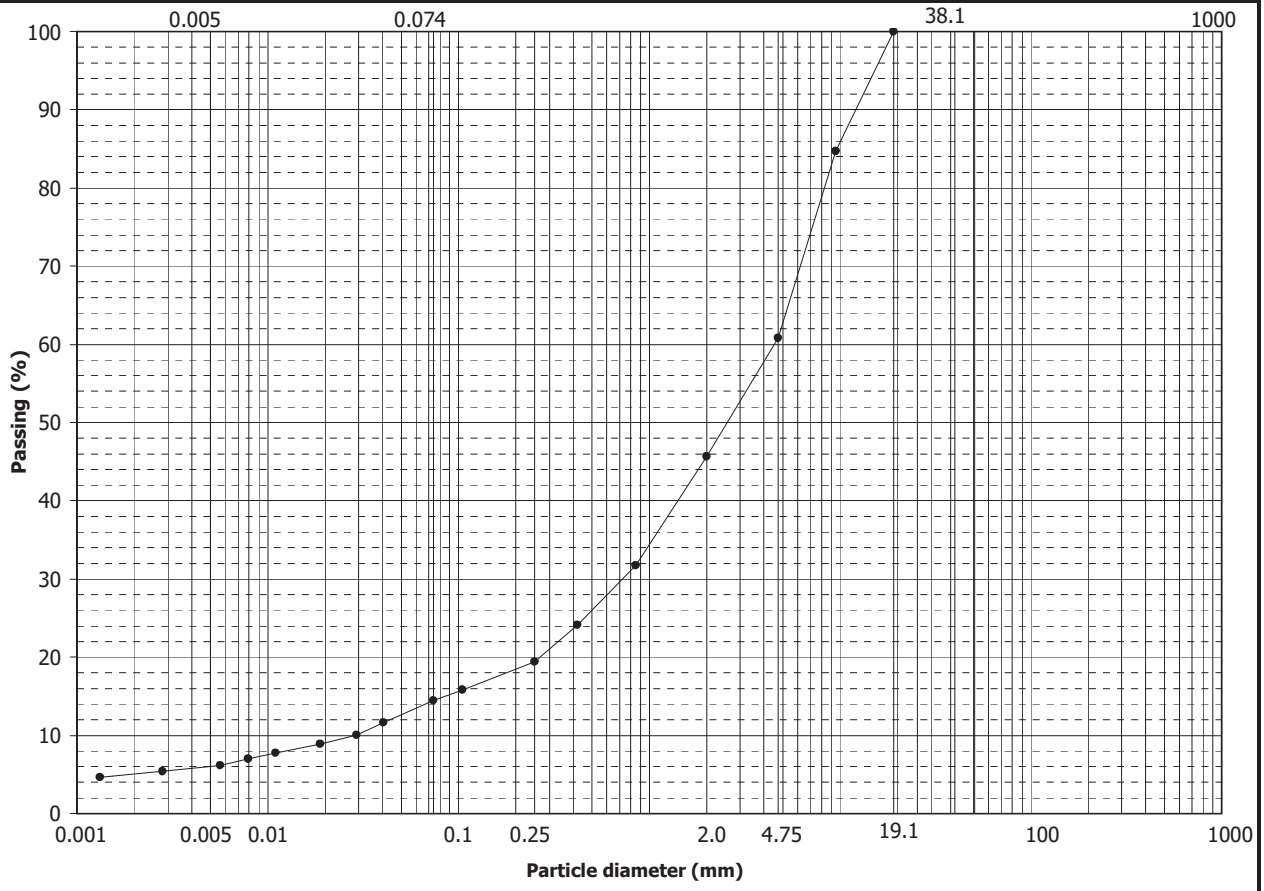
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**13.50 - 14.00**

SPECIFIC GRAVITY : **2.720**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
39.21	46.31	8.42	6.06	19.10	12.849	4.6070	2.7900	0.7532	0.0287	160.33	45.65	24.12	14.48



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**14.50 - 15.00**

Wt. (Air dry soil + container) = 455.9 gr
Wt. container No ..... = 36.36 gr
Wt. Of air dry soil W' = 419.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **419.54** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	63.40	36.36	27.04		6.45	93.55
4.75	85.80		49.44		11.78	88.22
2.00	101.40		65.04		15.50	84.50

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	14.50 - 15.00

Wt. (Air dry soil + container) = 137.28 gr — Specific Gravity : 2.686
Wt. of container B-86 = 34.01 gr — Plasticity Index : %
Wt. Of air dry soil W' = 103.27 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 84.50 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-01			NO	J-25			NO	J-34		
WW	51.77	DW	51.24	WW	50.22	DW	49.65	WW	52.96	DW	52.47	Mean value	
DW	51.24	TW	38.73	DW	49.65	TW	36.05	DW	52.47	TW	40.29	w	
Ww	0.53	Ws	12.51	Ww	0.57	Ws	13.60	Ww	0.49	Ws	12.18	4.15	%
w	4.24	%		w	4.19	%		w	4.02	%			

$$W = \frac{100 \times W'}{100 + w} : 99.155 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.0	14.0	28	12.063	12.063	3.4732	0.01232	0.0428	11.00	17.67	14.93
2	11.0	12.0	28	12.568	6.284	2.5068	0.01232	0.0309	9.00	14.46	12.22
5	9.5	10.5	28	12.946	2.589	1.6091	0.01232	0.0198	7.50	12.05	10.18
15	8.0	9.0	28	13.325	0.888	0.9425	0.01232	0.0116	6.00	9.64	8.15
30	7.0	8.0	28	13.577	0.453	0.6727	0.01232	0.0083	5.00	8.03	6.79
60	6.0	7.0	28	13.829	0.230	0.4801	0.01232	0.0059	4.00	6.43	5.43
240	5.0	6.0	29	14.081	0.059	0.2422	0.01219	0.0030	3.00	4.82	4.07
1140	4.0	5.0	28	14.334	0.013	0.1121	0.01232	0.0014	2.00	3.21	2.72

P = 100/W = 1.0085

$$Mx = \frac{G_s}{G_s - 1} = 1.5931$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	31.59	22.02	9.570		9.65	90.35	76.34
0.42	50.40		28.380		28.62	71.38	60.31
0.25	71.11		49.090		49.51	50.49	42.66
0.105	92.88		70.860		71.46	28.54	24.11
0.074	97.86		75.840		76.49	23.51	19.87

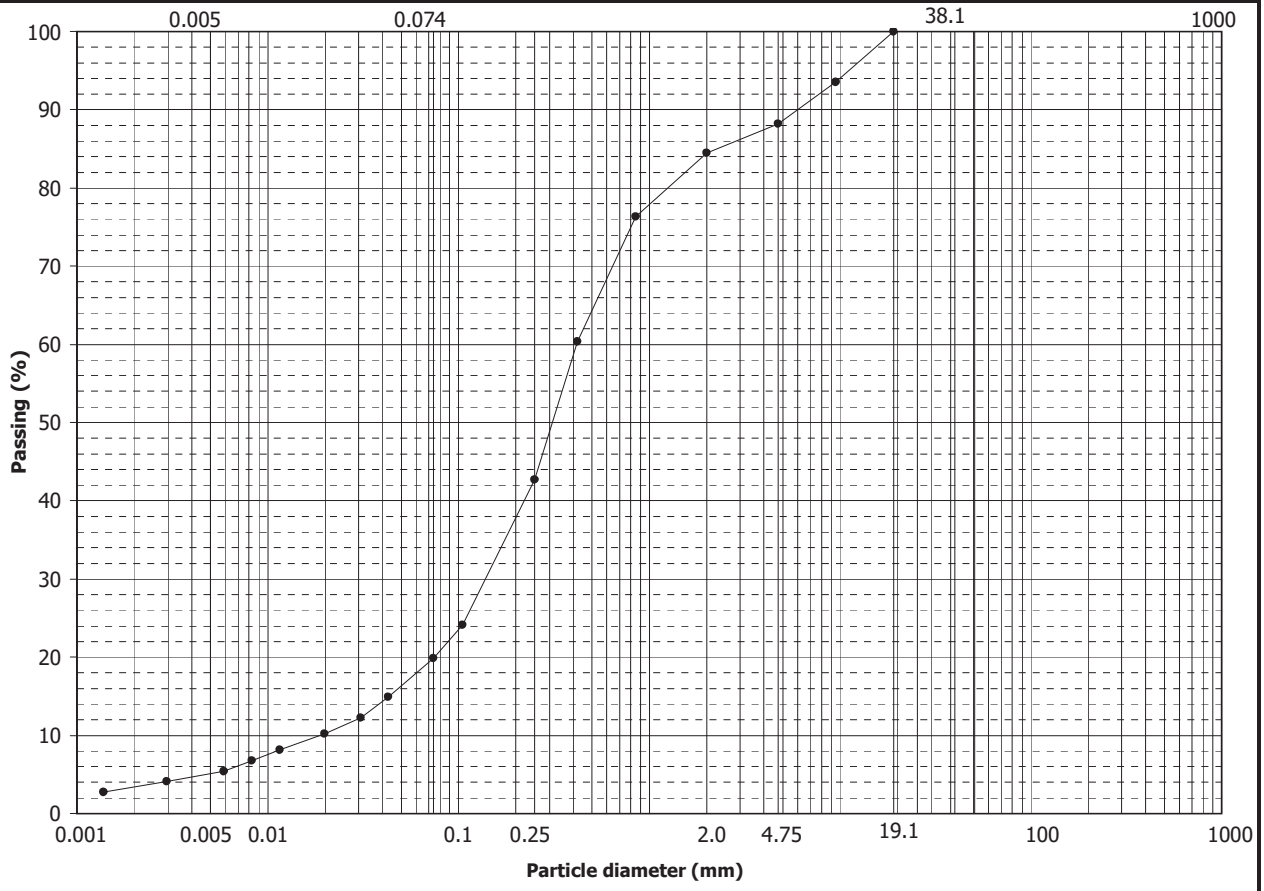
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**14.50 - 15.00**

SPECIFIC GRAVITY : **2.686**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
11.78	68.35	14.77	5.10	19.10	6.344	0.4170	0.3207	0.1510	0.0191	21.84	84.50	60.31	19.87



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**16.50 - 17.00**

Wt. (Air dry soil + container) = 421.1 gr
Wt. container No ..... = 35.45 gr
Wt. Of air dry soil W' = 385.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **385.65** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	68.60	35.45	33.15		8.60	91.40
4.75	98.00		62.55		16.22	83.78
2.00	142.10		106.65		27.65	72.35

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 20, 2019
LOCATION	LABUAN - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 16	DEPTH	16.50 - 17.00

Wt. (Air dry soil + container) = 118.23 gr — Specific Gravity : 2.698
Wt. of container B-05 = 35.40 gr — Plasticity Index : %
Wt. Of air dry soil W' = 82.83 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 72.35 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-07			NO	J-24			NO	J-41		
WW	51.59	DW	51.24	WW	49.45	DW	49.03	WW	49.61	DW	49.27	Mean value	
DW	51.24	TW	38.25	DW	49.03	TW	33.27	DW	49.27	TW	36.92	w	
Ww	0.35	Ws	12.99	Ww	0.42	Ws	15.76	Ww	0.34	Ws	12.35	2.70	%
w	2.69	%		w	2.67	%		w	2.75	%			

$$W = \frac{100 \times W'}{100 + w} : 80.649 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.5	18.5	28	10.928	10.928	3.3057	0.01228	0.0406	15.50	30.54	22.09
2	16.0	17.0	28	11.306	5.653	2.3776	0.01228	0.0292	14.00	27.58	19.95
5	14.0	15.0	28	11.811	2.362	1.5369	0.01228	0.0189	12.00	23.64	17.10
15	12.0	13.0	28	12.315	0.821	0.9061	0.01228	0.0111	10.00	19.70	14.25
30	11.0	12.0	28	12.568	0.419	0.6472	0.01228	0.0079	9.00	17.73	12.83
60	10.0	11.0	28	12.820	0.214	0.4622	0.01228	0.0057	8.00	15.76	11.40
240	8.0	9.0	29	13.325	0.056	0.2356	0.01214	0.0029	6.00	11.82	8.55
1140	7.0	8.0	28	13.577	0.012	0.1091	0.01228	0.0013	5.00	9.85	7.13

P = 100/W = 1.2399

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5889$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	42.70	22.02	20.680		25.64	74.36	53.79
0.42	55.33		33.310		41.30	58.70	42.46
0.25	63.25		41.230		51.12	48.88	35.36
0.105	70.03		48.010		59.53	40.47	29.28
0.074	72.88		50.860		63.06	36.94	26.72

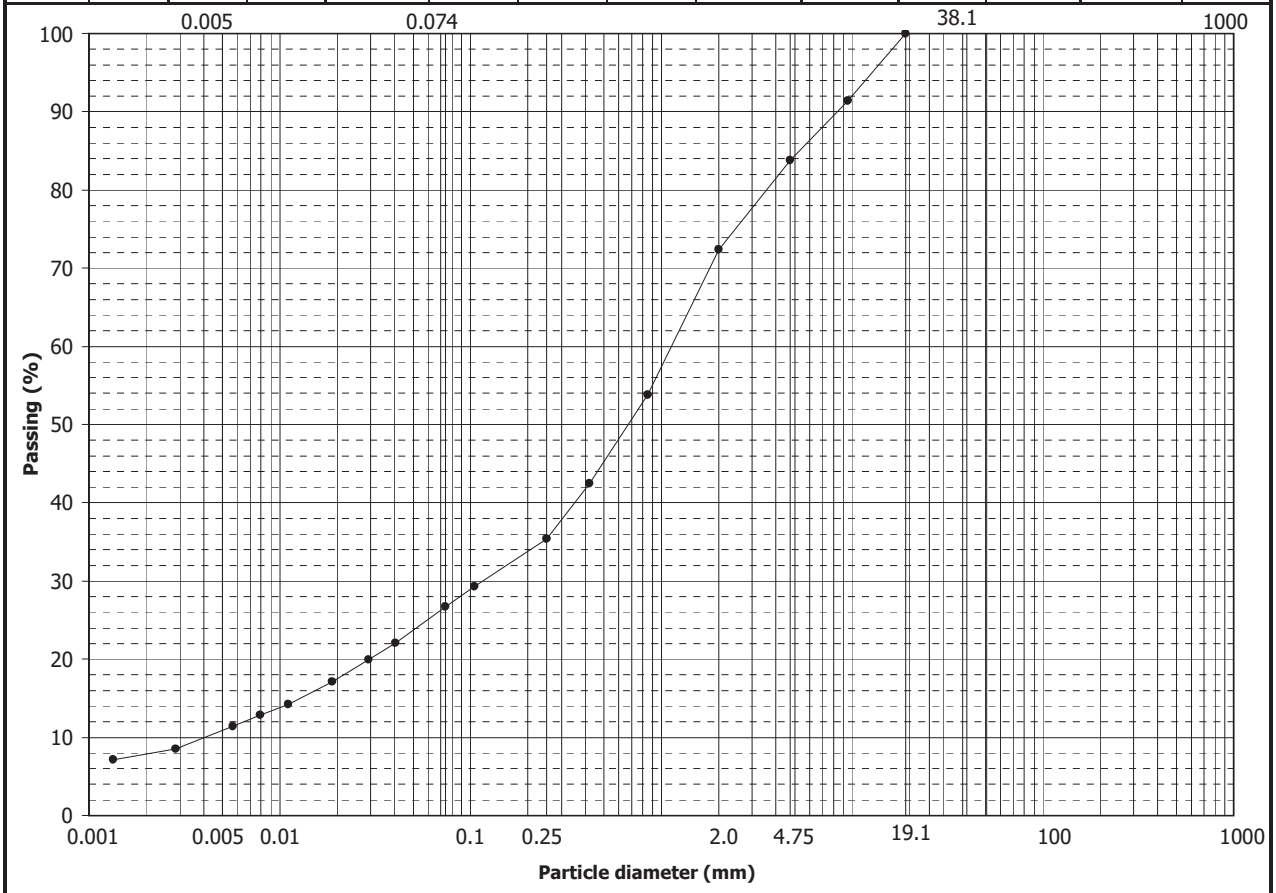
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**16.50 - 17.00**

SPECIFIC GRAVITY : **2.698**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
16.22	57.06	15.85	10.88	19.10	8.641	1.2347	0.7060	0.1222	0.0043	287.77	72.35	42.46	26.72



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = 420.8 gr
Wt. container No ..... = 32.95 gr
Wt. Of air dry soil W' = 387.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **387.85** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	45.40	32.95	12.45		3.21	96.79
4.75	70.50		37.55		9.68	90.32
2.00	98.47		65.52		16.89	83.11

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = 147.99 gr — Specific Gravity : **2.689**

Wt. of container B-89 = 36.63 gr — Plasticity Index : %

Wt. Of air dry soil W' = 111.36 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 83.11 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-11			NO	J-34			NO	J-43		
WW	51.98	DW	51.58	WW	52.25	DW	51.89	WW	50.34	DW	49.87	Mean value	
DW	51.58	TW	39.43	DW	51.89	TW	40.29	DW	49.87	TW	36.94	w	
Ww	0.40	Ws	12.15	Ww	0.36	Ws	11.60	Ww	0.47	Ws	12.93	3.34	%
w	3.29	%		w	3.10	%		w	3.63	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 107.757 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.0	22.0	28	10.045	10.045	3.1693	0.01231	0.0390	19.00	28.07	23.33
2	19.0	20.0	28	10.549	5.275	2.2967	0.01231	0.0283	17.00	25.12	20.87
5	17.0	18.0	28	11.054	2.211	1.4869	0.01231	0.0183	15.00	22.16	18.42
15	15.0	16.0	28	11.558	0.771	0.8778	0.01231	0.0108	13.00	19.21	15.96
30	13.0	14.0	28	12.063	0.402	0.6341	0.01231	0.0078	11.00	16.25	13.51
60	12.0	13.0	28	12.315	0.205	0.4531	0.01231	0.0056	10.00	14.77	12.28
240	9.5	10.5	29	12.946	0.054	0.2323	0.01218	0.0028	7.50	11.08	9.21
1140	8.0	9.0	28	13.325	0.012	0.1081	0.01231	0.0013	6.00	8.86	7.37

P = 100/W = 0.928

$$Mx = \frac{G_s}{G_s - 1} = 1.5921$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	36.48	22.02	14.460		13.42	86.58	71.95
0.42	58.74		36.720		34.08	65.92	54.79
0.25	76.84		54.820		50.87	49.13	40.83
0.105	91.03		69.010		64.04	35.96	29.88
0.074	94.35		72.330		67.12	32.88	27.32

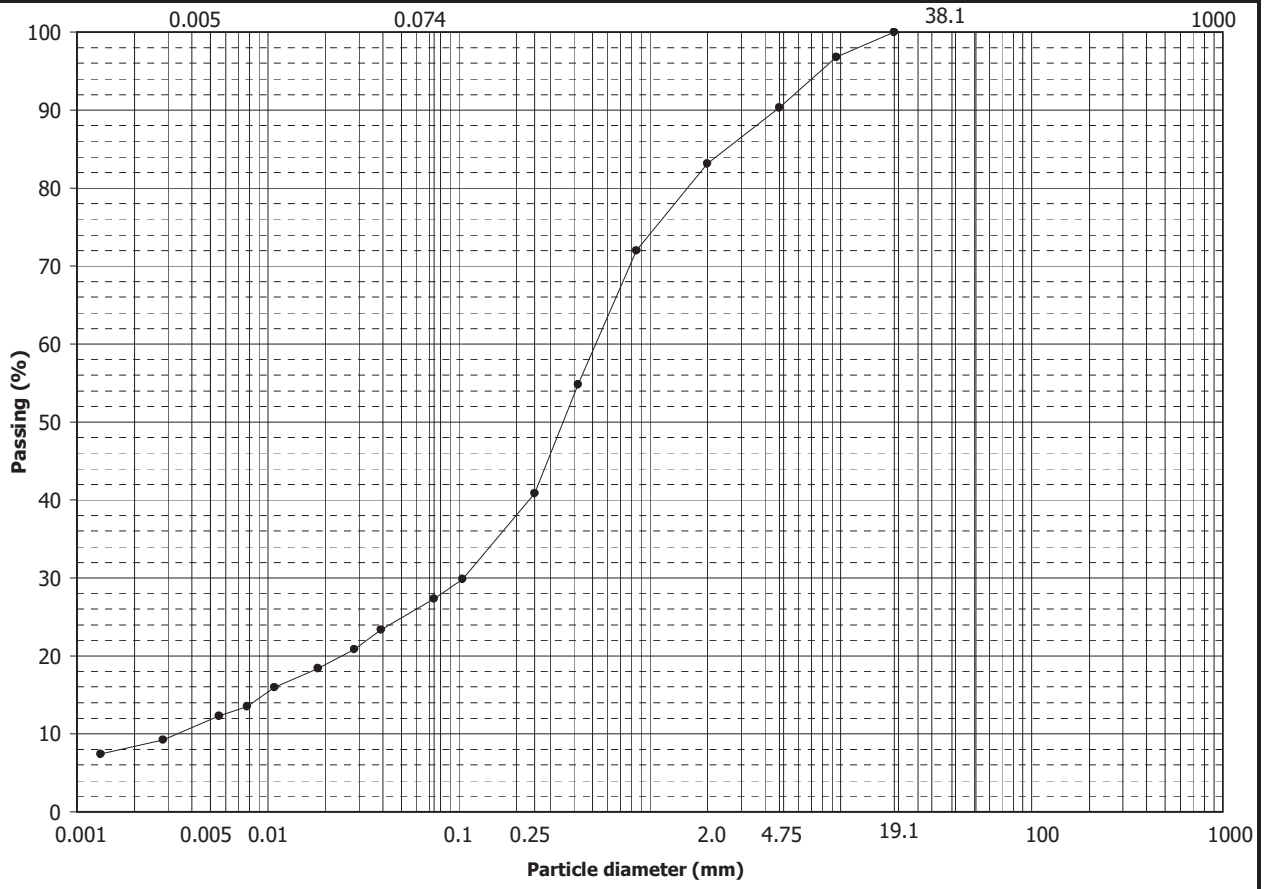
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Cabang : Jalan Jenggala Barat 27 Malang Telp.: (0341) 362391, Fax.: (0341) 334472, E-mail : divisi.ukl@indrakarya.co.id atau lab_geoteknik_ika@yahoo.com

RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 20, 2019
LOCATION	**LABUAN - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 16**	DEPTH	**19.50 - 20.00**

SPECIFIC GRAVITY : **2.689**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
9.68	63.00	15.54	11.79	19.10	4.629	0.5506	0.3617	0.1065	0.0035	155.69	83.11	54.79	27.32



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		0.50 - 1.00

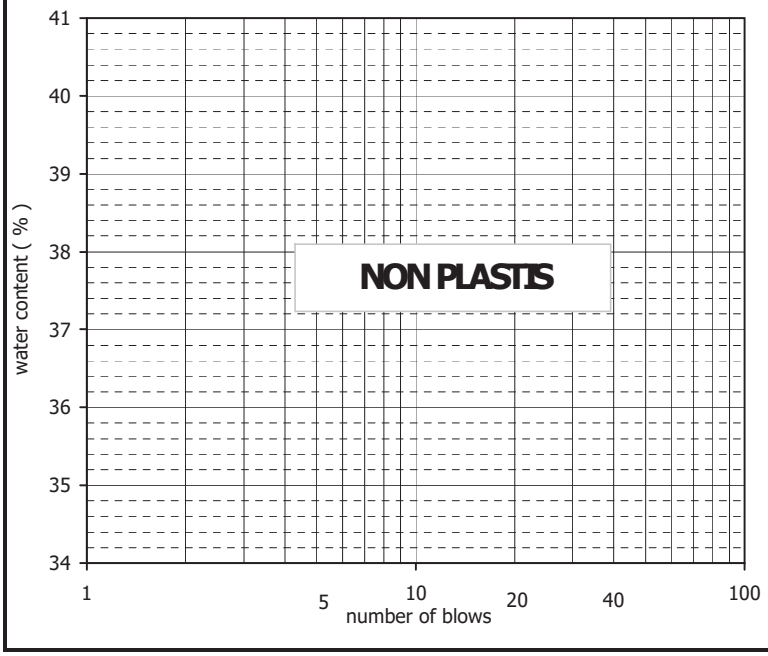
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		1.50 - 2.00

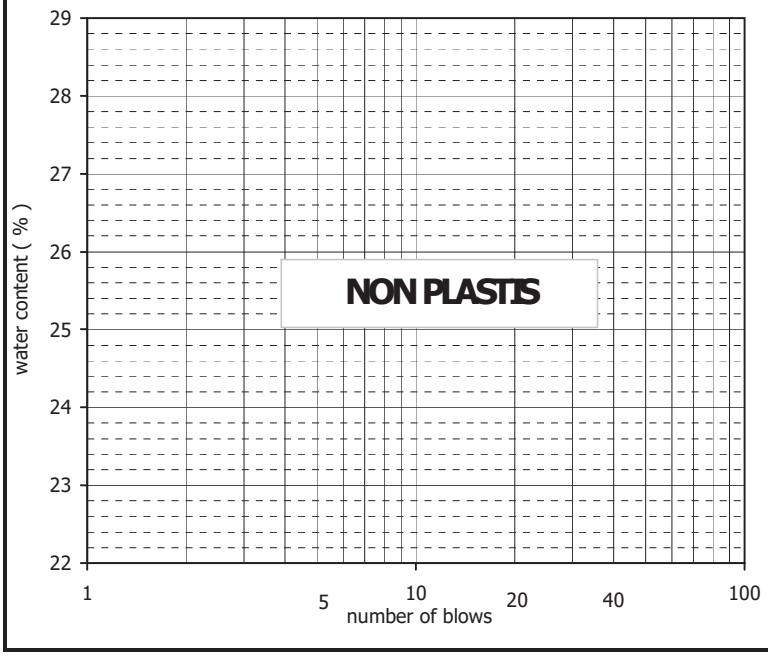
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		2.50 - 3.00

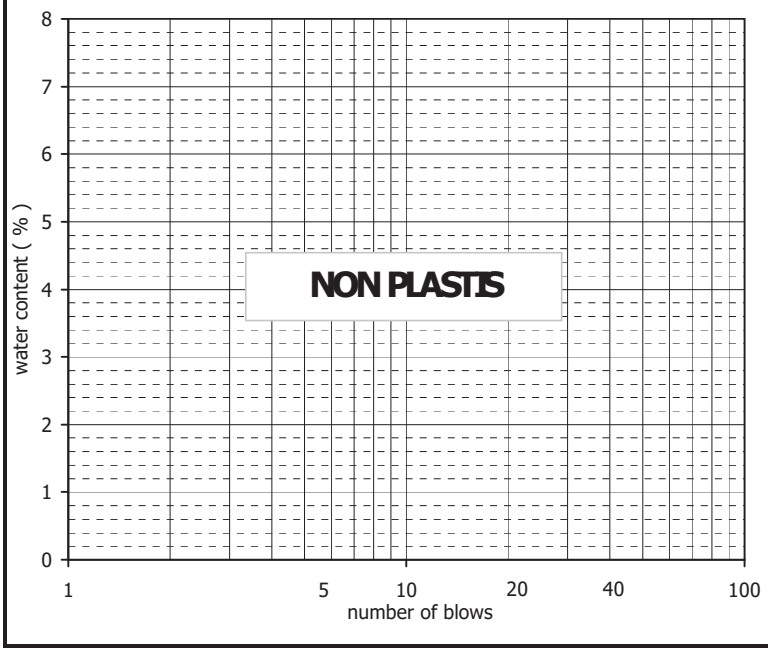
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		3.50 - 4.00

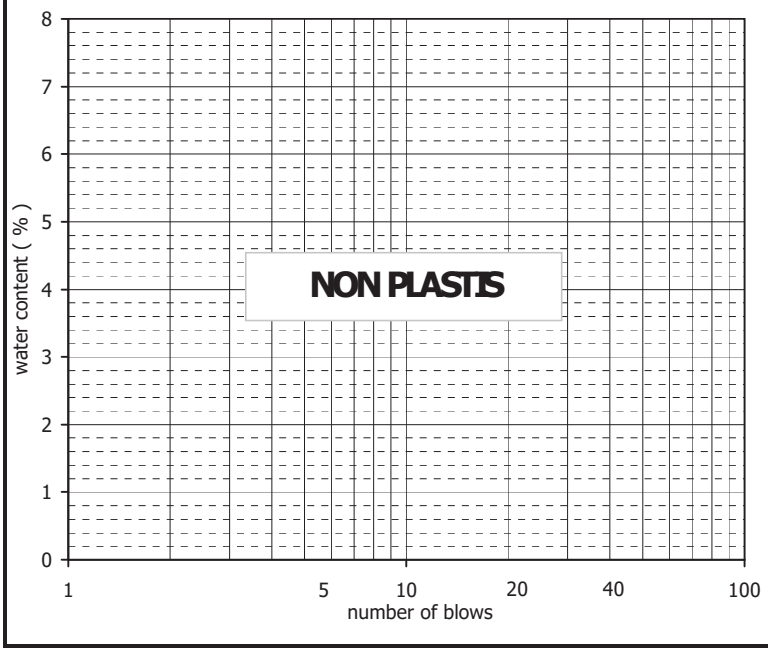
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		4.50 - 5.00

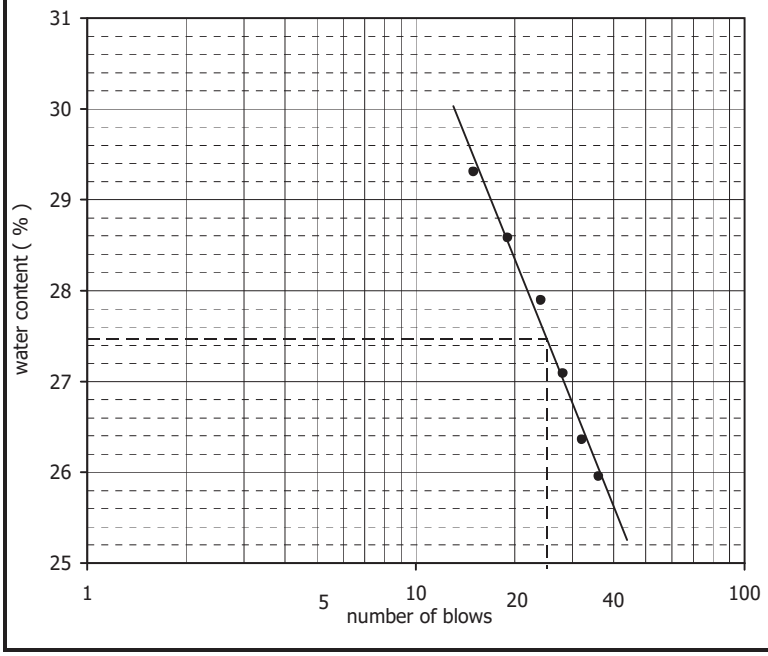
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	J-20			No.	L-17			No.	T-83
WW	54.550	DW	51.360	WW	55.020	DW	52.020	WW	50.810	DW	47.470
DW	51.360	TW	39.070	DW	52.020	TW	40.640	DW	47.470	TW	35.140
Ww	3.190	Ws	12.290	Ww	3.000	Ws	11.380	Ww	3.340	Ws	12.330
	W =		25.96 %		W =		26.36 %		W =		27.09 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	J-23			No.	J-89			No.	T-45
WW	52.480	DW	48.930	WW	51.960	DW	48.690	WW	54.880	DW	51.210
DW	48.930	TW	36.204	DW	48.690	TW	37.250	DW	51.210	TW	38.690
Ww	3.550	Ws	12.726	Ww	3.270	Ws	11.440	Ww	3.670	Ws	12.520
	W =		27.89 %		W =		28.58 %		W =		29.31 %

PLASTIC LIMIT

1				2				3			
		No.	J-50			No.	J-52			No.	T-46
WW	52.970	DW	50.370	WW	51.220	DW	48.640	WW	52.690	DW	50.050
DW	50.370	TW	38.240	DW	48.640	TW	36.710	DW	50.050	TW	37.820
Ww	2.600	Ws	12.130	Ww	2.580	Ws	11.930	Ww	2.640	Ws	12.230
	W =		21.43 %		W =		21.63 %		W =		21.59 %



LIQUID LIMIT	=	27.47	%
PLASTIC LIMIT	=	21.55	%
PLASTICITY INDEX	=	5.92	%
FLOW INDEX	=	9.02	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		5.50 - 6.00

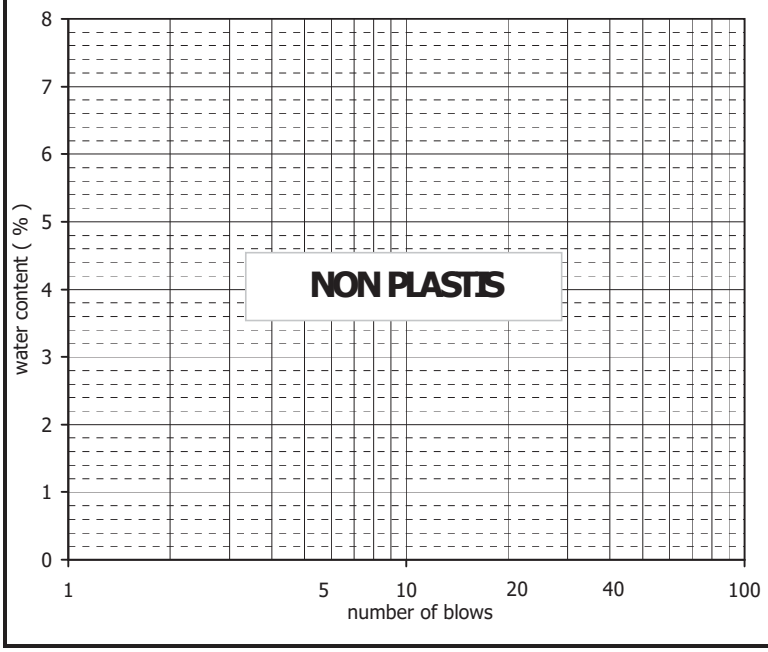
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		6.50 - 7.00

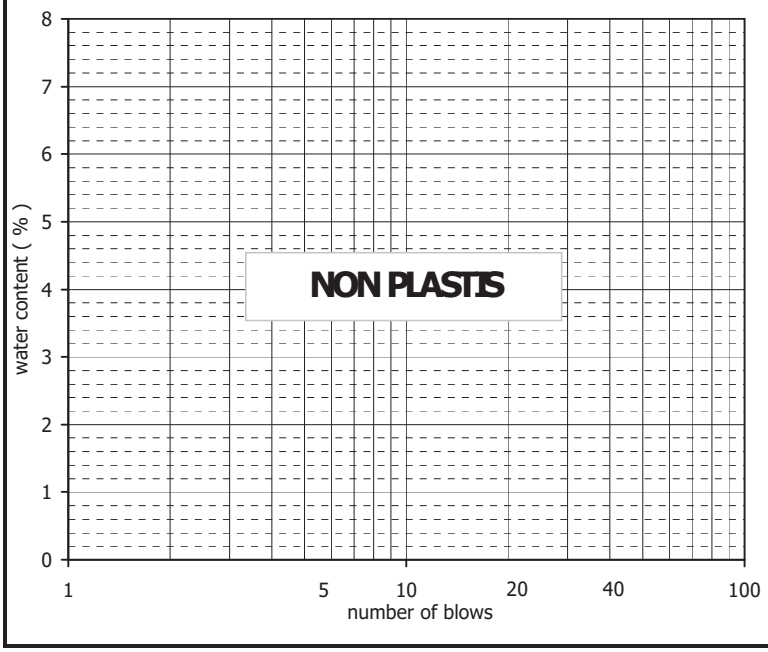
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		8.50 - 9.00

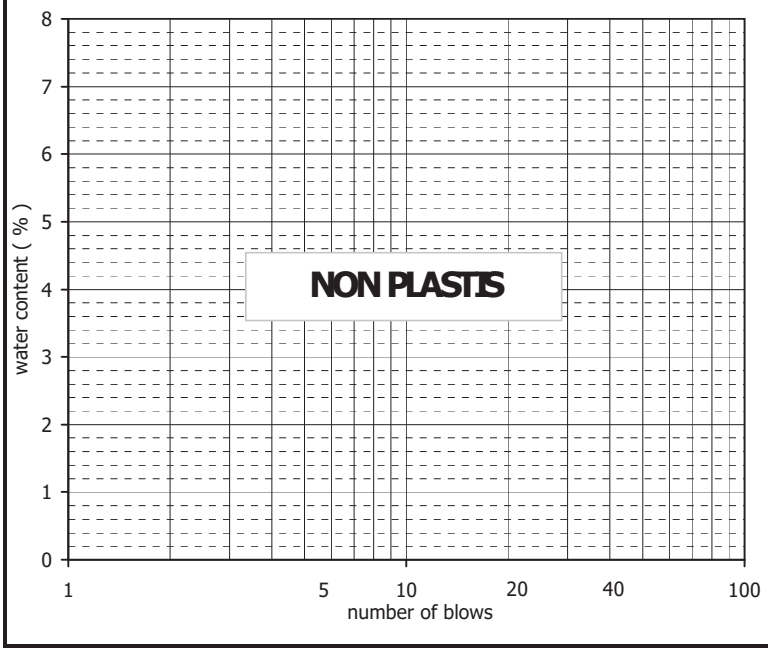
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		9.50 - 10.00

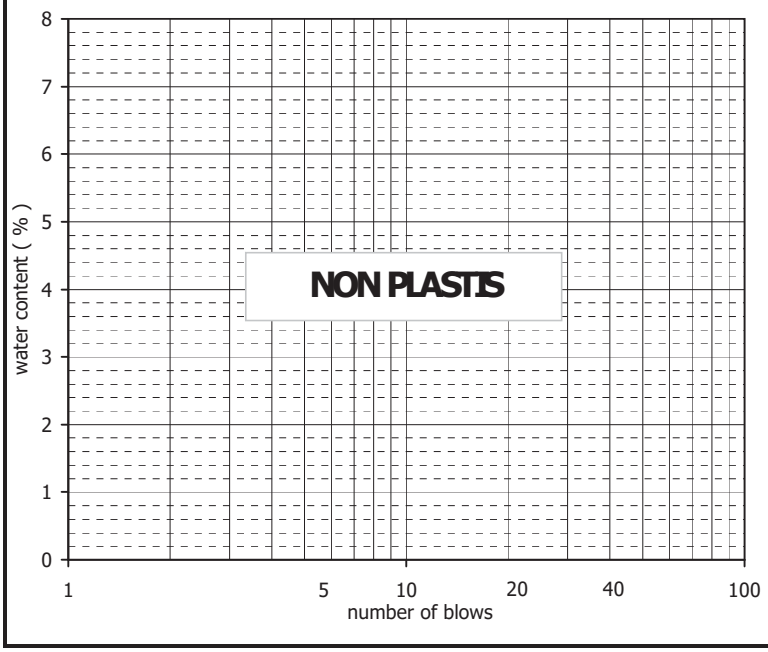
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		10.50 - 11.00

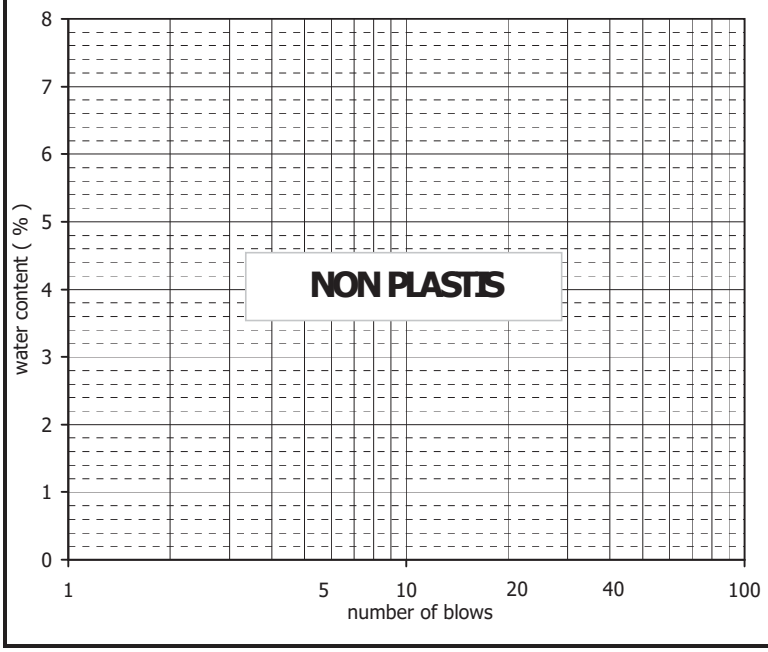
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		13.50 - 14.00

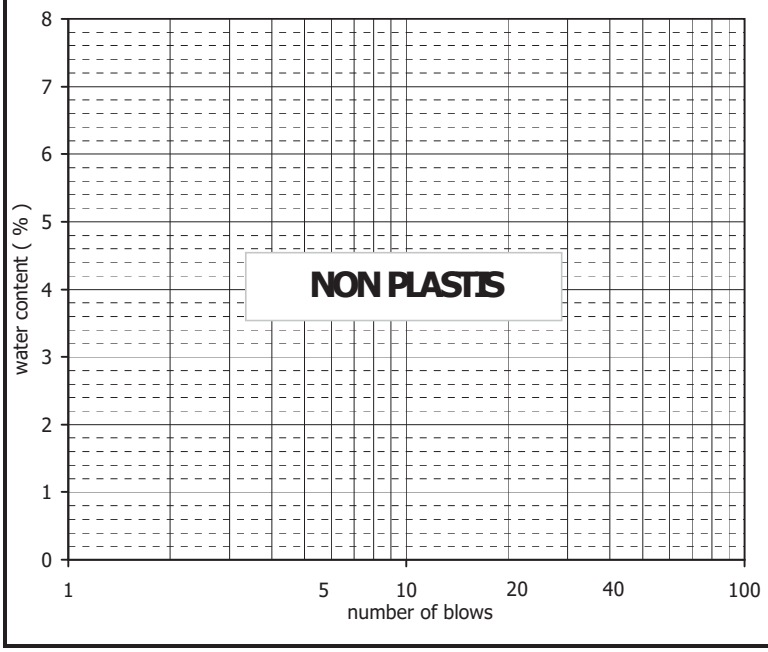
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		14.50 - 15.00

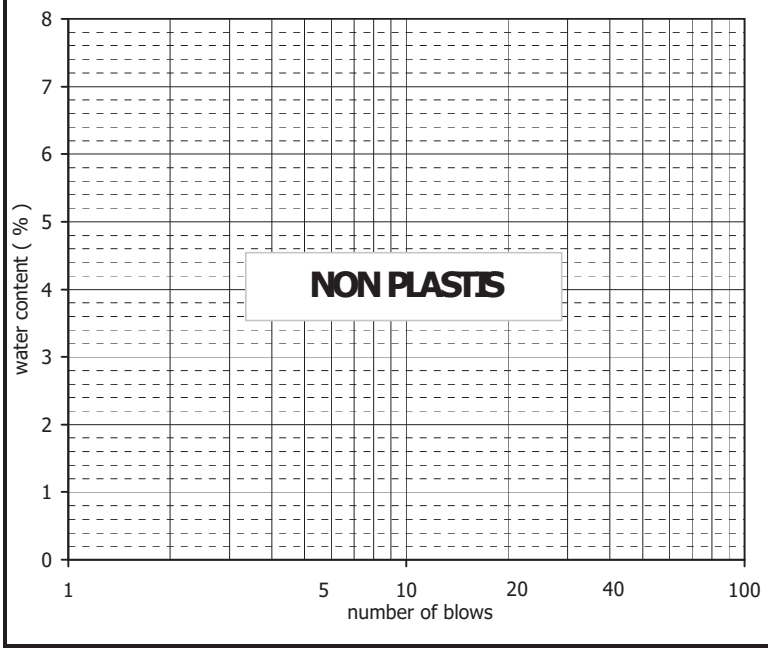
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		16.50 - 17.00

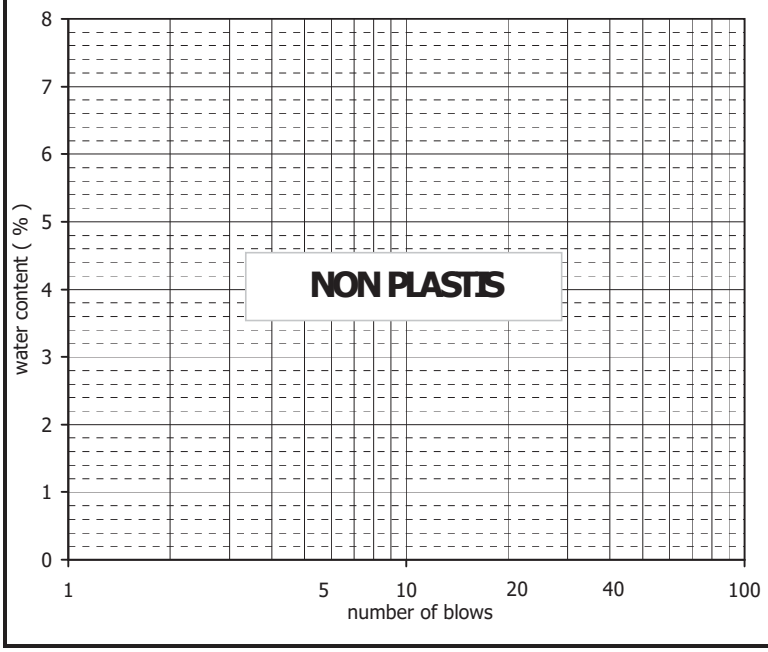
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	LABUAN - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 16	DEPTH (m)		19.50 - 20.00

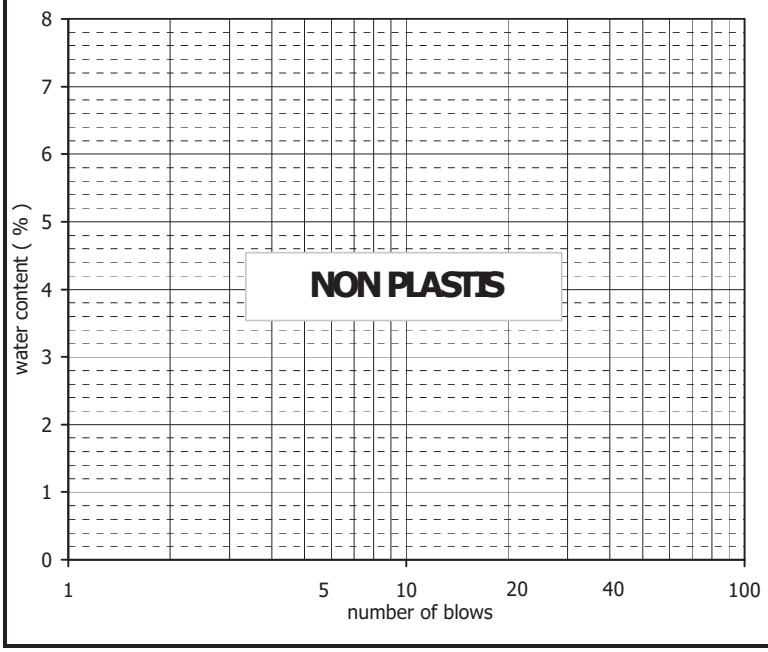
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**TONDO - PALU**									
SAMPLE No			BAY - 17	BAY - 17	BAY - 17	BAY - 17	BAY - 17	BAY - 17	BAY - 17	BAY - 17	BAY - 17
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	12.96	36.10	15.58	15.05	13.48	12.91	10.80	8.88	7.43
	Specific gravity of soil	*Gs*	2.609	2.685	2.647	2.694	2.691	2.674	2.680	2.678	2.682
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	10.34	14.17	43.60	27.93	19.11	6.82	18.76	27.88	31.14
	Proportion – Sand part	(%)	60.72	22.16	37.53	54.28	68.51	59.29	56.39	51.61	57.35
	Proportion – Silt part	(%)	21.29	47.81	15.49	12.20	9.81	25.06	18.57	15.07	9.20
	Proportion – Clay part	(%)	7.64	15.86	3.37	5.59	2.56	8.83	6.28	5.44	2.30
	Max. diameter	(mm)	19.10	25.40	25.40	25.40	38.10	19.10	25.40	25.40	25.40
	90 % diameter	(mm)	5.0431	14.8578	20.4109	13.1672	11.2810	2.0287	8.7013	14.8426	16.7123
	60 % diameter	(mm)	0.3840	0.0668	6.8434	1.6281	1.6855	0.3023	0.9025	1.7189	2.8116
	50 % diameter	(mm)	0.2496	0.0472	1.7995	0.7781	1.0898	0.1906	0.3810	0.7738	1.6055
	30 % diameter	(mm)	0.0790	0.0192	0.2100	0.2621	0.2805	0.0629	0.0985	0.2162	0.5864
	10 % diameter	(mm)	0.0095	-	0.0346	0.0255	0.0457	0.0065	0.0152	0.0255	0.0568
	Uniformity Coefficient		40.55	-	198.03	63.87	36.84	46.51	59.29	67.30	49.49
	Passing # 200		28.94	63.67	18.87	17.80	12.38	33.89	24.85	20.51	11.50
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	36.95	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS
	Plastic limit	*PL* (%)		27.39							
	Plasticity index	*PI* (%)		9.56							
	Flow index			10.27							
	Unified Classification			ML							

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**TONDO - PALU**									
SAMPLE No			BAY - 17	BAY - 17	BAY - 17	BAY - 17	BAY - 17				
DEPTH (m)			9.50 - 10.00	11.50 - 12.00	13.50 - 14.00	15.50 - 16.00	18.50 - 19.00				
PROPERTIES	Natural Water Content	(%)	10.57	29.28	20.62	21.53	21.58				
	Specific gravity of soil	*Gs*	2.665	2.697	2.605	2.687	2.684				
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	10.37	0.00	5.80	0.00	12.84				
	Proportion – Sand part	(%)	65.97	37.21	50.72	58.92	66.06				
	Proportion – Silt part	(%)	17.91	43.95	24.77	32.25	16.53				
	Proportion – Clay part	(%)	5.74	18.84	18.71	8.82	4.57				
	Max. diameter	(mm)	19.10	4.75	19.10	4.75	19.10				
	90 % diameter	(mm)	4.9796	0.2318	1.9490	0.3311	6.3274				
	60 % diameter	(mm)	0.4407	0.0691	0.2283	0.1039	0.5751				
	50 % diameter	(mm)	0.3151	0.0517	0.1257	0.0881	0.3715				
	30 % diameter	(mm)	0.1190	0.0203	0.0187	0.0468	0.1586				
	10 % diameter	(mm)	0.0142	-	-	0.0065	0.0195				
	Uniformity Coefficient		30.97	-	-	15.92	29.43				
	Passing # 200		23.66	62.79	43.48	41.08	21.10				
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	34.38	33.74	NON PLASTIS	NON PLASTIS				
	Plastic limit	*PL* (%)		24.62	24.83						
	Plasticity index	*PI* (%)		9.76	8.90						
	Flow index			10.01	9.86						
	Unified Classification			ML	SM						

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	TONDO - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	A-28								No	A-26	
11/02	BAY - 17		WW	85.40	DW	79.99			11/02	BAY - 17		WW	102.30	DW	97.80		
2019	0.50 - 1.00	12.96	DW	79.99	TW	38.24			2019	8.50 - 9.00	7.43	DW	97.80	TW	37.22		
			Ww	5.41	Ws	41.75						Ww	4.50	Ws	60.58		
				WC	(%)	12.96							WC	(%)	7.43		
					No	A-98								No	A-54		
11/02	BAY - 17		WW	99.94	DW	83.44			11/02	BAY - 17		WW	99.14	DW	93.24		
2019	1.50 - 2.00	36.10	DW	83.44	TW	37.73			2019	9.50 - 10.00	10.57	DW	93.24	TW	37.44		
			Ww	16.50	Ws	45.71						Ww	5.90	Ws	55.80		
				WC	(%)	36.10							WC	(%)	10.57		
					No	A-08								No	J-92		
11/02	BAY - 17		WW	104.25	DW	95.43			11/02	BAY - 17		WW	124.74	DW	105.09		
2019	2.50 - 3.00	15.58	DW	95.43	TW	38.81			2019	11.50 - 12.00	29.28	DW	105.09	TW	37.97		
			Ww	8.82	Ws	56.62						Ww	19.65	Ws	67.12		
				WC	(%)	15.58							WC	(%)	29.28		
					No	L-03								No	J-72		
11/02	BAY - 17		WW	105.39	DW	96.57			11/02	BAY - 17		WW	104.98	DW	92.90		
2019	3.50 - 4.00	15.05	DW	96.57	TW	37.98			2019	13.50 - 14.00	20.62	DW	92.90	TW	34.31		
			Ww	8.82	Ws	58.59						Ww	12.08	Ws	58.59		
				WC	(%)	15.05							WC	(%)	20.62		
					No	T-93								No	A-90		
11/02	BAY - 17		WW	115.74	DW	106.33			11/02	BAY - 17		WW	116.44	DW	102.82		
2019	4.50 - 5.00	13.48	DW	106.33	TW	36.50			2019	15.50 - 16.00	21.53	DW	102.82	TW	39.56		
			Ww	9.41	Ws	69.83						Ww	13.62	Ws	63.26		
				WC	(%)	13.48							WC	(%)	21.53		
					No	L-16								No	T-77		
11/02	BAY - 17		WW	99.77	DW	92.86			11/02	BAY - 17		WW	123.39	DW	108.53		
2019	5.50 - 6.00	12.91	DW	92.86	TW	39.33			2019	18.50 - 19.00	21.58	DW	108.53	TW	39.67		
			Ww	6.91	Ws	53.53						Ww	14.86	Ws	68.86		
				WC	(%)	12.91							WC	(%)	21.58		
					No	A-13								No			
11/02	BAY - 17		WW	108.40	DW	101.46						WW		DW			
2019	6.50 - 7.00	10.80	DW	101.46	TW	37.18						DW		TW			
			Ww	6.94	Ws	64.28						Ww		Ws			
				WC	(%)	10.80							WC	(%)			
					No	T-41								No			
11/02	BAY - 17		WW	87.02	DW	83.09						WW		DW			
2019	7.50 - 8.00	8.88	DW	83.09	TW	38.83						DW		TW			
			Ww	3.93	Ws	44.26						Ww		Ws			
				WC	(%)	8.88							WC	(%)			

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**TONDO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				15	58	13	
Weight of Pycnometer		Wf	(gr)	77.130	35.070	66.070	
Weight of (Pycnometer + Water)		Wa	(gr)	173.150	145.730	167.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	185.920	158.320	179.770	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.420	38.160	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.640	20.380	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	173.1500	145.7300	167.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.870	7.790	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.623	2.616	2.628	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.609	2.603	2.614	
Average Specific Gravity at 20° C							**2.609**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**TONDO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				2	36	60	
Weight of Pycnometer		Wf	(gr)	66.900	51.080	43.180	
Weight of (Pycnometer + Water)		Wa	(gr)	168.750	151.920	146.610	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.380	164.770	159.380	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.860	38.180	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.080	20.400	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.7500	151.9200	146.6100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.450	7.550	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.695	2.702	2.700	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.681	2.688	2.687	
Average Specific Gravity at 20° C							**2.685**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**TONDO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				45	57	37	
Weight of Pycnometer		Wf	(gr)	37.860	50.930	50.940	
Weight of (Pycnometer + Water)		Wa	(gr)	139.180	151.170	151.200	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.900	163.690	163.950	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.160	37.860	38.190	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.380	20.080	20.410	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	139.1800	151.1700	151.2000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.660	7.560	7.660	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.661	2.656	2.664	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.647	2.642	2.651	
Average Specific Gravity at 20° C							**2.647**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**TONDO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				54	46	70	
Weight of Pycnometer		Wf	(gr)	51.250	39.280	37.010	
Weight of (Pycnometer + Water)		Wa	(gr)	151.310	140.310	136.860	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.300	153.330	149.710	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.370	38.430	38.150	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.590	20.650	20.370	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.3100	140.3100	136.8600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.600	7.630	7.520	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.709	2.706	2.709	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.695	2.693	2.695	
Average Specific Gravity at 20° C							**2.694**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	TONDO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				49	69	68	
Weight of Pycnometer		Wf	(gr)	39.190	36.570	34.650	
Weight of (Pycnometer + Water)		Wa	(gr)	141.110	137.650	134.460	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	153.850	150.510	147.170	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.010	38.150	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.230	20.370	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	141.1100	137.6500	134.4600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.490	7.510	7.470	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.701	2.712	2.701	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.687	2.698	2.688	
Average Specific Gravity at 20° C							**2.691**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	TONDO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				18	3	82	
Weight of Pycnometer		Wf	(gr)	66.800	63.340	37.300	
Weight of (Pycnometer + Water)		Wa	(gr)	168.630	166.670	137.000	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.260	179.470	149.670	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.900	38.150	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.120	20.370	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.6300	166.6700	137.0000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.490	7.570	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.686	2.691	2.687	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.672	2.677	2.673	
Average Specific Gravity at 20° C							**2.674**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	TONDO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				21	78	47	
Weight of Pycnometer		Wf	(gr)	40.730	36.640	40.660	
Weight of (Pycnometer + Water)		Wa	(gr)	145.610	136.850	142.080	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	158.470	149.660	154.900	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.230	38.170	38.150	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.450	20.390	20.370	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	145.6100	136.8500	142.0800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.590	7.580	7.550	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.694	2.690	2.698	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.680	2.676	2.684	
Average Specific Gravity at 20° C							**2.680**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	TONDO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				86	71	72	
Weight of Pycnometer		Wf	(gr)	39.080	39.800	33.250	
Weight of (Pycnometer + Water)		Wa	(gr)	138.850	140.220	133.800	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.550	152.980	146.430	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.980	38.050	37.920	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.200	20.270	20.140	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.8500	140.2200	133.8000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.510	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.693	2.699	2.682	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.679	2.685	2.668	
Average Specific Gravity at 20° C							**2.678**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**TONDO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				63	84	59	
Weight of Pycnometer		Wf	(gr)	45.527	36.950	33.640	
Weight of (Pycnometer + Water)		Wa	(gr)	149.488	136.980	144.580	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	162.300	149.810	157.210	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.120	38.180	37.880	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.340	20.400	20.100	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	149.4884	136.9800	144.5800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.528	7.570	7.470	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.702	2.695	2.691	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.688	2.681	2.677	
Average Specific Gravity at 20° C							**2.682**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	TONDO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				31	73	79	
Weight of Pycnometer		Wf	(gr)	34.630	34.550	37.880	
Weight of (Pycnometer + Water)		Wa	(gr)	134.510	135.120	137.560	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	147.230	147.940	150.340	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.070	38.260	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.290	20.480	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	134.5100	135.1200	137.5600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.660	7.600	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.680	2.674	2.682	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.667	2.660	2.668	
Average Specific Gravity at 20° C							**2.665**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**TONDO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	11.50 - 12.00

Determination No				1	2	3	4
No of Pycnometer				22	769	19	
Weight of Pycnometer		Wf	(gr)	39.710	39.080	66.300	
Weight of (Pycnometer + Water)		Wa	(gr)	145.030	138.850	167.700	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	158.020	151.640	180.580	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.340	38.070	38.190	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.560	20.290	20.410	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	145.0300	138.8500	167.7000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.500	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.716	2.705	2.710	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.702	2.691	2.697	
Average Specific Gravity at 20° C							**2.697**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**TONDO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	13.50 - 14.00

Determination No				1	2	3	4
No of Pycnometer				23	41	80	
Weight of Pycnometer		Wf	(gr)	43.180	35.950	34.060	
Weight of (Pycnometer + Water)		Wa	(gr)	146.380	137.160	134.970	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	158.840	149.920	147.500	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.950	38.400	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.170	20.620	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.3800	137.1600	134.9700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.710	7.860	7.750	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.616	2.623	2.617	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.603	2.610	2.603	
Average Specific Gravity at 20° C							**2.605**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**TONDO - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	15.50 - 16.00

Determination No				1	2	3	4
No of Pycnometer				67	27	64	
Weight of Pycnometer		Wf	(gr)	36.820	39.750	37.070	
Weight of (Pycnometer + Water)		Wa	(gr)	137.620	140.000	148.310	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.340	152.870	161.130	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.000	38.200	38.130	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.220	20.420	20.350	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.6200	140.0000	148.3100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.550	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.696	2.705	2.703	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.682	2.691	2.689	
Average Specific Gravity at 20° C							**2.687**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	TONDO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 17	DEPTH	18.50 - 19.00

Determination No				1	2	3	4
No of Pycnometer				56	81	82	
Weight of Pycnometer		Wf	(gr)	52.690	36.910	37.300	
Weight of (Pycnometer + Water)		Wa	(gr)	152.160	135.890	137.000	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.840	148.680	149.770	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.920	38.120	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.140	20.340	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	152.1600	135.8900	137.0000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.460	7.550	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.700	2.694	2.700	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.686	2.680	2.687	
Average Specific Gravity at 20° C							**2.684**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 322.5 gr
Wt. container No ..... = 35.63 gr
Wt. Of air dry soil W' = 286.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **286.87** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	49.30	35.63	13.67		4.77	95.23
4.75	65.30		29.67		10.34	89.66
2.00	84.30		48.67		16.97	83.03

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 138.95 gr — Specific Gravity : **2.609**

Wt. of container B-03 = 35.13 gr — Plasticity Index : %

Wt. Of air dry soil W' = 103.82 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 83.03 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

			NO	A-06			NO	A-73			NO	A-93		
WW	53.40	DW	53.08		WW	54.35	DW	53.96	WW	52.43	DW	52.09	Mean value	
DW	53.08	TW	40.00		DW	53.96	TW	38.84	DW	52.09	TW	38.03	w	
Ww	0.32	Ws	13.08		Ww	0.39	Ws	15.12	Ww	0.34	Ws	14.06	2.48	%
w	2.45	%			w	2.58	%		w	2.42	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 101.306 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.5	18.5	28	10.928	10.928	3.3057	0.01261	0.0417	15.50	24.81	20.60
2	15.5	16.5	28	11.432	5.716	2.3909	0.01261	0.0302	13.50	21.61	17.94
5	13.0	14.0	28	12.063	2.413	1.5533	0.01261	0.0196	11.00	17.61	14.62
15	10.5	11.5	28	12.694	0.846	0.9199	0.01261	0.0116	8.50	13.61	11.30
30	9.0	10.0	28	13.072	0.436	0.6601	0.01261	0.0083	7.00	11.20	9.30
60	8.0	9.0	28	13.325	0.222	0.4712	0.01261	0.0059	6.00	9.60	7.97
240	7.0	8.0	29	13.577	0.057	0.2378	0.01248	0.0030	5.00	8.00	6.65
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01261	0.0014	4.00	6.40	5.32

P = 100/W = 0.9871

$$Mx = \frac{G_s}{G_s - 1} = 1.6215$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	32.80	22.02	10.780		10.64	89.36	74.20
0.42	46.86		24.840		24.52	75.48	62.67
0.25	62.28		40.260		39.74	60.26	50.04
0.105	80.04		58.020		57.27	42.73	35.48
0.074	88.02		66.000		65.15	34.85	28.94

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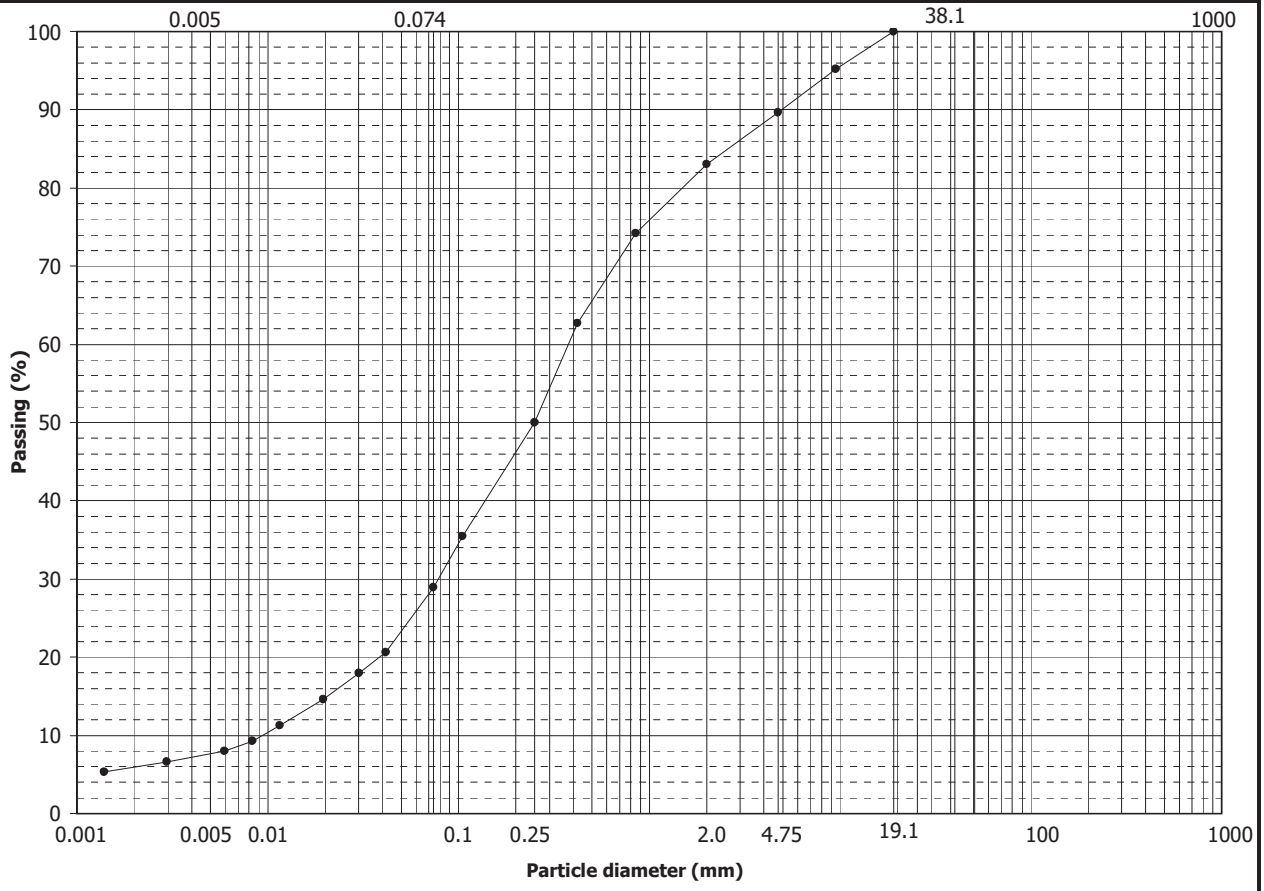
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.609**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
10.34	60.72	21.29	7.64	19.10	5.043	0.3840	0.2496	0.0790	0.0095	40.55	83.03	62.67	28.94



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 561.8 gr
Wt. container No ..... = 35.88 gr
Wt. Of air dry soil W' = 525.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **525.92** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	77.80	35.88	41.92		7.97	92.03
9.52	101.90		66.02		12.55	87.45
4.75	110.40		74.52		14.17	85.83
2.00	112.53		76.65		14.57	85.43

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 106.95 gr — Specific Gravity : **2.685**

Wt. of container B-03 = 32.47 gr — Plasticity Index : %

Wt. Of air dry soil W' = 74.48 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 85.43 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-30			NO	A-85			NO	A-96		
WW	56.70	DW	55.60	WW	55.22	DW	54.02	WW	54.70	DW	53.66	Mean value	
DW	55.60	TW	39.36	DW	54.02	TW	36.04	DW	53.66	TW	37.88	w	
Ww	1.10	Ws	16.24	Ww	1.20	Ws	17.98	Ww	1.04	Ws	15.78	6.68	%
w	6.77	%		w	6.67	%		w	6.59	%			

$$W = \frac{100 \times W'}{100 + w} : 69.817 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	25.0	26.0	28	9.035	9.035	3.0059	0.01232	0.0370	23.00	52.49	44.84
2	21.0	22.0	28	10.045	5.022	2.2411	0.01232	0.0276	19.00	43.36	37.04
5	17.0	18.0	28	11.054	2.211	1.4869	0.01232	0.0183	15.00	34.24	29.25
15	14.0	15.0	28	11.811	0.787	0.8873	0.01232	0.0109	12.00	27.39	23.40
30	12.0	13.0	28	12.315	0.411	0.6407	0.01232	0.0079	10.00	22.82	19.50
60	10.5	11.5	28	12.694	0.212	0.4600	0.01232	0.0057	8.50	19.40	16.57
240	8.5	9.5	29	13.198	0.055	0.2345	0.01219	0.0029	6.50	14.84	12.67
1140	7.5	8.5	28	13.451	0.012	0.1086	0.01232	0.0013	5.50	12.55	10.72

P = 100/W = 1.4323

$$Mx = \frac{G_s}{G_s - 1} = 1.5935$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.71	22.02	0.690		0.99	99.01	84.58
0.42	23.51		1.490		2.13	97.87	83.60
0.25	25.29		3.270		4.68	95.32	81.42
0.105	31.90		9.880		14.15	85.85	73.34
0.074	39.80		17.780		25.47	74.53	63.67

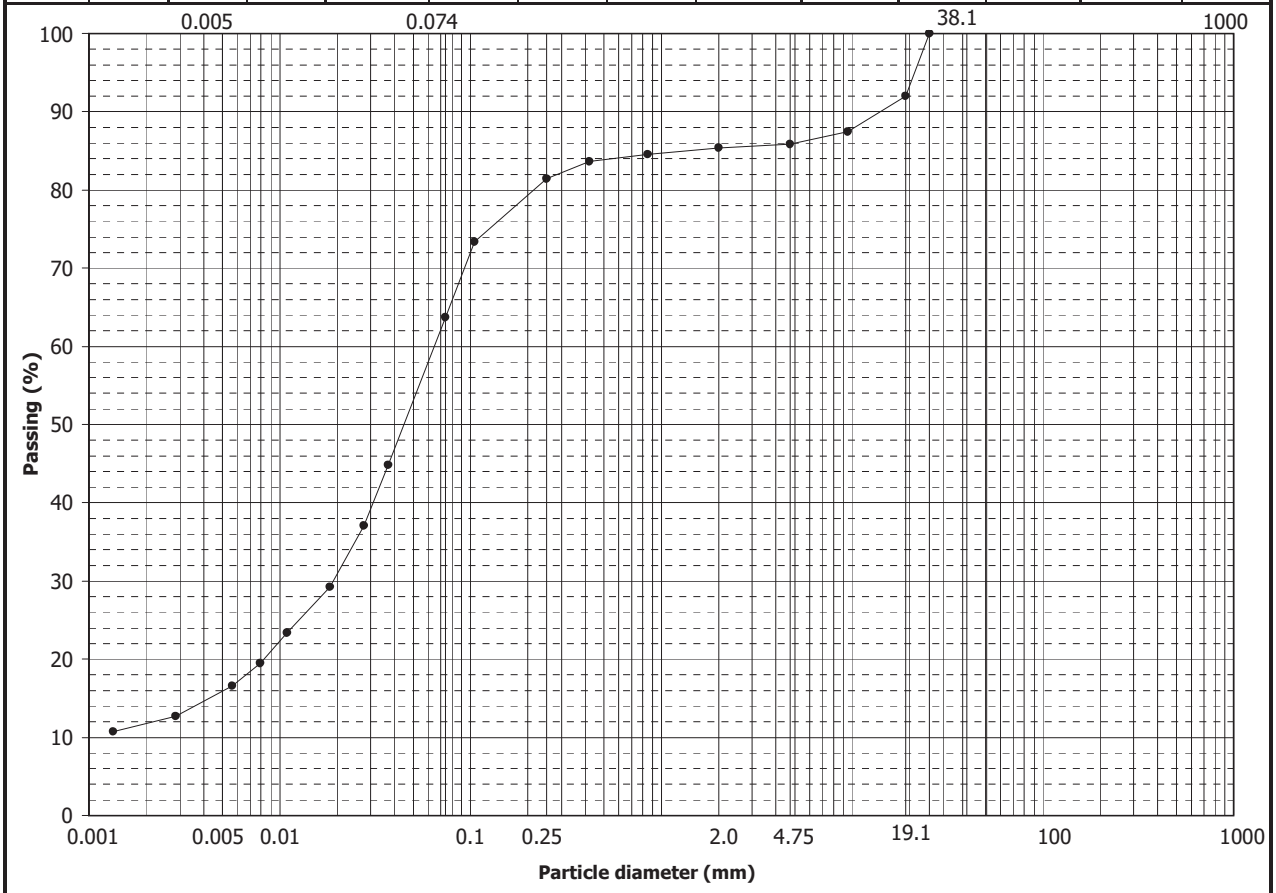
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.685**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
14.17	22.16	47.81	15.86	25.40	14.858	0.0668	0.0472	0.0192	-	-	85.43	83.60	63.67



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 529.7 gr
Wt. container No ..... = 36.41 gr
Wt. Of air dry soil W' = 493.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **493.29** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	98.70	36.41	62.29		12.63	87.37
9.52	211.00		174.59		35.39	64.61
4.75	251.50		215.09		43.60	56.40
2.00	276.40		239.99		48.65	51.35

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 109.69 gr — Specific Gravity : **2.647**

Wt. of container B-35 = 35.92 gr — Plasticity Index : %

Wt. Of air dry soil W' = 73.77 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 51.35 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-49			NO	J-40			NO	J-30		
WW	57.20	DW	56.36	WW	57.79	DW	56.80	WW	55.88	DW	54.98	Mean value	
DW	56.36	TW	40.36	DW	56.80	TW	38.32	DW	54.98	TW	37.61	w	
Ww	0.84	Ws	16.00	Ww	0.99	Ws	18.48	Ww	0.90	Ws	17.37	5.26	%
w	5.25	%		w	5.36	%		w	5.18	%			

$$W = \frac{100 \times W'}{100 + w} : 70.082 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	28	12.315	12.315	3.5093	0.01247	0.0437	10.00	22.93	11.78
2	10.0	11.0	28	12.820	6.410	2.5318	0.01247	0.0316	8.00	18.35	9.42
5	8.0	9.0	28	13.325	2.665	1.6325	0.01247	0.0203	6.00	13.76	7.07
15	6.0	7.0	28	13.829	0.922	0.9602	0.01247	0.0120	4.00	9.17	4.71
30	5.5	6.5	28	13.955	0.465	0.6820	0.01247	0.0085	3.50	8.03	4.12
60	5.0	6.0	28	14.081	0.235	0.4844	0.01247	0.0060	3.00	6.88	3.53
240	4.5	5.5	29	14.208	0.059	0.2433	0.01233	0.0030	2.50	5.73	2.94
1140	4.0	5.0	28	14.334	0.013	0.1121	0.01247	0.0014	2.00	4.59	2.36

P = 100/W = 1.4269

$$Mx = \frac{G_s}{G_s - 1} = 1.6072$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	32.58	22.02	10.560		15.07	84.93	43.61
0.42	41.20		19.180		27.37	72.63	37.30
0.25	47.99		25.970		37.06	62.94	32.32
0.105	59.46		37.440		53.42	46.58	23.92
0.074	66.35		44.330		63.25	36.75	18.87

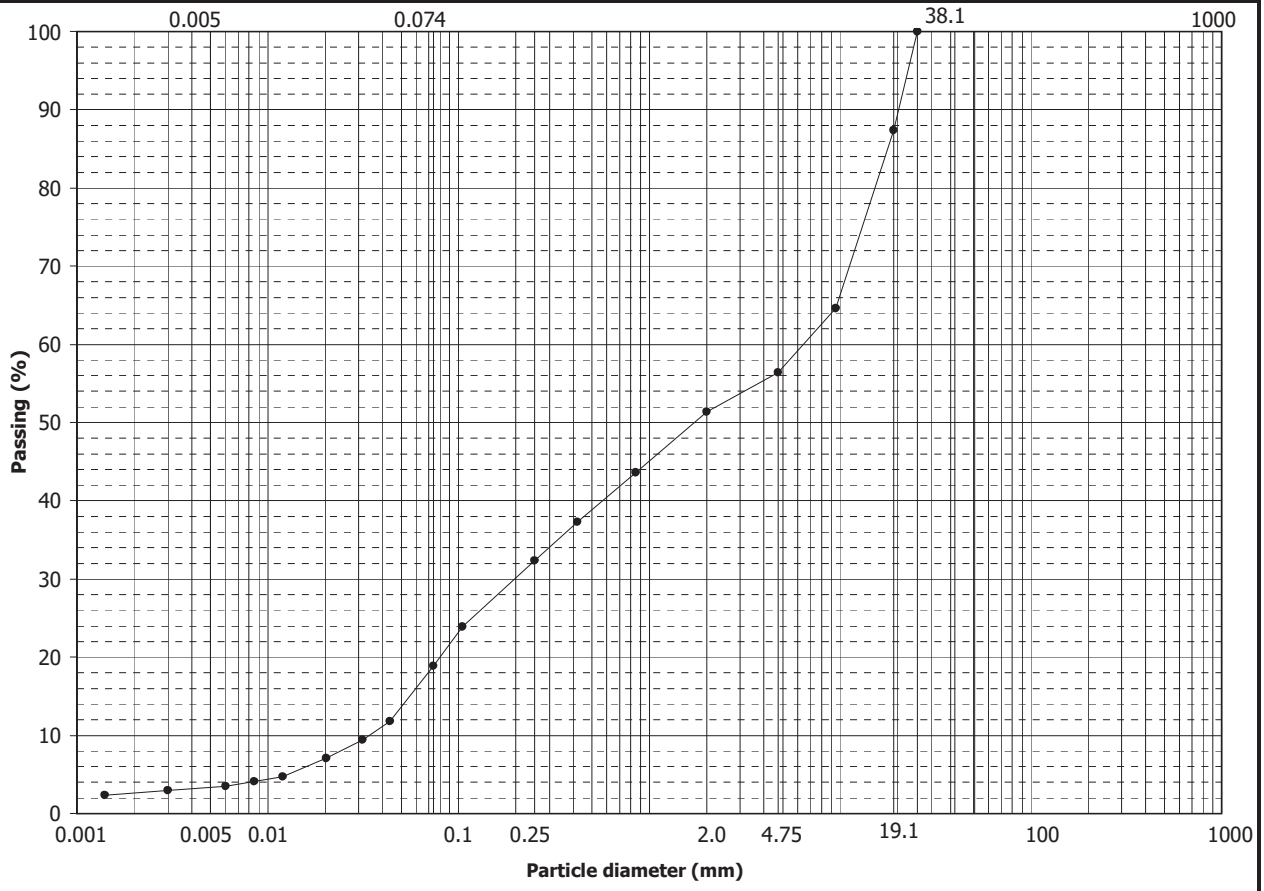
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.647**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
43.60	37.53	15.49	3.37	25.40	20.411	6.8434	1.7995	0.2100	0.0346	198.03	51.35	37.30	18.87



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 522.0 gr
Wt. container No ..... = 41.65 gr
Wt. Of air dry soil W' = 480.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **480.35** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	55.50	41.65	13.85		2.88	97.12
9.52	110.70		69.05		14.37	85.63
4.75	175.80		134.15		27.93	72.07
2.00	216.60		174.95		36.42	63.58

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 141.43 gr — Specific Gravity : **2.694**

Wt. of container B-24 = 34.50 gr — Plasticity Index : %

Wt. Of air dry soil W' = 106.93 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 63.58 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-37			NO	A-87			NO	A-33		
WW	51.08	DW	50.63	WW	58.99	DW	58.60	WW	57.53	DW	57.09	Mean value	
DW	50.63	TW	30.17	DW	58.60	TW	40.13	DW	57.09	TW	37.89	w	
Ww	0.45	Ws	20.46	Ww	0.39	Ws	18.47	Ww	0.44	Ws	19.20	2.20	%
w	2.20	%		w	2.11	%		w	2.29	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 104.627 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01229	0.0418	13.00	19.76	12.56
2	13.0	14.0	28	12.063	6.032	2.4559	0.01229	0.0302	11.00	16.72	10.63
5	11.5	12.5	28	12.442	2.488	1.5774	0.01229	0.0194	9.50	14.44	9.18
15	10.0	11.0	28	12.820	0.855	0.9245	0.01229	0.0114	8.00	12.16	7.73
30	9.0	10.0	28	13.072	0.436	0.6601	0.01229	0.0081	7.00	10.64	6.76
60	8.0	9.0	28	13.325	0.222	0.4712	0.01229	0.0058	6.00	9.12	5.80
240	7.0	8.0	29	13.577	0.057	0.2378	0.01216	0.0029	5.00	7.60	4.83
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01229	0.0014	4.00	6.08	3.87

P = 100/W = 0.9558

$$Mx = \frac{G_s}{G_s - 1} = 1.5903$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	40.23	22.02	18.210		17.40	82.60	52.51
0.42	64.97		42.950		41.05	58.95	37.48
0.25	78.22		56.200		53.71	46.29	29.43
0.105	91.89		69.870		66.78	33.22	21.12
0.074	97.36		75.340		72.01	27.99	17.80

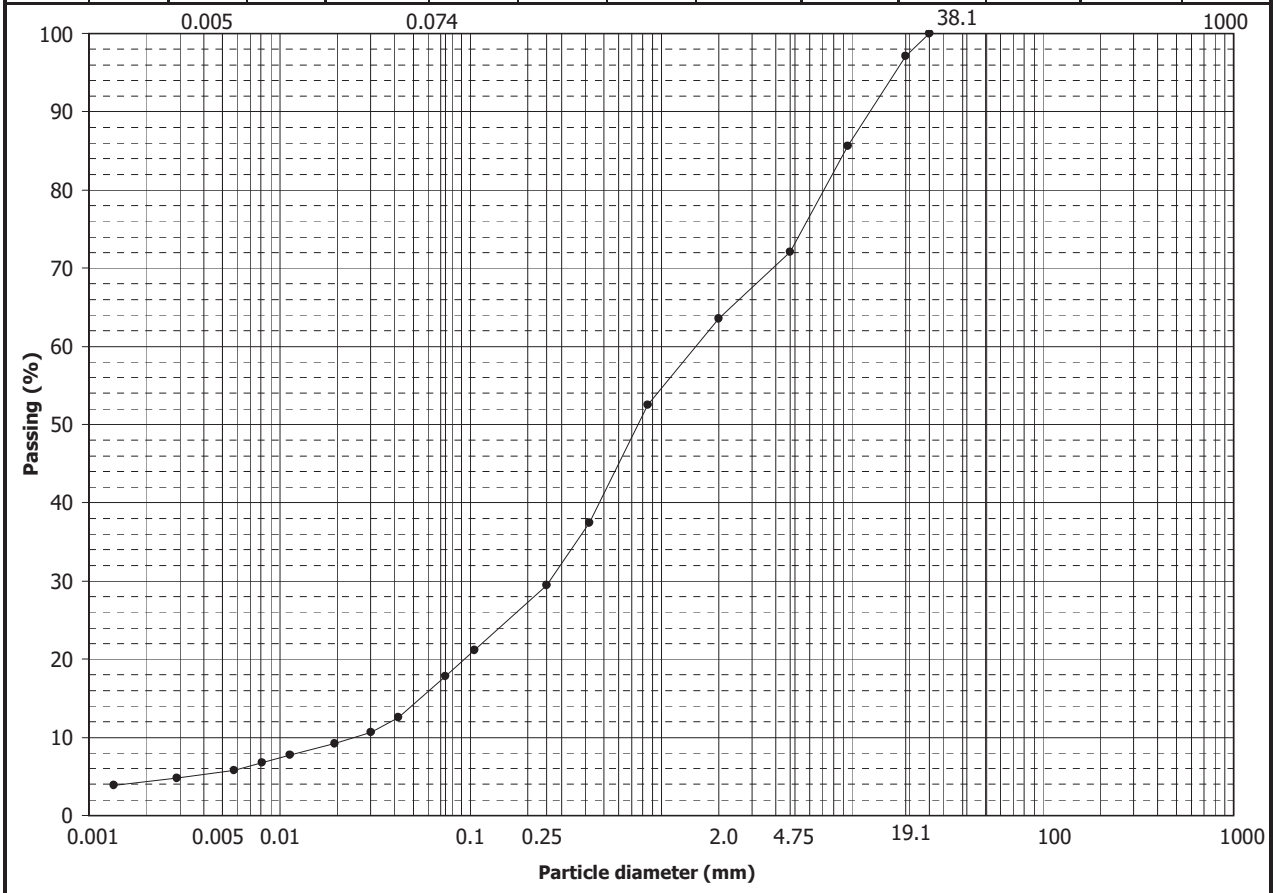
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.694**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
27.93	54.28	12.20	5.59	25.40	13.167	1.6281	0.7781	0.2621	0.0255	63.87	63.58	37.48	17.80



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 587.8 gr
Wt. container No ..... = 45.85 gr
Wt. Of air dry soil W' = 542.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **541.95** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						100.00
25.40	59.18	45.85	13.33		2.46	97.54
19.10	70.94		25.09		4.63	95.37
9.52	106.60		60.75		11.21	88.79
4.75	149.44		103.59		19.11	80.89
2.00	234.02		188.17		34.72	65.28

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 152.74 gr — Specific Gravity : **2.691**

Wt. of container M-45 = 42.75 gr — Plasticity Index : %

Wt. Of air dry soil W' = 109.99 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 65.28 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-14			NO	J-26			NO	J-39		
WW	49.530	DW	49.020	WW	51.740	DW	51.280	WW	50.050	DW	49.620	Mean value	
DW	49.020	TW	35.200	DW	51.280	TW	38.610	DW	49.620	TW	37.110	w	
Ww	0.51	Ws	13.82	Ww	0.46	Ws	12.67	Ww	0.43	Ws	12.51	3.59	%
w	3.69	%		w	3.63	%		w	3.44	%			

$$W = \frac{100 \times W}{100 + w}$$: 106.182 gr

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	28	12.315	12.315	3.5093	0.01230	0.0432	10.00	14.99	9.78
2	11.0	12.0	28	12.568	6.284	2.5068	0.01230	0.0308	9.00	13.49	8.81
5	9.0	10.0	28	13.072	2.614	1.6169	0.01230	0.0199	7.00	10.49	6.85
15	7.0	8.0	28	13.577	0.905	0.9514	0.01230	0.0117	5.00	7.49	4.89
30	6.0	7.0	28	13.829	0.461	0.6789	0.01230	0.0084	4.00	5.99	3.91
60	5.0	6.0	28	14.081	0.235	0.4844	0.01230	0.0060	3.00	4.50	2.94
240	3.5	4.5	29	14.460	0.060	0.2455	0.01217	0.0030	1.50	2.25	1.47
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01230	0.0014	1.00	1.50	0.98

P = 100/W = 0.9418

$$Mx = \frac{G\,s}{G\,s - 1} =$$ 1.5914

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	53.42	22.02	31.400		29.57	70.43	45.97
0.42	70.60		48.580		45.75	54.25	35.41
0.25	81.33		59.310		55.86	44.14	28.82
0.105	102.21		80.190		75.52	24.48	15.98
0.074	108.07		86.050		81.04	18.96	12.38

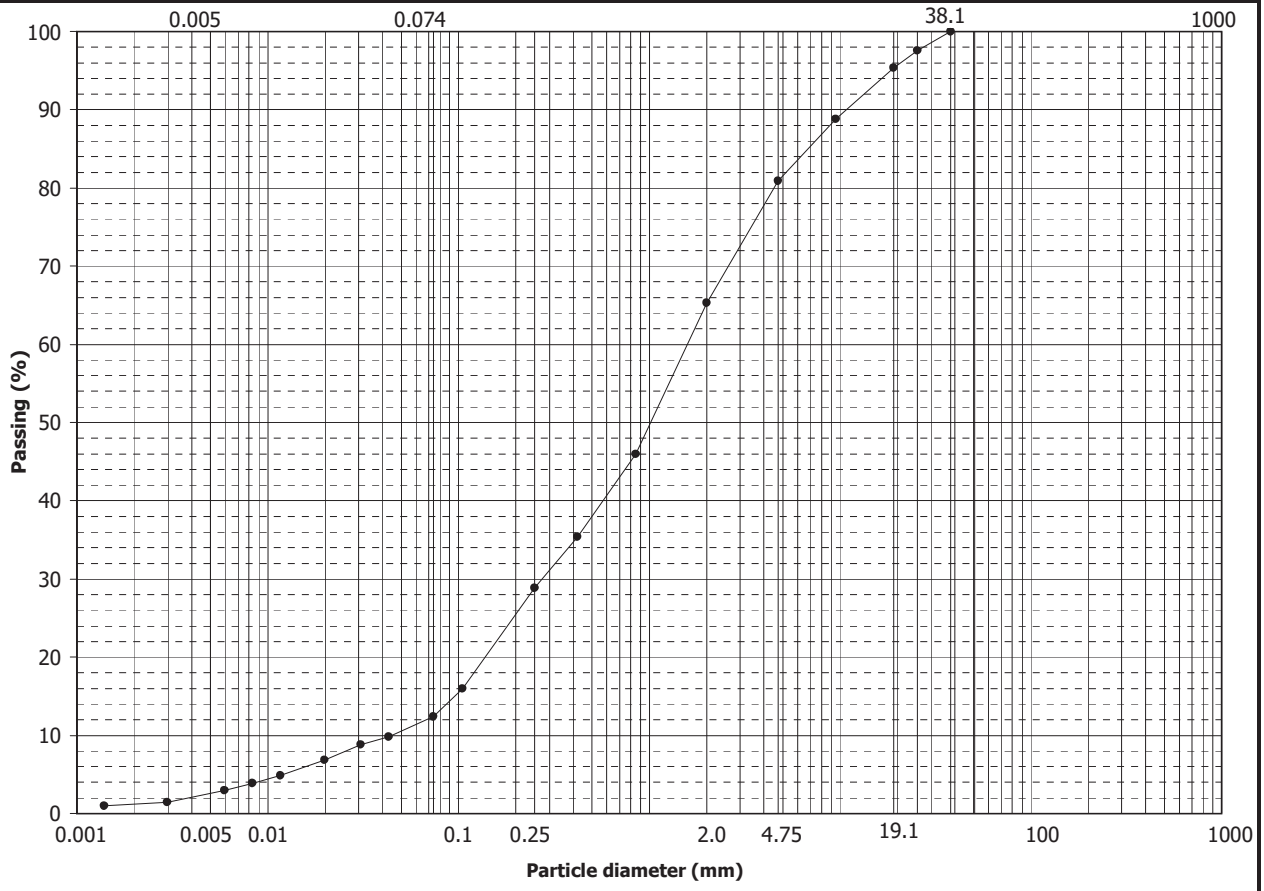
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.691**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
19.11	68.51	9.81	2.56	38.10	11.281	1.6855	1.0898	0.2805	0.0457	36.84	65.28	35.41	12.38



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 447.4 gr
Wt. container No ..... = 41.96 gr
Wt. Of air dry soil W' = 405.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **405.44** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	56.20	41.96	14.24		3.51	96.49
4.75	69.60		27.64		6.82	93.18
2.00	82.64		40.68		10.03	89.97

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 116.51 gr — Specific Gravity : **2.674**

Wt. of container B-27 = 36.85 gr — Plasticity Index : %

Wt. Of air dry soil W' = 79.66 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 89.97 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-04			NO	J-21			NO	J-29		
WW	49.870	DW	49.170	WW	49.830	DW	49.160	WW	50.620	DW	49.980	Mean value	
DW	49.170	TW	36.646	DW	49.160	TW	36.559	DW	49.980	TW	37.510	w	
Ww	0.70	Ws	12.52	Ww	0.67	Ws	12.60	Ww	0.64	Ws	12.47	5.35	%
w	5.59	%		w	5.32	%		w	5.13	%			

$$W = \frac{100 \times W'}{100 + w} : 75.617 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.0	15.0	28	11.811	11.811	3.4367	0.01236	0.0425	12.00	25.35	22.81
2	12.0	13.0	28	12.315	6.158	2.4815	0.01236	0.0307	10.00	21.12	19.00
5	10.5	11.5	28	12.694	2.539	1.5934	0.01236	0.0197	8.50	17.96	16.15
15	9.0	10.0	28	13.072	0.871	0.9335	0.01236	0.0115	7.00	14.79	13.30
30	8.0	9.0	28	13.325	0.444	0.6664	0.01236	0.0082	6.00	12.67	11.40
60	7.0	8.0	28	13.577	0.226	0.4757	0.01236	0.0059	5.00	10.56	9.50
240	5.5	6.5	29	13.955	0.058	0.2411	0.01223	0.0029	3.50	7.39	6.65
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01236	0.0014	2.50	5.28	4.75

P = 100/W = 1.3224

$$Mx = \frac{G_s}{G_s - 1} = 1.5974$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.79	22.02	6.770		8.95	91.05	81.91
0.42	39.84		17.820		23.57	76.43	68.76
0.25	50.48		28.460		37.64	62.36	56.11
0.105	63.00		40.980		54.19	45.81	41.21
0.074	69.15		47.130		62.33	37.67	33.89

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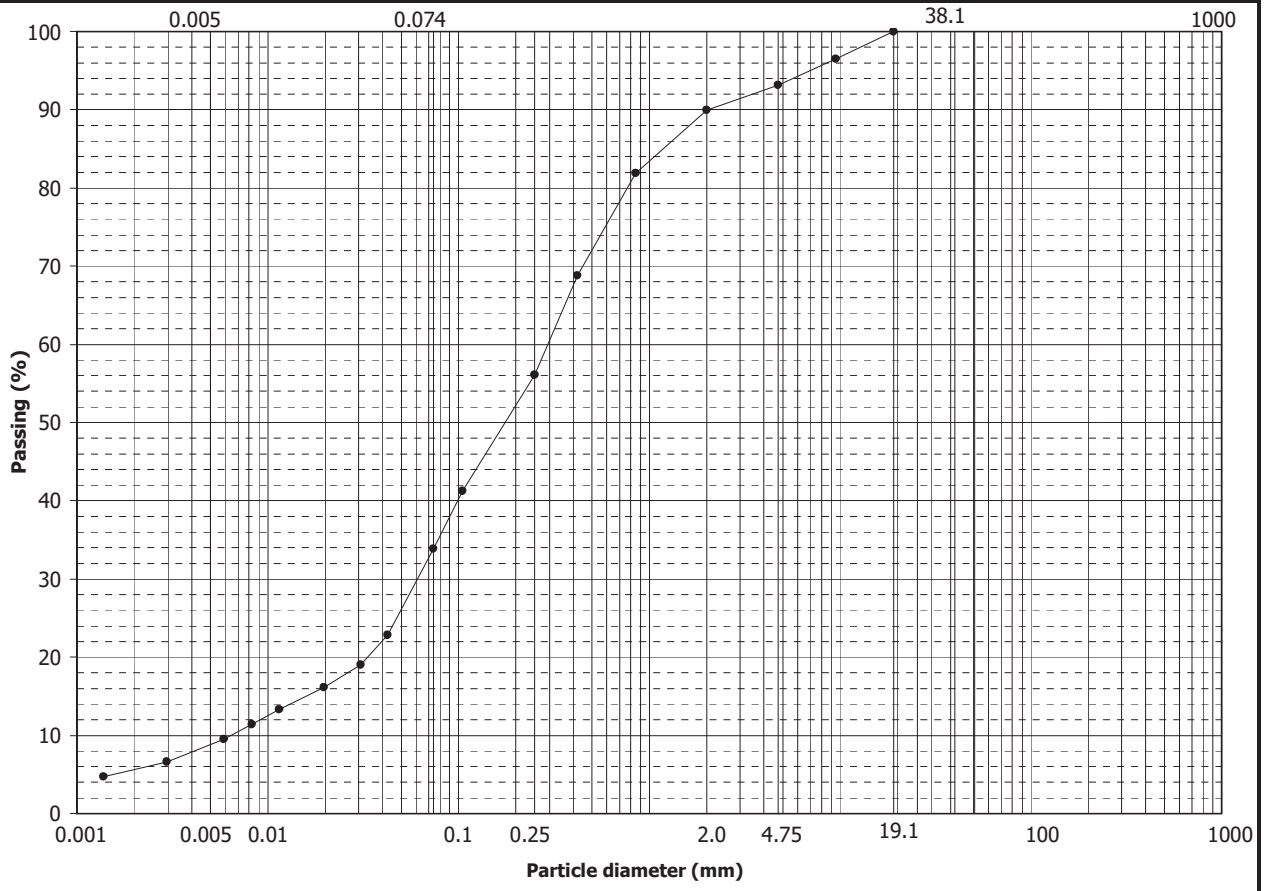
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.674**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
6.82	59.29	25.06	8.83	19.10	2.029	0.3023	0.1906	0.0629	0.0065	46.51	89.97	68.76	33.89



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 681.4 gr
Wt. container No ..... = 38.59 gr
Wt. Of air dry soil W' = 642.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **642.81** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	55.10	38.59	16.51		2.57	97.43
9.52	91.20		52.61		8.18	91.82
4.75	159.20		120.61		18.76	81.24
2.00	233.60		195.01		30.34	69.66

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 147.88 gr — Specific Gravity : **2.680**

Wt. of container M-42 = 39.61 gr — Plasticity Index : %

Wt. Of air dry soil W' = 108.27 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 69.66 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-05			NO	J-21			NO	J-32		
WW	50.330	DW	49.580	WW	50.460	DW	49.680	WW	53.130	DW	52.430	Mean value	
DW	49.580	TW	36.523	DW	49.680	TW	36.559	DW	52.430	TW	39.900	w	
Ww	0.75	Ws	13.06	Ww	0.78	Ws	13.12	Ww	0.70	Ws	12.53	5.76	%
w	5.74	%		w	5.94	%		w	5.59	%			

$$W = \frac{100 \times W'}{100 + w} : 102.375 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.0	19.0	28	10.802	10.802	3.2866	0.01234	0.0406	16.00	24.93	17.37
2	15.5	16.5	28	11.432	5.716	2.3909	0.01234	0.0295	13.50	21.04	14.65
5	12.5	13.5	28	12.189	2.438	1.5614	0.01234	0.0193	10.50	16.36	11.40
15	10.0	11.0	28	12.820	0.855	0.9245	0.01234	0.0114	8.00	12.47	8.68
30	9.0	10.0	28	13.072	0.436	0.6601	0.01234	0.0081	7.00	10.91	7.60
60	8.0	9.0	28	13.325	0.222	0.4712	0.01234	0.0058	6.00	9.35	6.51
240	7.0	8.0	29	13.577	0.057	0.2378	0.01221	0.0029	5.00	7.79	5.43
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01234	0.0014	4.00	6.23	4.34

P = 100/W = 0.9768

$$Mx = \frac{G_s}{G_s - 1} = 1.5952$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	36.90	22.02	14.880		14.53	85.47	59.54
0.42	48.49		26.470		25.86	74.14	51.65
0.25	59.07		37.050		36.19	63.81	44.45
0.105	78.30		56.280		54.97	45.03	31.37
0.074	87.88		65.860		64.33	35.67	24.85

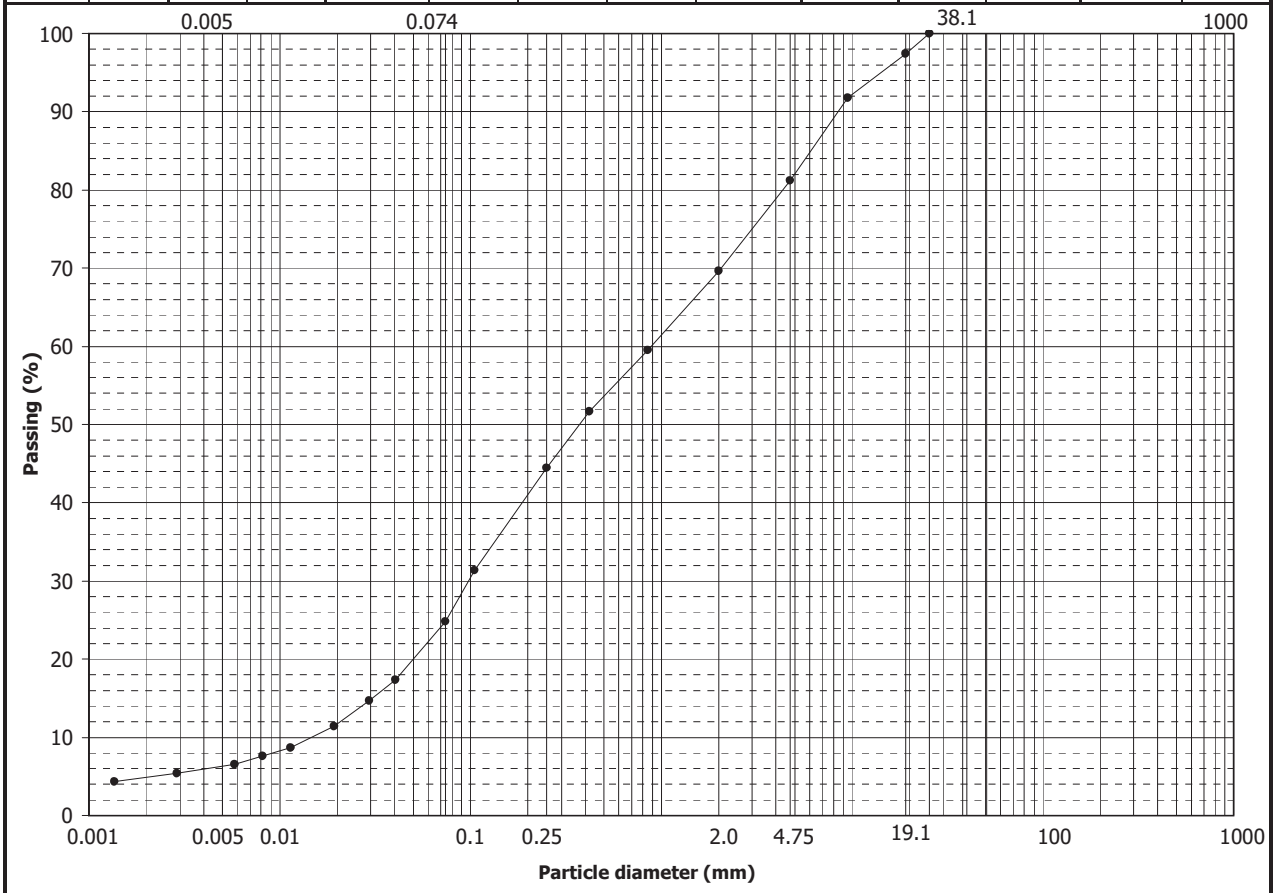
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.680**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
18.76	56.39	18.57	6.28	25.40	8.701	0.9025	0.3810	0.0985	0.0152	59.29	69.66	51.65	24.85



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 394.1 gr
Wt. container No ..... = 39.95 gr
Wt. Of air dry soil W' = 354.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **354.15** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	55.90	39.95	15.95		4.50	95.50
9.52	99.70		59.75		16.87	83.13
4.75	138.70		98.75		27.88	72.12
2.00	172.80		132.85		37.51	62.49

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	TONDO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 17	DEPTH	7.50 - 8.00

Wt. (Air dry soil + container) = 146.59 gr — Specific Gravity : 2.678
Wt. of container E-81 = 37.10 gr — Plasticity Index : %
Wt. Of air dry soil W' = 109.49 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 62.49 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-22			NO	J-25			NO	J-36		
WW	53.07	DW	52.63	WW	49.18	DW	48.79	WW	51.67	DW	51.24	Mean value	
DW	52.63	TW	39.01	DW	48.79	TW	36.05	DW	51.24	TW	38.80	w	
Ww	0.44	Ws	13.62	Ww	0.39	Ws	12.74	Ww	0.43	Ws	12.44	3.25	%
w	3.23	%		w	3.06	%		w	3.46	%			

$$W = \frac{100 \times W'}{100 + w} : 106.044 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	28	11.306	11.306	3.3625	0.01235	0.0415	14.00	21.07	13.17
2	13.5	14.5	28	11.937	5.968	2.4430	0.01235	0.0302	11.50	17.31	10.81
5	11.5	12.5	28	12.442	2.488	1.5774	0.01235	0.0195	9.50	14.30	8.93
15	10.0	11.0	28	12.820	0.855	0.9245	0.01235	0.0114	8.00	12.04	7.52
30	9.0	10.0	28	13.072	0.436	0.6601	0.01235	0.0082	7.00	10.53	6.58
60	8.0	9.0	28	13.325	0.222	0.4712	0.01235	0.0058	6.00	9.03	5.64
240	7.0	8.0	29	13.577	0.057	0.2378	0.01222	0.0029	5.00	7.52	4.70
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01235	0.0014	4.00	6.02	3.76

P = 100/W = 0.943

$$Mx = \frac{G_s}{G_s - 1} = 1.5959$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	39.29	22.02	17.270		16.29	83.71	52.31
0.42	61.41		39.390		37.15	62.85	39.28
0.25	73.96		51.940		48.98	51.02	31.88
0.105	87.64		65.620		61.88	38.12	23.82
0.074	93.26		71.240		67.18	32.82	20.51

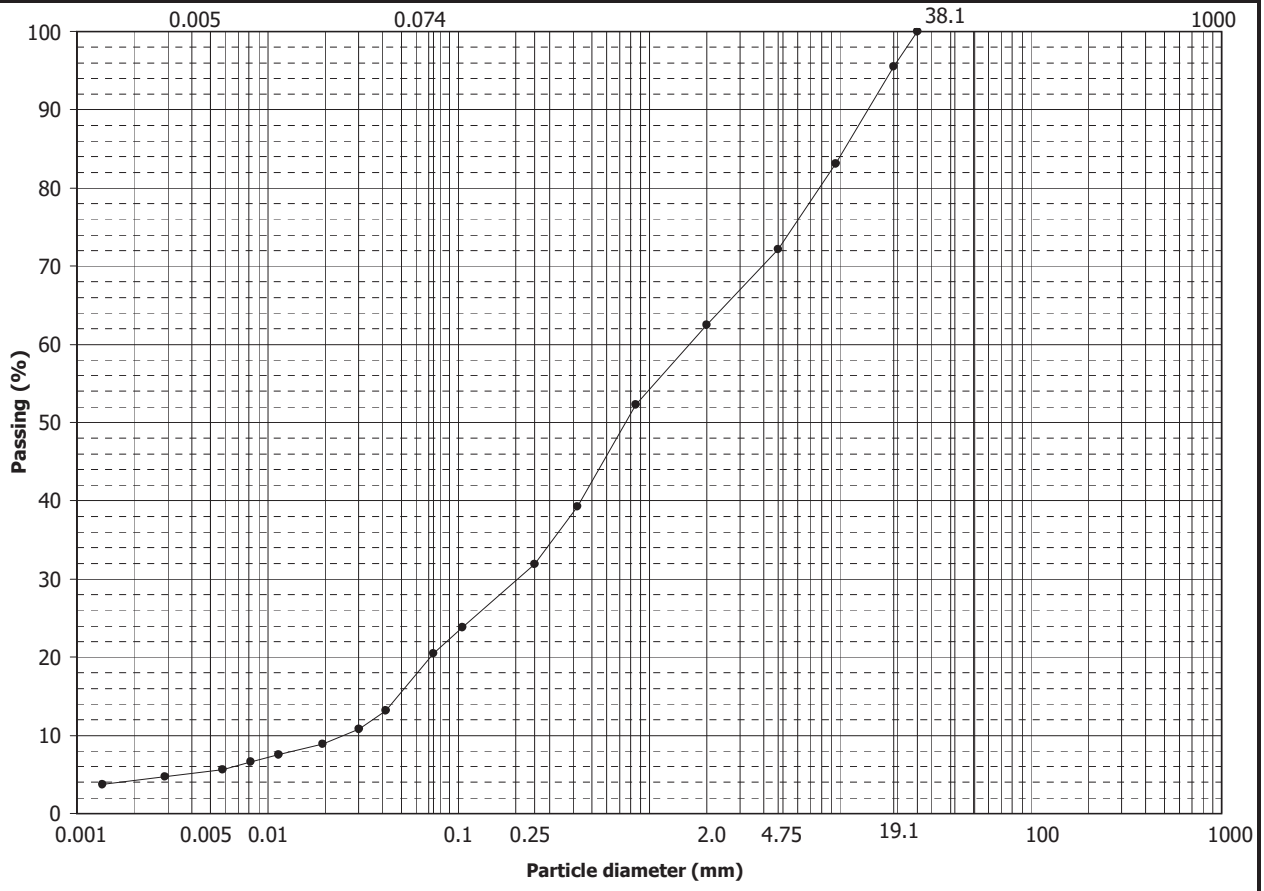
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.678**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
27.88	51.61	15.07	5.44	25.40	14.843	1.7189	0.7738	0.2162	0.0255	67.30	62.49	39.28	20.51



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 405.2 gr
Wt. container No ..... = 42.27 gr
Wt. Of air dry soil W' = 362.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **362.93** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	66.40	42.27	24.13		6.65	93.35
9.52	115.20		72.93		20.09	79.91
4.75	155.30		113.03		31.14	68.86
2.00	200.90		158.63		43.71	56.29

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 147.75 gr — Specific Gravity : **2.682**

Wt. of container M-55 = 43.74 gr — Plasticity Index : %

Wt. Of air dry soil W' = 104.01 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 56.29 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-10			NO	J-22			NO	J-38		
WW	49.970	DW	49.680	WW	52.740	DW	52.470	WW	50.520	DW	50.240	Mean value	
DW	49.680	TW	36.956	DW	52.470	TW	39.010	DW	50.240	TW	37.580	w	
Ww	0.29	Ws	12.72	Ww	0.27	Ws	13.46	Ww	0.28	Ws	12.66	2.17	%
w	2.28	%		w	2.01	%		w	2.21	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 101.805 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	28	12.315	12.315	3.5093	0.01233	0.0433	10.00	15.66	8.82
2	10.5	11.5	28	12.694	6.347	2.5193	0.01233	0.0311	8.50	13.31	7.49
5	9.0	10.0	28	13.072	2.614	1.6169	0.01233	0.0199	7.00	10.96	6.17
15	7.0	8.0	28	13.577	0.905	0.9514	0.01233	0.0117	5.00	7.83	4.41
30	6.0	7.0	28	13.829	0.461	0.6789	0.01233	0.0084	4.00	6.27	3.53
60	5.0	6.0	28	14.081	0.235	0.4844	0.01233	0.0060	3.00	4.70	2.65
240	3.5	4.5	29	14.460	0.060	0.2455	0.01220	0.0030	1.50	2.35	1.32
1140	2.5	3.5	28	14.712	0.013	0.1136	0.01233	0.0014	0.50	0.78	0.44

P = 100/W = 0.9823

$$Mx = \frac{G_s}{G_s - 1} = 1.5945$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	55.19	22.02	33.170		32.58	67.42	37.95
0.42	78.65		56.630		55.63	44.37	24.98
0.25	88.99		66.970		65.78	34.22	19.26
0.105	99.52		77.500		76.13	23.87	13.44
0.074	103.02		81.000		79.56	20.44	11.50

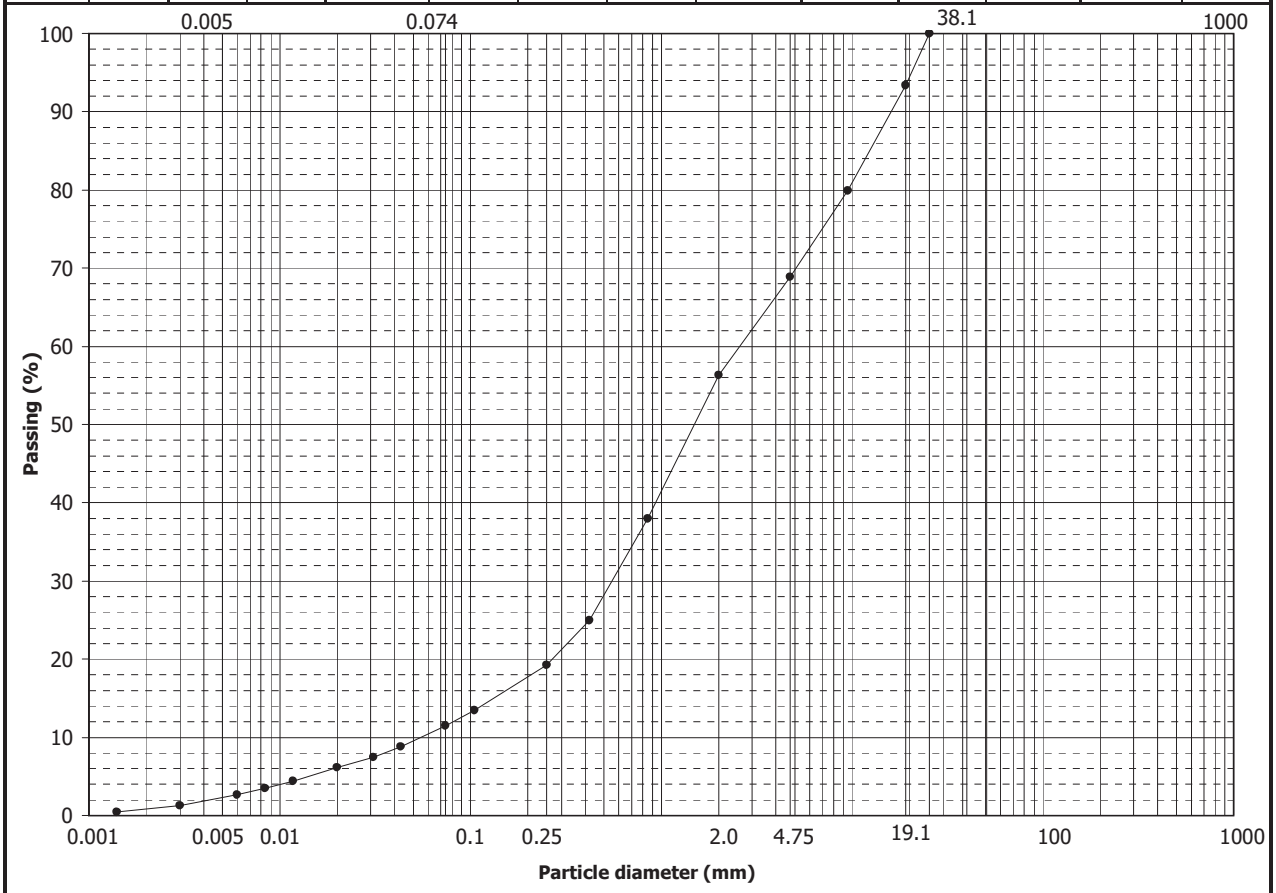
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.682**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
31.14	57.35	9.20	2.30	25.40	16.712	2.8116	1.6055	0.5864	0.0568	49.49	56.29	24.98	11.50



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 442.9 gr
Wt. container No ..... = 44.38 gr
Wt. Of air dry soil W' = 398.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **398.52** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	55.20	44.38	10.82		2.72	97.28
4.75	85.70		41.32		10.37	89.63
2.00	109.05		64.67		16.23	83.77

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	TONDO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 17	DEPTH	9.50 - 10.00

Wt. (Air dry soil + container) = 122.45 gr — Specific Gravity : 2.665
Wt. of container B-02 = 33.74 gr — Plasticity Index : %
Wt. Of air dry soil W' = 88.71 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 83.77 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-09			NO	J-02			NO	J-23		
WW	52.30	DW	51.74	WW	54.28	DW	53.62	WW	50.55	DW	49.86	Mean value	
DW	51.74	TW	40.12	DW	53.62	TW	40.30	DW	49.86	TW	36.20	w	
Ww	0.56	Ws	11.62	Ww	0.66	Ws	13.32	Ww	0.69	Ws	13.66	4.94	%
w	4.82	%		w	4.96	%		w	5.05	%			

$$W = \frac{100 \times W'}{100 + w} : 84.532 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.5	13.5	28	12.189	12.189	3.4913	0.01240	0.0433	10.50	19.88	16.66
2	11.0	12.0	28	12.568	6.284	2.5068	0.01240	0.0311	9.00	17.04	14.28
5	9.0	10.0	28	13.072	2.614	1.6169	0.01240	0.0200	7.00	13.25	11.10
15	8.0	9.0	28	13.325	0.888	0.9425	0.01240	0.0117	6.00	11.36	9.52
30	7.0	8.0	28	13.577	0.453	0.6727	0.01240	0.0083	5.00	9.47	7.93
60	6.0	7.0	28	13.829	0.230	0.4801	0.01240	0.0060	4.00	7.57	6.34
240	4.5	5.5	29	14.208	0.059	0.2433	0.01226	0.0030	2.50	4.73	3.97
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01240	0.0014	1.50	2.84	2.38

P = 100/W = 1.183

$$Mx = \frac{G_s}{G_s - 1} = 1.6006$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	29.95	22.02	7.930		9.38	90.62	75.91
0.42	46.82		24.800		29.34	70.66	59.20
0.25	61.85		39.830		47.12	52.88	44.30
0.105	77.82		55.800		66.01	33.99	28.47
0.074	82.68		60.660		71.76	28.24	23.66

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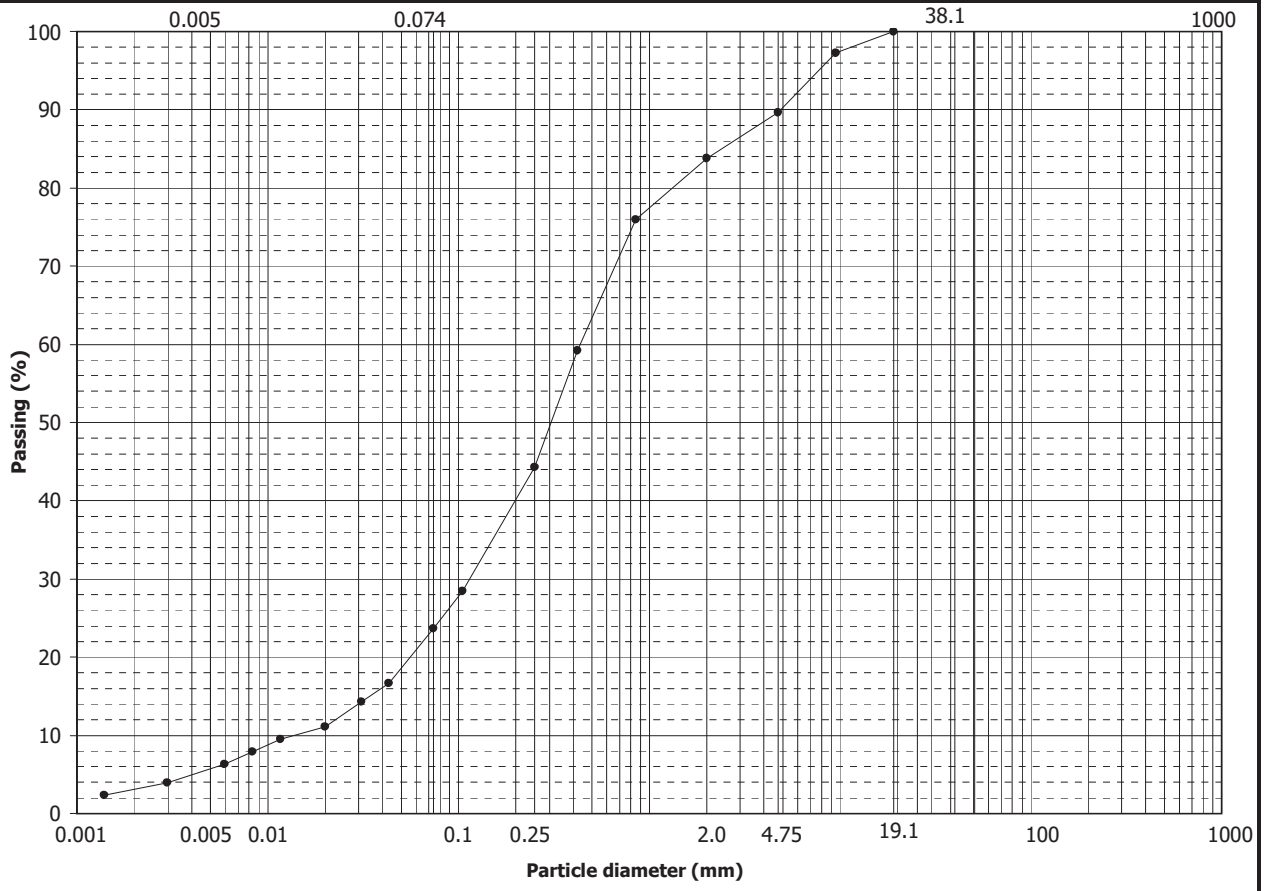
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.665**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
10.37	65.97	17.91	5.74	19.10	4.980	0.4407	0.3151	0.1190	0.0142	30.97	83.77	59.20	23.66



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = 648.4 gr
Wt. container No ..... = 35.99 gr
Wt. Of air dry soil W' = 612.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **612.41** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	40.83	35.99	4.84		0.79	99.21

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = 109.10 gr — Specific Gravity : **2.697**

Wt. of container B-23 = 36.00 gr — Plasticity Index : %

Wt. Of air dry soil W' = 73.10 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.21 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-08			NO	J-20			NO	J-30		
WW	53.720	DW	52.890	WW	53.440	DW	52.460	WW	52.240	DW	51.240	Mean value	
DW	52.890	TW	41.210	DW	52.460	TW	39.070	DW	51.240	TW	37.612	w	
Ww	0.83	Ws	11.68	Ww	0.98	Ws	13.39	Ww	1.00	Ws	13.63	7.25	%
w	7.11	%		w	7.32	%		w	7.34	%			

$$W = \frac{100 \times W'}{100 + w} : 68.156 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\eta}{980(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.5	21.5	28	10.171	10.171	3.1892	0.01228	0.0392	18.50	43.14	42.80
2	17.5	18.5	28	10.928	5.464	2.3375	0.01228	0.0287	15.50	36.14	35.86
5	14.5	15.5	28	11.685	2.337	1.5287	0.01228	0.0188	12.50	29.15	28.92
15	12.5	13.5	28	12.189	0.813	0.9015	0.01228	0.0111	10.50	24.48	24.29
30	11.5	12.5	28	12.442	0.415	0.6440	0.01228	0.0079	9.50	22.15	21.98
60	10.5	11.5	28	12.694	0.212	0.4600	0.01228	0.0056	8.50	19.82	19.66
240	8.5	9.5	29	13.198	0.055	0.2345	0.01215	0.0028	6.50	15.16	15.04
1140	7.5	8.5	28	13.451	0.012	0.1086	0.01228	0.0013	5.50	12.83	12.72

P = 100/W = 1.4672

$$Mx = \frac{Gs}{Gs - 1} = 1.5893$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.47	22.02	1.450		2.13	97.87	97.10
0.42	25.14		3.120		4.58	95.42	94.67
0.25	27.37		5.350		7.85	92.15	91.42
0.105	35.16		13.140		19.28	80.72	80.08
0.074	47.04		25.020		36.71	63.29	62.79

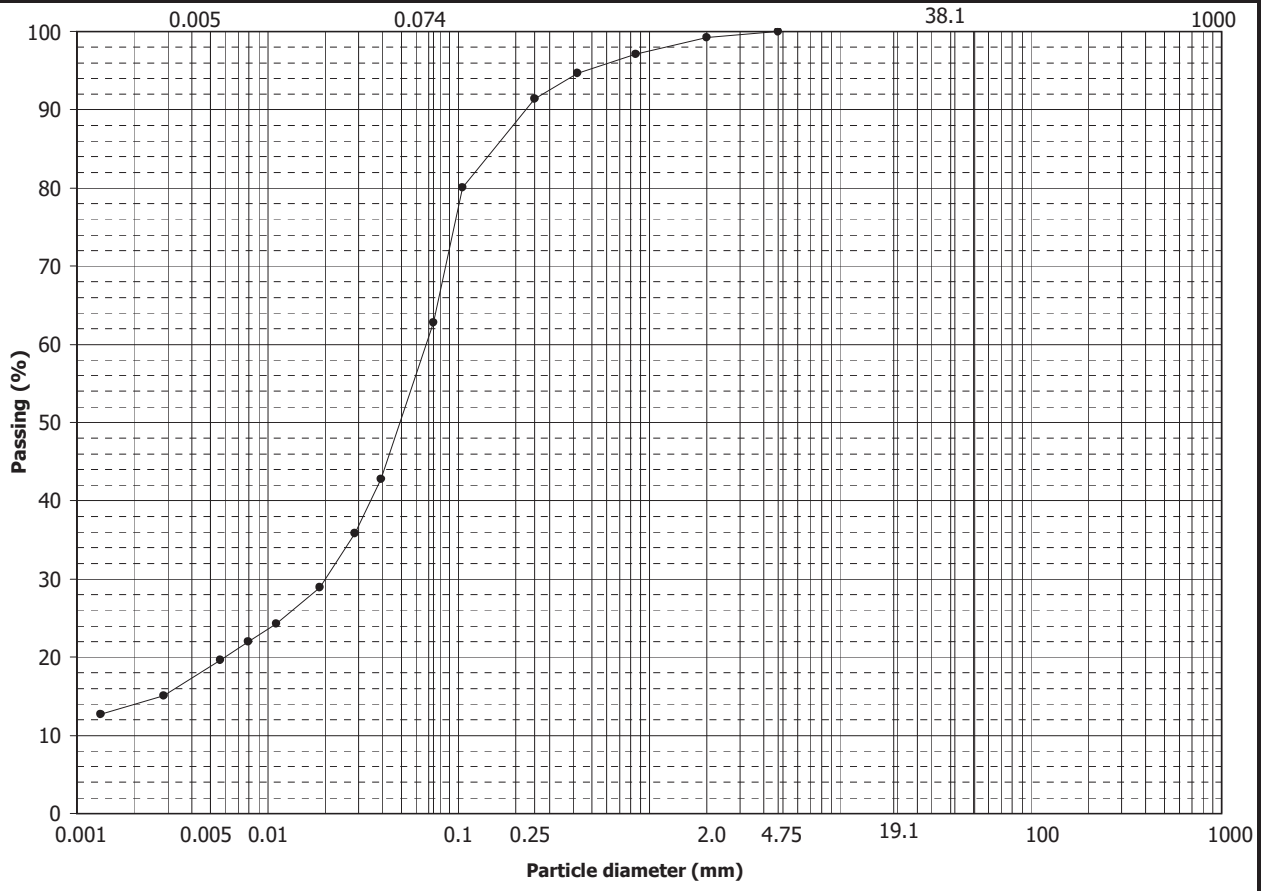
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**11.50 - 12.00**

SPECIFIC GRAVITY : **2.697**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	37.21	43.95	18.84	4.75	0.232	0.0691	0.0517	0.0203	-	-	99.21	94.67	62.79



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = 534.2 gr
Wt. container No ..... = 46.11 gr
Wt. Of air dry soil W' = 488.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **488.09** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	54.10	46.11	7.99		1.64	98.36
4.75	74.40		28.29		5.80	94.20
2.00	93.54		47.43		9.72	90.28

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = 110.41 gr — Specific Gravity : **2.605**

Wt. of container B-12 = 38.38 gr — Plasticity Index : %

Wt. Of air dry soil W' = 72.03 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 90.28 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-06			NO	J-17			NO	J-29		
WW	52.830	DW	52.140	WW	50.410	DW	49.680	WW	51.010	DW	50.270	Mean value	
DW	52.140	TW	40.480	DW	49.680	TW	37.600	DW	50.270	TW	37.510	w	
Ww	0.69	Ws	11.66	Ww	0.73	Ws	12.08	Ww	0.74	Ws	12.76	5.92	%
w	5.92	%		w	6.04	%		w	5.80	%			

$$W = \frac{100 \times W'}{100 + w} : 68.004 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.5	20.5	28	10.423	10.423	3.2285	0.01263	0.0408	17.50	41.77	37.71
2	18.0	19.0	28	10.802	5.401	2.3240	0.01263	0.0293	16.00	38.19	34.48
5	16.0	17.0	28	11.306	2.261	1.5037	0.01263	0.0190	14.00	33.41	30.17
15	13.5	14.5	28	11.937	0.796	0.8921	0.01263	0.0113	11.50	27.45	24.78
30	12.0	13.0	28	12.315	0.411	0.6407	0.01263	0.0081	10.00	23.87	21.55
60	11.0	12.0	28	12.568	0.209	0.4577	0.01263	0.0058	9.00	21.48	19.39
240	9.5	10.5	29	12.946	0.054	0.2323	0.01249	0.0029	7.50	17.90	16.16
1140	8.5	9.5	28	13.198	0.012	0.1076	0.01263	0.0014	6.50	15.51	14.01

P = 100/W = 1.4705

$$Mx = \frac{G_s}{G_s - 1} = 1.6231$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	26.82	22.02	4.800		7.06	92.94	83.91
0.42	35.67		13.650		20.07	79.93	72.16
0.25	43.24		21.220		31.20	68.80	62.11
0.105	53.88		31.860		46.85	53.15	47.99
0.074	57.27		35.250		51.84	48.16	43.48

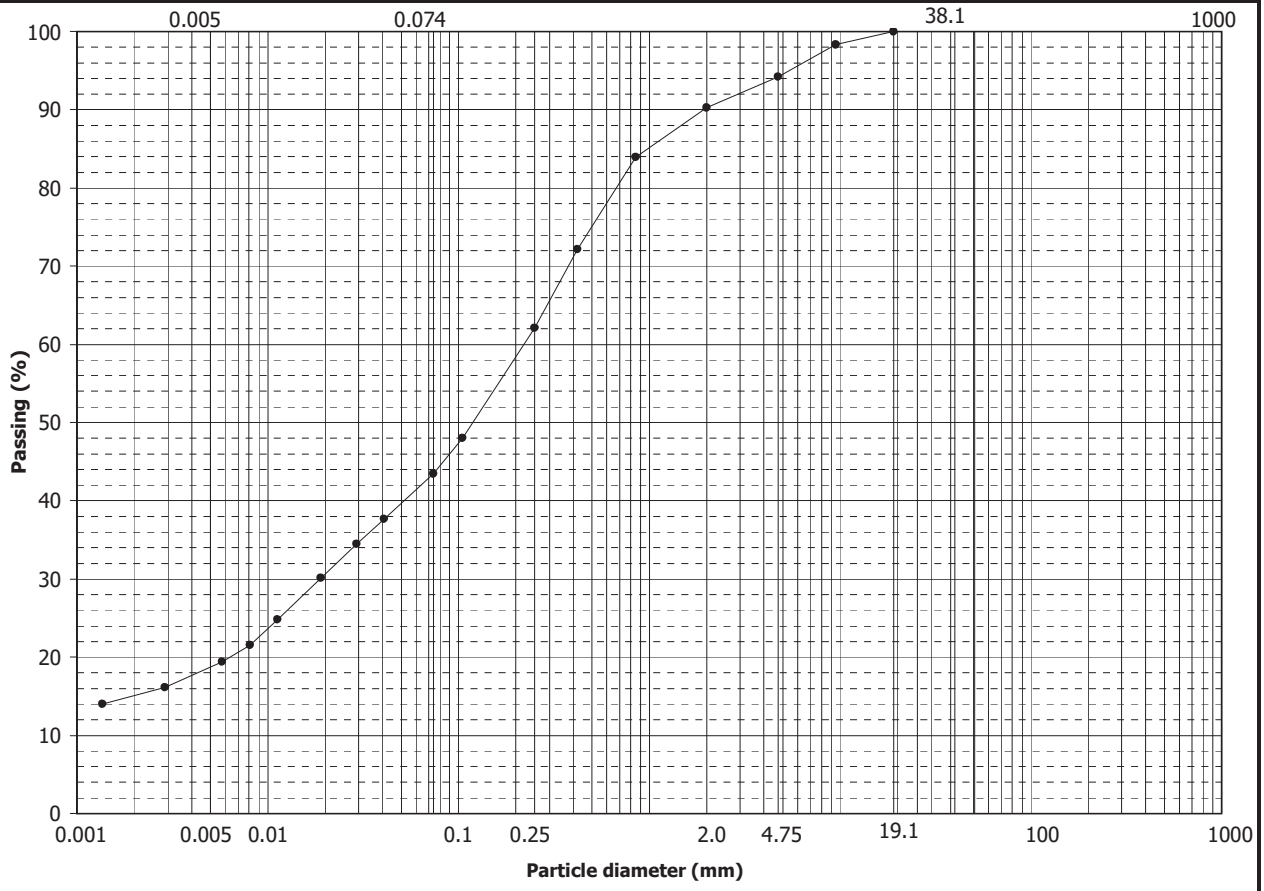
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**13.50 - 14.00**

SPECIFIC GRAVITY : **2.605**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
5.80	50.72	24.77	18.71	19.10	1.949	0.2283	0.1257	0.0187	-	-	90.28	72.16	43.48



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container)	=	571.8	gr
Wt. container No	=	39.61	gr
Wt. Of air dry soil W'	=	532.2	gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **532.19** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container)	=		gr
Wt. Of container No.....	=		gr
Wo	=		gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	40.89	39.61	1.28		0.24	99.76

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 106.56 gr — Specific Gravity : **2.687**

Wt. of container B-64 = 34.94 gr — Plasticity Index : %

Wt. Of air dry soil W' = 71.62 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.76 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-13			NO	J-24			NO	J-35		
WW	53.160	DW	52.470	WW	49.910	DW	49.020	WW	50.250	DW	49.360	Mean value	
DW	52.470	TW	40.750	DW	49.020	TW	33.272	DW	49.360	TW	34.380	w	
Ww	0.69	Ws	11.72	Ww	0.89	Ws	15.75	Ww	0.89	Ws	14.98	5.83	%
w	5.89	%		w	5.65	%		w	5.94	%			

$$W = \frac{100 \times W'}{100 + w} : 67.677 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.0	15.0	28	11.811	11.811	3.4367	0.01232	0.0423	12.00	28.24	28.17
2	12.0	13.0	28	12.315	6.158	2.4815	0.01232	0.0306	10.00	23.53	23.48
5	10.0	11.0	28	12.820	2.564	1.6012	0.01232	0.0197	8.00	18.83	18.78
15	8.0	9.0	28	13.325	0.888	0.9425	0.01232	0.0116	6.00	14.12	14.09
30	7.0	8.0	28	13.577	0.453	0.6727	0.01232	0.0083	5.00	11.77	11.74
60	6.0	7.0	28	13.829	0.230	0.4801	0.01232	0.0059	4.00	9.41	9.39
240	5.0	6.0	29	14.081	0.059	0.2422	0.01218	0.0030	3.00	7.06	7.04
1140	4.0	5.0	28	14.334	0.013	0.1121	0.01232	0.0014	2.00	4.71	4.70

P = 100/W = 1.4776

$$Mx = \frac{G_s}{G_s - 1} = 1.5928$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.01	22.02	0.990		1.46	98.54	98.30
0.42	26.47		4.450		6.58	93.42	93.20
0.25	30.62		8.600		12.71	87.29	87.08
0.105	48.52		26.500		39.16	60.84	60.70
0.074	61.83		39.810		58.82	41.18	41.08

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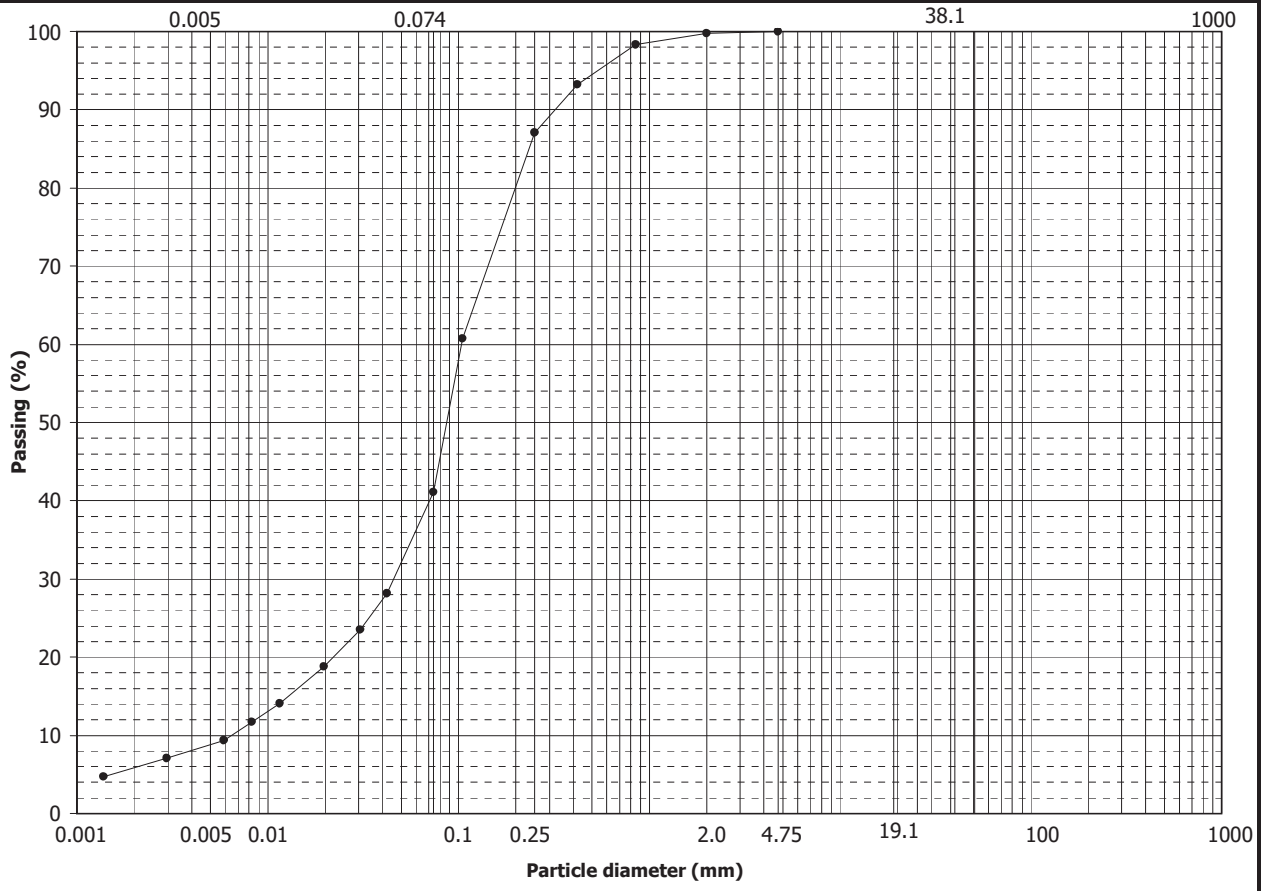
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**15.50 - 16.00**

SPECIFIC GRAVITY : **2.687**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	58.92	32.25	8.82	4.75	0.331	0.1039	0.0881	0.0468	0.0065	15.92	99.76	93.20	41.08



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**18.50 - 19.00**

Wt. (Air dry soil + container) = 509.6 gr
Wt. container No ..... = 42.27 gr
Wt. Of air dry soil W' = 467.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **467.33** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	62.13	42.27	19.86		4.25	95.75
4.75	102.28		60.01		12.84	87.16
2.00	135.50		93.23		19.95	80.05

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**18.50 - 19.00**

Wt. (Air dry soil + container) = 151.24 gr — Specific Gravity : **2.684**

Wt. of container M-35 = 46.29 gr — Plasticity Index : %

Wt. Of air dry soil W' = 104.95 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 80.05 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-31			NO	J-09			NO	J-23		
WW	48.36	DW	47.83	WW	54.09	DW	53.63	WW	51.71	DW	51.17	Mean value	
DW	47.83	TW	31.91	DW	53.63	TW	40.12	DW	51.17	TW	36.20	w	
Ww	0.53	Ws	15.92	Ww	0.46	Ws	13.51	Ww	0.54	Ws	14.97	3.45	%
w	3.33	%		w	3.40	%		w	3.61	%			

$$W = \frac{100 \times W'}{100 + w} : 101.453 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.0	15.0	28	11.811	11.811	3.4367	0.01233	0.0424	12.00	18.85	15.09
2	12.0	13.0	28	12.315	6.158	2.4815	0.01233	0.0306	10.00	15.71	12.58
5	10.0	11.0	28	12.820	2.564	1.6012	0.01233	0.0197	8.00	12.57	10.06
15	8.0	9.0	28	13.325	0.888	0.9425	0.01233	0.0116	6.00	9.43	7.55
30	7.0	8.0	28	13.577	0.453	0.6727	0.01233	0.0083	5.00	7.86	6.29
60	6.0	7.0	28	13.829	0.230	0.4801	0.01233	0.0059	4.00	6.28	5.03
240	4.5	5.5	29	14.208	0.059	0.2433	0.01219	0.0030	2.50	3.93	3.14
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01233	0.0014	1.50	2.36	1.89

P = 100/W = 0.9857

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5938$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	33.93	22.02	11.910		11.74	88.26	70.65
0.42	55.05		33.030		32.56	67.44	53.99
0.25	72.76		50.740		50.01	49.99	40.01
0.105	92.89		70.870		69.86	30.14	24.13
0.074	96.73		74.710		73.64	26.36	21.10

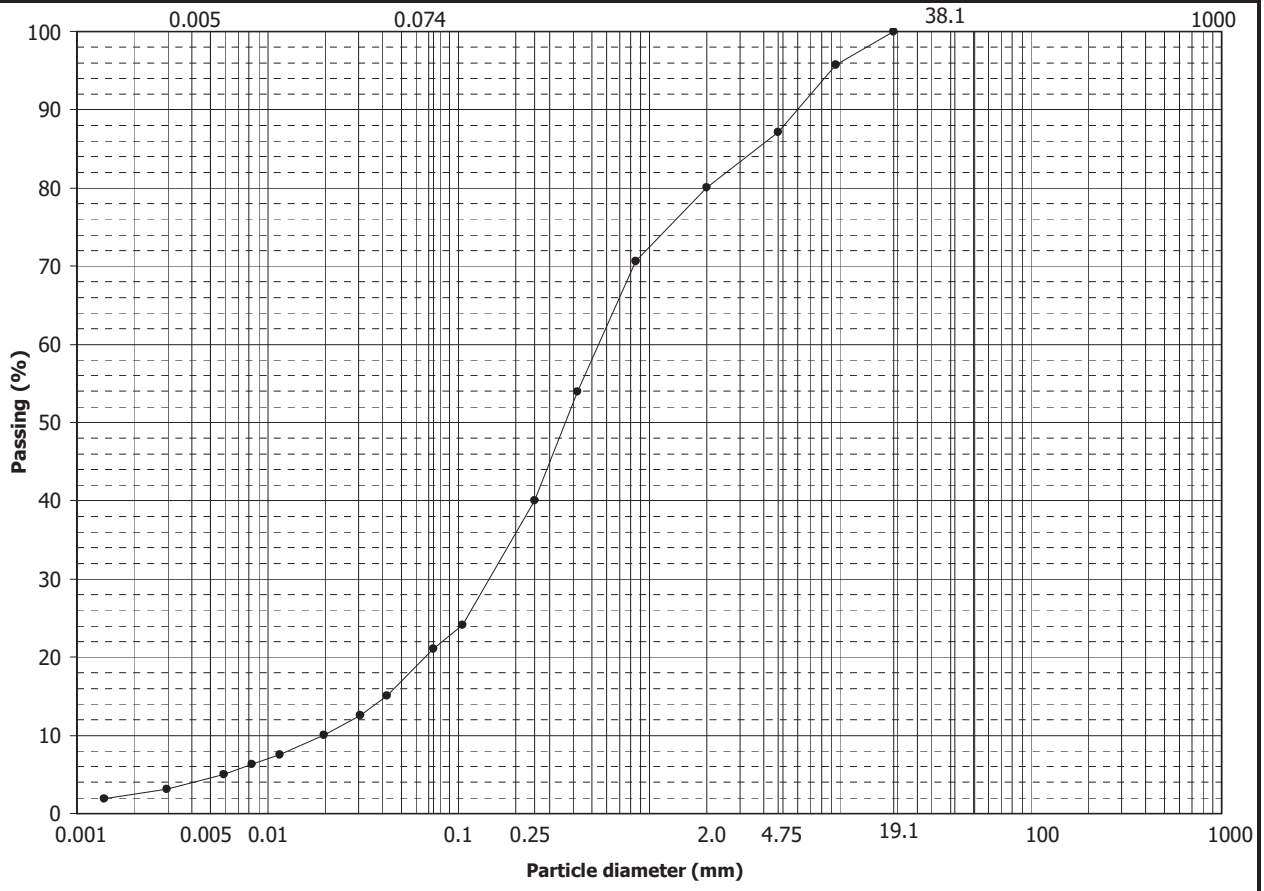
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Cab. Sby : Jalan Jemursari 27 Surabaya Telp.: (031) 8283291, Fax.: (031) 8284472; E-mail : divisi.sby@indrakarya.co.id atau lab_geoteknik_ika@yahoo.com

RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 21, 2019
LOCATION	**TONDO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 17**	DEPTH	**18.50 - 19.00**

SPECIFIC GRAVITY : **2.684**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
12.84	66.06	16.53	4.57	19.10	6.327	0.5751	0.3715	0.1586	0.0195	29.43	80.05	53.99	21.10



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		0.50 - 1.00

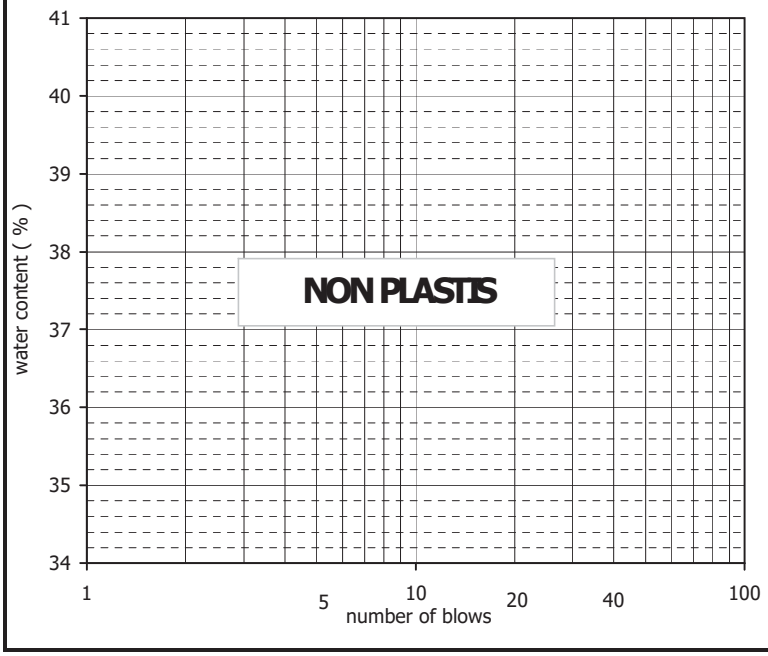
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

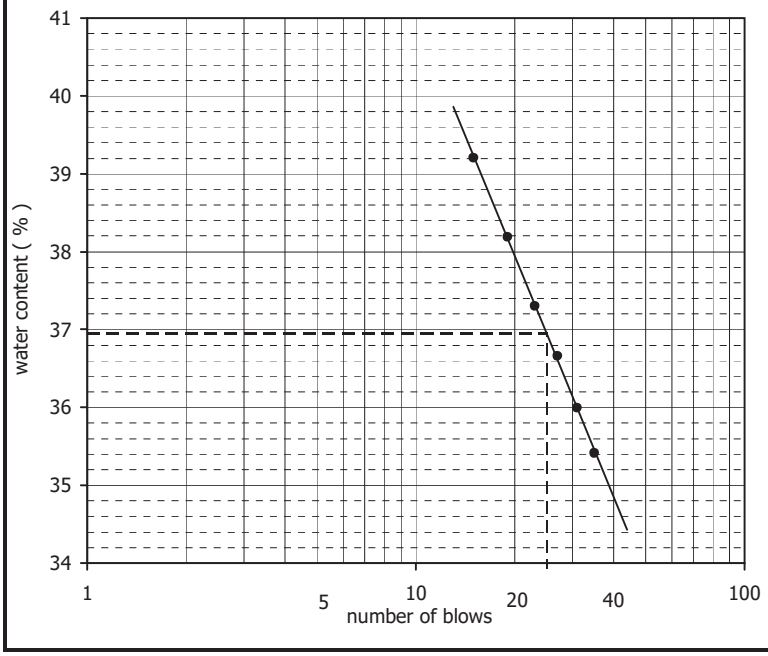
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		1.50 - 2.00

LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	A-45			No.	T-19			No.	A-48
WW	55.960	DW	51.360	WW	56.270	DW	51.720	WW	57.440	DW	52.880
DW	51.360	TW	38.370	DW	51.720	TW	39.080	DW	52.880	TW	40.440
Ww	4.600	Ws	12.990	Ww	4.550	Ws	12.640	Ww	4.560	Ws	12.440
	W =		35.41 %		W =		36.00 %		W =		36.66 %
4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	L-09			No.	A-69			No.	A-40
WW	56.630	DW	51.710	WW	52.650	DW	47.250	WW	59.620	DW	53.880
DW	51.710	TW	38.520	DW	47.250	TW	33.110	DW	53.880	TW	39.240
Ww	4.920	Ws	13.190	Ww	5.400	Ws	14.140	Ww	5.740	Ws	14.640
	W =		37.30 %		W =		38.19 %		W =		39.21 %

PLASTIC LIMIT

1				2				3			
		No.	T-04			No.	J-29			No.	J-64
WW	55.220	DW	51.320	WW	53.950	DW	50.360	WW	52.761	DW	49.360
DW	51.320	TW	36.740	DW	50.360	TW	37.510	DW	49.360	TW	36.990
Ww	3.900	Ws	14.580	Ww	3.590	Ws	12.850	Ww	3.401	Ws	12.370
	W =		26.75 %		W =		27.94 %		W =		27.49 %



LIQUID LIMIT	=	36.95 %
PLASTIC LIMIT	=	27.39 %
PLASTICITY INDEX	=	9.56 %
FLOW INDEX	=	10.27

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		2.50 - 3.00

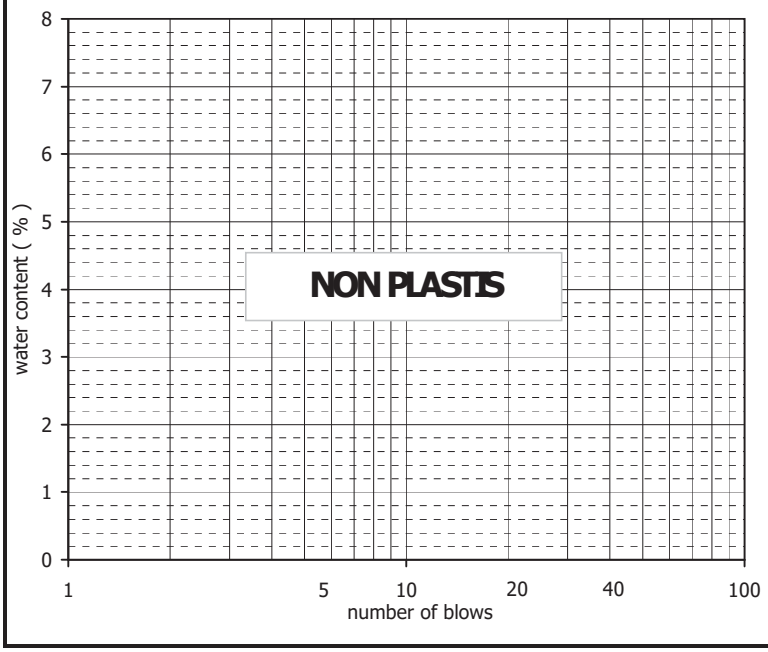
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		3.50 - 4.00

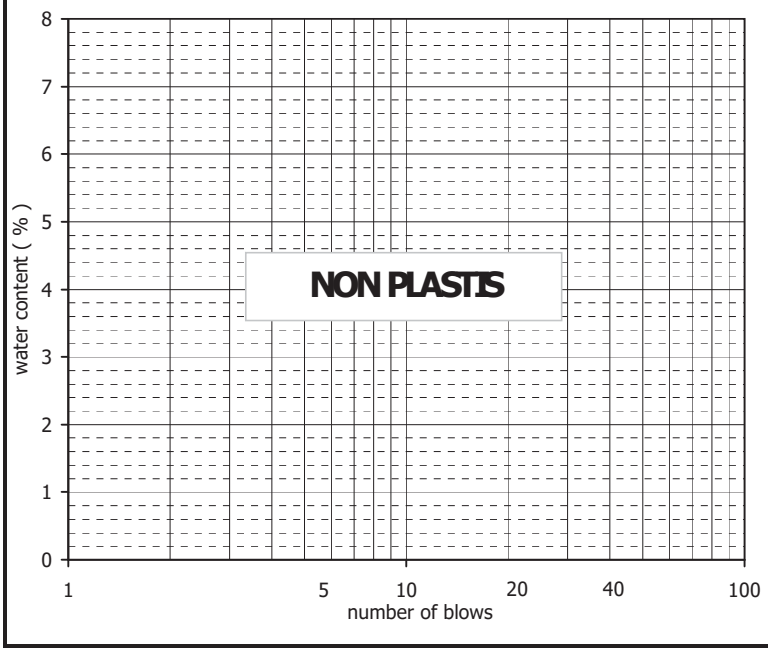
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		4.50 - 5.00

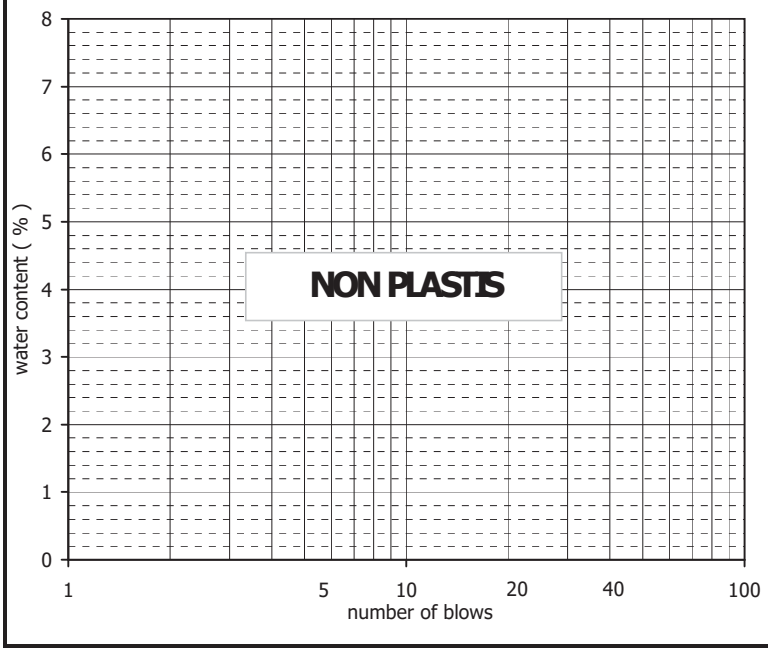
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		5.50 - 6.00

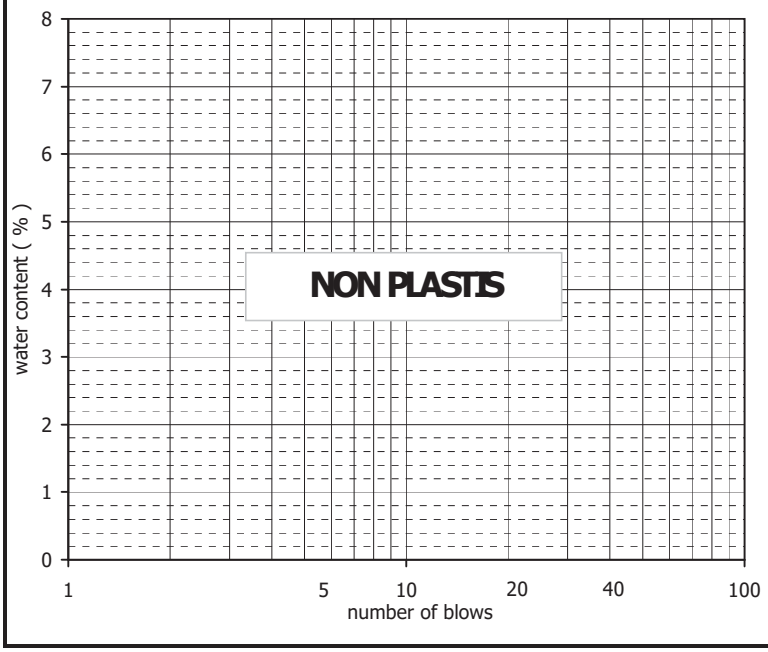
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		6.50 - 7.00

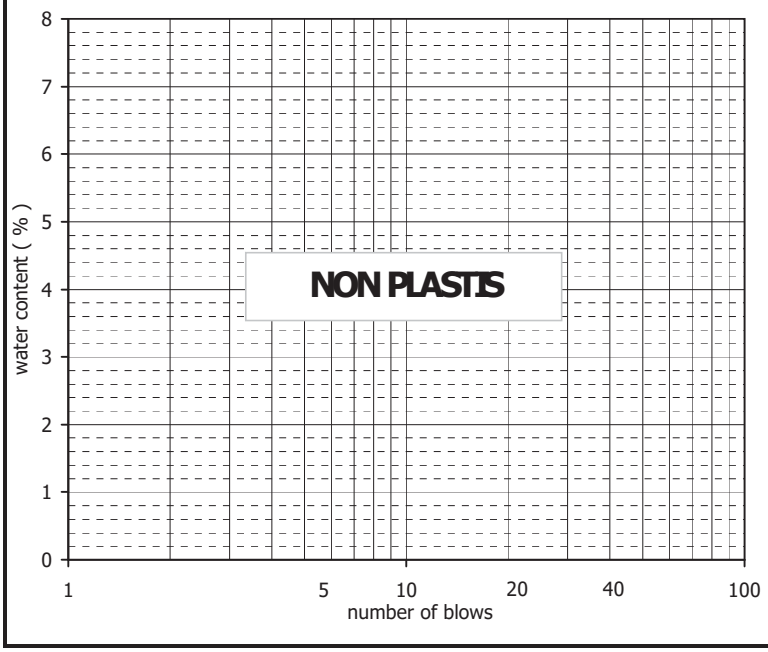
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		7.50 - 8.00

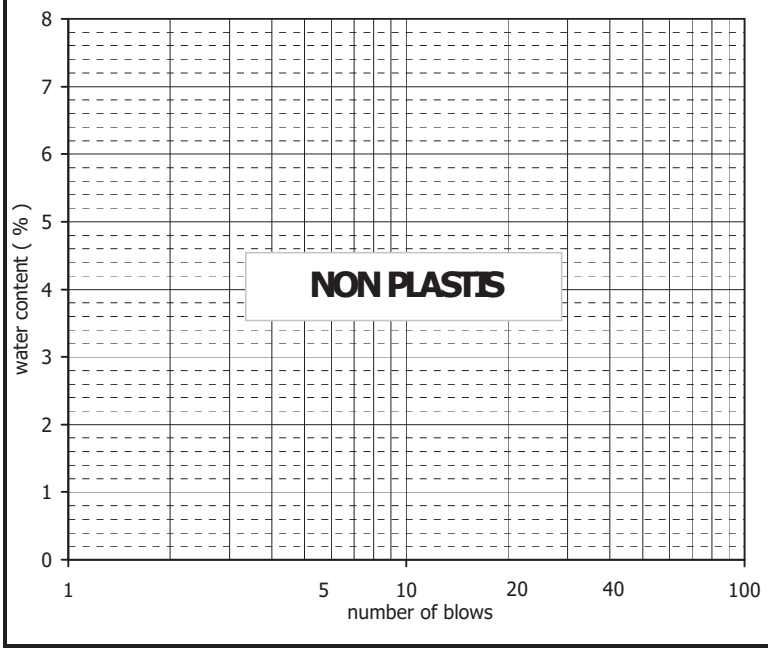
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

PT INDRA KARYA (PERSERO)
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Cb. Sit : Jalan Jendi Barat 27 Malang Telp.: (0341) 362261, Fax.: (0341) 324402; E-mail : divisi.sit@indrakarya.co.id atau lab_geoteknik_ika@yahoo.com

LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		8.50 - 9.00

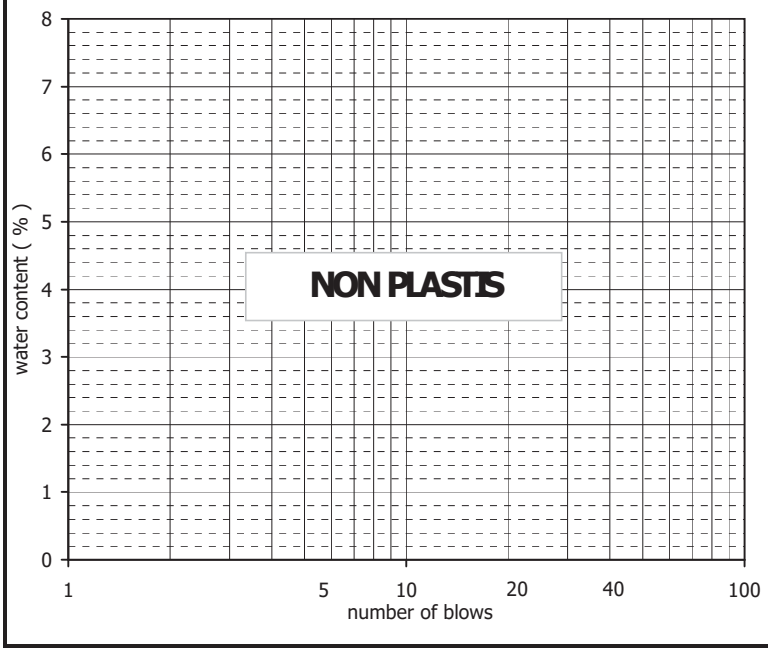
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		9.50 - 10.00

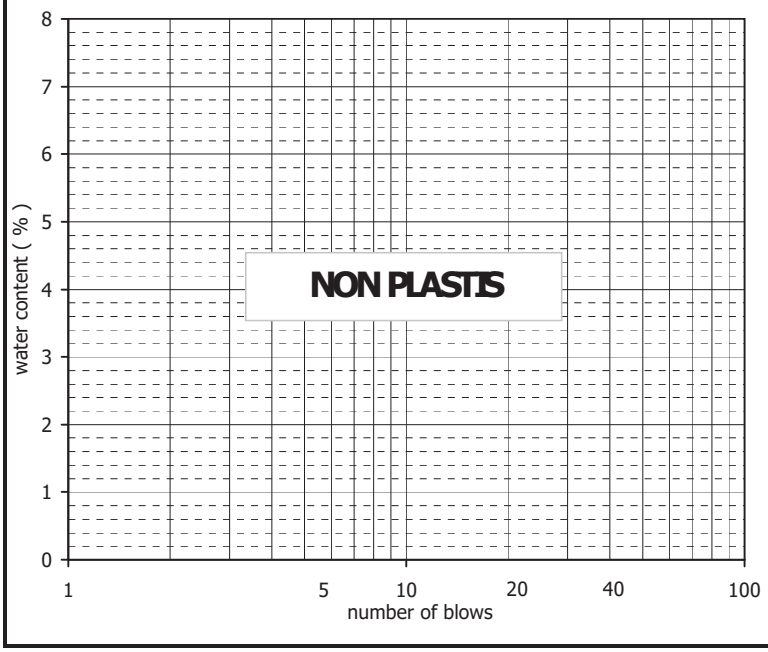
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		11.50 - 12.00

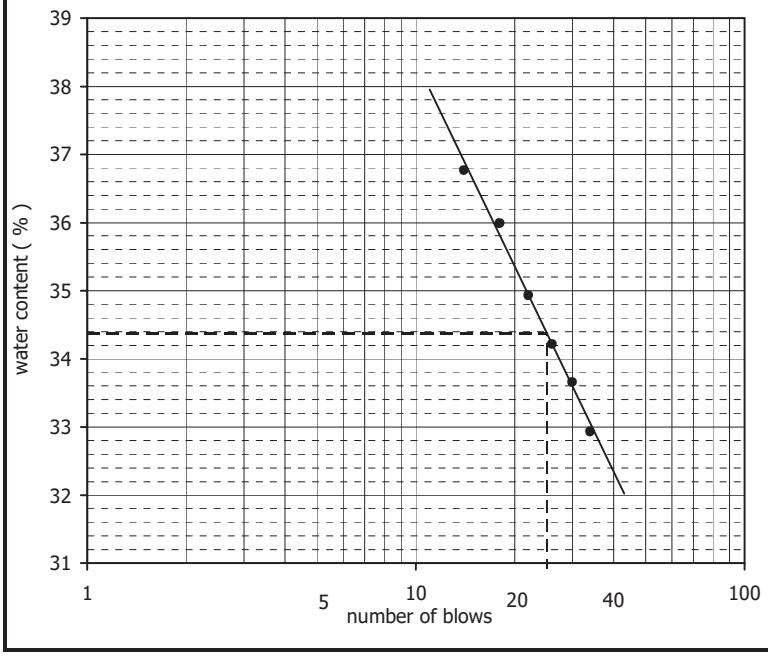
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			30 x	NO. OF BLOWS			26 x
		No.	T-84			No.	J-25			No.	A-73
WW	55.400	DW	51.280	WW	56.780	DW	51.560	WW	57.590	DW	52.810
DW	51.280	TW	38.770	DW	51.560	TW	36.050	DW	52.810	TW	38.840
Ww	4.120	Ws	12.510	Ww	5.220	Ws	15.510	Ww	4.780	Ws	13.970
	W =		32.93 %		W =		33.66 %		W =		34.22 %

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			18 x	NO. OF BLOWS			14 x
		No.	J-78			No.	A-19			No.	A-20
WW	56.350	DW	51.310	WW	57.690	DW	52.850	WW	58.580	DW	53.370
DW	51.310	TW	36.880	DW	52.850	TW	39.400	DW	53.370	TW	39.200
Ww	5.040	Ws	14.430	Ww	4.840	Ws	13.450	Ww	5.210	Ws	14.170
	W =		34.93 %		W =		35.99 %		W =		36.77 %

PLASTIC LIMIT

1				2				3			
		No.	A-24			No.	A-60			No.	A-26
WW	51.330	DW	48.030	WW	51.600	DW	49.170	WW	50.670	DW	48.030
DW	48.030	TW	34.290	DW	49.170	TW	39.610	DW	48.030	TW	37.220
Ww	3.300	Ws	13.740	Ww	2.430	Ws	9.560	Ww	2.640	Ws	10.810
	W =		24.02 %		W =		25.42 %		W =		24.42 %



LIQUID LIMIT	=	34.38	%
PLASTIC LIMIT	=	24.62	%
PLASTICITY INDEX	=	9.76	%
FLOW INDEX	=	10.01	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

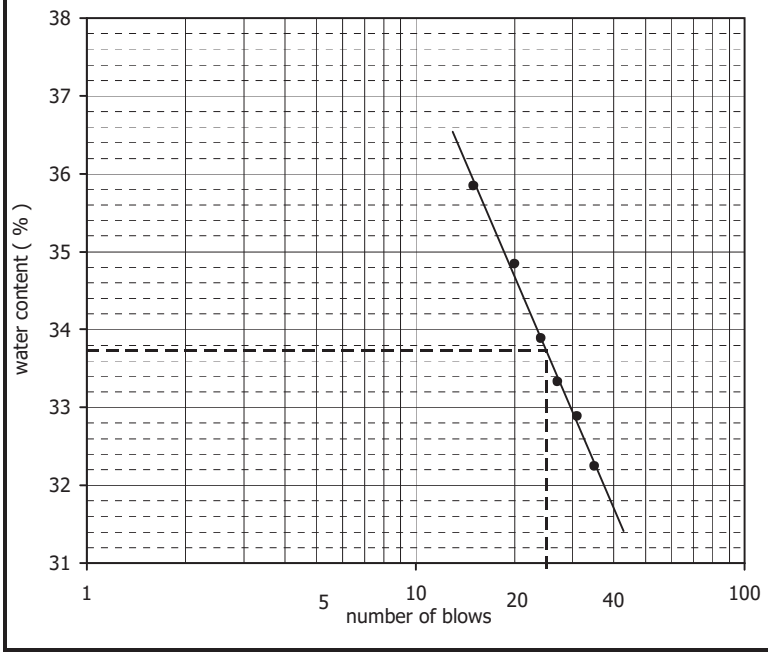
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		13.50 - 14.00

LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	T-11			No.	J-11			No.	T-12
WW	55.610	DW	51.260	WW	56.440	DW	52.230	WW	57.300	DW	52.810
DW	51.260	TW	37.770	DW	52.230	TW	39.430	DW	52.810	TW	39.340
Ww	4.350	Ws	13.490	Ww	4.210	Ws	12.800	Ww	4.490	Ws	13.470
	W =	32.25	%		W =	32.89	%		W =	33.33	%
4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			15 x
		No.	T-56			No.	L-07			No.	T-18
WW	55.540	DW	51.270	WW	58.010	DW	52.870	WW	53.410	DW	48.990
DW	51.270	TW	38.670	DW	52.870	TW	38.120	DW	48.990	TW	36.660
Ww	4.270	Ws	12.600	Ww	5.140	Ws	14.750	Ww	4.420	Ws	12.330
	W =	33.89	%		W =	34.85	%		W =	35.85	%

PLASTIC LIMIT

1				2				3			
		No.	T-43			No.	T-44			No.	T-76
WW	54.800	DW	51.350	WW	57.530	DW	53.570	WW	56.850	DW	52.960
DW	51.350	TW	37.600	DW	53.570	TW	37.410	DW	52.960	TW	37.340
Ww	3.450	Ws	13.750	Ww	3.960	Ws	16.160	Ww	3.890	Ws	15.620
	W =	25.09	%		W =	24.50	%		W =	24.90	%



LIQUID LIMIT	=	33.74	%
PLASTIC LIMIT	=	24.83	%
PLASTICITY INDEX	=	8.90	%
FLOW INDEX	=	9.86	

REMARKS :

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		15.50 - 16.00

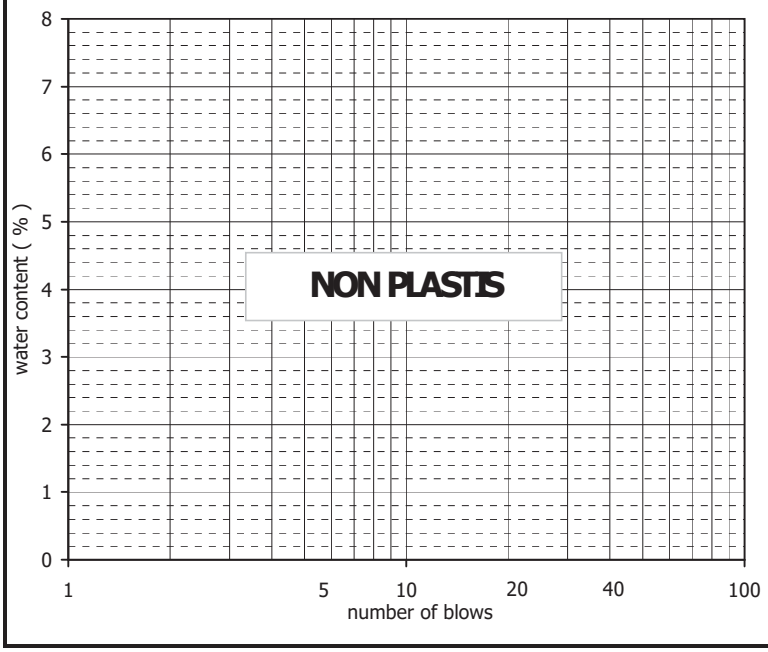
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 15, 2019
LOCATION	:	TONDO - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 17	DEPTH (m)		18.50 - 19.00

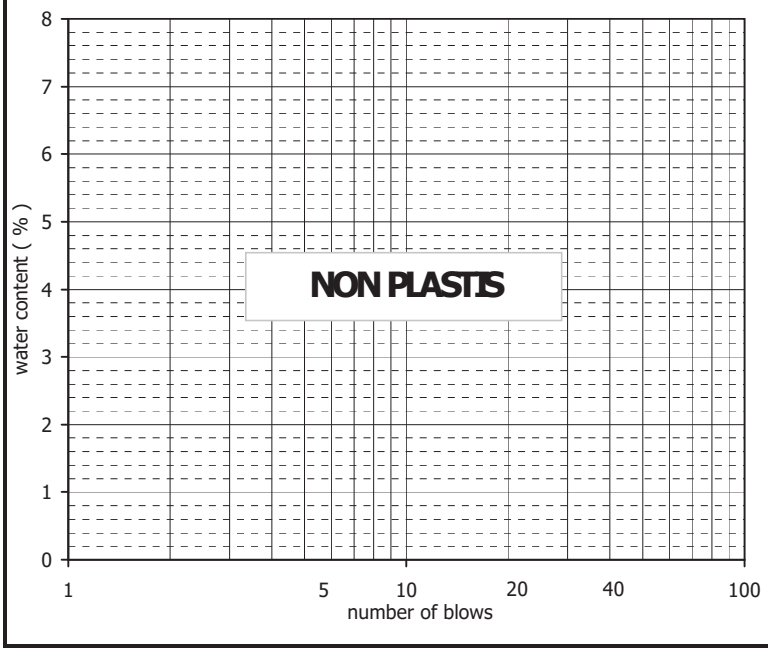
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

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TW : Wt. of container in g.

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BUMN
Hadir untuk negeri

ISO 9001 CQMS - 3017883
ISO 14001 CQMS - 3019894
OHSAS 18001 CQMS - 3019827

SUMMARY OF SOIL TEST

PROJECT			**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**								
LOCATION			**LERE - PALU**								
SAMPLE No			BAY - 18	BAY - 18	BAY - 18	BAY - 18	BAY - 18	BAY - 18	BAY - 18	BAY - 18	BAY - 18
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	4.11	15.09	13.77	36.60	25.15	35.26	30.98	22.77	24.53
	Specific gravity of soil	*Gs*	2.718	2.678	2.682	2.680	2.681	2.679	2.684	2.676	2.692
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	26.59	16.90	9.57	0.00	38.49	0.00	0.00	0.00	0.00
	Proportion — Sand part	(%)	63.77	74.96	78.89	7.37	16.23	43.98	30.63	48.52	52.62
	Proportion — Silt part	(%)	7.94	6.06	7.48	66.62	28.67	40.58	50.41	36.60	33.38
	Proportion — Clay part	(%)	1.69	2.08	4.06	26.01	16.61	15.44	18.96	14.88	14.01
	Max. diameter	(mm)	25.40	25.40	25.40	4.75	25.40	4.75	4.75	4.75	4.75
	90 % diameter	(mm)	14.6084	9.5005	4.6356	0.0677	21.0364	0.2370	0.2051	0.7020	0.8932
	60 % diameter	(mm)	1.9101	1.1204	0.7722	0.0218	3.4197	0.0888	0.0513	0.1184	0.1545
	50 % diameter	(mm)	1.0544	0.7388	0.5847	0.0165	0.2578	0.0576	0.0309	0.0702	0.0871
	30 % diameter	(mm)	0.3421	0.3864	0.2729	0.0074	0.0168	0.0221	0.0130	0.0230	0.0217
	10 % diameter	(mm)	0.0775	0.1044	0.0530	-	-	-	-	0.0016	0.0022
	Uniformity Coefficient		24.65	10.73	14.57	-	-	-	-	74.25	69.63
	Passing # 200		9.63	8.14	11.54	92.63	45.28	56.02	69.37	51.48	47.38
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	42.48	35.82	27.39	35.66	25.69	25.35
	Plastic limit	*PL* (%)				33.63	24.85	20.61	25.07	21.40	20.94
	Plasticity index	*PI* (%)				8.85	10.96	6.78	10.59	4.29	4.41
	Flow index					12.40	10.20	8.21	10.32	7.60	7.18
	Unified Classification					ML	ML	CL - ML	ML	CL - ML	SC - SM

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**LERE - PALU**									
SAMPLE No			BAY - 18	BAY - 18	BAY - 18	BAY - 18	BAY - 18				
DEPTH (m)			9.50 - 10.00	11.50 - 12.00	15.50 - 16.00	17.50 - 18.00	19.50 - 20.00				
PROPERTIES	Natural Water Content	(%)	16.15	32.37	23.13	22.33	25.76				
	Specific gravity of soil	*Gs*	2.691	2.681	2.698	2.729	2.697				
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	0.00	0.00	0.00	0.00	0.00				
	Proportion — Sand part	(%)	62.06	8.66	8.43	3.48	48.56				
	Proportion — Silt part	(%)	28.78	59.63	68.28	69.27	42.17				
	Proportion — Clay part	(%)	9.16	31.71	23.29	27.25	9.27				
	Max. diameter	(mm)	4.75	2.00	4.75	2.00	2.00				
	90 % diameter	(mm)	1.4199	0.0709	0.0725	0.0648	0.2879				
	60 % diameter	(mm)	0.2227	0.0213	0.0438	0.0265	0.0903				
	50 % diameter	(mm)	0.1414	0.0143	0.0336	0.0185	0.0721				
	30 % diameter	(mm)	0.0488	0.0045	0.0095	0.0063	0.0455				
	10 % diameter	(mm)	0.0062	-	-	-	0.0061				
	Uniformity Coefficient		36.20	-	-	-	14.85				
	Passing # 200		37.94	91.34	91.57	96.52	51.44				
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	35.26	31.48	32.46	NON PLASTIS				
	Plastic limit	*PL* (%)		25.11	23.99	24.43					
	Plasticity index	*PI* (%)		10.15	7.48	8.03					
	Flow index			11.77	9.70	9.55					
	Unified Classification			ML	ML	ML					

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ISO 9001 CCBS-3417003
ISO 14001 CCBS-3418004
OHSAS 18001 CCBS-3418007

NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	LERE - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	A-102								No	J-54	
11/02	BAY - 18		WW	78.79	DW	77.18			11/02	BAY - 18		WW	104.12	DW	90.93		
2019	0.50 - 1.00	4.11	DW	77.18	TW	38.01			2019	8.50 - 9.00	24.53	DW	90.93	TW	37.16		
			Ww	1.61	Ws	39.17						Ww	13.19	Ws	53.77		
				WC	(%)	4.11							WC	(%)	24.53		
					No	T-47								No	J-49		
11/02	BAY - 18		WW	101.40	DW	92.86			11/02	BAY - 18		WW	101.70	DW	93.17		
2019	1.50 - 2.00	15.09	DW	92.86	TW	36.27			2019	9.50 - 10.00	16.15	DW	93.17	TW	40.36		
			Ww	8.54	Ws	56.59						Ww	8.53	Ws	52.81		
				WC	(%)	15.09							WC	(%)	16.15		
					No	J-52								No	A-70		
11/02	BAY - 18		WW	109.73	DW	100.89			11/02	BAY - 18		WW	114.02	DW	95.39		
2019	2.50 - 3.00	13.77	DW	100.89	TW	36.71			2019	11.50 - 12.00	32.37	DW	95.39	TW	37.83		
			Ww	8.84	Ws	64.18						Ww	18.63	Ws	57.56		
				WC	(%)	13.77							WC	(%)	32.37		
					No	J-11								No	J-78		
11/02	BAY - 18		WW	87.54	DW	74.65			11/02	BAY - 18		WW	88.83	DW	79.07		
2019	3.50 - 4.00	36.60	DW	74.65	TW	39.43			2019	15.50 - 16.00	23.13	DW	79.07	TW	36.88		
			Ww	12.89	Ws	35.22						Ww	9.76	Ws	42.19		
				WC	(%)	36.60							WC	(%)	23.13		
					No	L-06								No	T-36		
11/02	BAY - 18		WW	89.87	DW	79.11			11/02	BAY - 18		WW	95.28	DW	84.71		
2019	4.50 - 5.00	25.15	DW	79.11	TW	36.32			2019	17.50 - 18.00	22.33	DW	84.71	TW	37.37		
			Ww	10.76	Ws	42.79						Ww	10.57	Ws	47.34		
				WC	(%)	25.15							WC	(%)	22.33		
					No	A-52								No	T-60		
11/02	BAY - 18		WW	105.60	DW	89.17			11/02	BAY - 18		WW	123.53	DW	106.43		
2019	5.50 - 6.00	35.26	DW	89.17	TW	42.57			2019	19.50 - 20.00	25.76	DW	106.43	TW	40.04		
			Ww	16.43	Ws	46.60						Ww	17.10	Ws	66.39		
				WC	(%)	35.26							WC	(%)	25.76		
					No	A-19								No			
11/02	BAY - 18		WW	101.76	DW	87.01						WW		DW			
2019	6.50 - 7.00	30.98	DW	87.01	TW	39.40						DW		TW			
			Ww	14.75	Ws	47.61						Ww		Ws			
				WC	(%)	30.98							WC	(%)			
					No	J-27								No			
11/02	BAY - 18		WW	98.86	DW	87.06						WW		DW			
2019	7.50 - 8.00	22.77	DW	87.06	TW	35.23						DW		TW			
			Ww	11.80	Ws	51.83						Ww		Ws			
				WC	(%)	22.77							WC	(%)			

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				2	48	47	
Weight of Pycnometer		Wf	(gr)	66.900	37.760	40.660	
Weight of (Pycnometer + Water)		Wa	(gr)	168.750	139.170	142.080	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.780	152.050	154.940	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.320	38.120	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.540	20.340	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.7500	139.1700	142.0800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.510	7.460	7.420	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.735	2.727	2.733	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.721	2.713	2.719	
Average Specific Gravity at 20° C							**2.718**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				23	40	61	
Weight of Pycnometer		Wf	(gr)	43.180	52.250	37.700	
Weight of (Pycnometer + Water)		Wa	(gr)	146.380	153.170	146.520	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.040	166.110	159.320	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.970	38.360	38.110	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.190	20.580	20.330	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.3800	153.1700	146.5200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.640	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.681	2.694	2.700	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.667	2.680	2.686	
Average Specific Gravity at 20° C							**2.678**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				9	18	1	
Weight of Pycnometer		Wf	(gr)	65.320	66.800	62.150	
Weight of (Pycnometer + Water)		Wa	(gr)	167.290	168.630	165.770	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	180.040	181.440	178.390	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.060	38.120	37.850	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.280	20.340	20.070	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.2900	168.6300	165.7700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.530	7.450	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.693	2.701	2.694	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.679	2.687	2.680	
Average Specific Gravity at 20° C							**2.682**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				35	34	75	
Weight of Pycnometer		Wf	(gr)	37.070	52.710	35.700	
Weight of (Pycnometer + Water)		Wa	(gr)	136.920	152.200	135.380	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.780	165.050	148.230	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.210	38.230	38.220	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.430	20.450	20.440	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9200	152.2000	135.3800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.600	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.699	2.691	2.693	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.685	2.677	2.679	
Average Specific Gravity at 20° C							**2.680**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				25	50	72	
Weight of Pycnometer		Wf	(gr)	43.080	52.650	33.250	
Weight of (Pycnometer + Water)		Wa	(gr)	146.430	154.080	133.800	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.070	166.810	146.470	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.870	38.050	37.900	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.090	20.270	20.120	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.4300	154.0800	133.8000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.450	7.540	7.450	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.697	2.688	2.701	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.683	2.675	2.687	
Average Specific Gravity at 20° C							**2.681**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				37	28	57	
Weight of Pycnometer		Wf	(gr)	50.940	34.010	50.930	
Weight of (Pycnometer + Water)		Wa	(gr)	151.200	135.370	151.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.010	148.090	163.850	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.140	38.020	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.360	20.240	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.2000	135.3700	151.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.550	7.520	7.500	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.697	2.691	2.691	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.683	2.678	2.677	
Average Specific Gravity at 20° C							**2.679**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				5	14	41	
Weight of Pycnometer		Wf	(gr)	65.390	69.710	35.950	
Weight of (Pycnometer + Water)		Wa	(gr)	168.330	170.370	137.160	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.210	183.090	149.970	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.230	38.020	38.120	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.450	20.240	20.340	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.3300	170.3700	137.1600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.520	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.701	2.691	2.701	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.688	2.678	2.687	
Average Specific Gravity at 20° C							**2.684**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				83	42	45	
Weight of Pycnometer		Wf	(gr)	38.130	39.190	37.860	
Weight of (Pycnometer + Water)		Wa	(gr)	137.630	142.220	139.180	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.360	154.960	152.000	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.080	38.050	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.300	20.270	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.6300	142.2200	139.1800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.530	7.560	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.682	2.692	2.696	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.668	2.678	2.682	
Average Specific Gravity at 20° C							**2.676**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				12	39	63	
Weight of Pycnometer		Wf	(gr)	67.220	36.940	45.527	
Weight of (Pycnometer + Water)		Wa	(gr)	169.330	136.930	149.488	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.140	149.800	162.280	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.110	38.180	38.080	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.330	20.400	20.300	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.3300	136.9300	149.4884	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.520	7.530	7.508	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.703	2.709	2.704	
Coefficient for Temperature Correction K				0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.690	2.695	2.690	
Average Specific Gravity at 20° C							**2.692**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				19	4	79	
Weight of Pycnometer		Wf	(gr)	66.300	65.900	37.880	
Weight of (Pycnometer + Water)		Wa	(gr)	167.700	167.100	137.560	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	180.410	179.710	150.850	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.930	37.810	38.860	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.150	20.030	21.080	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.7000	167.1000	137.5600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.440	7.420	7.790	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.708	2.699	2.706	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.694	2.686	2.692	
Average Specific Gravity at 20° C							**2.691**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	11.50 - 12.00

Determination No				1	2	3	4
No of Pycnometer				74	73	85	
Weight of Pycnometer		Wf	(gr)	38.550	34.550	38.870	
Weight of (Pycnometer + Water)		Wa	(gr)	138.630	135.120	138.670	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.440	147.810	151.360	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.140	37.960	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.360	20.180	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.6300	135.1200	138.6700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.550	7.490	7.490	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.697	2.694	2.694	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.683	2.680	2.680	
Average Specific Gravity at 20° C							**2.681**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	15.50 - 16.00

Determination No				1	2	3	4
No of Pycnometer				21	30	68	
Weight of Pycnometer		Wf	(gr)	40.730	38.460	34.650	
Weight of (Pycnometer + Water)		Wa	(gr)	145.610	138.140	134.460	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	158.460	150.890	147.300	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.130	37.990	38.120	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.350	20.210	20.340	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	145.6100	138.1400	134.4600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.460	7.500	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.713	2.709	2.712	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.699	2.695	2.698	
Average Specific Gravity at 20° C							**2.698**

Remarks

SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	17.50 - 18.00

Determination No				1	2	3	4
No of Pycnometer				26	32	69	
Weight of Pycnometer		Wf	(gr)	38.840	51.260	36.570	
Weight of (Pycnometer + Water)		Wa	(gr)	138.580	151.350	137.650	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.740	164.260	150.450	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.490	38.100	37.920	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.710	20.320	20.140	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.5800	151.3500	137.6500	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.550	7.410	7.340	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.743	2.742	2.744	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.729	2.728	2.730	
Average Specific Gravity at 20° C							**2.729**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 18	DEPTH	19.50 - 20.00

Determination No				1	2	3	4
No of Pycnometer				24	20	80	
Weight of Pycnometer		Wf	(gr)	38.140	68.510	34.060	
Weight of (Pycnometer + Water)		Wa	(gr)	137.560	168.600	134.970	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.350	181.340	147.830	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	37.970	38.150	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.190	20.370	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.5600	168.6000	134.9700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.480	7.450	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.710	2.710	2.712	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.696	2.696	2.698	
Average Specific Gravity at 20° C							**2.697**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 455.7 gr
Wt. container No ..... = 47.02 gr
Wt. Of air dry soil W' = 408.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **408.68** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	70.40	47.02	23.38		5.72	94.28
9.52	107.70		60.68		14.85	85.15
4.75	155.70		108.68		26.59	73.41
2.00	206.20		159.18		38.95	61.05

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	0.50 - 1.00

Wt. (Air dry soil + container) = 146.01 gr — Specific Gravity : 2.718
Wt. of container E-64 = 36.01 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.00 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 61.05 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-10			NO	J-20			NO	J-30		
WW	53.31	DW	52.85	WW	55.14	DW	54.74	WW	54.44	DW	53.99	Mean value	
DW	52.85	TW	36.96	DW	54.74	TW	39.07	DW	53.99	TW	37.61	w	
Ww	0.46	Ws	15.89	Ww	0.40	Ws	15.67	Ww	0.45	Ws	16.38	2.73	%
w	2.89	%		w	2.55	%		w	2.75	%			

$$W = \frac{100 \times W'}{100 + w} : 107.075 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	9.0	10.0	28	13.072	13.072	3.6156	0.01221	0.0441	7.00	10.34	6.31
2	7.0	8.0	28	13.577	6.788	2.6055	0.01221	0.0318	5.00	7.39	4.51
5	6.0	7.0	28	13.829	2.766	1.6631	0.01221	0.0203	4.00	5.91	3.61
15	5.0	6.0	28	14.081	0.939	0.9689	0.01221	0.0118	3.00	4.43	2.71
30	4.5	5.5	28	14.208	0.474	0.6882	0.01221	0.0084	2.50	3.69	2.26
60	4.0	5.0	28	14.334	0.239	0.4888	0.01221	0.0060	2.00	2.96	1.80
240	3.5	4.5	29	14.460	0.060	0.2455	0.01207	0.0030	1.50	2.22	1.35
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01221	0.0014	1.00	1.48	0.90

P = 100/W = 0.9339

$$Mx = \frac{Gs}{Gs - 1} = 1.5821$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	45.59	22.02	23.570		22.01	77.99	47.61
0.42	68.04		46.020		42.98	57.02	34.81
0.25	86.46		64.440		60.18	39.82	24.31
0.105	106.49		84.470		78.89	21.11	12.89
0.074	112.20		90.180		84.22	15.78	9.63

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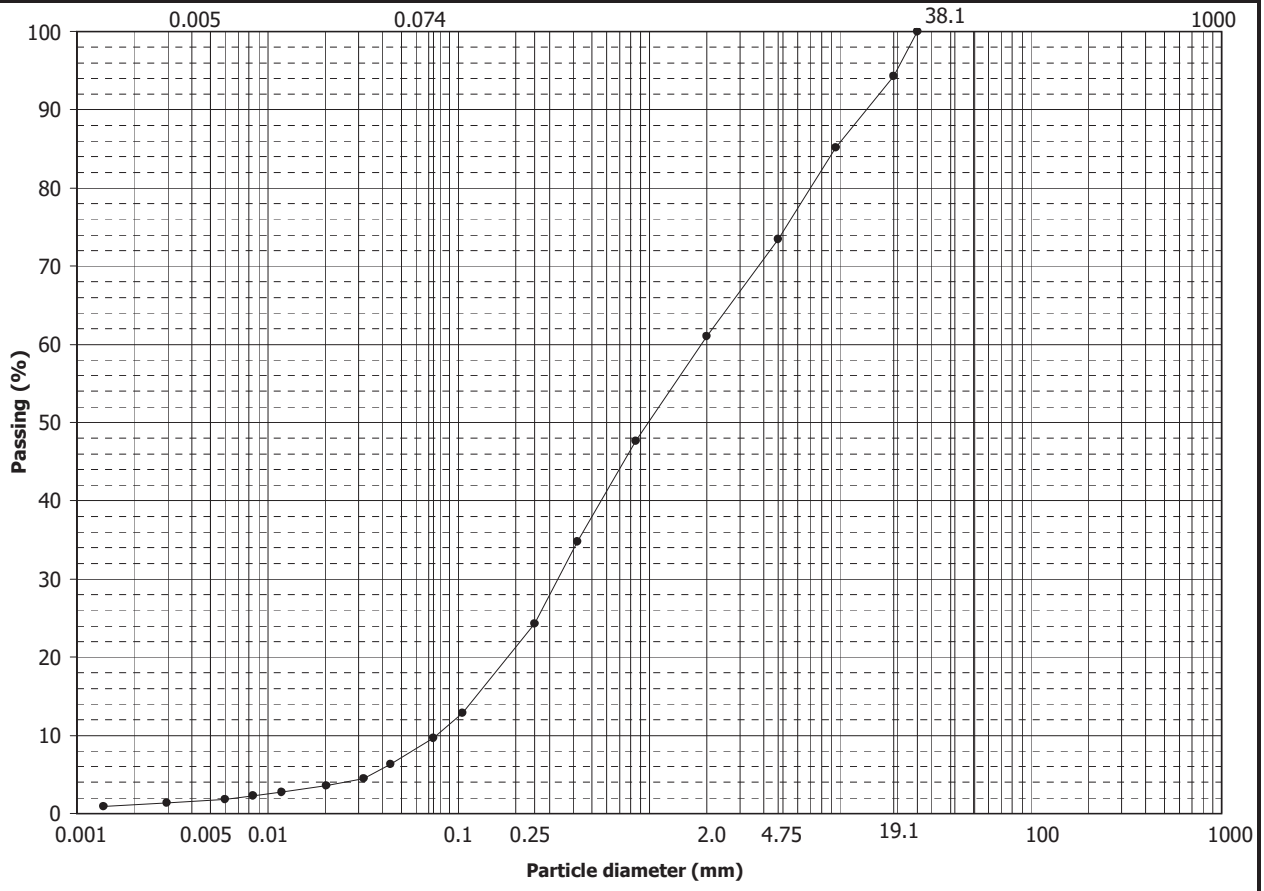
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.718**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
26.59	63.77	7.94	1.69	25.40	14.608	1.9101	1.0544	0.3421	0.0775	24.65	61.05	34.81	9.63



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 574.4 gr
Wt. container No ..... = 34.57 gr
Wt. Of air dry soil W' = 539.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **539.83** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	65.10	34.57	30.53		5.66	94.34
9.52	88.40		53.83		9.97	90.03
4.75	125.80		91.23		16.90	83.10
2.00	182.50		147.93		27.40	72.60

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 144.98 gr — Specific Gravity : **2.678**

Wt. of container E-78 = 37.40 gr — Plasticity Index : %

Wt. Of air dry soil W' = 107.58 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 72.60 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-07			NO	J-23			NO	J-61		
WW	54.55	DW	53.95	WW	53.31	DW	52.74	WW	51.05	DW	50.47	Mean value	
DW	53.95	TW	38.25	DW	52.74	TW	36.20	DW	50.47	TW	35.06	w	
Ww	0.60	Ws	15.70	Ww	0.57	Ws	16.54	Ww	0.58	Ws	15.41	3.68	%
w	3.82	%		w	3.45	%		w	3.76	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 103.764 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	7.5	8.5	28	13.451	13.451	3.6675	0.01235	0.0453	5.50	8.46	6.14
2	6.5	7.5	28	13.703	6.852	2.6175	0.01235	0.0323	4.50	6.92	5.02
5	5.5	6.5	28	13.955	2.791	1.6706	0.01235	0.0206	3.50	5.38	3.91
15	5.0	6.0	28	14.081	0.939	0.9689	0.01235	0.0120	3.00	4.61	3.35
30	4.5	5.5	28	14.208	0.474	0.6882	0.01235	0.0085	2.50	3.85	2.79
60	4.0	5.0	28	14.334	0.239	0.4888	0.01235	0.0060	2.00	3.08	2.23
240	3.5	4.5	29	14.460	0.060	0.2455	0.01222	0.0030	1.50	2.31	1.67
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01235	0.0014	1.00	1.54	1.12

P = 100/W = 0.9637

$$Mx = \frac{G_s}{G_s - 1} = 1.5959$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	45.56	22.02	23.540		22.69	77.31	56.13
0.42	79.43		57.410		55.33	44.67	32.43
0.25	97.00		74.980		72.26	27.74	20.14
0.105	111.44		89.420		86.18	13.82	10.04
0.074	114.15		92.130		88.79	11.21	8.14

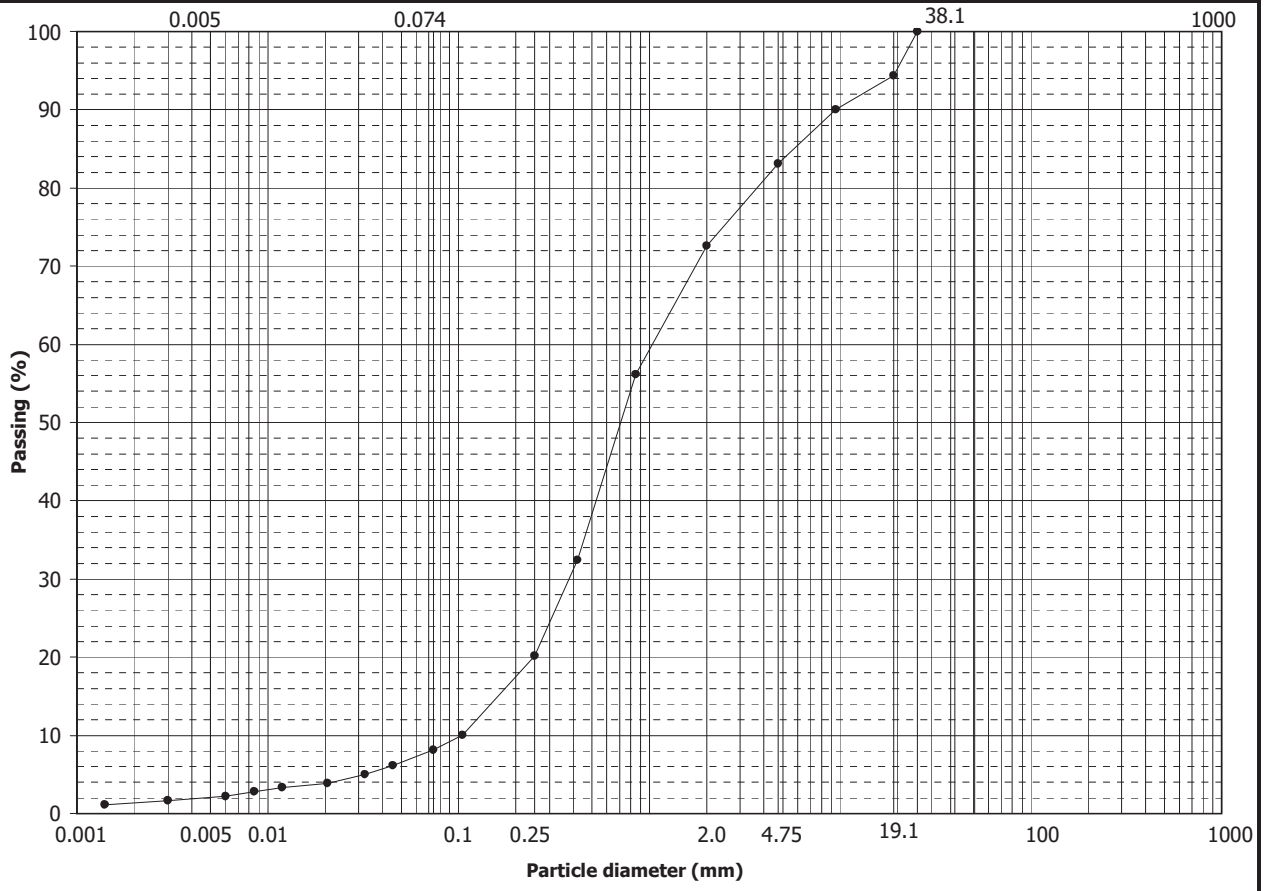
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.678**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
16.90	74.96	6.06	2.08	25.40	9.5005	1.1204	0.7388	0.3864	0.1044	10.73	72.60	32.43	8.14



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 479.3 gr
Wt. container No ..... = 39.90 gr
Wt. Of air dry soil W' = 439.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **439.40** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	45.30	39.90	5.40		1.23	98.77
9.52	58.66		18.76		4.27	95.73
4.75	81.94		42.04		9.57	90.43
2.00	127.60		87.70		19.96	80.04

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	2.50 - 3.00

Wt. (Air dry soil + container) = 149.86 gr — Specific Gravity : 2.682
Wt. of container M-44 = 42.05 gr — Plasticity Index : %
Wt. Of air dry soil W' = 107.81 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 80.04 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-07			NO	J-16			NO	J-19		
WW	50.98	DW	50.29	WW	53.18	DW	52.47	WW	50.30	DW	49.67	Mean value	
DW	50.29	TW	38.25	DW	52.47	TW	39.56	DW	49.67	TW	37.77	w	
Ww	0.69	Ws	12.04	Ww	0.71	Ws	12.91	Ww	0.63	Ws	11.90	5.51	%
w	5.73	%		w	5.50	%		w	5.29	%			

$$W = \frac{100 \times W'}{100 + w} : 102.182 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	9.5	10.5	28	12.946	12.946	3.5981	0.01233	0.0444	7.50	11.70	9.37
2	8.5	9.5	28	13.198	6.599	2.5689	0.01233	0.0317	6.50	10.14	8.12
5	7.5	8.5	28	13.451	2.690	1.6402	0.01233	0.0202	5.50	8.58	6.87
15	6.5	7.5	28	13.703	0.914	0.9558	0.01233	0.0118	4.50	7.02	5.62
30	6.0	7.0	28	13.829	0.461	0.6789	0.01233	0.0084	4.00	6.24	5.00
60	5.5	6.5	28	13.955	0.233	0.4823	0.01233	0.0059	3.50	5.46	4.37
240	4.5	5.5	29	14.208	0.059	0.2433	0.01220	0.0030	2.50	3.90	3.12
1140	4.0	5.0	28	14.334	0.013	0.1121	0.01233	0.0014	2.00	3.12	2.50

P = 100/W = 0.9786

$$Mx = \frac{G_s}{G_s - 1} = 1.5945$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	42.31	22.02	20.290		19.86	80.14	64.15
0.42	71.58		49.560		48.50	51.50	41.22
0.25	88.13		66.110		64.70	35.30	28.26
0.105	105.49		83.470		81.69	18.31	14.66
0.074	109.47		87.450		85.58	14.42	11.54

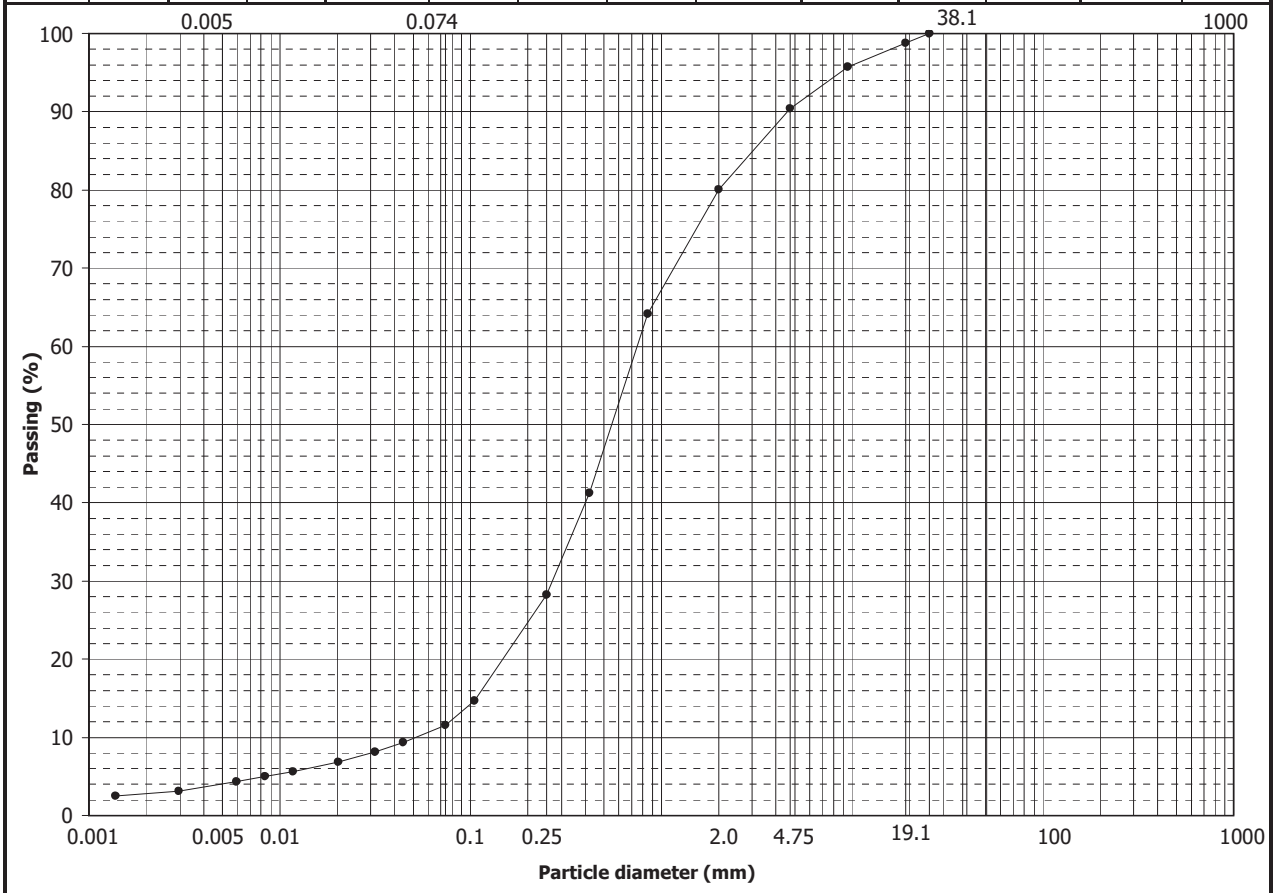
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.682**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
9.57	78.89	7.48	4.06	25.40	4.6356	0.7722	0.5847	0.2729	0.0530	14.57	80.04	41.22	11.54



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 421.7 gr
Wt. container No ..... = 43.62 gr
Wt. Of air dry soil W' = 378.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **378.08** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	43.67	43.62	0.05		0.01	99.99

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 99.42 gr — Specific Gravity : **2.680**

Wt. of container B-103 = 35.86 gr — Plasticity Index : %

Wt. Of air dry soil W' = 63.56 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 99.99 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-12			NO	J-18			NO	J-29		
WW	53.85	DW	52.85	WW	52.83	DW	51.91	WW	52.66	DW	51.77	Mean value	
DW	52.85	TW	37.07	DW	51.91	TW	37.00	DW	51.77	TW	37.51	w	
Ww	1.00	Ws	15.78	Ww	0.92	Ws	14.91	Ww	0.89	Ws	14.26	6.25	%
w	6.34	%		w	6.17	%		w	6.24	%			

$$W = \frac{100 \times W'}{100 + w} : 59.821 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	30.5	31.5	28	7.648	7.648	2.7655	0.01234	0.0341	28.50	76.00	75.99
2	27.0	28.0	28	8.531	4.265	2.0653	0.01234	0.0255	25.00	66.67	66.66
5	21.5	22.5	28	9.919	1.984	1.4084	0.01234	0.0174	19.50	52.00	51.99
15	16.0	17.0	28	11.306	0.754	0.8682	0.01234	0.0107	14.00	37.33	37.33
30	13.5	14.5	28	11.937	0.398	0.6308	0.01234	0.0078	11.50	30.67	30.66
60	12.0	13.0	28	12.315	0.205	0.4531	0.01234	0.0056	10.00	26.67	26.66
240	10.5	11.5	29	12.694	0.053	0.2300	0.01221	0.0028	8.50	22.67	22.66
1140	9.5	10.5	28	12.946	0.011	0.1066	0.01234	0.0013	7.50	20.00	20.00

P = 100/W = 1.6716

$$Mx = \frac{G_s}{G_s - 1} = 1.5952$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.15	22.02	0.130		0.22	99.78	99.77
0.42	22.35		0.330		0.55	99.45	99.44
0.25	22.75		0.730		1.22	98.78	98.77
0.105	24.56		2.540		4.25	95.75	95.74
0.074	26.42		4.400		7.36	92.64	92.63

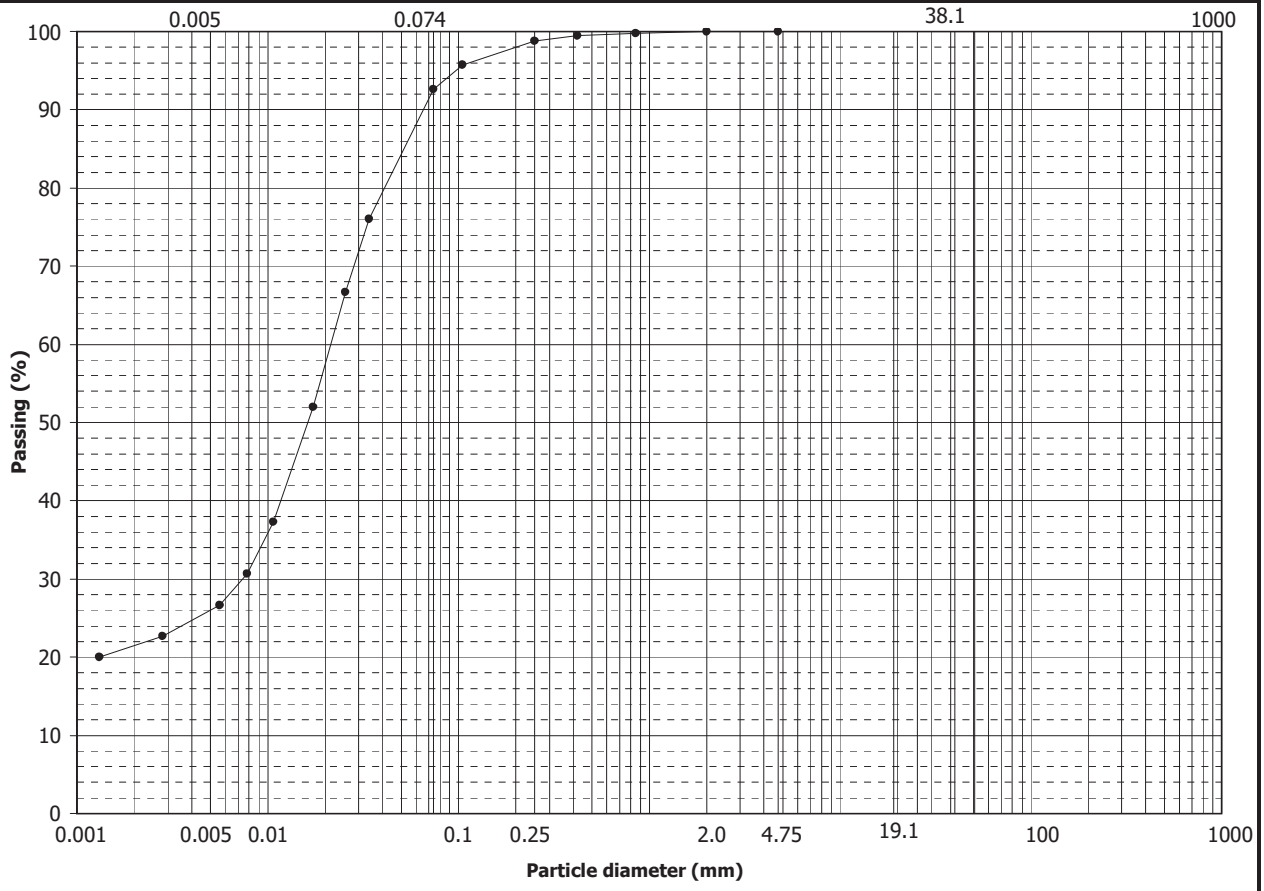
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.680**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	7.37	66.62	26.01	4.75	0.0677	0.0218	0.0165	0.0074	-	-	99.99	99.44	92.63



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 410.9 gr
Wt. container No ..... = 32.58 gr
Wt. Of air dry soil W' = 378.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **378.32** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	87.20	32.58	54.62		14.44	85.56
9.52	155.20		122.62		32.41	67.59
4.75	178.20		145.62		38.49	61.51
2.00	190.00		157.42		41.61	58.39

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 93.17 gr — Specific Gravity : **2.681**

Wt. of container B-70 = 33.31 gr — Plasticity Index : %

Wt. Of air dry soil W' = 59.86 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 58.39 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-04			NO	J-14			NO	J-24		
WW	52.66	DW	52.05	WW	52.08	DW	51.41	WW	49.47	DW	48.86	Mean value	
DW	52.05	TW	36.65	DW	51.41	TW	35.20	DW	48.86	TW	33.27	w	
Ww	0.61	Ws	15.40	Ww	0.67	Ws	16.21	Ww	0.61	Ws	15.59	4.00	%
w	3.96	%		w	4.13	%		w	3.91	%			

$$W = \frac{100 \times W'}{100 + w} : 57.556 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	27.0	28.0	28	8.531	8.531	2.9208	0.01234	0.0360	25.00	69.27	40.45
2	25.0	26.0	28	9.035	4.518	2.1255	0.01234	0.0262	23.00	63.73	37.21
5	21.0	22.0	28	10.045	2.009	1.4174	0.01234	0.0175	19.00	52.65	30.74
15	16.5	17.5	28	11.180	0.745	0.8633	0.01234	0.0107	14.50	40.18	23.46
30	14.5	15.5	28	11.685	0.389	0.6241	0.01234	0.0077	12.50	34.64	20.22
60	12.5	13.5	28	12.189	0.203	0.4507	0.01234	0.0056	10.50	29.10	16.99
240	11.0	12.0	29	12.568	0.052	0.2288	0.01221	0.0028	9.00	24.94	14.56
1140	10.0	11.0	28	12.820	0.011	0.1060	0.01234	0.0013	8.00	22.17	12.94

P = 100/W = 1.7374

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5949$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	25.20	22.02	3.180		5.53	94.47	55.16
0.42	28.01		5.990		10.41	89.59	52.31
0.25	30.40		8.380		14.56	85.44	49.89
0.105	32.87		10.850		18.85	81.15	47.38
0.074	34.94		12.920		22.45	77.55	45.28

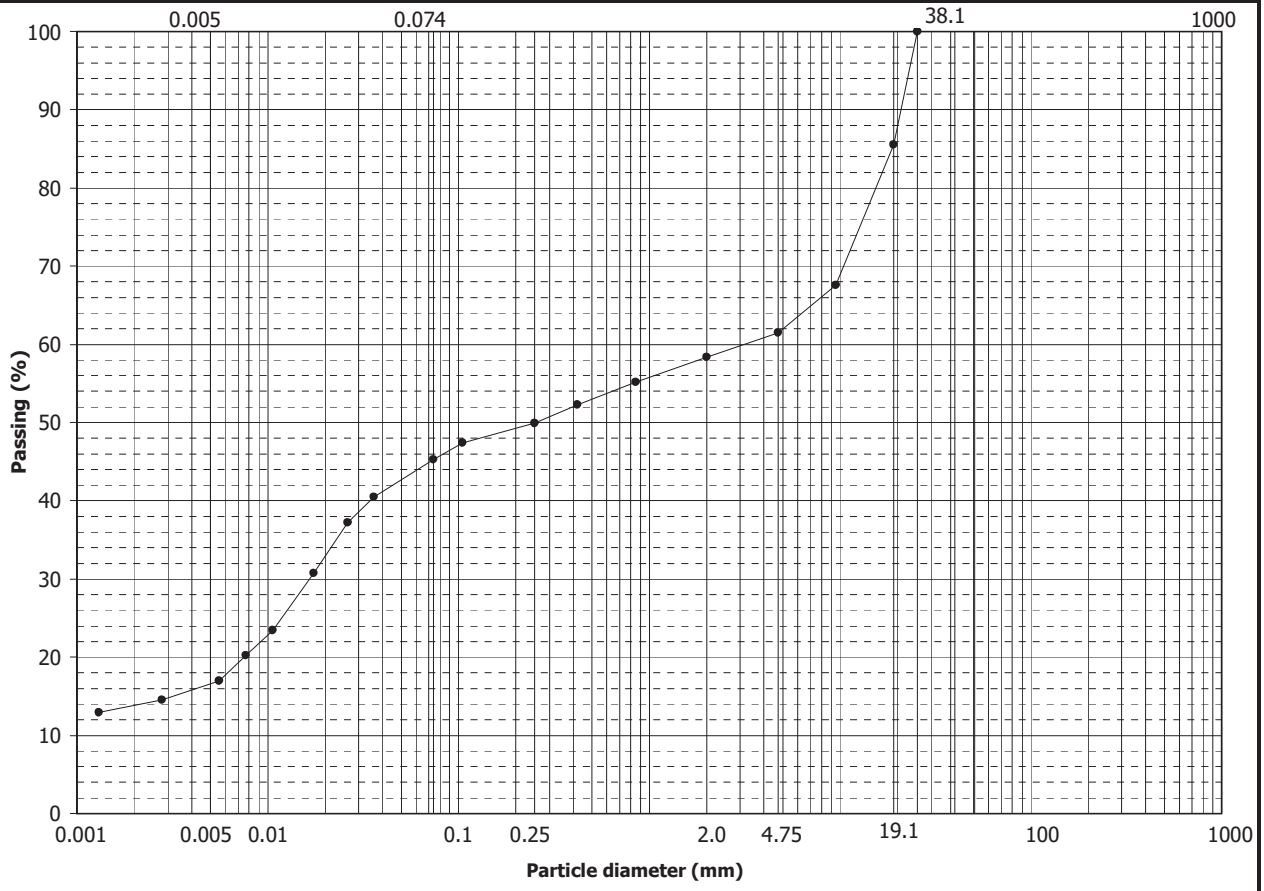
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.681**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
38.49	16.23	28.67	16.61	25.40	21.036	3.4197	0.2578	0.0168	-	-	58.39	52.31	45.28



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 768.9 gr
Wt. container No ..... = 34.55 gr
Wt. Of air dry soil W' = 734.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **734.35** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	37.29	34.55	2.74		0.37	99.63

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	5.50 - 6.00

Wt. (Air dry soil + container) = 92.49 gr — Specific Gravity : 2.679
Wt. of container B-75 = 34.56 gr — Plasticity Index : %
Wt. Of air dry soil W' = 57.93 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 99.63 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-19			NO	J-06			NO	J-36		
WW	51.84	DW	50.96	WW	54.61	DW	53.75	WW	53.83	DW	52.88	Mean value	
DW	50.96	TW	37.77	DW	53.75	TW	40.48	DW	52.88	TW	38.80	w	
Ww	0.88	Ws	13.19	Ww	0.86	Ws	13.27	Ww	0.95	Ws	14.08	6.63	%
w	6.67	%		w	6.48	%		w	6.75	%			

$$W = \frac{100 \times W'}{100 + w} : 54.326 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	28	11.054	11.054	3.3247	0.01235	0.0410	15.00	44.06	43.89
2	14.5	15.5	28	11.685	5.842	2.4171	0.01235	0.0298	12.50	36.71	36.58
5	11.5	12.5	28	12.442	2.488	1.5774	0.01235	0.0195	9.50	27.90	27.80
15	9.5	10.5	28	12.946	0.863	0.9290	0.01235	0.0115	7.50	22.03	21.95
30	8.5	9.5	28	13.198	0.440	0.6633	0.01235	0.0082	6.50	19.09	19.02
60	7.5	8.5	28	13.451	0.224	0.4735	0.01235	0.0058	5.50	16.15	16.09
240	6.5	7.5	29	13.703	0.057	0.2389	0.01221	0.0029	4.50	13.22	13.17
1140	5.5	6.5	28	13.955	0.012	0.1106	0.01235	0.0014	3.50	10.28	10.24

P = 100/W = 1.8407

$$Mx = \frac{G_s}{G_s - 1} = 1.5956$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.70	22.02	0.680		1.25	98.75	98.38
0.42	23.33		1.310		2.41	97.59	97.22
0.25	25.89		3.870		7.12	92.88	92.53
0.105	41.26		19.240		35.42	64.58	64.34
0.074	45.80		23.780		43.77	56.23	56.02

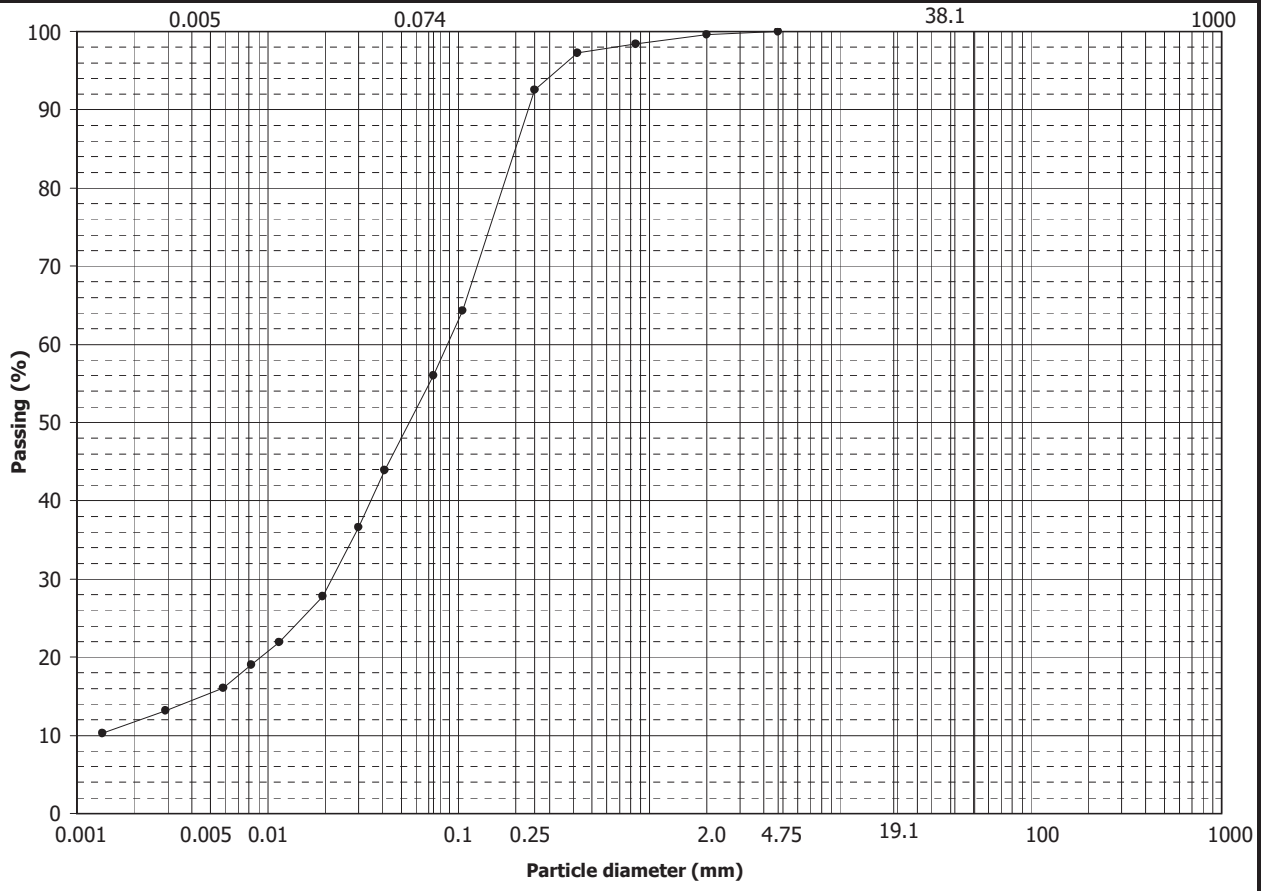
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.679**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	43.98	40.58	15.44	4.75	0.237	0.0888	0.0576	0.0221	-	-	99.63	97.22	56.02



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 600.6 gr

Wt. container No ..... = 41.75 gr

Wt. Of air dry soil W' = 558.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **558.85** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	42.70	41.75	0.95		0.17	99.83

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	6.50 - 7.00

Wt. (Air dry soil + container) = 99.95 gr — Specific Gravity : 2.684
Wt. of container B-103 = 34.62 gr — Plasticity Index : %
Wt. Of air dry soil W' = 65.33 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 99.83 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-22			NO	J-27			NO	J-38		
WW	53.53	DW	52.64	WW	51.72	DW	50.74	WW	52.90	DW	51.91	Mean value	
DW	52.64	TW	39.01	DW	50.74	TW	35.23	DW	51.91	TW	37.58	w	
Ww	0.89	Ws	13.63	Ww	0.98	Ws	15.51	Ww	0.99	Ws	14.33	6.59	%
w	6.53	%		w	6.32	%		w	6.91	%			

$$W = \frac{100 \times W'}{100 + w}$$: 61.293 gr

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	23.0	24.0	28	9.540	9.540	3.0887	0.01233	0.0381	21.00	54.61	54.51
2	20.5	21.5	28	10.171	5.085	2.2551	0.01233	0.0278	18.50	48.11	48.02
5	16.5	17.5	28	11.180	2.236	1.4953	0.01233	0.0184	14.50	37.70	37.64
15	12.5	13.5	28	12.189	0.813	0.9015	0.01233	0.0111	10.50	27.30	27.26
30	10.5	11.5	28	12.694	0.423	0.6505	0.01233	0.0080	8.50	22.10	22.07
60	9.5	10.5	28	12.946	0.216	0.4645	0.01233	0.0057	7.50	19.50	19.47
240	8.5	9.5	29	13.198	0.055	0.2345	0.01219	0.0029	6.50	16.90	16.87
1140	8.0	9.0	28	13.325	0.012	0.1081	0.01233	0.0013	6.00	15.60	15.58

P = 100/W = 1.6315

$$Mx = \frac{Gs}{Gs - 1} =$$ 1.5938

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.41	22.02	0.390		0.64	99.36	99.19
0.42	22.71		0.690		1.13	98.87	98.71
0.25	24.31		2.290		3.74	96.26	96.10
0.105	36.41		14.390		23.48	76.52	76.39
0.074	40.72		18.700		30.51	69.49	69.37

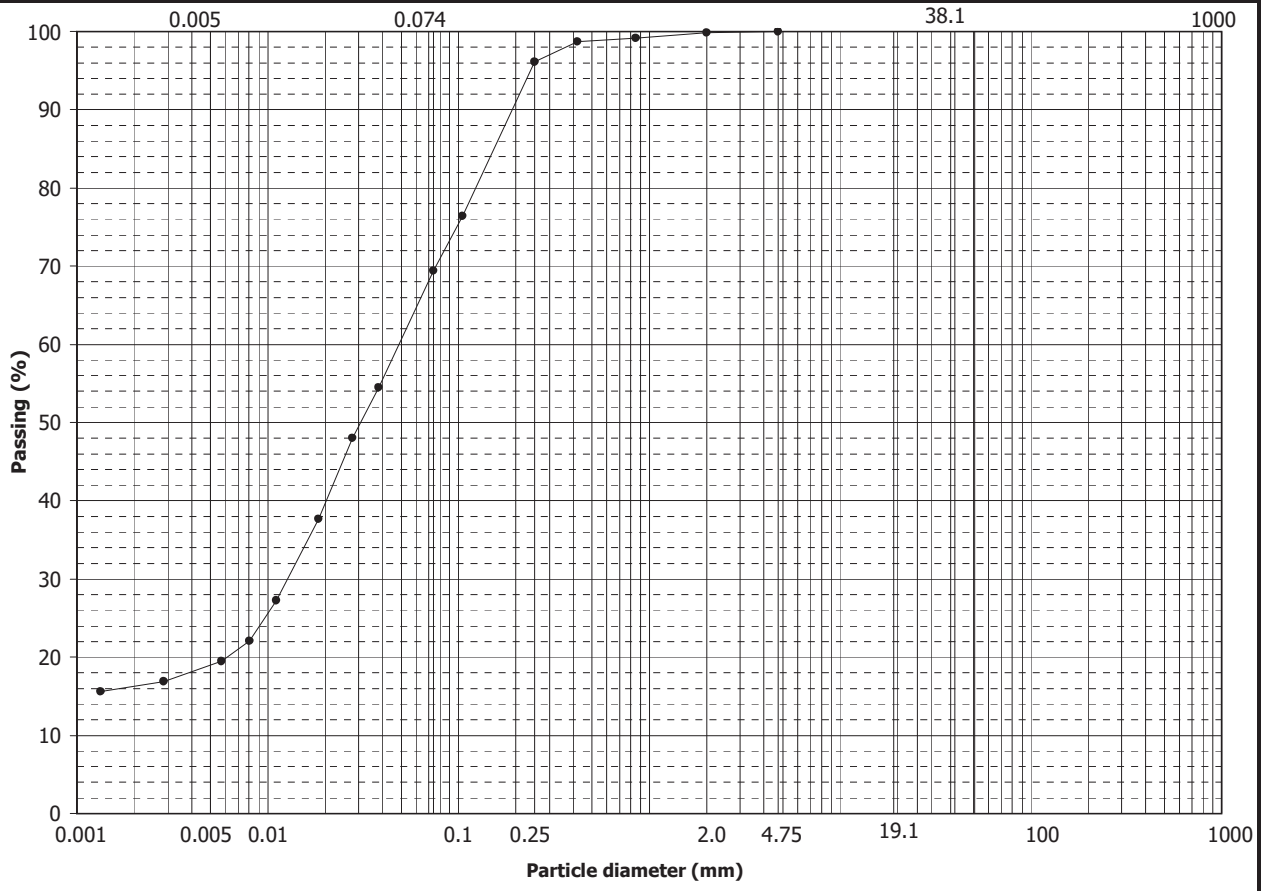
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.684**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	30.63	50.41	18.96	4.75	0.2051	0.0513	0.0309	0.0130	-	-	99.83	98.71	69.37



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 446.5 gr
Wt. container No ..... = 39.68 gr
Wt. Of air dry soil W' = 406.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **406.82** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	43.91	39.68	4.23		1.04	98.96

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	7.50 - 8.00

Wt. (Air dry soil + container) = 106.75 gr — Specific Gravity : 2.676
Wt. of container M-53 = 36.84 gr — Plasticity Index : %
Wt. Of air dry soil W' = 69.91 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 98.96 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-18			NO	J-03			NO	J-12		
WW	55.09	DW	53.93	WW	55.79	DW	54.77	WW	55.97	DW	54.85	Mean value	
DW	53.93	TW	37.00	DW	54.77	TW	39.31	DW	54.85	TW	37.07	w	
Ww	1.16	Ws	16.93	Ww	1.02	Ws	15.46	Ww	1.12	Ws	17.78	6.58	%
w	6.85	%		w	6.60	%		w	6.30	%			

$$W = \frac{100 \times W'}{100 + w} : 65.592 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.0	19.0	28	10.802	10.802	3.2866	0.01236	0.0406	16.00	38.95	38.54
2	16.0	17.0	28	11.306	5.653	2.3776	0.01236	0.0294	14.00	34.08	33.72
5	13.5	14.5	28	11.937	2.387	1.5451	0.01236	0.0191	11.50	27.99	27.70
15	11.0	12.0	28	12.568	0.838	0.9153	0.01236	0.0113	9.00	21.91	21.68
30	9.5	10.5	28	12.946	0.432	0.6569	0.01236	0.0081	7.50	18.26	18.07
60	8.5	9.5	28	13.198	0.220	0.4690	0.01236	0.0058	6.50	15.82	15.66
240	7.0	8.0	29	13.577	0.057	0.2378	0.01222	0.0029	5.00	12.17	12.04
1140	6.0	7.0	28	13.829	0.012	0.1101	0.01236	0.0014	4.00	9.74	9.64

P = 100/W = 1.5246

$$Mx = \frac{G_s}{G_s - 1} = 1.5967$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	25.87	22.02	3.850		5.87	94.13	93.15
0.42	31.94		9.920		15.12	84.88	83.99
0.25	36.30		14.280		21.77	78.23	77.42
0.105	49.02		27.000		41.16	58.84	58.22
0.074	53.49		31.470		47.98	52.02	51.48

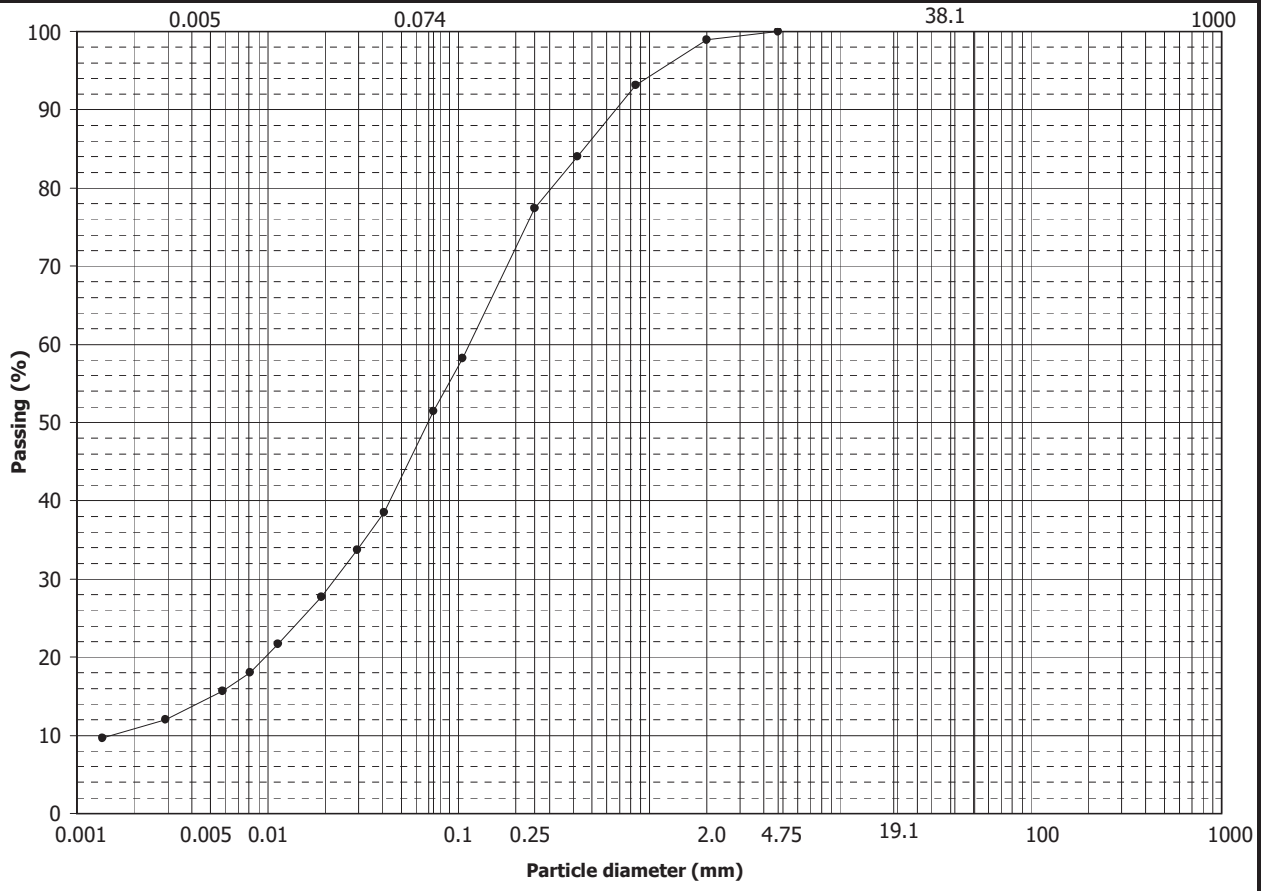
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.676**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	48.52	36.60	14.88	4.75	0.7020	0.1184	0.0702	0.0230	0.0016	74.25	98.96	83.99	51.48



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 113.6 gr
Wt. container No ..... = 32.69 gr
Wt. Of air dry soil W' = 80.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **80.87** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	34.54	32.69	1.85		2.29	97.71

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 101.01 gr — Specific Gravity : **2.692**

Wt. of container B-13 = 32.70 gr — Plasticity Index : %

Wt. Of air dry soil W' = 68.31 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 97.71 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-09			NO	J-31			NO	J-35		
WW	55.15	DW	53.96	WW	49.14	DW	47.85	WW	51.43	DW	50.11	Mean value	
DW	53.96	TW	40.12	DW	47.85	TW	31.91	DW	50.11	TW	34.38	w	
Ww	1.19	Ws	13.84	Ww	1.29	Ws	15.94	Ww	1.32	Ws	15.73	8.36	%
w	8.60	%		w	8.09	%		w	8.39	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 63.039 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.5	18.5	28	10.928	10.928	3.3057	0.01230	0.0407	15.50	39.12	38.22
2	16.0	17.0	28	11.306	5.653	2.3776	0.01230	0.0292	14.00	35.33	34.53
5	13.5	14.5	28	11.937	2.387	1.5451	0.01230	0.0190	11.50	29.02	28.36
15	10.5	11.5	28	12.694	0.846	0.9199	0.01230	0.0113	8.50	21.45	20.96
30	9.0	10.0	28	13.072	0.436	0.6601	0.01230	0.0081	7.00	17.67	17.26
60	8.0	9.0	28	13.325	0.222	0.4712	0.01230	0.0058	6.00	15.14	14.80
240	6.5	7.5	29	13.703	0.057	0.2389	0.01217	0.0029	4.50	11.36	11.10
1140	5.5	6.5	28	13.955	0.012	0.1106	0.01230	0.0014	3.50	8.83	8.63

P = 100/W = 1.5863

$$Mx = \frac{G_s}{G_s - 1} = 1.5910$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	27.19	22.02	5.170		8.20	91.80	89.70
0.42	32.90		10.880		17.26	82.74	80.85
0.25	38.34		16.320		25.89	74.11	72.42
0.105	50.50		28.480		45.18	54.82	53.57
0.074	54.49		32.470		51.51	48.49	47.38

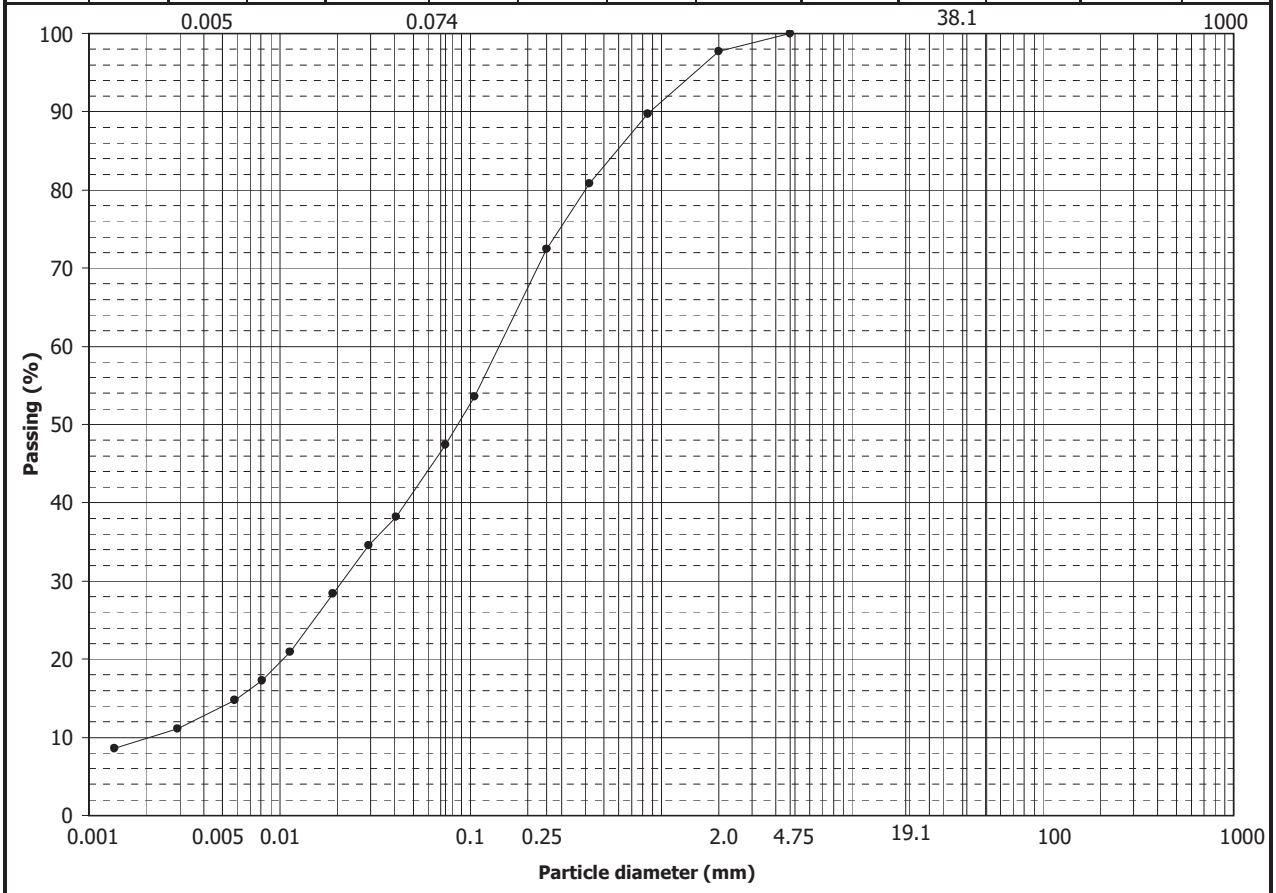
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.692**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	52.62	33.38	14.01	4.75	0.8932	0.1545	0.0871	0.0217	0.0022	69.63	97.71	80.85	47.38



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 626.1 gr
Wt. container No ..... = 34.40 gr
Wt. Of air dry soil W' = 591.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **591.70** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	55.08	34.40	20.68		3.50	96.50

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	9.50 - 10.00

Wt. (Air dry soil + container) = 101.96 gr — Specific Gravity : 2.691
Wt. of container B-92 = 34.39 gr — Plasticity Index : %
Wt. Of air dry soil W' = 67.57 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 96.50 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-09			NO	J-31			NO	J-35		
WW	55.94	DW	54.86	WW	46.96	DW	45.96	WW	48.73	DW	47.76	Mean value	
DW	54.86	TW	40.12	DW	45.96	TW	31.91	DW	47.76	TW	34.38	w	
Ww	1.08	Ws	14.74	Ww	1.00	Ws	14.05	Ww	0.97	Ws	13.38	7.23	%
w	7.33	%		w	7.12	%		w	7.25	%			

$$W = \frac{100 \times W'}{100 + w} : 63.013 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.5	14.5	28	11.937	11.937	3.4550	0.01230	0.0425	11.50	29.04	28.03
2	12.0	13.0	28	12.315	6.158	2.4815	0.01230	0.0305	10.00	25.25	24.37
5	10.0	11.0	28	12.820	2.564	1.6012	0.01230	0.0197	8.00	20.20	19.50
15	8.0	9.0	28	13.325	0.888	0.9425	0.01230	0.0116	6.00	15.15	14.62
30	7.0	8.0	28	13.577	0.453	0.6727	0.01230	0.0083	5.00	12.63	12.19
60	6.0	7.0	28	13.829	0.230	0.4801	0.01230	0.0059	4.00	10.10	9.75
240	5.0	6.0	29	14.081	0.059	0.2422	0.01217	0.0029	3.00	7.58	7.31
1140	4.0	5.0	28	14.334	0.013	0.1121	0.01230	0.0014	2.00	5.05	4.87

P = 100/W = 1.587

$$Mx = \frac{Gs}{Gs - 1} = 1.5914$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	30.44	22.02	8.420		13.36	86.64	83.61
0.42	38.46		16.440		26.09	73.91	71.33
0.25	43.66		21.640		34.34	65.66	63.36
0.105	55.31		33.290		52.83	47.17	45.52
0.074	60.26		38.240		60.69	39.31	37.94

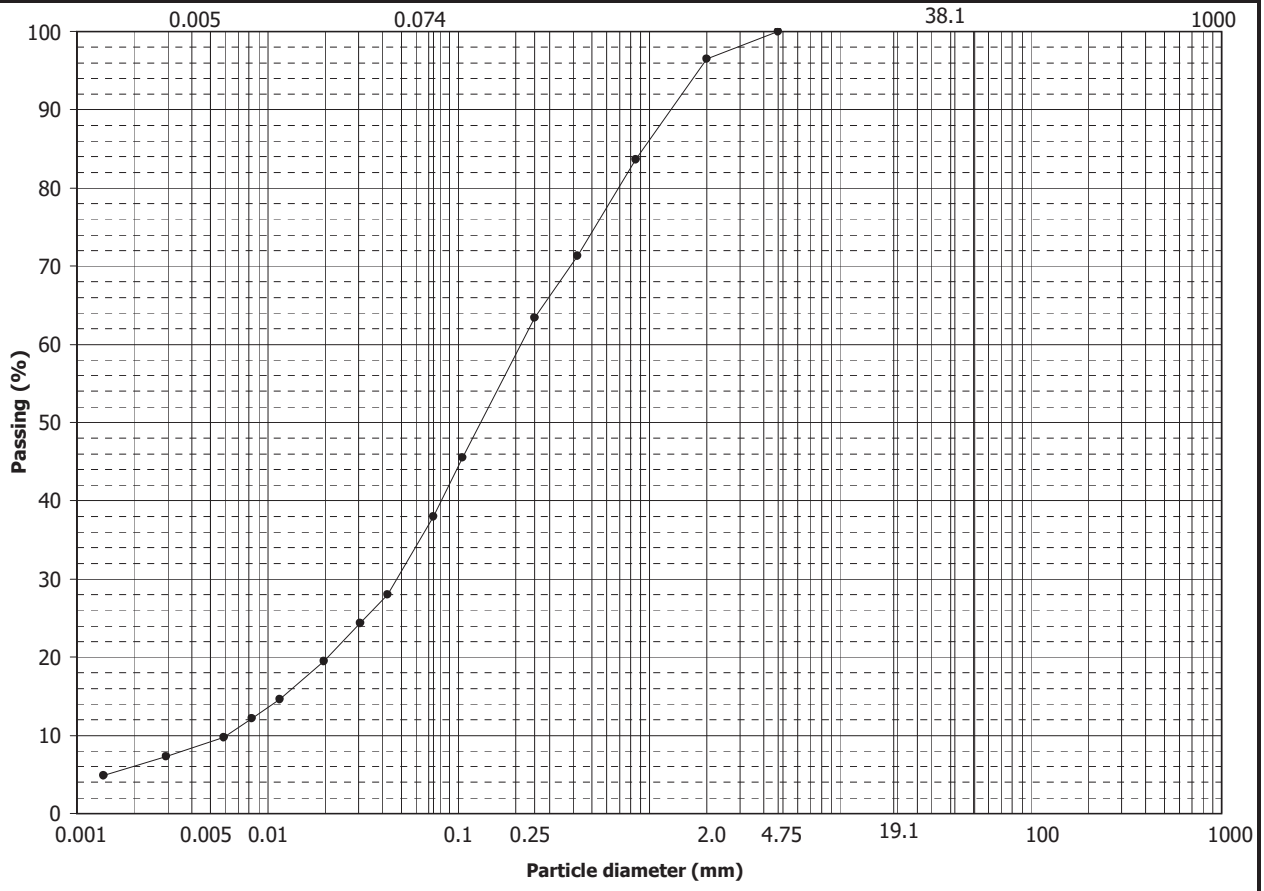
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.691**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	62.06	28.78	9.16	4.75	1.4199	0.2227	0.1414	0.0488	0.0062	36.20	96.50	71.33	37.94



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	11.50 - 12.00

Wt. (Air dry soil + container) = 110.44 gr — Specific Gravity : 2.681
Wt. of container M-43 = 42.19 gr — Plasticity Index : %
Wt. Of air dry soil W' = 68.25 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-05			NO	J-10			NO	J-24		
WW	50.29	DW	49.35	WW	50.12	DW	49.24	WW	50.17	DW	49.00	Mean value	
DW	49.35	TW	36.52	DW	49.24	TW	36.96	DW	49.00	TW	33.27	w	
Ww	0.94	Ws	12.83	Ww	0.88	Ws	12.28	Ww	1.17	Ws	15.73	7.31	%
w	7.33	%		w	7.16	%		w	7.44	%			

$$W = \frac{100 \times W'}{100 + w} : 63.601 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	31.5	32.5	28	7.396	7.396	2.7195	0.01234	0.0336	29.50	73.98	73.98
2	28.0	29.0	28	8.279	4.139	2.0345	0.01234	0.0251	26.00	65.20	65.20
5	23.5	24.5	28	9.414	1.883	1.3721	0.01234	0.0169	21.50	53.91	53.91
15	19.5	20.5	28	10.423	0.695	0.8336	0.01234	0.0103	17.50	43.88	43.88
30	17.0	18.0	28	11.054	0.368	0.6070	0.01234	0.0075	15.00	37.61	37.61
60	15.0	16.0	28	11.558	0.193	0.4389	0.01234	0.0054	13.00	32.60	32.60
240	12.0	13.0	29	12.315	0.051	0.2265	0.01221	0.0028	10.00	25.08	25.08
1140	10.0	11.0	28	12.820	0.011	0.1060	0.01234	0.0013	8.00	20.06	20.06

P = 100/W = 1.5723

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5949$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.31	22.02	0.290		0.46	99.54	99.54
0.42	22.72		0.700		1.10	98.90	98.90
0.25	23.02		1.000		1.57	98.43	98.43
0.105	25.02		3.000		4.72	95.28	95.28
0.074	27.53		5.510		8.66	91.34	91.34

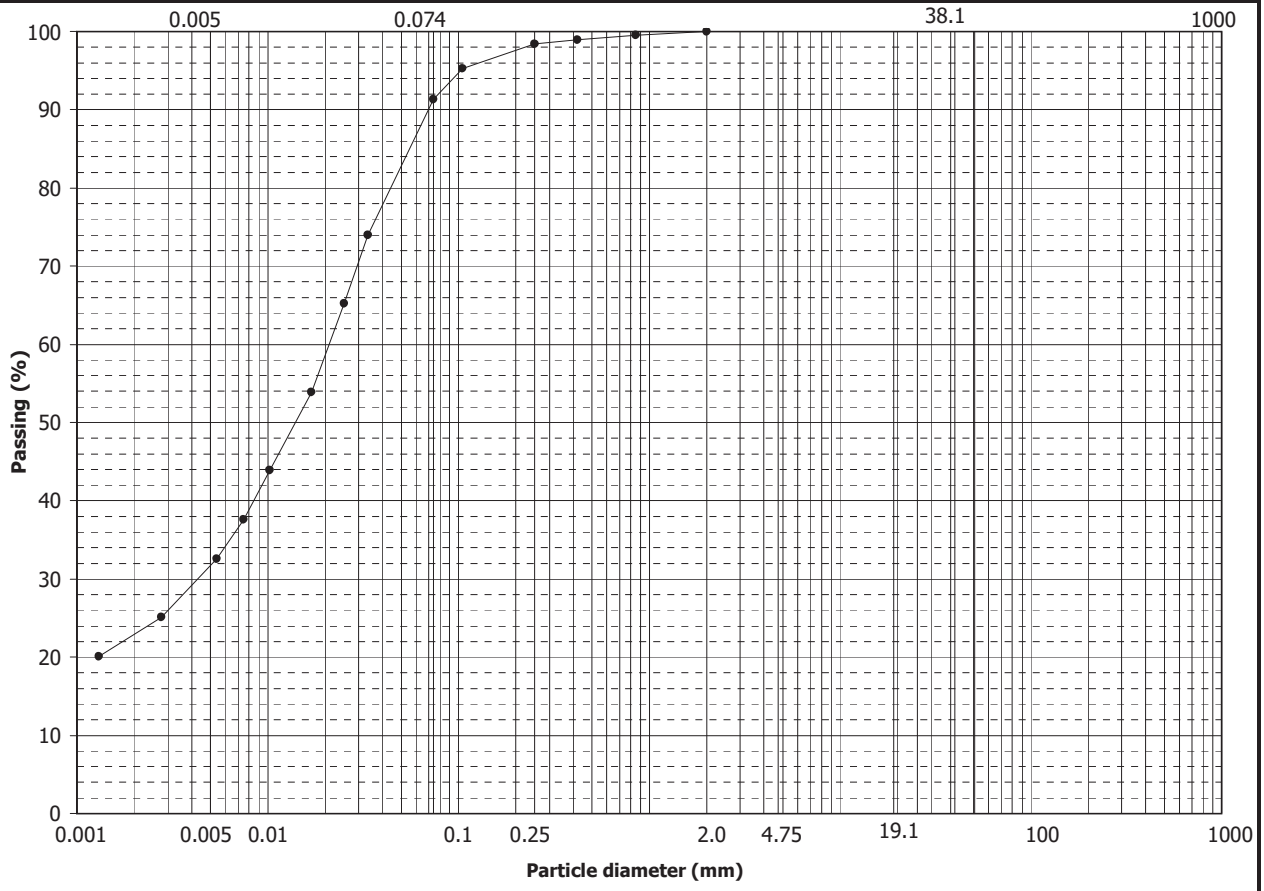
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**11.50 - 12.00**

SPECIFIC GRAVITY : **2.681**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	8.66	59.63	31.71	2.00	0.0709	0.0213	0.0143	0.0045	-	-	100.00	98.90	91.34



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 463.0 gr
Wt. container No ..... = 35.55 gr
Wt. Of air dry soil W' = 427.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **427.45** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	36.64	35.55	1.09		0.26	99.74

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	15.50 - 16.00

Wt. (Air dry soil + container) = 105.13 gr — Specific Gravity : 2.698
Wt. of container B-72 = 35.53 gr — Plasticity Index : %
Wt. Of air dry soil W' = 69.60 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 99.74 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-17			NO	J-06			NO	J-28		
WW	55.02	DW	53.93	WW	55.75	DW	54.85	WW	52.97	DW	51.96	Mean value	
DW	53.93	TW	37.60	DW	54.85	TW	40.48	DW	51.96	TW	36.12	w	
Ww	1.09	Ws	16.33	Ww	0.90	Ws	14.37	Ww	1.01	Ws	15.84	6.44	%
w	6.67	%		w	6.26	%		w	6.38	%			

$$W = \frac{100 \times W'}{100 + w} : 65.390 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	24.0	25.0	28	9.288	9.288	3.0476	0.01228	0.0374	22.00	53.46	53.32
2	20.5	21.5	28	10.171	5.085	2.2551	0.01228	0.0277	18.50	44.95	44.84
5	18.0	19.0	28	10.802	2.160	1.4698	0.01228	0.0180	16.00	38.88	38.78
15	15.0	16.0	28	11.558	0.771	0.8778	0.01228	0.0108	13.00	31.59	31.51
30	13.5	14.5	28	11.937	0.398	0.6308	0.01228	0.0077	11.50	27.94	27.87
60	12.0	13.0	28	12.315	0.205	0.4531	0.01228	0.0056	10.00	24.30	24.24
240	9.5	10.5	29	12.946	0.054	0.2323	0.01214	0.0028	7.50	18.22	18.18
1140	8.0	9.0	28	13.325	0.012	0.1081	0.01228	0.0013	6.00	14.58	14.54

P = 100/W = 1.5293

$$Mx = \frac{G_s}{G_s - 1} = 1.5889$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.21	22.02	0.190		0.29	99.71	99.46
0.42	22.34		0.320		0.49	99.51	99.26
0.25	22.67		0.650		0.99	99.01	98.75
0.105	23.93		1.910		2.92	97.08	96.83
0.074	27.38		5.360		8.20	91.80	91.57

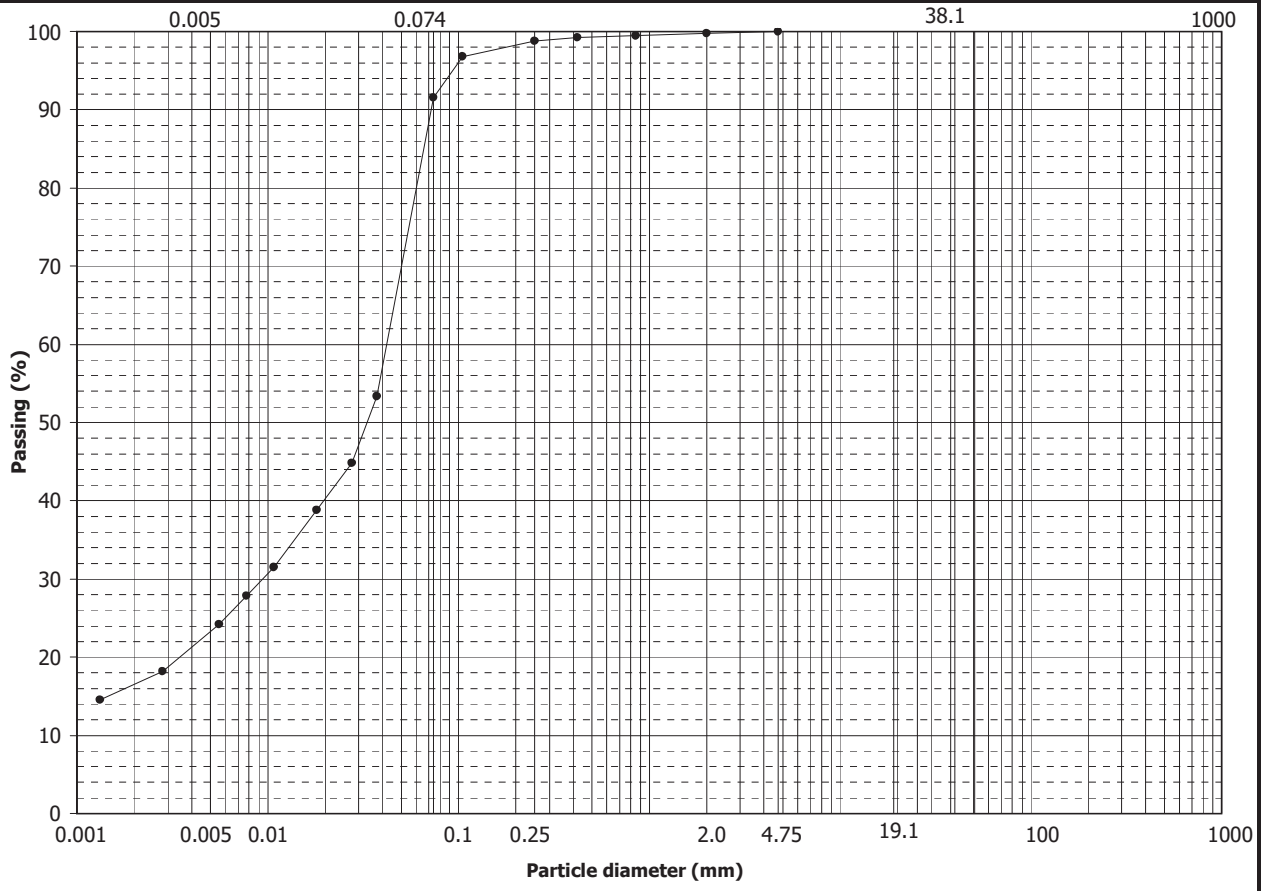
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**15.50 - 16.00**

SPECIFIC GRAVITY : **2.698**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	8.43	68.28	23.29	4.75	0.0725	0.0438	0.0336	0.0095	-	-	99.74	99.26	91.57



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**17.50 - 18.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	LERE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 18	DEPTH	17.50 - 18.00

Wt. (Air dry soil + container) = 108.50 gr — Specific Gravity : 2.729
Wt. of container E-48 = 36.80 gr — Plasticity Index : %
Wt. Of air dry soil W' = 71.70 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-21			NO	J-49			NO	J-52		
WW	53.73	DW	52.74	WW	55.97	DW	55.08	WW	54.72	DW	53.64	Mean value	
DW	52.74	TW	36.56	DW	55.08	TW	40.36	DW	53.64	TW	36.71	w	
Ww	0.99	Ws	16.18	Ww	0.89	Ws	14.72	Ww	1.08	Ws	16.93	6.18	%
w	6.12	%		w	6.05	%		w	6.38	%			

$$W = \frac{100 \times W'}{100 + w} : 67.526 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	31.0	32.0	28	7.522	7.522	2.7426	0.01217	0.0334	29.00	67.79	67.79
2	27.0	28.0	28	8.531	4.265	2.0653	0.01217	0.0251	25.00	58.44	58.44
5	22.5	23.5	28	9.666	1.933	1.3904	0.01217	0.0169	20.50	47.92	47.92
15	18.5	19.5	28	10.675	0.712	0.8436	0.01217	0.0103	16.50	38.57	38.57
30	16.0	17.0	28	11.306	0.377	0.6139	0.01217	0.0075	14.00	32.72	32.72
60	14.0	15.0	28	11.811	0.197	0.4437	0.01217	0.0054	12.00	28.05	28.05
240	11.0	12.0	29	12.568	0.052	0.2288	0.01203	0.0028	9.00	21.04	21.04
1140	9.0	10.0	28	13.072	0.011	0.1071	0.01217	0.0013	7.00	16.36	16.36

P = 100/W = 1.4809

$$Mx = \frac{G_s}{G_s - 1} = 1.5784$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.13	22.02	0.110		0.16	99.84	99.84
0.42	22.20		0.180		0.27	99.73	99.73
0.25	22.41		0.390		0.58	99.42	99.42
0.105	22.96		0.940		1.39	98.61	98.61
0.074	24.37		2.350		3.48	96.52	96.52

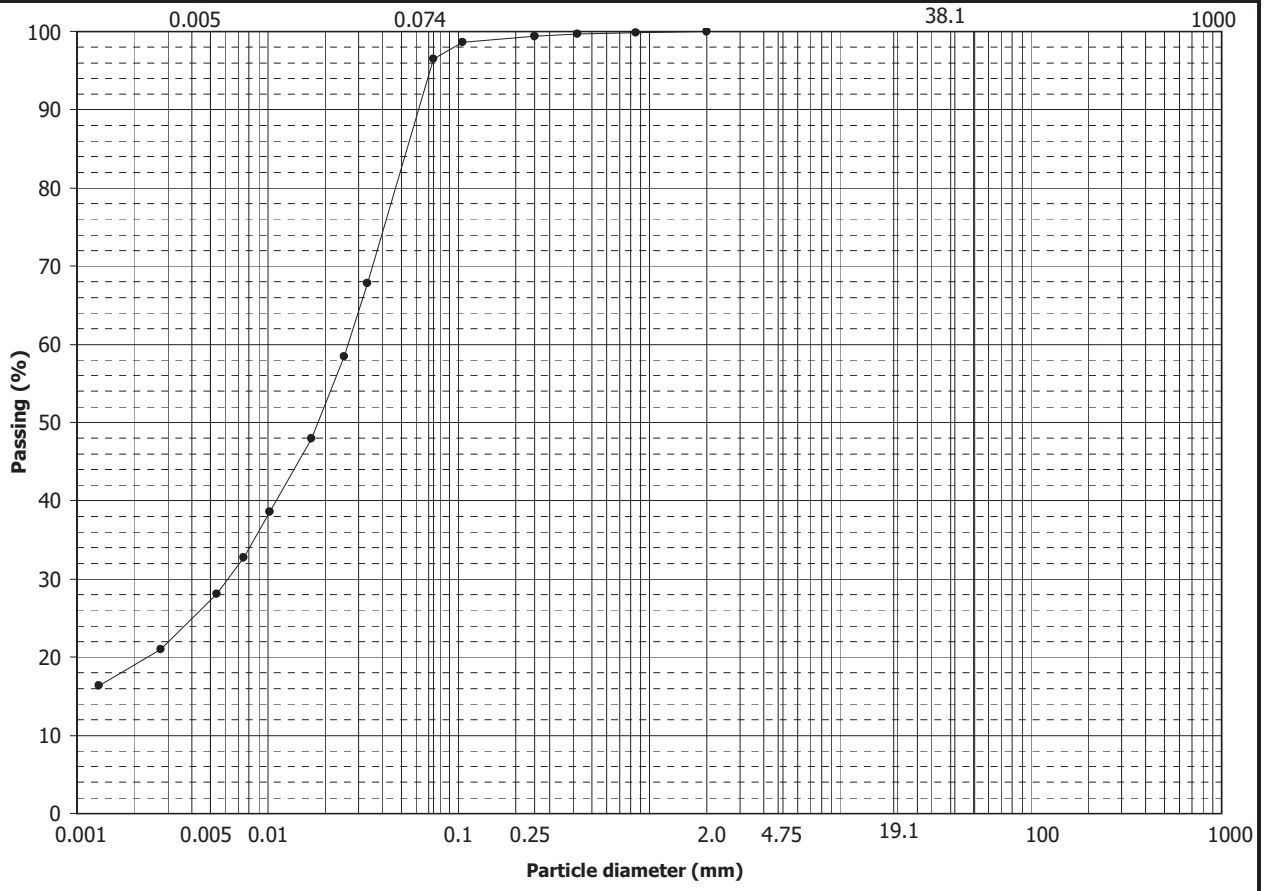
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**17.50 - 18.00**

SPECIFIC GRAVITY : **2.729**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	3.48	69.27	27.25	2.00	0.0648	0.0265	0.0185	0.0063	-	-	100.00	99.73	96.52



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = 140.71 gr — Specific Gravity : **2.697**

Wt. of container B-36 = 36.39 gr — Plasticity Index : %

Wt. Of air dry soil W' = 104.32 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-39			NO	J-42			NO	J-46		
WW	53.94	DW	52.85	WW	53.59	DW	52.62	WW	52.85	DW	51.77	Mean value	
DW	52.85	TW	37.11	DW	52.62	TW	39.10	DW	51.77	TW	36.92	w	
Ww	1.09	Ws	15.74	Ww	0.97	Ws	13.52	Ww	1.08	Ws	14.85	7.12	%
w	6.93	%		w	7.17	%		w	7.27	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 97.382 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.0	19.0	28	10.802	10.802	3.2866	0.01228	0.0404	16.00	26.11	26.11
2	15.0	16.0	28	11.558	5.779	2.4040	0.01228	0.0295	13.00	21.22	21.22
5	12.0	13.0	28	12.315	2.463	1.5694	0.01228	0.0193	10.00	16.32	16.32
15	10.0	11.0	28	12.820	0.855	0.9245	0.01228	0.0114	8.00	13.06	13.06
30	9.0	10.0	28	13.072	0.436	0.6601	0.01228	0.0081	7.00	11.42	11.42
60	8.0	9.0	28	13.325	0.222	0.4712	0.01228	0.0058	6.00	9.79	9.79
240	6.5	7.5	29	13.703	0.057	0.2389	0.01215	0.0029	4.50	7.34	7.34
1140	5.5	6.5	28	13.955	0.012	0.1106	0.01228	0.0014	3.50	5.71	5.71

P = 100/W = 1.0269

$$Mx = \frac{G_s}{G_s - 1} = 1.5893$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.59	22.02	0.570		0.59	99.41	99.41
0.42	24.84		2.820		2.90	97.10	97.10
0.25	33.74		11.720		12.04	87.96	87.96
0.105	53.48		31.460		32.31	67.69	67.69
0.074	69.31		47.290		48.56	51.44	51.44

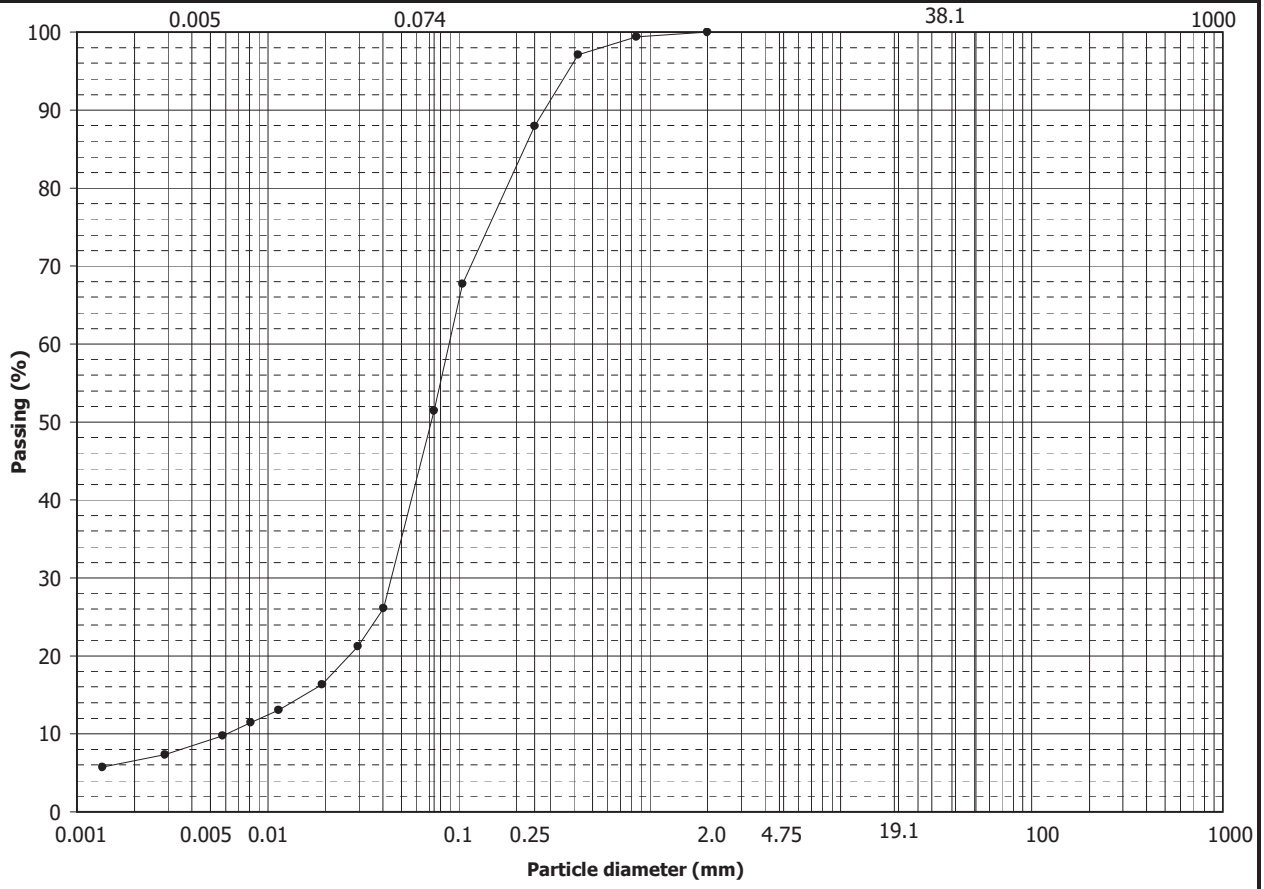
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 22, 2019
LOCATION	**LERE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 18**	DEPTH	**19.50 - 20.00**

SPECIFIC GRAVITY : **2.697**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	48.56	42.17	9.27	2.00	0.2879	0.0903	0.0721	0.0455	0.0061	14.85	100.00	97.10	51.44



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		0.50 - 1.00

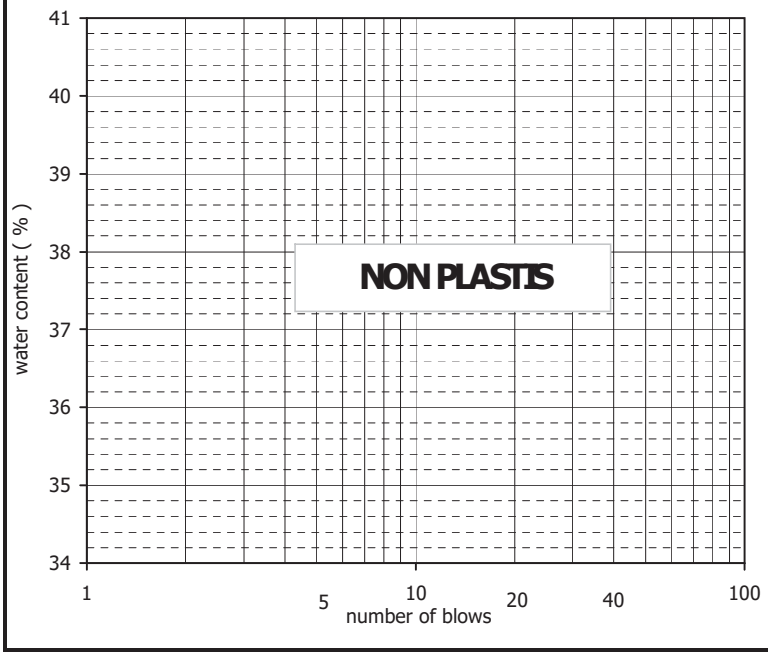
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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Cab. Sby : Jalan Jemursari 27 Surabaya Telp.: (031) 8492261, Fax.: (031) 8494402; E-mail : divlab_indrakarya@yahoo.com

LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		1.50 - 2.00

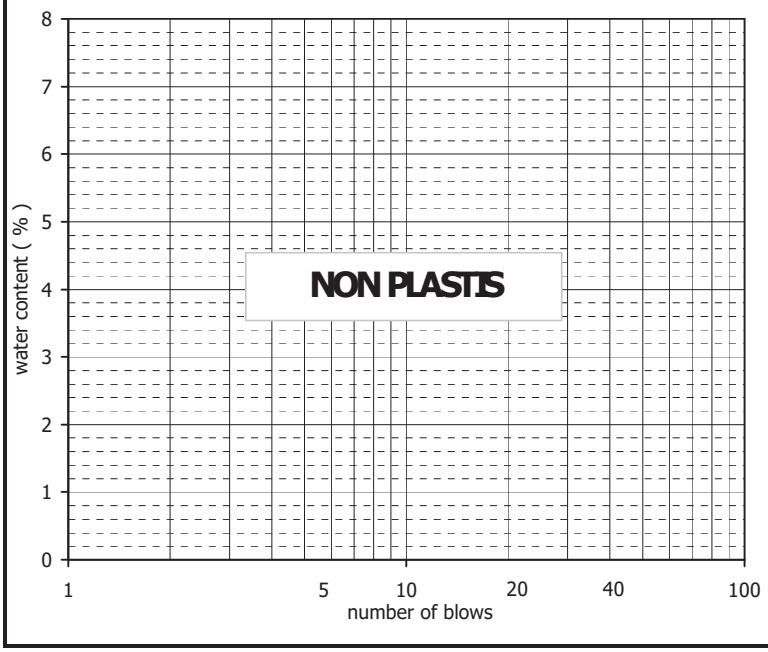
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		2.50 - 3.00

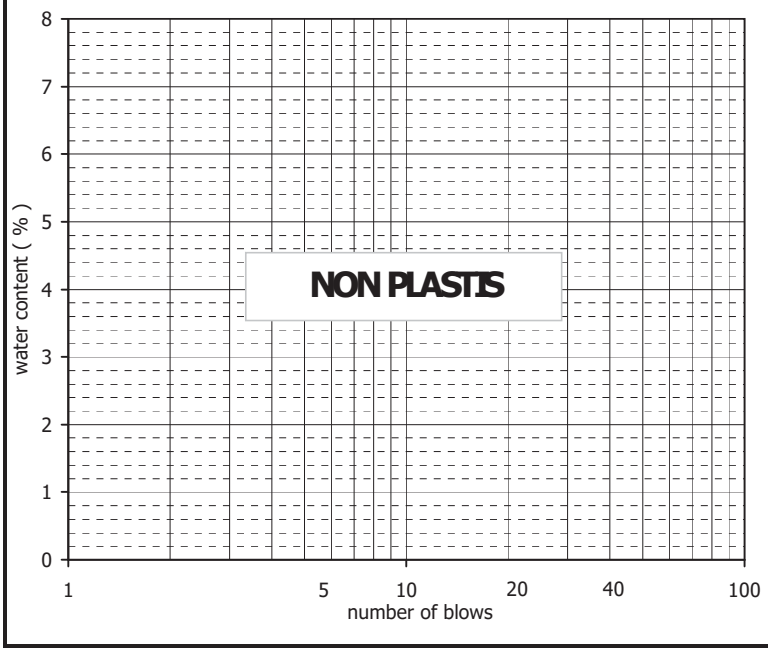
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		3.50 - 4.00

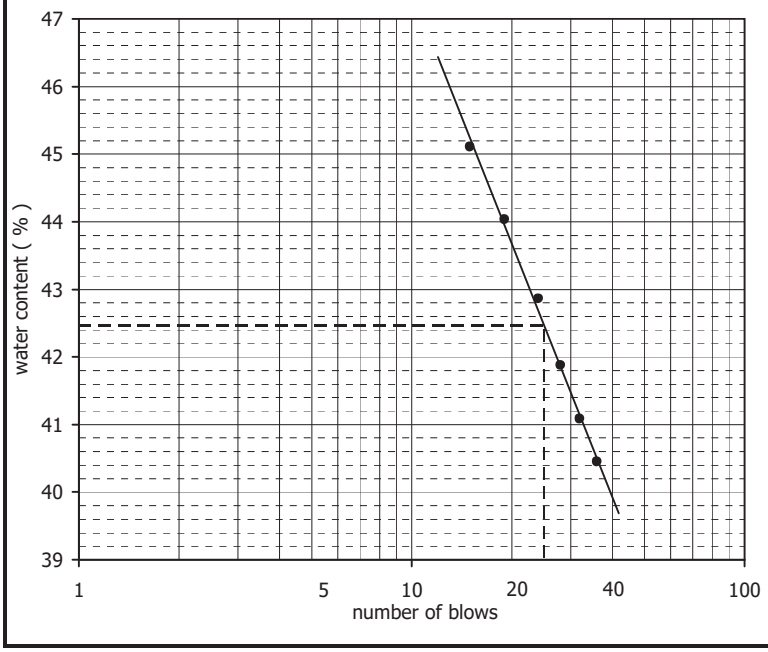
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	A-101			No.	T-90			No.	A-31
WW	51.970	DW	46.990	WW	52.480	DW	48.240	WW	58.300	DW	52.990
DW	46.990	TW	34.680	DW	48.240	TW	37.920	DW	52.990	TW	40.310
Ww	4.980	Ws	12.310	Ww	4.240	Ws	10.320	Ww	5.310	Ws	12.680
	W =		40.45 %		W =		41.09 %		W =		41.88 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	T-03			No.	A-44			No.	A-61
WW	60.660	DW	54.770	WW	55.170	DW	48.860	WW	57.040	DW	50.820
DW	54.770	TW	41.030	DW	48.860	TW	34.530	DW	50.820	TW	37.030
Ww	5.890	Ws	13.740	Ww	6.310	Ws	14.330	Ww	6.220	Ws	13.790
	W =		42.87 %		W =		44.03 %		W =		45.11 %

PLASTIC LIMIT

1				2				3			
		No.	J-69			No.	J-49			No.	T-20
WW	56.830	DW	52.450	WW	55.690	DW	51.850	WW	52.080	DW	48.260
DW	52.450	TW	39.380	DW	51.850	TW	40.360	DW	48.260	TW	37.010
Ww	4.380	Ws	13.070	Ww	3.840	Ws	11.490	Ww	3.820	Ws	11.250
	W =		33.51 %		W =		33.42 %		W =		33.96 %



LIQUID LIMIT	=	42.48	%
PLASTIC LIMIT	=	33.63	%
PLASTICITY INDEX	=	8.85	%
FLOW INDEX	=	12.40	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		4.50 - 5.00

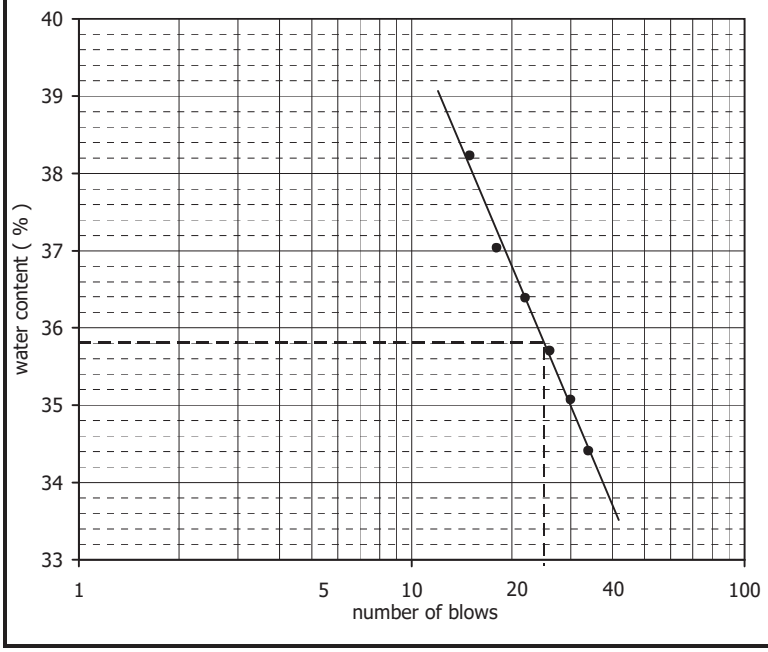
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			30 x	NO. OF BLOWS			26 x
		No.	A-92			No.	A-53			No.	L-25
WW	53.710	DW	49.760	WW	53.230	DW	48.660	WW	53.950	DW	49.880
DW	49.760	TW	38.280	DW	48.660	TW	35.630	DW	49.880	TW	38.480
Ww	3.950	Ws	11.480	Ww	4.570	Ws	13.030	Ww	4.070	Ws	11.400
	W =	34.41	%		W =	35.07	%		W =	35.70	%

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			18 x	NO. OF BLOWS			15 x
		No.	L-47			No.	J-38			No.	J-84
WW	59.550	DW	55.260	WW	54.860	DW	50.190	WW	55.970	DW	51.440
DW	55.260	TW	43.470	DW	50.190	TW	37.580	DW	51.440	TW	39.590
Ww	4.290	Ws	11.790	Ww	4.670	Ws	12.610	Ww	4.530	Ws	11.850
	W =	36.39	%		W =	37.03	%		W =	38.23	%

PLASTIC LIMIT

1				2				3			
		No.	A-89			No.	T-54			No.	T-64
WW	52.870	DW	49.790	WW	51.950	DW	48.770	WW	54.930	DW	51.660
DW	49.790	TW	37.460	DW	48.770	TW	35.880	DW	51.660	TW	38.530
Ww	3.080	Ws	12.330	Ww	3.180	Ws	12.890	Ww	3.270	Ws	13.130
	W =	24.98	%		W =	24.67	%		W =	24.90	%



LIQUID LIMIT	=	35.82	%
PLASTIC LIMIT	=	24.85	%
PLASTICITY INDEX	=	10.96	%
FLOW INDEX	=	10.20	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		5.50 - 6.00

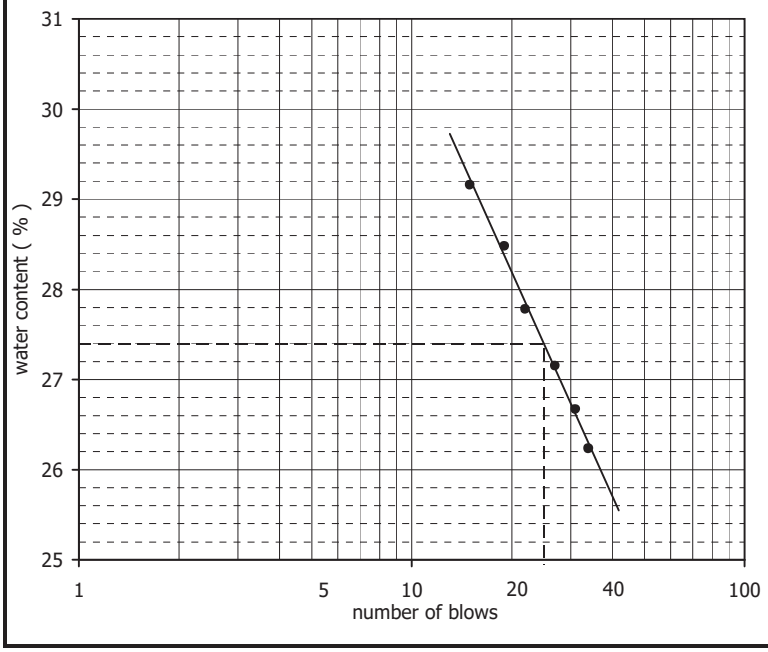
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	A-46			No.	A-28			No.	A-79
WW	55.100	DW	51.220	WW	56.810	DW	52.900	WW	53.450	DW	50.330
DW	51.220	TW	36.430	DW	52.900	TW	38.240	DW	50.330	TW	38.840
Ww	3.880	Ws	14.790	Ww	3.910	Ws	14.660	Ww	3.120	Ws	11.490
	W =		26.23 %		W =		26.67 %		W =		27.15 %

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	A-98			No.	L-29			No.	L-03
WW	56.680	DW	52.560	WW	53.550	DW	50.110	WW	52.730	DW	49.400
DW	52.560	TW	37.730	DW	50.110	TW	38.030	DW	49.400	TW	37.980
Ww	4.120	Ws	14.830	Ww	3.440	Ws	12.080	Ww	3.330	Ws	11.420
	W =		27.78 %		W =		28.48 %		W =		29.16 %

PLASTIC LIMIT

1				2				3			
		No.	T-59			No.	J-31			No.	T-77
WW	54.960	DW	51.970	WW	49.660	DW	46.640	WW	56.490	DW	53.600
DW	51.970	TW	37.450	DW	46.640	TW	31.910	DW	53.600	TW	39.670
Ww	2.990	Ws	14.520	Ww	3.020	Ws	14.730	Ww	2.890	Ws	13.930
	W =		20.59 %		W =		20.50 %		W =		20.75 %



LIQUID LIMIT	=	27.39	%
PLASTIC LIMIT	=	20.61	%
PLASTICITY INDEX	=	6.78	%
FLOW INDEX	=	8.21	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		6.50 - 7.00

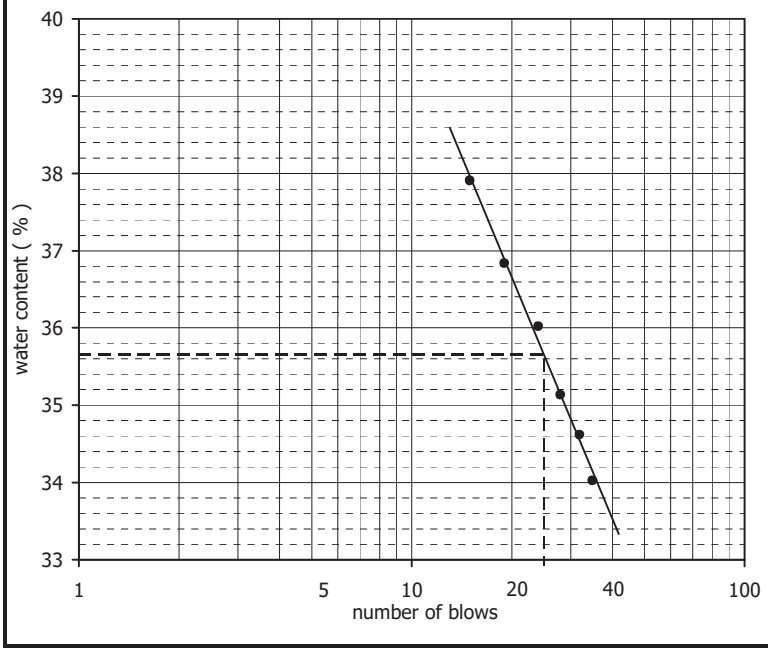
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	T-39			No.	T-88			No.	T-87
WW	53.430	DW	48.830	WW	57.170	DW	52.220	WW	54.910	DW	50.160
DW	48.830	TW	35.310	DW	52.220	TW	37.920	DW	50.160	TW	36.640
Ww	4.600	Ws	13.520	Ww	4.950	Ws	14.300	Ww	4.750	Ws	13.520
	W =		34.02 %		W =		34.62 %		W =		35.13 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	J-41			No.	A-67			No.	A-68
WW	53.310	DW	48.970	WW	54.970	DW	50.100	WW	54.110	DW	49.410
DW	48.970	TW	36.920	DW	50.100	TW	36.880	DW	49.410	TW	37.010
Ww	4.340	Ws	12.050	Ww	4.870	Ws	13.220	Ww	4.700	Ws	12.400
	W =		36.02 %		W =		36.84 %		W =		37.90 %

PLASTIC LIMIT

1				2				3			
		No.	A-42			No.	L-36			No.	T-25
WW	56.340	DW	52.980	WW	56.230	DW	53.040	WW	52.050	DW	48.740
DW	52.980	TW	39.460	DW	53.040	TW	40.360	DW	48.740	TW	35.600
Ww	3.360	Ws	13.520	Ww	3.190	Ws	12.680	Ww	3.310	Ws	13.140
	W =		24.85 %		W =		25.16 %		W =		25.19 %



LIQUID LIMIT	=	35.66	%
PLASTIC LIMIT	=	25.07	%
PLASTICITY INDEX	=	10.59	%
FLOW INDEX	=	10.32	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		7.50 - 8.00

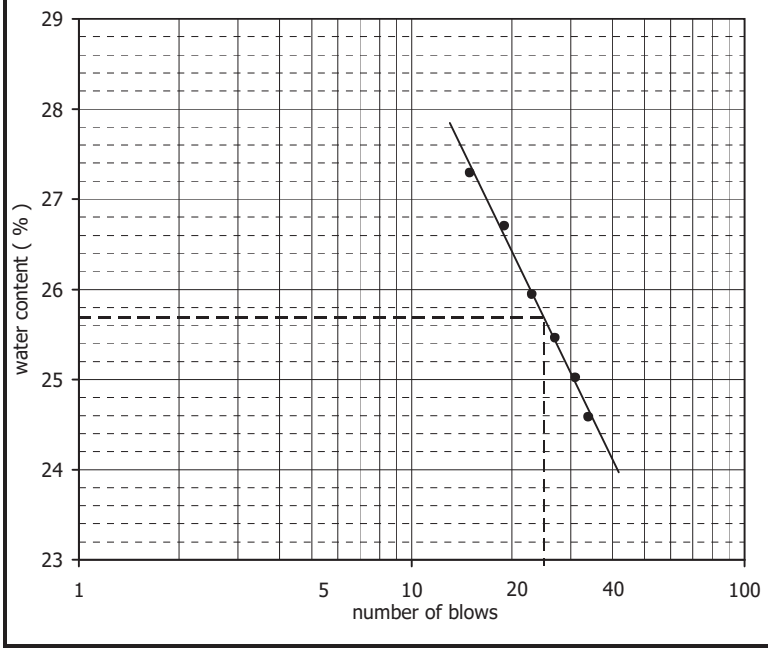
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	T-86			No.	L-28			No.	L-37
WW	54.880	DW	50.720	WW	55.400	DW	52.220	WW	53.040	DW	50.160
DW	50.720	TW	33.800	DW	52.220	TW	39.510	DW	50.160	TW	38.850
Ww	4.160	Ws	16.920	Ww	3.180	Ws	12.710	Ww	2.880	Ws	11.310
	W =		24.59 %		W =		25.02 %		W =		25.46 %

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	J-53			No.	T-53			No.	L-46
WW	57.480	DW	53.620	WW	53.530	DW	49.890	WW	53.910	DW	50.660
DW	53.620	TW	38.740	DW	49.890	TW	36.260	DW	50.660	TW	38.750
Ww	3.860	Ws	14.880	Ww	3.640	Ws	13.630	Ww	3.250	Ws	11.910
	W =		25.94 %		W =		26.71 %		W =		27.29 %

PLASTIC LIMIT

1				2				3			
		No.	T-07			No.	L-06			No.	L-59
WW	54.760	DW	51.840	WW	53.010	DW	50.040	WW	52.510	DW	49.960
DW	51.840	TW	38.160	DW	50.040	TW	36.320	DW	49.960	TW	37.930
Ww	2.920	Ws	13.680	Ww	2.970	Ws	13.720	Ww	2.550	Ws	12.030
	W =		21.35 %		W =		21.65 %		W =		21.20 %



LIQUID LIMIT	=	25.69	%
PLASTIC LIMIT	=	21.40	%
PLASTICITY INDEX	=	4.29	%
FLOW INDEX	=	7.60	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		8.50 - 9.00

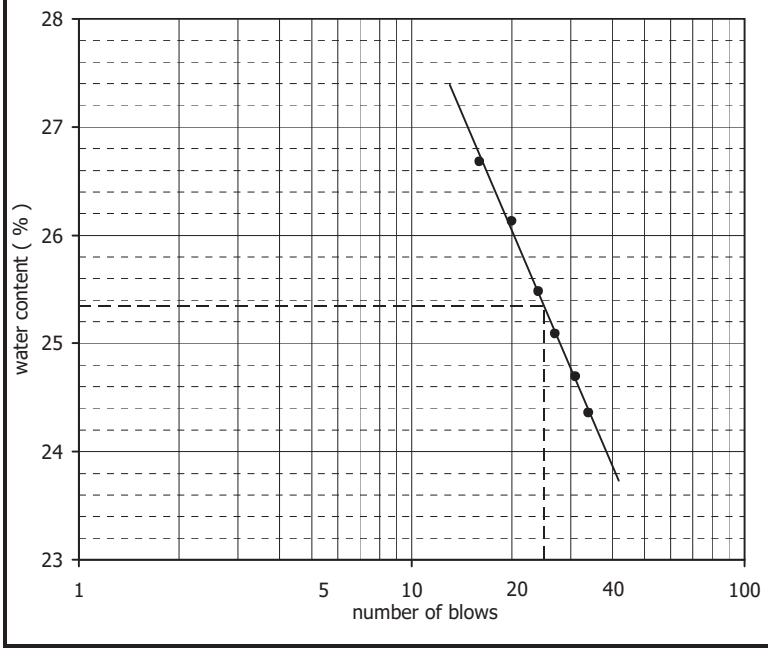
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-14			No.	J-07			No.	A-83
WW	52.150	DW	48.830	WW	55.670	DW	52.220	WW	51.912	DW	48.550
DW	48.830	TW	35.200	DW	52.220	TW	38.250	DW	48.550	TW	35.150
Ww	3.320	Ws	13.630	Ww	3.450	Ws	13.970	Ww	3.362	Ws	13.400
	W =	24.36	%		W =	24.70	%		W =	25.09	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	A-87			No.	J-27			No.	L-24
WW	54.460	DW	51.550	WW	53.960	DW	50.080	WW	52.980	DW	49.410
DW	51.550	TW	40.130	DW	50.080	TW	35.230	DW	49.410	TW	36.030
Ww	2.910	Ws	11.420	Ww	3.880	Ws	14.850	Ww	3.570	Ws	13.380
	W =	25.48	%		W =	26.13	%		W =	26.68	%

PLASTIC LIMIT

1				2				3			
		No.	A-88			No.	A-91			No.	A-71
WW	51.810	DW	49.220	WW	52.980	DW	50.220	WW	52.640	DW	50.360
DW	49.220	TW	36.860	DW	50.220	TW	37.030	DW	50.360	TW	39.470
Ww	2.590	Ws	12.360	Ww	2.760	Ws	13.190	Ww	2.280	Ws	10.890
	W =	20.95	%		W =	20.92	%		W =	20.94	%



LIQUID LIMIT	=	25.35	%
PLASTIC LIMIT	=	20.94	%
PLASTICITY INDEX	=	4.41	%
FLOW INDEX	=	7.18	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		9.50 - 10.00

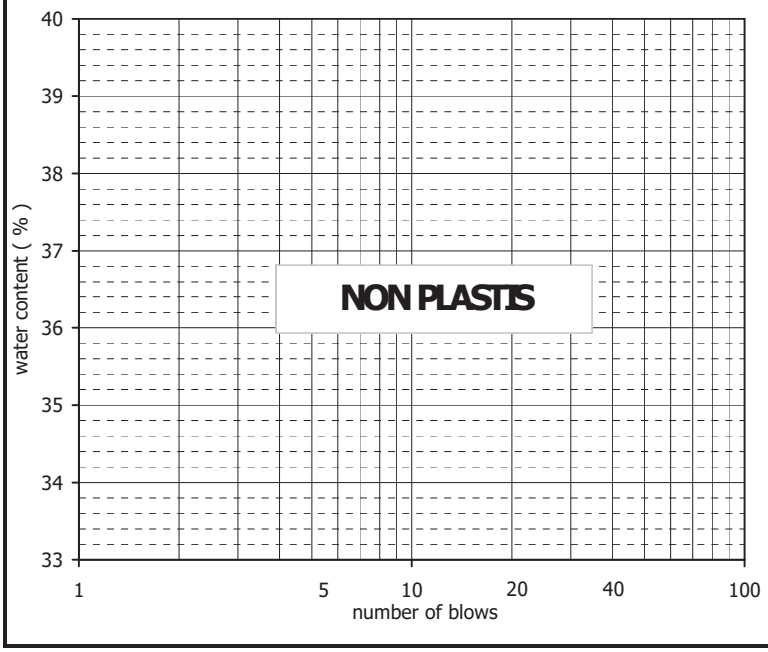
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		11.50 - 12.00

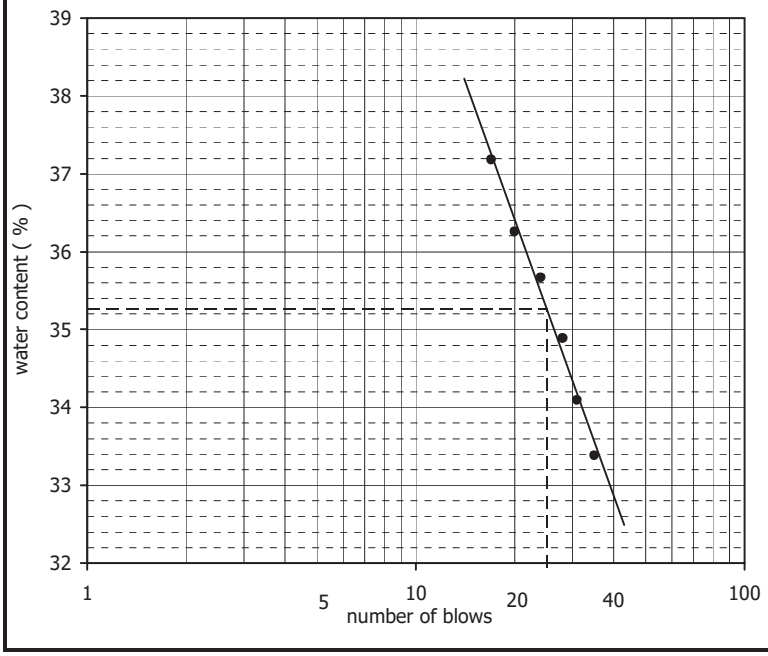
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	T-20			No.	A-51			No.	J-03
WW	53.830	DW	49.620	WW	56.070	DW	52.340	WW	56.670	DW	52.180
DW	49.620	TW	37.010	DW	52.340	TW	41.400	DW	52.180	TW	39.310
Ww	4.210	Ws	12.610	Ww	3.730	Ws	10.940	Ww	4.490	Ws	12.870
	W =		33.39 %		W =		34.10 %		W =		34.89 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	J-45			No.	J-06			No.	T-85
WW	53.700	DW	49.630	WW	57.090	DW	52.670	WW	54.480	DW	49.680
DW	49.630	TW	38.220	DW	52.670	TW	40.480	DW	49.680	TW	36.770
Ww	4.070	Ws	11.410	Ww	4.420	Ws	12.190	Ww	4.800	Ws	12.910
	W =		35.67 %		W =		36.26 %		W =		37.18 %

PLASTIC LIMIT

1				2				3			
		No.	T-14			No.	J-50			No.	T-15
WW	56.090	DW	52.640	WW	52.370	DW	49.520	WW	52.190	DW	49.380
DW	52.640	TW	38.840	DW	49.520	TW	38.240	DW	49.380	TW	38.170
Ww	3.450	Ws	13.800	Ww	2.850	Ws	11.280	Ww	2.810	Ws	11.210
	W =		25.00 %		W =		25.27 %		W =		25.07 %



LIQUID LIMIT	=	35.26 %
PLASTIC LIMIT	=	25.11 %
PLASTICITY INDEX	=	10.15 %
FLOW INDEX	=	11.77

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		15.50 - 16.00

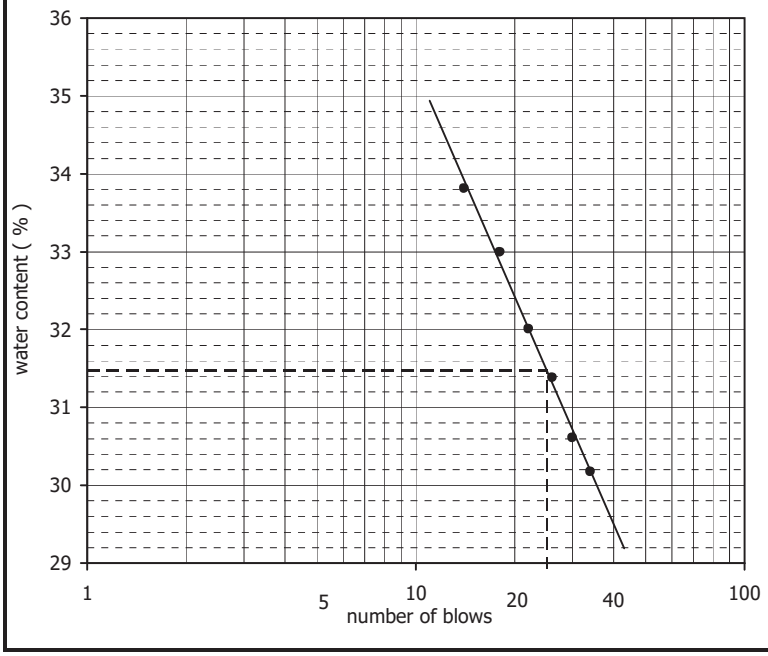
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			30 x	NO. OF BLOWS			26 x
		No.	A-30			No.	A-70			No.	T-95
WW	54.890	DW	51.290	WW	59.420	DW	54.360	WW	54.520	DW	50.110
DW	51.290	TW	39.360	DW	54.360	TW	37.830	DW	50.110	TW	36.060
Ww	3.600	Ws	11.930	Ww	5.060	Ws	16.530	Ww	4.410	Ws	14.050
	W =		30.18 %		W =		30.61 %		W =		31.39 %

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			18 x	NO. OF BLOWS			14 x
		No.	T-60			No.	L-30			No.	T-48
WW	60.620	DW	55.630	WW	54.360	DW	50.230	WW	53.720	DW	49.050
DW	55.630	TW	40.040	DW	50.230	TW	37.714	DW	49.050	TW	35.240
Ww	4.990	Ws	15.590	Ww	4.130	Ws	12.516	Ww	4.670	Ws	13.810
	W =		32.01 %		W =		33.00 %		W =		33.82 %

PLASTIC LIMIT

1				2				3			
		No.	A-03			No.	T-47			No.	A-106
WW	57.630	DW	53.760	WW	55.870	DW	52.080	WW	50.130	DW	47.120
DW	53.760	TW	37.650	DW	52.080	TW	36.270	DW	47.120	TW	34.570
Ww	3.870	Ws	16.110	Ww	3.790	Ws	15.810	Ww	3.010	Ws	12.550
	W =		24.02 %		W =		23.97 %		W =		23.98 %



LIQUID LIMIT	=	31.48	%
PLASTIC LIMIT	=	23.99	%
PLASTICITY INDEX	=	7.48	%
FLOW INDEX	=	9.70	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

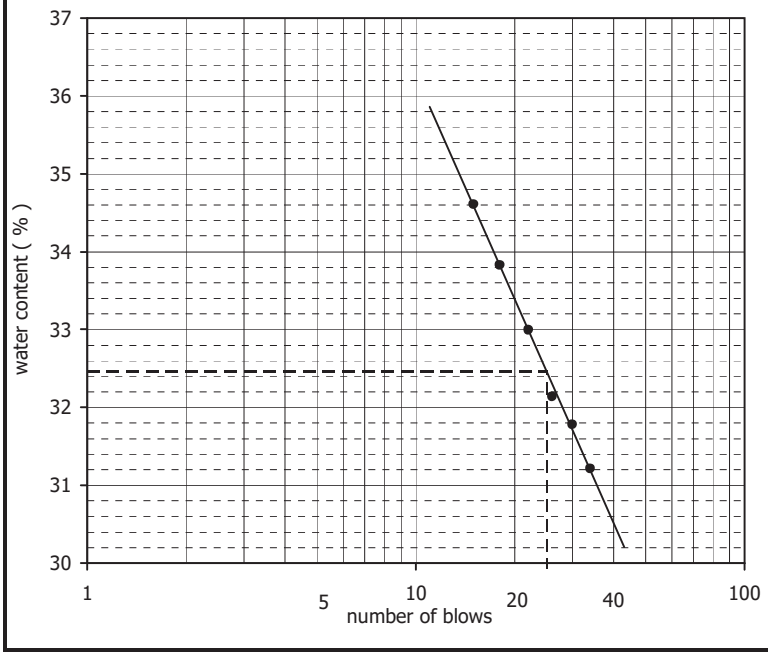
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		17.50 - 18.00

LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			30 x	NO. OF BLOWS			26 x
		No.	A-06			No.	L-48			No.	A-73
WW	55.300	DW	51.660	WW	53.730	DW	49.440	WW	57.300	DW	52.810
DW	51.660	TW	40.000	DW	49.440	TW	35.940	DW	52.810	TW	38.840
Ww	3.640	Ws	11.660	Ww	4.290	Ws	13.500	Ww	4.490	Ws	13.970
	W =		31.22 %		W =		31.78 %		W =		32.14 %
4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			18 x	NO. OF BLOWS			15 x
		No.	T-16			No.	A-19			No.	J-82
WW	62.250	DW	56.730	WW	57.400	DW	52.850	WW	57.820	DW	52.920
DW	56.730	TW	40.000	DW	52.850	TW	39.400	DW	52.920	TW	38.760
Ww	5.520	Ws	16.730	Ww	4.550	Ws	13.450	Ww	4.900	Ws	14.160
	W =		32.99 %		W =		33.83 %		W =		34.60 %

PLASTIC LIMIT

1				2				3			
		No.	J-44			No.	T-65			No.	A-104
WW	52.210	DW	49.330	WW	52.510	DW	48.900	WW	52.420	DW	48.900
DW	49.330	TW	37.460	DW	48.900	TW	33.940	DW	48.900	TW	34.760
Ww	2.880	Ws	11.870	Ww	3.610	Ws	14.960	Ww	3.520	Ws	14.140
	W =		24.26 %		W =		24.13 %		W =		24.89 %



LIQUID LIMIT	=	32.46	%
PLASTIC LIMIT	=	24.43	%
PLASTICITY INDEX	=	8.03	%
FLOW INDEX	=	9.55	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 16, 2019
LOCATION	:	LERE - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 18	DEPTH (m)		19.50 - 20.00

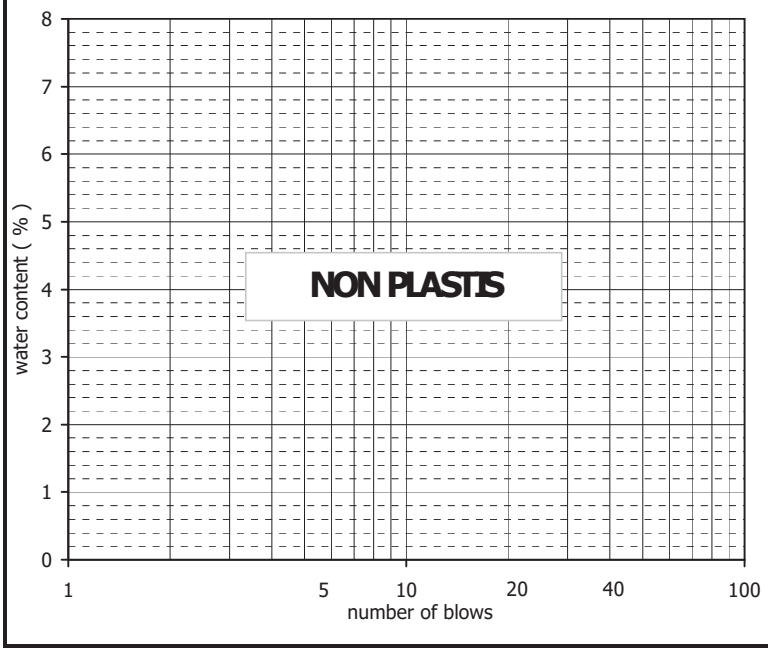
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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BUMN
Hadir untuk negeri

ISO 9001 CCMS - 3017883
ISO 14001 CCMS - 3019894
OHSAS 18001 CCMS - 3019827

SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**TALISE - PALU**									
SAMPLE No			BAY - 19	BAY - 19	BAY - 19	BAY - 19	BAY - 19	BAY - 19	BAY - 19	BAY - 19	BAY - 19
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	11.82	12.02	13.95	38.38	9.86	34.61	38.63	35.52	46.09
	Specific gravity of soil	*Gs*	2.646	2.640	2.652	2.636	2.622	2.607	2.639	2.643	2.669
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	16.74	18.79	13.42	9.14	34.81	16.83	5.35	5.26	1.38
	Proportion — Sand part	(%)	72.61	48.11	57.51	37.86	38.36	37.21	26.20	23.30	13.01
	Proportion — Silt part	(%)	8.47	27.06	24.25	32.32	18.53	21.27	36.53	37.46	47.31
	Proportion — Clay part	(%)	2.18	6.05	4.82	20.68	8.31	24.68	31.92	33.98	38.30
	Max. diameter	(mm)	19.10	19.10	19.10	25.40	19.10	25.40	19.10	19.10	9.52
	90 % diameter	(mm)	8.7358	9.3682	7.0363	4.3366	14.6888	12.8353	1.7368	1.8885	0.2217
	60 % diameter	(mm)	1.5654	0.6061	0.7133	0.1546	3.3023	0.3372	0.0383	0.0254	0.0126
	50 % diameter	(mm)	1.1053	0.2324	0.3382	0.0629	1.2538	0.1150	0.0180	0.0128	0.0083
	30 % diameter	(mm)	0.4752	0.0638	0.0798	0.0123	0.1045	0.0083	0.0045	0.0038	0.0027
	10 % diameter	(mm)	0.0662	0.0091	0.0102	-	0.0074	-	-	-	-
	Uniformity Coefficient		23.65	66.27	69.99	-	443.95	-	-	-	-
	Passing # 200		10.65	33.10	29.07	53.00	26.83	45.96	68.45	71.44	85.61
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	32.20	NON PLASTIS	36.23	39.97	42.63	49.43
	Plastic limit	*PL* (%)				27.72		27.73	22.53	23.98	29.90
	Plasticity index	*PI* (%)				4.48		8.50	17.44	18.66	19.53
	Flow index					11.83		10.06	11.69	13.27	13.96
	Unified Classification					CL - ML		ML	CL	CL	ML

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**TALISE - PALU**									
SAMPLE No				BAY - 19	BAY - 19	BAY - 19	BAY - 19	BAY - 19				
DEPTH (m)				9.50 - 10.00	11.50 - 12.00	13.50 - 14.00	16.50 - 17.00	19.50 - 20.00				
PROPERTIES	Natural Water Content		(%)	51.26	49.20	43.84	43.04	46.89				
	Specific gravity of soil		*Gs*	2.669	2.654	2.672	2.666	2.662				
GRAIN SIZE ANALYSIS	Proportion	Gravel part	(%)	0.00	0.56	0.00	0.00	0.00				
		Sand part	(%)	3.56	8.02	1.12	8.04	5.70				
		Silt part	(%)	53.06	43.53	46.94	45.59	36.49				
		Clay part	(%)	43.38	47.90	51.94	46.37	57.81				
	Max. diameter		(mm)	2.00	19.10	2.00	2.00	2.00				
	90 % diameter		(mm)	0.0294	0.0627	0.0164	0.0641	0.0264				
	60 % diameter		(mm)	0.0090	0.0082	0.0060	0.0082	0.0056				
	50 % diameter		(mm)	0.0062	0.0055	0.0046	0.0056	0.0040				
	30 % diameter		(mm)	0.0029	0.0017	0.0018	0.0020	0.0013				
	10 % diameter		(mm)	-	-	-	-	-				
	Uniformity Coefficient			-	-	-	-	-				
	Passing # 200			96.44	91.43	98.88	91.96	94.30				
CONSISTENCY	Liquid limit	*LL*	(%)	52.37	52.86	56.11	53.09	56.31				
	Plastic limit	*PL*	(%)	30.86	30.98	30.96	30.95	31.41				
	Plasticity index	*PI*	(%)	21.52	21.88	25.15	22.14	24.90				
	Flow index			14.11	14.78	15.42	15.06	16.01				
	Unified Classification			MH	MH	MH	MH	MH				

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	TALISE - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	J-35								No	T-39	
04/02	BAY - 19		WW	102.57	DW	95.36			04/02	BAY - 19		WW	120.22	DW	93.43		
2019	0.50 - 1.00	11.82	DW	95.36	TW	34.38			2019	8.50 - 9.00	46.09	DW	93.43	TW	35.31		
			Ww	7.21	Ws	60.98						Ww	26.79	Ws	58.12		
				WC	(%)	11.82							WC	(%)	46.09		
					No	J-29								No	J-83		
04/02	BAY - 19		WW	96.77	DW	90.41			04/02	BAY - 19		WW	126.54	DW	96.58		
2019	1.50 - 2.00	12.02	DW	90.41	TW	37.51			2019	9.50 - 10.00	51.26	DW	96.58	TW	38.13		
			Ww	6.36	Ws	52.90						Ww	29.96	Ws	58.45		
				WC	(%)	12.02							WC	(%)	51.26		
					No	A-05								No	J-09		
04/02	BAY - 19		WW	105.83	DW	97.61			04/02	BAY - 19		WW	95.25	DW	77.07		
2019	2.50 - 3.00	13.95	DW	97.61	TW	38.67			2019	11.50 - 12.00	49.20	DW	77.07	TW	40.12		
			Ww	8.22	Ws	58.94						Ww	18.18	Ws	36.95		
				WC	(%)	13.95							WC	(%)	49.20		
					No	J-27								No	T-73		
04/02	BAY - 19		WW	110.88	DW	89.90			04/02	BAY - 19		WW	130.08	DW	100.98		
2019	3.50 - 4.00	38.38	DW	89.90	TW	35.23			2019	13.50 - 14.00	43.84	DW	100.98	TW	34.60		
			Ww	20.98	Ws	54.67						Ww	29.10	Ws	66.38		
				WC	(%)	38.38							WC	(%)	43.84		
					No	B-80								No	J-33		
04/02	BAY - 19		WW	174.54	DW	162.10			04/02	BAY - 19		WW	107.69	DW	86.17		
2019	4.50 - 5.00	9.86	DW	162.10	TW	35.89			2019	16.50 - 17.00	43.04	DW	86.17	TW	36.17		
			Ww	12.44	Ws	126.21						Ww	21.52	Ws	50.00		
				WC	(%)	9.86							WC	(%)	43.04		
					No	T-25								No	T-77		
04/02	BAY - 19		WW	101.53	DW	84.58			04/02	BAY - 19		WW	96.53	DW	78.38		
2019	5.50 - 6.00	34.61	DW	84.58	TW	35.60			2019	19.50 - 20.00	46.89	DW	78.38	TW	39.67		
			Ww	16.95	Ws	48.98						Ww	18.15	Ws	38.71		
				WC	(%)	34.61							WC	(%)	46.89		
					No	L-11								No			
04/02	BAY - 19		WW	109.54	DW	90.62						WW		DW			
2019	6.50 - 7.00	38.63	DW	90.62	TW	41.64						DW		TW			
			Ww	18.92	Ws	48.98						Ww		Ws			
				WC	(%)	38.63							WC	(%)			
					No	L-18								No			
04/02	BAY - 19		WW	101.14	DW	84.66						WW		DW			
2019	7.50 - 8.00	35.52	DW	84.66	TW	38.27						DW		TW			
			Ww	16.48	Ws	46.39						Ww		Ws			
				WC	(%)	35.52							WC	(%)			

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 9, 2019
LOCATION	**TALISE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				37	77	72	
Weight of Pycnometer		Wf	(gr)	50.940	39.760	33.250	
Weight of (Pycnometer + Water)		Wa	(gr)	151.200	139.850	133.800	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	163.970	152.490	146.320	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.250	38.020	37.850	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.470	20.240	20.070	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.2000	139.8500	133.8000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.700	7.600	7.550	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.658	2.663	2.658	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.645	2.649	2.645	
Average Specific Gravity at 20° C							**2.646**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				56	85	62	
Weight of Pycnometer		Wf	(gr)	52.690	38.870	41.480	
Weight of (Pycnometer + Water)		Wa	(gr)	152.160	138.670	152.370	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.840	151.240	165.000	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.110	37.960	38.050	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.330	20.180	20.270	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	152.1600	138.6700	152.3700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.610	7.640	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.658	2.652	2.653	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.644	2.638	2.639	
Average Specific Gravity at 20° C							**2.640**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 9, 2019
LOCATION	**TALISE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				70	61	9	
Weight of Pycnometer		Wf	(gr)	37.010	37.700	65.320	
Weight of (Pycnometer + Water)		Wa	(gr)	136.860	146.520	167.290	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.520	159.060	179.960	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	37.830	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.050	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.8600	146.5200	167.2900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.610	7.510	7.610	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.664	2.670	2.665	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.650	2.656	2.651	
Average Specific Gravity at 20° C							**2.652**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				79	54	84	
Weight of Pycnometer		Wf	(gr)	37.880	51.250	36.950	
Weight of (Pycnometer + Water)		Wa	(gr)	137.560	151.310	136.980	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.120	163.950	149.620	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.970	38.050	38.100	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.190	20.270	20.320	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.5600	151.3100	136.9800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.630	7.630	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.646	2.657	2.646	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.633	2.643	2.632	
Average Specific Gravity at 20° C							**2.636**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				24	14	67	
Weight of Pycnometer		Wf	(gr)	38.140	69.710	36.820	
Weight of (Pycnometer + Water)		Wa	(gr)	137.560	170.370	137.620	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.140	182.780	150.110	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.030	37.800	37.900	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.250	20.020	20.120	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.5600	170.3700	137.6200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.670	7.610	7.630	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.640	2.631	2.637	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.627	2.617	2.623	
Average Specific Gravity at 20° C							**2.622**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				26	47	75	
Weight of Pycnometer		Wf	(gr)	38.840	40.660	35.700	
Weight of (Pycnometer + Water)		Wa	(gr)	138.580	142.080	135.380	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.260	154.630	147.900	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.300	38.050	38.030	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.520	20.270	20.250	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.5800	142.0800	135.3800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.840	7.720	7.730	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.617	2.626	2.620	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.604	2.612	2.606	
Average Specific Gravity at 20° C							**2.607**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				41	69	2	
Weight of Pycnometer		Wf	(gr)	35.950	36.570	66.900	
Weight of (Pycnometer + Water)		Wa	(gr)	137.160	137.650	168.750	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.800	150.220	181.430	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.080	37.950	38.120	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.300	20.170	20.340	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.1600	137.6500	168.7500	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.660	7.600	7.660	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.650	2.654	2.655	
Coefficient for Temperature Correction K				0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.637	2.640	2.642	
Average Specific Gravity at 20° C							**2.639**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				55	18	76	
Weight of Pycnometer		Wf	(gr)	51.050	66.800	38.610	
Weight of (Pycnometer + Water)		Wa	(gr)	151.910	168.630	139.040	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.560	181.220	151.580	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.060	37.990	37.880	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.280	20.210	20.100	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.9100	168.6300	139.0400	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.630	7.620	7.560	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.658	2.652	2.659	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.644	2.639	2.645	
Average Specific Gravity at 20° C							**2.643**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				10	40	18	
Weight of Pycnometer		Wf	(gr)	67.070	52.250	66.800	
Weight of (Pycnometer + Water)		Wa	(gr)	168.920	153.170	168.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.550	166.020	181.260	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.930	38.250	37.920	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.150	20.470	20.140	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.9200	153.1700	168.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.520	7.620	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.680	2.686	2.682	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.666	2.673	2.668	
Average Specific Gravity at 20° C							**2.669**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				1	15	57	
Weight of Pycnometer		Wf	(gr)	62.150	77.130	50.930	
Weight of (Pycnometer + Water)		Wa	(gr)	165.770	173.150	151.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	178.670	186.070	163.990	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.330	38.420	38.190	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.550	20.640	20.410	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	165.7700	173.1500	151.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.720	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.686	2.674	2.689	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.672	2.660	2.675	
Average Specific Gravity at 20° C							**2.669**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	11.50 - 12.00

Determination No				1	2	3	4
No of Pycnometer				86	42	5	
Weight of Pycnometer		Wf	(gr)	39.080	39.190	65.390	
Weight of (Pycnometer + Water)		Wa	(gr)	138.850	142.220	168.330	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.550	154.790	180.990	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	37.880	38.090	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.100	20.310	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.8500	142.2200	168.3300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.530	7.650	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.678	2.669	2.655	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.664	2.656	2.641	
Average Specific Gravity at 20° C							**2.654**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	13.50 - 14.00

Determination No				1	2	3	4
No of Pycnometer				8	25	68	
Weight of Pycnometer		Wf	(gr)	67.390	43.080	34.650	
Weight of (Pycnometer + Water)		Wa	(gr)	168.560	146.430	134.460	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.740	159.220	147.290	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.780	38.160	38.220	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	21.000	20.380	20.440	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.5600	146.4300	134.4600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.820	7.590	7.610	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.685	2.685	2.686	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.672	2.671	2.672	
Average Specific Gravity at 20° C							**2.672**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	16.50 - 17.00

Determination No				1	2	3	4
No of Pycnometer				53	54	3	
Weight of Pycnometer		Wf	(gr)	52.280	51.250	63.340	
Weight of (Pycnometer + Water)		Wa	(gr)	153.170	151.310	166.670	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	165.780	164.080	179.310	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.890	38.180	37.930	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.110	20.400	20.150	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	153.1700	151.3100	166.6700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.630	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.681	2.674	2.683	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.668	2.660	2.669	
Average Specific Gravity at 20° C							**2.666**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 9, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 19	DEPTH	19.50 - 20.00

Determination No				1	2	3	4
No of Pycnometer				16	29	46	
Weight of Pycnometer		Wf	(gr)	66.000	36.900	39.280	
Weight of (Pycnometer + Water)		Wa	(gr)	169.300	135.800	140.310	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.920	148.370	152.950	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.900	37.830	38.010	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.120	20.050	20.230	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.3000	135.8000	140.3100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.480	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.683	2.680	2.665	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.669	2.667	2.652	
Average Specific Gravity at 20° C							**2.662**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 533.3 gr

Wt. container No ..... = 42.53 gr

Wt. Of air dry soil W' = 490.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **490.80** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	85.10	42.53	42.57		8.67	91.33
4.75	124.70		82.17		16.74	83.26
2.00	192.50		149.97		30.56	69.44

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 19	DEPTH	0.50 - 1.00

Wt. (Air dry soil + container) = 127.67 gr — Specific Gravity : 2.646
Wt. of container B-41 = 36.26 gr — Plasticity Index : %
Wt. Of air dry soil W' = 91.41 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 69.44 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-04			NO	J-21			NO	J-43		
WW	61.16	DW	60.32	WW	62.34	DW	61.45	WW	61.71	DW	60.87	Mean value	
DW	60.32	TW	36.65	DW	61.45	TW	36.56	DW	60.87	TW	36.94	w	
Ww	0.84	Ws	23.67	Ww	0.89	Ws	24.89	Ww	0.84	Ws	23.93	3.54	%
w	3.55	%		w	3.58	%		w	3.51	%			

$$W = \frac{100 \times W'}{100 + w} : 88.281 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	8.5	9.5	29	13.198	13.198	3.6330	0.01233	0.0448	6.50	11.84	8.22
2	7.5	8.5	29	13.451	6.725	2.5933	0.01233	0.0320	5.50	10.02	6.95
5	6.5	7.5	29	13.703	2.741	1.6555	0.01233	0.0204	4.50	8.19	5.69
15	5.5	6.5	29	13.955	0.930	0.9645	0.01233	0.0119	3.50	6.37	4.43
30	5.0	6.0	29	14.081	0.469	0.6851	0.01233	0.0085	3.00	5.46	3.79
60	4.0	5.0	29	14.334	0.239	0.4888	0.01233	0.0060	2.00	3.64	2.53
240	3.0	4.0	28	14.586	0.061	0.2465	0.01247	0.0031	1.00	1.82	1.26
1140	2.5	3.5	29	14.712	0.013	0.1136	0.01233	0.0014	0.50	0.91	0.63

P = 100/W = 1.1327

$$Mx = \frac{Gs}{Gs - 1} = 1.6075$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	53.79	22.02	31.770		35.99	64.01	44.45
0.42	74.87		52.850		59.87	40.13	27.87
0.25	85.29		63.270		71.67	28.33	19.67
0.105	93.76		71.740		81.26	18.74	13.01
0.074	96.76		74.740		84.66	15.34	10.65

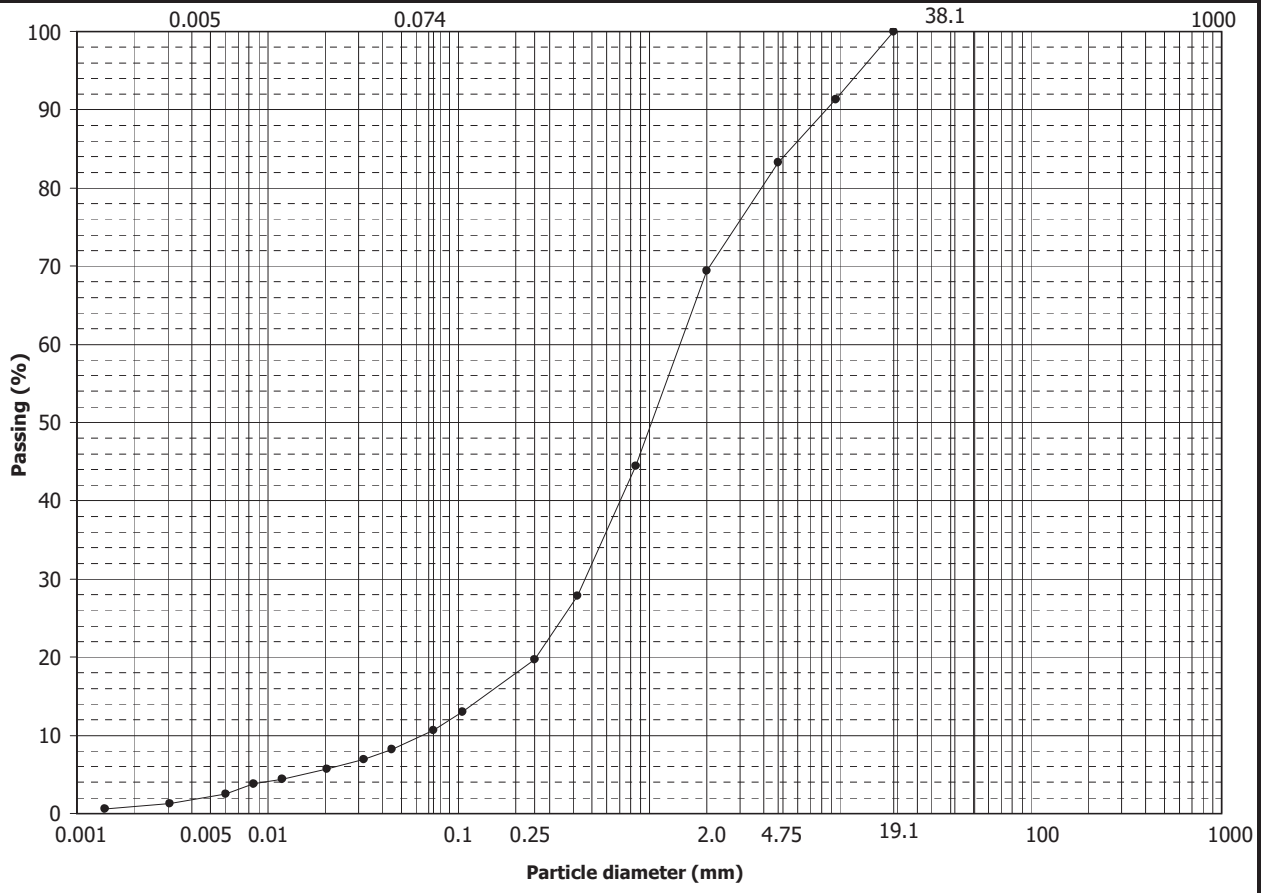
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.646**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
16.74	72.61	8.47	2.18	19.10	8.7358	1.5654	1.1053	0.4752	0.0662	23.65	69.44	27.87	10.65



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 204.4 gr
Wt. container No ..... = 34.72 gr
Wt. Of air dry soil W' = 169.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **169.70** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	51.20	34.72	16.48		9.71	90.29
4.75	66.60		31.88		18.79	81.21
2.00	81.10		46.38		27.33	72.67

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 122.76 gr — Specific Gravity : **2.640**

Wt. of container B-37 = 32.04 gr — Plasticity Index : %

Wt. Of air dry soil W' = 90.72 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 72.67 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-87			NO	A-43			NO	A-17		
WW	62.34	DW	61.52	WW	59.26	DW	58.37	WW	59.94	DW	59.04	Mean value	
DW	61.52	TW	40.13	DW	58.37	TW	35.83	DW	59.04	TW	36.39	w	
Ww	0.82	Ws	21.39	Ww	0.89	Ws	22.54	Ww	0.90	Ws	22.65	3.92	%
w	3.83	%		w	3.95	%		w	3.97	%			

$$W = \frac{100 \times W'}{100 + w} : 87.299 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	29	10.549	10.549	3.2480	0.01236	0.0401	17.00	31.35	22.78
2	16.0	17.0	29	11.306	5.653	2.3776	0.01236	0.0294	14.00	25.82	18.76
5	13.0	14.0	29	12.063	2.413	1.5533	0.01236	0.0192	11.00	20.28	14.74
15	10.5	11.5	29	12.694	0.846	0.9199	0.01236	0.0114	8.50	15.67	11.39
30	9.0	10.0	29	13.072	0.436	0.6601	0.01236	0.0082	7.00	12.91	9.38
60	7.0	8.0	29	13.577	0.226	0.4757	0.01236	0.0059	5.00	9.22	6.70
240	5.0	6.0	28	14.081	0.059	0.2422	0.01249	0.0030	3.00	5.53	4.02
1140	3.0	4.0	29	14.586	0.013	0.1131	0.01236	0.0014	1.00	1.84	1.34

P = 100/W = 1.1455

$$Mx = \frac{G_s}{G_s - 1} = 1.6098$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	32.17	22.02	10.150		11.63	88.37	64.22
0.42	41.11		19.090		21.87	78.13	56.78
0.25	47.36		25.340		29.03	70.97	51.58
0.105	62.94		40.920		46.87	53.13	38.61
0.074	69.55		47.530		54.44	45.56	33.10

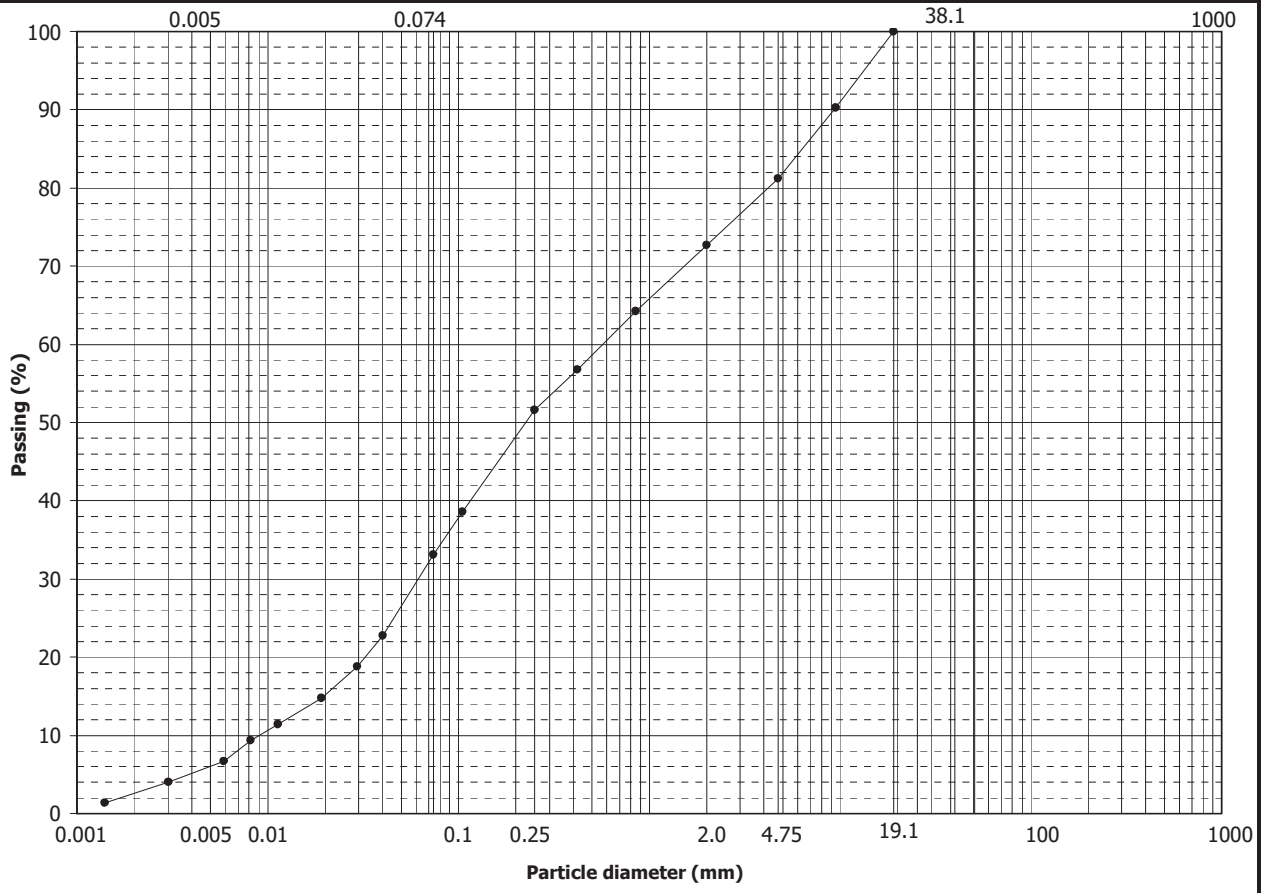
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.640**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
18.79	48.11	27.06	6.05	19.10	9.3682	0.6061	0.2324	0.0638	0.0091	66.27	72.67	56.78	33.10



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 241.9 gr
Wt. container No ..... = 38.84 gr
Wt. Of air dry soil W' = 203.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **203.10** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	51.60	38.84	12.76		6.28	93.72
4.75	66.10		27.26		13.42	86.58
2.00	87.20		48.36		23.81	76.19

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 125.37 gr — Specific Gravity : **2.652**

Wt. of container B-82 = 33.81 gr — Plasticity Index : %

Wt. Of air dry soil W' = 91.56 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 76.19 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-73			NO	J-12			NO	J-44		
WW	58.55	DW	57.84	WW	59.22	DW	58.54	WW	59.90	DW	59.19	Mean value	
DW	57.84	TW	36.28	DW	58.54	TW	37.07	DW	59.19	TW	37.46	w	
Ww	0.71	Ws	21.56	Ww	0.68	Ws	21.47	Ww	0.71	Ws	21.73	3.24	%
w	3.29	%		w	3.17	%		w	3.27	%			

$$W = \frac{100 \times W'}{100 + w} : 88.684 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.0	19.0	29	10.802	10.802	3.2866	0.01231	0.0405	16.00	28.96	22.07
2	16.0	17.0	29	11.306	5.653	2.3776	0.01231	0.0293	14.00	25.34	19.31
5	13.0	14.0	29	12.063	2.413	1.5533	0.01231	0.0191	11.00	19.91	15.17
15	10.0	11.0	29	12.820	0.855	0.9245	0.01231	0.0114	8.00	14.48	11.03
30	8.0	9.0	29	13.325	0.444	0.6664	0.01231	0.0082	6.00	10.86	8.27
60	6.0	7.0	29	13.829	0.230	0.4801	0.01231	0.0059	4.00	7.24	5.52
240	4.0	5.0	28	14.334	0.060	0.2444	0.01245	0.0030	2.00	3.62	2.76
1140	3.0	4.0	29	14.586	0.013	0.1131	0.01231	0.0014	1.00	1.81	1.38

P = 100/W = 1.1276

$$Mx = \frac{G_s}{G_s - 1} = 1.6053$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	37.54	22.02	15.520		17.50	82.50	62.86
0.42	48.00		25.980		29.29	70.71	53.87
0.25	57.36		35.340		39.85	60.15	45.83
0.105	71.08		49.060		55.32	44.68	34.04
0.074	76.87		54.850		61.85	38.15	29.07

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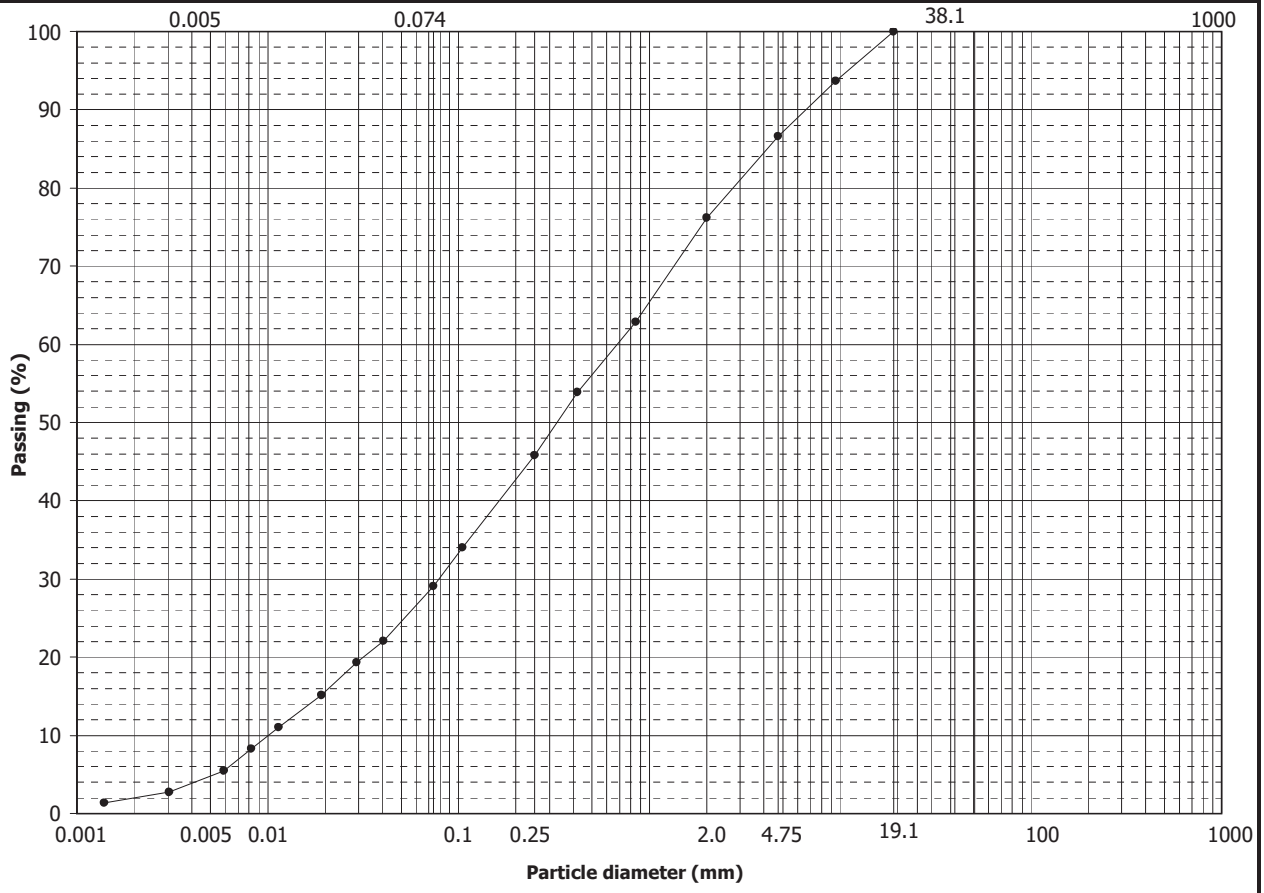
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.652**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
13.42	57.51	24.25	4.82	19.10	7.0363	0.7133	0.3382	0.0798	0.0102	69.99	76.19	53.87	29.07



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 611.8 gr
Wt. container No ..... = 74.28 gr
Wt. Of air dry soil W' = 537.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **537.50** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	82.30	74.28	8.02		1.49	98.51
9.52	100.80		26.52		4.93	95.07
4.75	123.40		49.12		9.14	90.86
2.00	154.20		79.92		14.87	85.13

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 117.15 gr — Specific Gravity : **2.636**

Wt. of container B-81 = 36.41 gr — Plasticity Index : %

Wt. Of air dry soil W' = 80.74 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 85.13 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-74			NO	J-25			NO	J-34		
WW	60.31	DW	59.21	WW	58.71	DW	57.58	WW	62.36	DW	61.28	Mean value	
DW	59.21	TW	38.41	DW	57.58	TW	36.05	DW	61.28	TW	40.29	w	
Ww	1.10	Ws	20.80	Ww	1.13	Ws	21.53	Ww	1.08	Ws	20.99	5.23	%
w	5.29	%		w	5.25	%		w	5.15	%			

$$W = \frac{100 \times W'}{100 + w} : 76.729 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	26.0	27.0	29	8.783	8.783	2.9636	0.01237	0.0367	24.00	50.40	42.90
2	24.0	25.0	29	9.288	4.644	2.1550	0.01237	0.0267	22.00	46.20	39.33
5	21.0	22.0	29	10.045	2.009	1.4174	0.01237	0.0175	19.00	39.90	33.97
15	18.0	19.0	29	10.802	0.720	0.8486	0.01237	0.0105	16.00	33.60	28.60
30	16.0	17.0	29	11.306	0.377	0.6139	0.01237	0.0076	14.00	29.40	25.03
60	14.0	15.0	29	11.811	0.197	0.4437	0.01237	0.0055	12.00	25.20	21.45
240	11.0	12.0	28	12.568	0.052	0.2288	0.01251	0.0029	9.00	18.90	16.09
1140	8.0	9.0	29	13.325	0.012	0.1081	0.01237	0.0013	6.00	12.60	10.73

P = 100/W = 1.3033

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6112$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.11	22.02	6.090		7.94	92.06	78.37
0.42	34.36		12.340		16.08	83.92	71.44
0.25	39.65		17.630		22.98	77.02	65.57
0.105	47.28		25.260		32.92	67.08	57.11
0.074	50.98		28.960		37.74	62.26	53.00

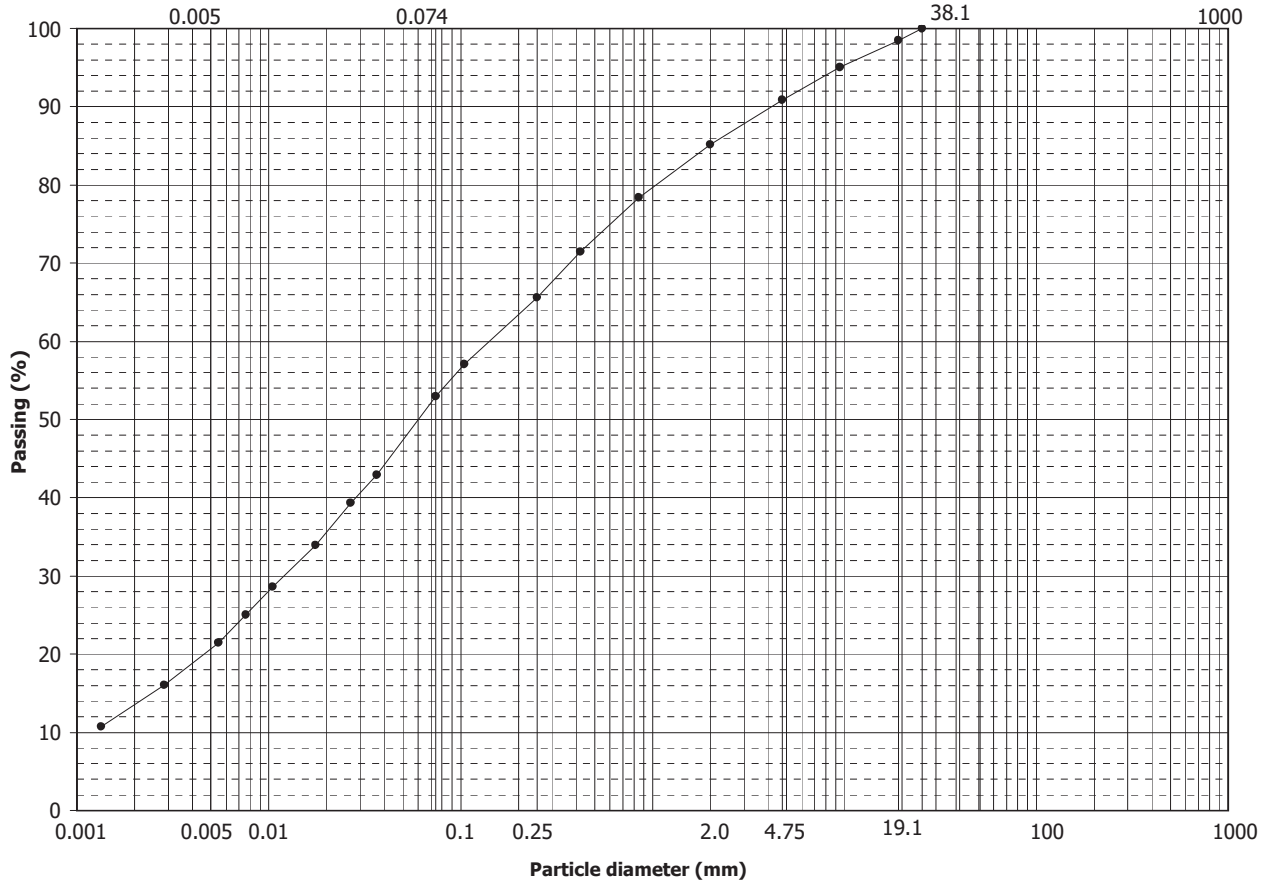
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.636**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
9.14	37.86	32.32	20.68	25.40	4.3366	0.1546	0.0629	0.0123	-	-	85.13	71.44	53.00



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 221.5 gr
Wt. container No ..... = 35.89 gr
Wt. Of air dry soil W' = 185.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **185.61** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	76.20	35.89	40.31		21.72	78.28
4.75	100.50		64.61		34.81	65.19
2.00	118.80		82.91		44.67	55.33

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 19	DEPTH	4.50 - 5.00

Wt. (Air dry soil + container) = 119.70 gr — Specific Gravity : 2.622
Wt. of container B-103 = 34.65 gr — Plasticity Index : %
Wt. Of air dry soil W' = 85.05 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 55.33 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-15			NO	A-34			NO	A-85		
WW	61.08	DW	60.21	WW	59.64	DW	58.68	WW	58.04	DW	57.18	Mean value	
DW	60.21	TW	39.40	DW	58.68	TW	36.54	DW	57.18	TW	36.04	w	
Ww	0.87	Ws	20.81	Ww	0.96	Ws	22.14	Ww	0.86	Ws	21.14	4.19	%
w	4.18	%		w	4.34	%		w	4.07	%			

$$W = \frac{100 \times W'}{100 + w} : 81.626 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.0	22.0	29	10.045	10.045	3.1693	0.01243	0.0394	19.00	37.63	20.82
2	19.0	20.0	29	10.549	5.275	2.2967	0.01243	0.0285	17.00	33.67	18.63
5	16.0	17.0	29	11.306	2.261	1.5037	0.01243	0.0187	14.00	27.73	15.34
15	13.5	14.5	29	11.937	0.796	0.8921	0.01243	0.0111	11.50	22.77	12.60
30	11.5	12.5	29	12.442	0.415	0.6440	0.01243	0.0080	9.50	18.81	10.41
60	10.0	11.0	29	12.820	0.214	0.4622	0.01243	0.0057	8.00	15.84	8.77
240	8.0	9.0	28	13.325	0.056	0.2356	0.01256	0.0030	6.00	11.88	6.57
1140	6.0	7.0	29	13.829	0.012	0.1101	0.01243	0.0014	4.00	7.92	4.38

P = 100/W = 1.2251

$$Mx = \frac{Gs}{Gs - 1} = 1.6165$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	34.14	22.02	12.120		14.85	85.15	47.12
0.42	42.48		20.460		25.07	74.93	41.46
0.25	48.68		26.660		32.66	67.34	37.26
0.105	59.31		37.290		45.68	54.32	30.05
0.074	64.06		42.040		51.50	48.50	26.83

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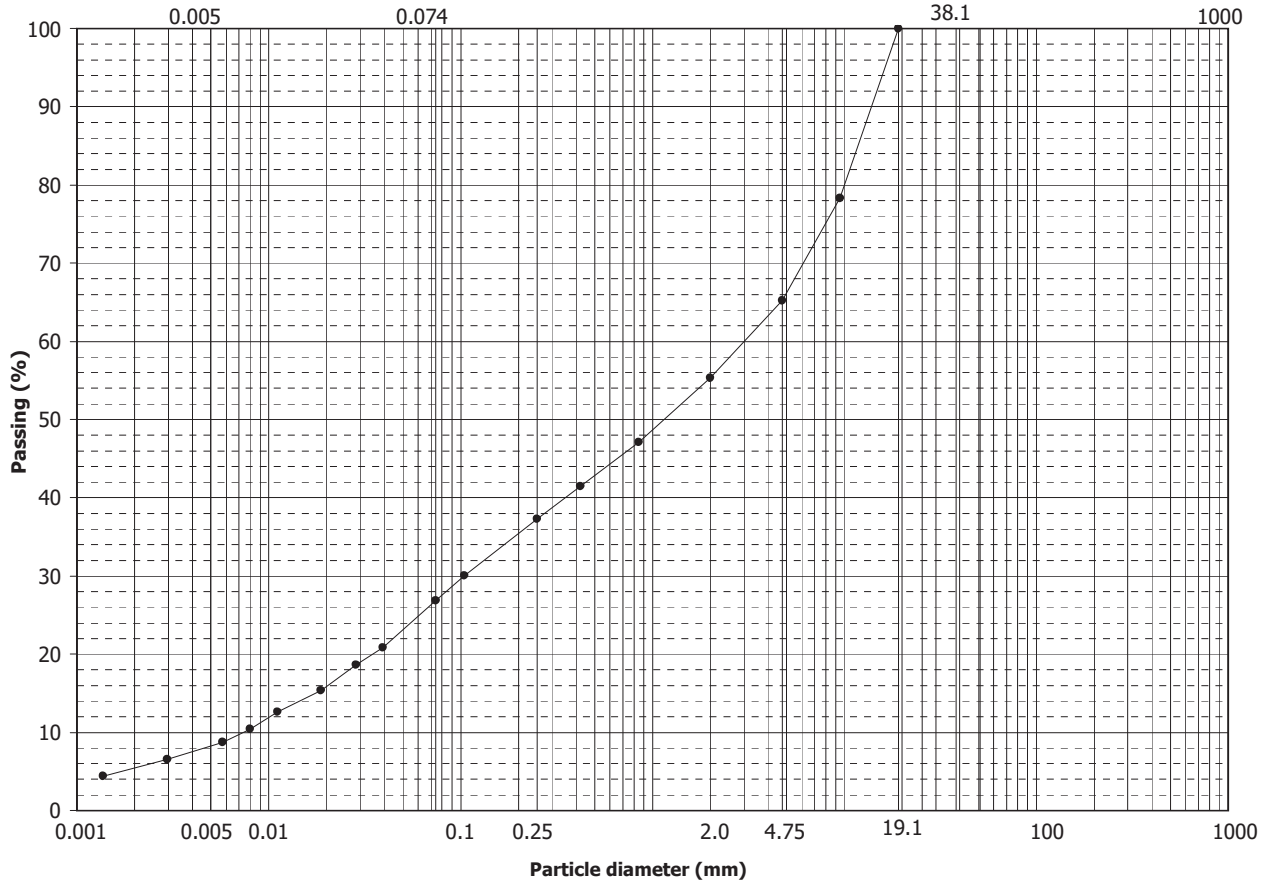
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.622**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
34.81	38.36	18.53	8.31	19.10	14.6888	3.3023	1.2538	0.1045	0.0074	443.95	55.33	41.46	26.83



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 726.7 gr
Wt. container No ..... = 42.95 gr
Wt. Of air dry soil W' = 683.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **683.70** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	76.40	42.95	33.45		4.89	95.11
9.52	129.80		86.85		12.70	87.30
4.75	158.00		115.05		16.83	83.17
2.00	208.40		165.45		24.20	75.80

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 105.21 gr — Specific Gravity : **2.607**

Wt. of container B-16 = 33.61 gr — Plasticity Index : %

Wt. Of air dry soil W' = 71.60 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 75.80 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-75			NO	J-17			NO	J-65		
WW	60.69	DW	59.38	WW	61.70	DW	60.44	WW	62.26	DW	60.81	Mean value	
DW	59.38	TW	35.09	DW	60.44	TW	37.60	DW	60.81	TW	34.25	w	
Ww	1.31	Ws	24.29	Ww	1.26	Ws	22.84	Ww	1.45	Ws	26.56	5.46	%
w	5.39	%		w	5.52	%		w	5.46	%			

$$W = \frac{100 \times W'}{100 + w} : 67.895 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	25.0	26.0	29	9.035	9.035	3.0059	0.01248	0.0375	23.00	54.96	41.66
2	24.0	25.0	29	9.288	4.644	2.1550	0.01248	0.0269	22.00	52.57	39.85
5	22.0	23.0	29	9.792	1.958	1.3995	0.01248	0.0175	20.00	47.79	36.22
15	20.0	21.0	29	10.297	0.686	0.8285	0.01248	0.0103	18.00	43.01	32.60
30	18.0	19.0	29	10.802	0.360	0.6000	0.01248	0.0075	16.00	38.23	28.98
60	16.0	17.0	29	11.306	0.188	0.4341	0.01248	0.0054	14.00	33.45	25.36
240	13.0	14.0	28	12.063	0.050	0.2242	0.01262	0.0028	11.00	26.28	19.92
1140	11.0	12.0	29	12.568	0.011	0.1050	0.01248	0.0013	9.00	21.50	16.30

P = 100/W = 1.4729

$$Mx = \frac{G_s}{G_s - 1} = 1.6223$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	30.09	22.02	8.070		11.89	88.11	66.79
0.42	34.58		12.560		18.50	81.50	61.78
0.25	37.85		15.830		23.32	76.68	58.13
0.105	45.67		23.650		34.83	65.17	49.40
0.074	48.75		26.730		39.37	60.63	45.96

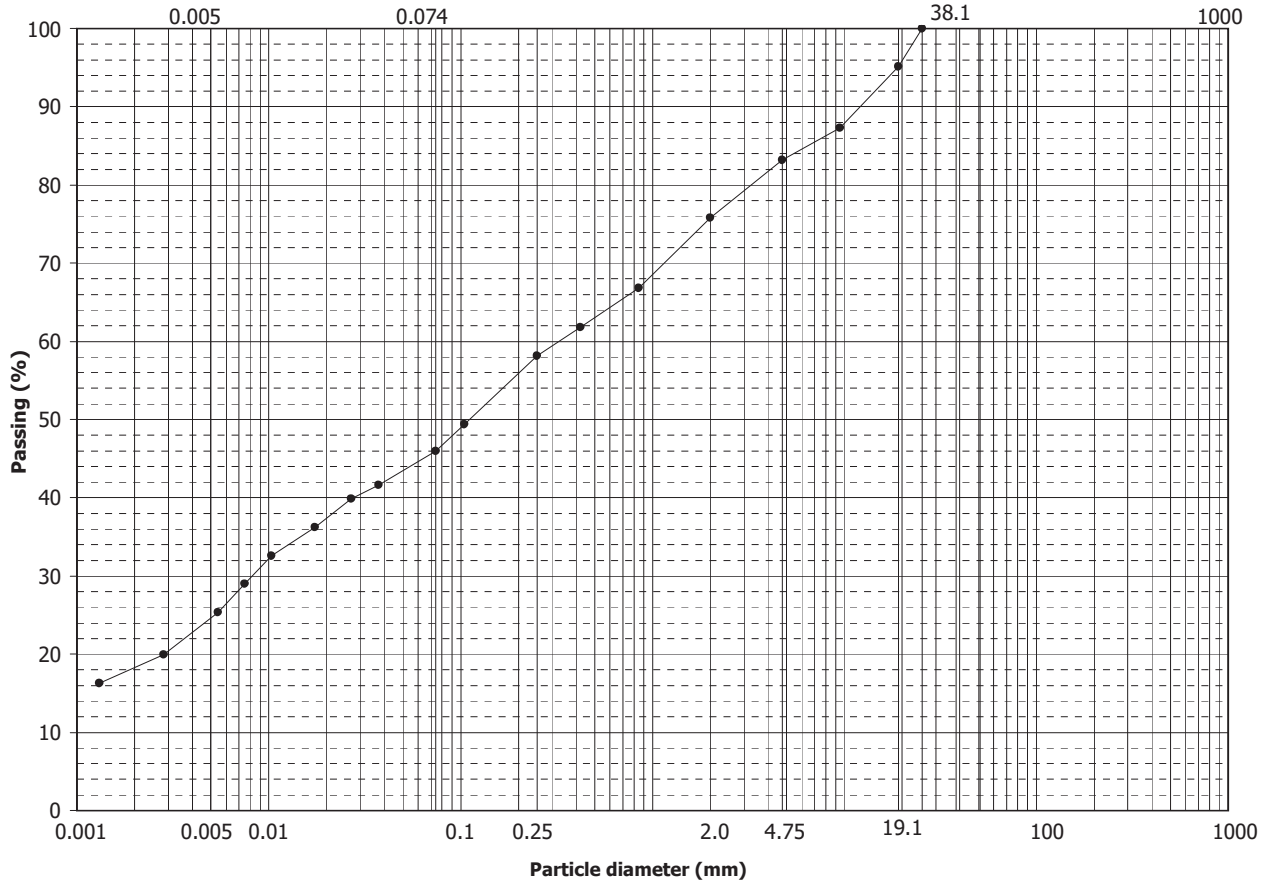
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.607**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
16.83	37.21	21.27	24.68	25.40	12.8353	0.3372	0.1150	0.0083	-	-	75.80	61.78	45.96



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 637.5 gr
Wt. container No ..... = 66.68 gr
Wt. Of air dry soil W' = 570.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **570.80** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	82.15	66.68	15.47		2.71	97.29
4.75	97.20		30.52		5.35	94.65
2.00	116.60		49.92		8.75	91.25

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 111.58 gr — Specific Gravity : **2.639**

Wt. of container B-25 = 35.56 gr — Plasticity Index : %

Wt. Of air dry soil W' = 76.02 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 91.25 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-74			NO	A-61			NO	A-107		
WW	58.65	DW	57.57	WW	59.07	DW	57.98	WW	58.29	DW	57.18	Mean value	
DW	57.57	TW	36.47	DW	57.98	TW	37.03	DW	57.18	TW	36.07	w	
Ww	1.08	Ws	21.10	Ww	1.09	Ws	20.95	Ww	1.11	Ws	21.11	5.19	%
w	5.12	%		w	5.20	%		w	5.26	%			

$$W = \frac{100 \times W'}{100 + w} : 72.267 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	31.0	32.0	29	7.522	7.522	2.7426	0.01236	0.0339	29.00	64.61	58.96
2	29.0	30.0	29	8.026	4.013	2.0033	0.01236	0.0248	27.00	60.16	54.90
5	26.0	27.0	29	8.783	1.757	1.3254	0.01236	0.0164	24.00	53.47	48.80
15	23.0	24.0	29	9.540	0.636	0.7975	0.01236	0.0099	21.00	46.79	42.70
30	20.5	21.5	29	10.171	0.339	0.5823	0.01236	0.0072	18.50	41.22	37.61
60	18.0	19.0	29	10.802	0.180	0.4243	0.01236	0.0052	16.00	35.65	32.53
240	14.0	15.0	28	11.811	0.049	0.2218	0.01250	0.0028	12.00	26.74	24.40
1140	11.0	12.0	29	12.568	0.011	0.1050	0.01236	0.0013	9.00	20.05	18.30

P = 100/W = 1.3838

$$Mx = \frac{Gs}{Gs - 1} = 1.6101$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	26.36	22.02	4.340		6.01	93.99	85.77
0.42	29.41		7.390		10.23	89.77	81.92
0.25	32.22		10.200		14.11	85.89	78.37
0.105	37.35		15.330		21.21	78.79	71.90
0.074	40.08		18.060		24.99	75.01	68.45

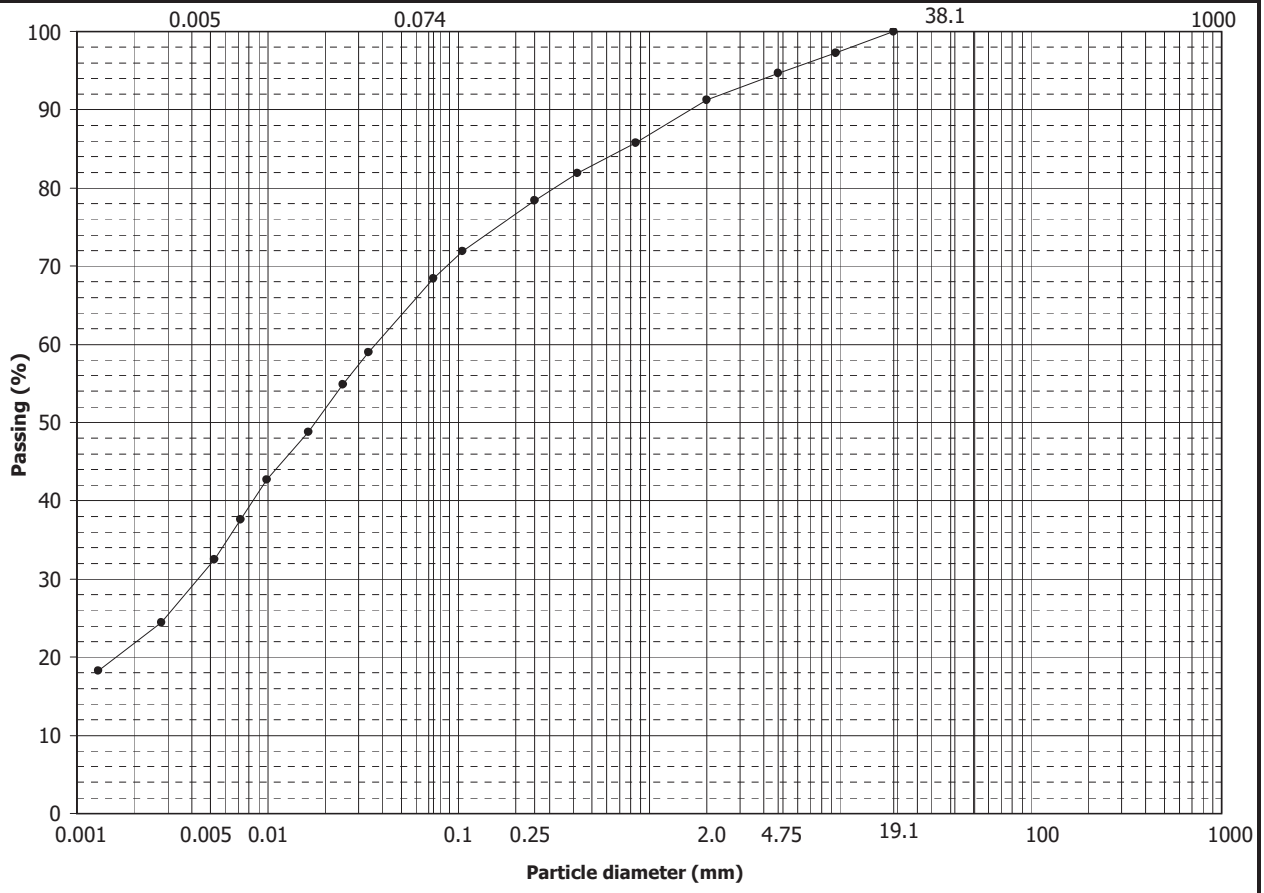
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.639**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
5.35	26.20	36.53	31.92	19.10	1.7368	0.0383	0.0180	0.0045	-	-	91.25	81.92	68.45



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 363.1 gr
Wt. container No ..... = 67.45 gr
Wt. Of air dry soil W' = 295.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **295.60** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	73.00	67.45	5.55		1.88	98.12
4.75	83.00		15.55		5.26	94.74
2.00	96.00		28.55		9.66	90.34

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 19	DEPTH	7.50 - 8.00

Wt. (Air dry soil + container) = 113.18 gr — Specific Gravity : 2.643
Wt. of container B-20 = 32.45 gr — Plasticity Index : %
Wt. Of air dry soil W' = 80.73 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 90.34 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-67			NO	A-53			NO	A-45		
WW	58.75	DW	57.58	WW	57.35	DW	56.17	WW	61.53	DW	60.28	Mean value	
DW	57.58	TW	36.88	DW	56.17	TW	35.63	DW	60.28	TW	38.37	w	
Ww	1.17	Ws	20.70	Ww	1.18	Ws	20.54	Ww	1.25	Ws	21.91	5.70	%
w	5.65	%		w	5.74	%		w	5.71	%			

$$W = \frac{100 \times W'}{100 + w} : 76.376 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	35.0	36.0	29	6.512	6.512	2.5520	0.01235	0.0315	33.00	69.51	62.79
2	33.0	34.0	29	7.017	3.509	1.8731	0.01235	0.0231	31.00	65.29	58.99
5	30.0	31.0	29	7.774	1.555	1.2469	0.01235	0.0154	28.00	58.97	53.28
15	26.0	27.0	29	8.783	0.586	0.7652	0.01235	0.0094	24.00	50.55	45.67
30	23.0	24.0	29	9.540	0.318	0.5639	0.01235	0.0070	21.00	44.23	39.96
60	20.0	21.0	29	10.297	0.172	0.4143	0.01235	0.0051	18.00	37.91	34.25
240	16.0	17.0	28	11.306	0.047	0.2170	0.01248	0.0027	14.00	29.49	26.64
1140	12.0	13.0	29	12.315	0.011	0.1039	0.01235	0.0013	10.00	21.06	19.03

P = 100/W = 1.3093

$$Mx = \frac{G_s}{G_s - 1} = 1.6086$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	25.00	22.02	2.980		3.90	96.10	86.82
0.42	28.00		5.980		7.83	92.17	83.27
0.25	30.00		7.980		10.45	89.55	80.90
0.105	35.00		12.980		16.99	83.01	74.99
0.074	38.00		15.980		20.92	79.08	71.44

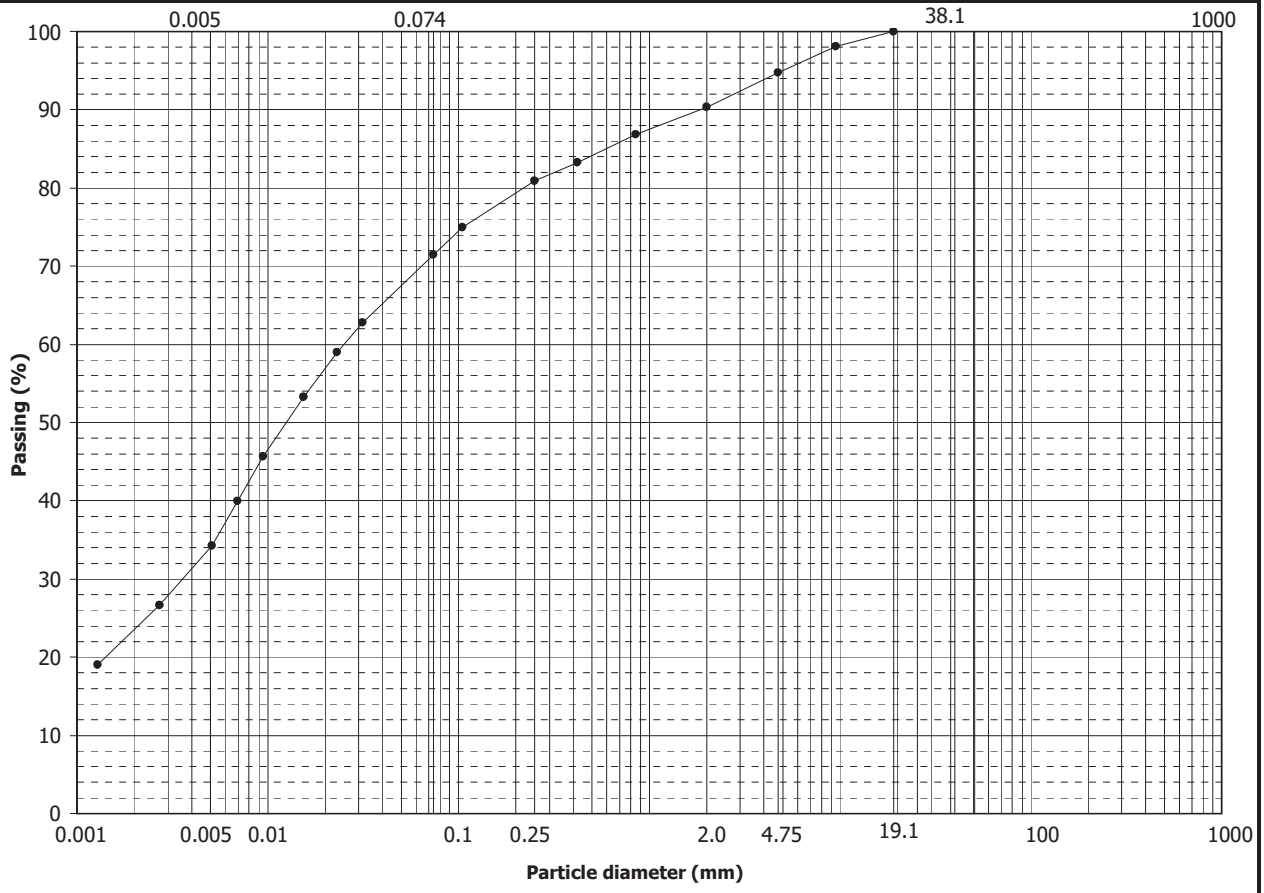
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.643**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
5.26	23.30	37.46	33.98	19.10	1.8885	0.0254	0.0128	0.0038	-	-	90.34	83.27	71.44



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 718.9 gr
Wt. container No ..... = 35.59 gr
Wt. Of air dry soil W' = 683.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **683.31** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	45.02	35.59	9.43		1.38	98.62
2.00	58.09		22.50		3.29	96.71

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 19	DEPTH	8.50 - 9.00

Wt. (Air dry soil + container) = 111.58 gr
Wt. of container E-46 = 35.60 gr
Wt. Of air dry soil W' = 75.98 gr
Specific Gravity : 2.669
Plasticity Index : %
Deflocculating agent 2.0
% finer then 2.00 mm : 96.71 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-40			NO	A-19			NO	A-57		
WW	53.00	DW	52.34	WW	52.99	DW	52.34	WW	51.41	DW	50.85	Mean value	
DW	52.34	TW	39.24	DW	52.34	TW	39.40	DW	50.85	TW	39.96	w	
Ww	0.66	Ws	13.10	Ww	0.65	Ws	12.94	Ww	0.56	Ws	10.89	5.07	%
w	5.04	%		w	5.02	%		w	5.14	%			

$$W = \frac{100 \times W'}{100 + w} : 72.315 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	37.0	38.0	29	6.008	6.008	2.4511	0.01225	0.0300	35.00	77.40	74.85
2	35.0	36.0	29	6.512	3.256	1.8045	0.01225	0.0221	33.00	72.98	70.57
5	32.0	33.0	29	7.269	1.454	1.2058	0.01225	0.0148	30.00	66.34	64.16
15	27.0	28.0	29	8.531	0.569	0.7541	0.01225	0.0092	25.00	55.28	53.46
30	23.0	24.0	29	9.540	0.318	0.5639	0.01225	0.0069	21.00	46.44	44.91
60	20.0	21.0	29	10.297	0.172	0.4143	0.01225	0.0051	18.00	39.80	38.49
240	16.0	17.0	28	11.306	0.047	0.2170	0.01238	0.0027	14.00	30.96	29.94
1140	12.0	13.0	29	12.315	0.011	0.1039	0.01225	0.0013	10.00	22.11	21.39

P = 100/W = 1.3828

$$Mx = \frac{G_s}{G_s - 1} = 1.5992$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	24.64	22.02	2.620		3.62	96.38	93.20
0.42	26.01		3.990		5.52	94.48	91.37
0.25	26.69		4.670		6.46	93.54	90.46
0.105	28.46		6.440		8.91	91.09	88.09
0.074	30.32		8.300		11.48	88.52	85.61

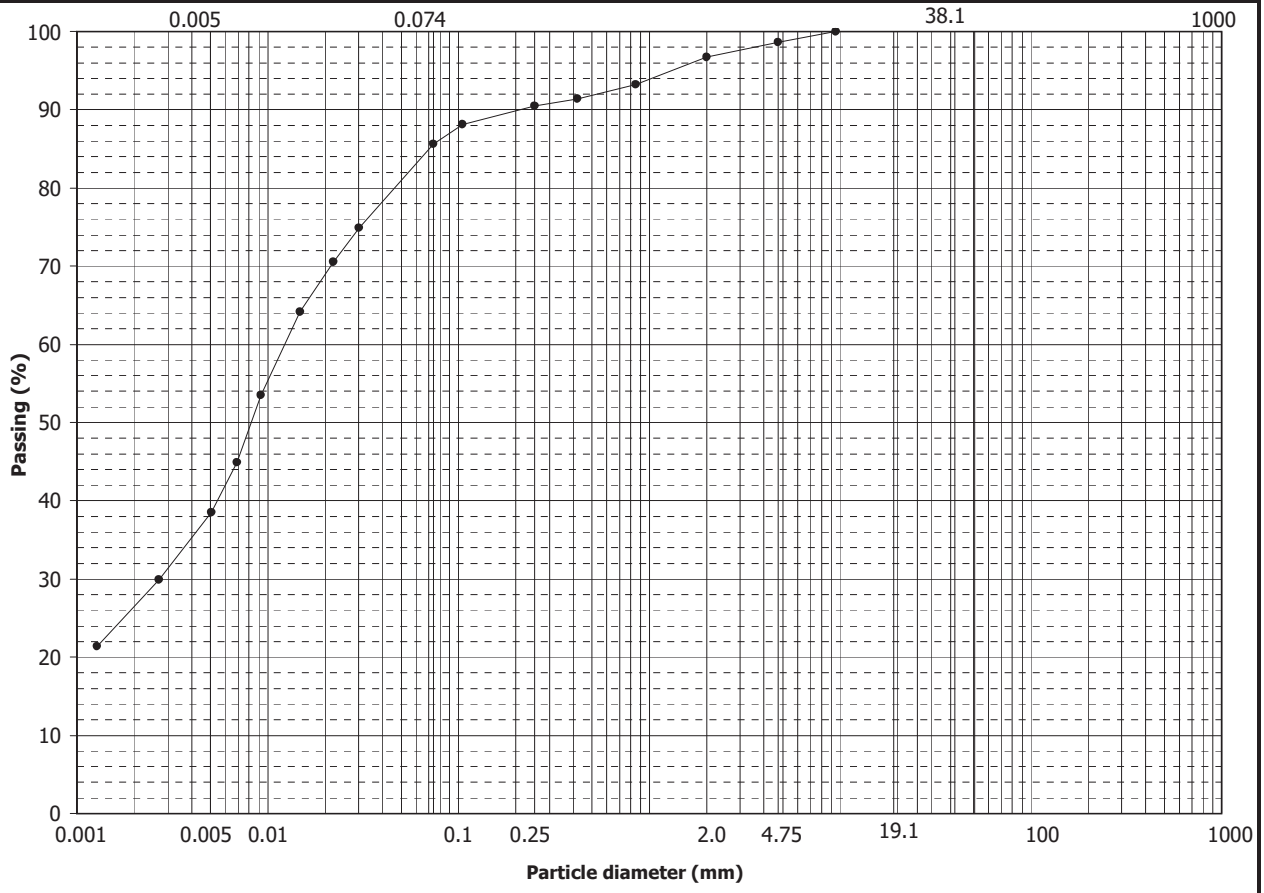
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.669**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
1.38	13.01	47.31	38.30	9.52	0.2217	0.0126	0.0083	0.0027	-	-	96.71	91.37	85.61



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 19	DEPTH	9.50 - 10.00

Wt. (Air dry soil + container) = 105.50 gr — Specific Gravity : 2.669
Wt. of container B-86 = 34.01 gr — Plasticity Index : %
Wt. Of air dry soil W' = 71.49 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-40			NO	A-19			NO	A-57		
WW	51.62	DW	50.65	WW	53.83	DW	52.67	WW	52.57	DW	51.57	Mean value	
DW	50.65	TW	39.24	DW	52.67	TW	39.40	DW	51.57	TW	39.96	w	
Ww	0.97	Ws	11.41	Ww	1.16	Ws	13.27	Ww	1.00	Ws	11.61	8.62	%
w	8.50	%		w	8.74	%		w	8.61	%			

$$W = \frac{100 \times W'}{100 + w} : 65.817 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	39.0	40.0	29	5.503	5.503	2.3459	0.01225	0.0287	37.00	89.90	89.90
2	37.0	38.0	29	6.008	3.004	1.7332	0.01225	0.0212	35.00	85.04	85.04
5	33.0	34.0	29	7.017	1.403	1.1847	0.01225	0.0145	31.00	75.32	75.32
15	27.0	28.0	29	8.531	0.569	0.7541	0.01225	0.0092	25.00	60.74	60.74
30	24.0	25.0	29	9.288	0.310	0.5564	0.01225	0.0068	22.00	53.45	53.45
60	20.0	21.0	29	10.297	0.172	0.4143	0.01225	0.0051	18.00	43.73	43.73
240	14.0	15.0	28	11.811	0.049	0.2218	0.01238	0.0027	12.00	29.16	29.16
1140	10.0	11.0	29	12.820	0.011	0.1060	0.01225	0.0013	8.00	19.44	19.44

P = 100/W = 1.5194

$$Mx = \frac{G_s}{G_s - 1} = 1.5992$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.74	22.02	0.720		1.09	98.91	98.91
0.42	23.14		1.120		1.70	98.30	98.30
0.25	23.45		1.430		2.17	97.83	97.83
0.105	23.86		1.840		2.80	97.20	97.20
0.074	24.36		2.340		3.56	96.44	96.44

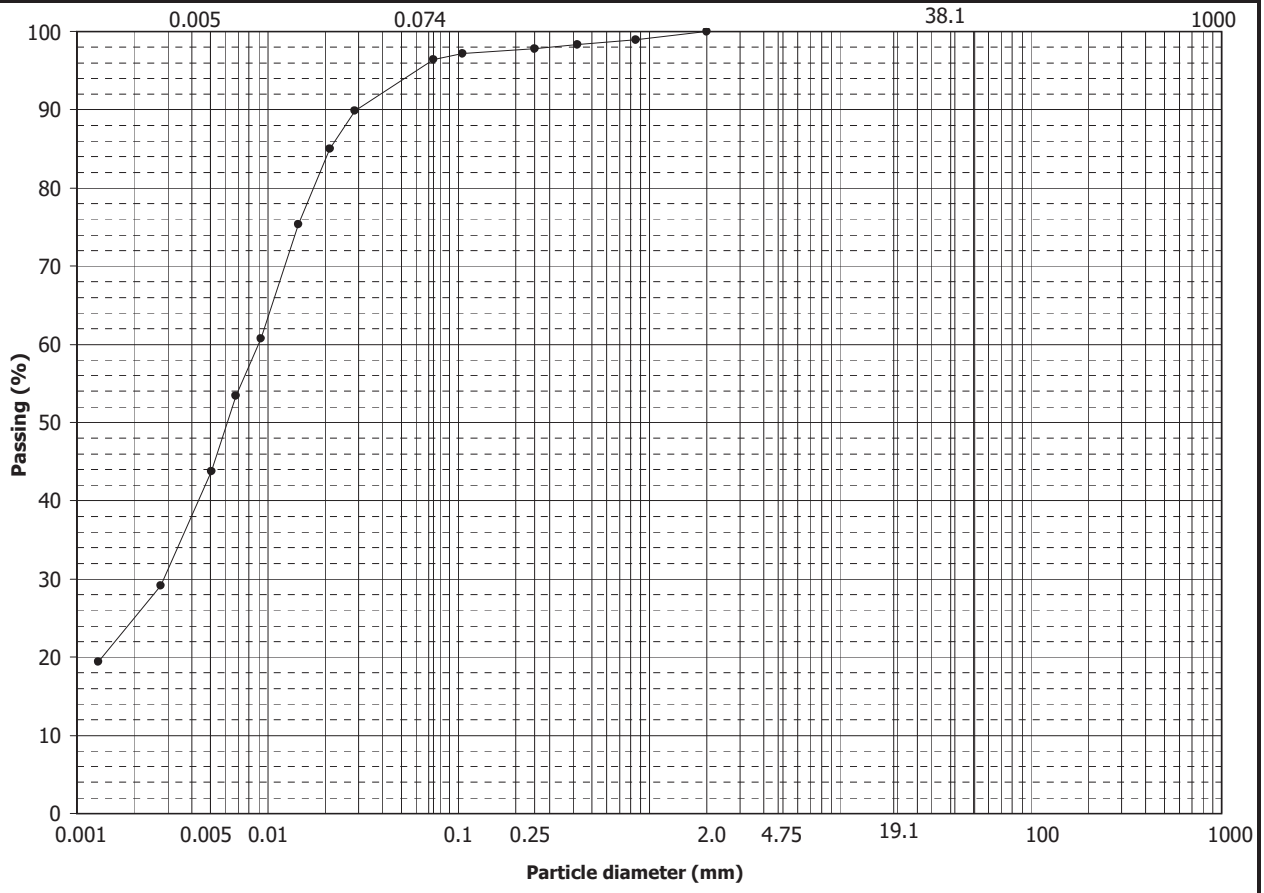
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.669**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	3.56	53.06	43.38	2.00	0.0294	0.0090	0.0062	0.0029	-	-	100.00	98.30	96.44



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = 757.6 gr
Wt. container No ..... = 34.98 gr
Wt. Of air dry soil W' = 722.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **722.60** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	37.00	34.98	2.02		0.28	99.72
4.75	39.00		4.02		0.56	99.44
2.00	45.00		10.02		1.39	98.61

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 19	DEPTH	11.50 - 12.00

Wt. (Air dry soil + container) = 105.99 gr — Specific Gravity : 2.654
Wt. of container B-12 = 38.38 gr — Plasticity Index : %
Wt. Of air dry soil W' = 67.61 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 98.61 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-07			NO	A-18			NO	A-32		
WW	67.48	DW	65.58	WW	62.92	DW	61.28	WW	59.86	DW	58.10	Mean value	
DW	65.58	TW	42.09	DW	61.28	TW	40.87	DW	58.10	TW	36.04	w	
Ww	1.90	Ws	23.49	Ww	1.64	Ws	20.41	Ww	1.76	Ws	22.06	8.03	%
w	8.09	%		w	8.04	%		w	7.98	%			

$$W = \frac{100 \times W'}{100 + w} : 62.582 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	36.0	37.0	29	6.260	6.260	2.5020	0.01230	0.0308	34.00	87.18	85.97
2	34.5	35.5	29	6.639	3.319	1.8219	0.01230	0.0224	32.50	83.33	82.17
5	31.5	32.5	29	7.396	1.479	1.2162	0.01230	0.0150	29.50	75.64	74.59
15	27.0	28.0	29	8.531	0.569	0.7541	0.01230	0.0093	25.00	64.10	63.21
30	24.0	25.0	29	9.288	0.310	0.5564	0.01230	0.0068	22.00	56.41	55.63
60	21.0	22.0	29	10.045	0.167	0.4092	0.01230	0.0050	19.00	48.72	48.04
240	16.0	17.0	28	11.306	0.047	0.2170	0.01244	0.0027	14.00	35.90	35.40
1140	13.0	14.0	29	12.063	0.011	0.1029	0.01230	0.0013	11.00	28.20	27.81

P = 100/W = 1.5979

$$Mx = \frac{G_s}{G_s - 1} = 1.6046$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.01	22.02	0.990		1.58	98.42	97.05
0.42	24.12		2.100		3.36	96.64	95.30
0.25	24.81		2.790		4.46	95.54	94.22
0.105	25.87		3.850		6.15	93.85	92.55
0.074	26.58		4.560		7.29	92.71	91.43

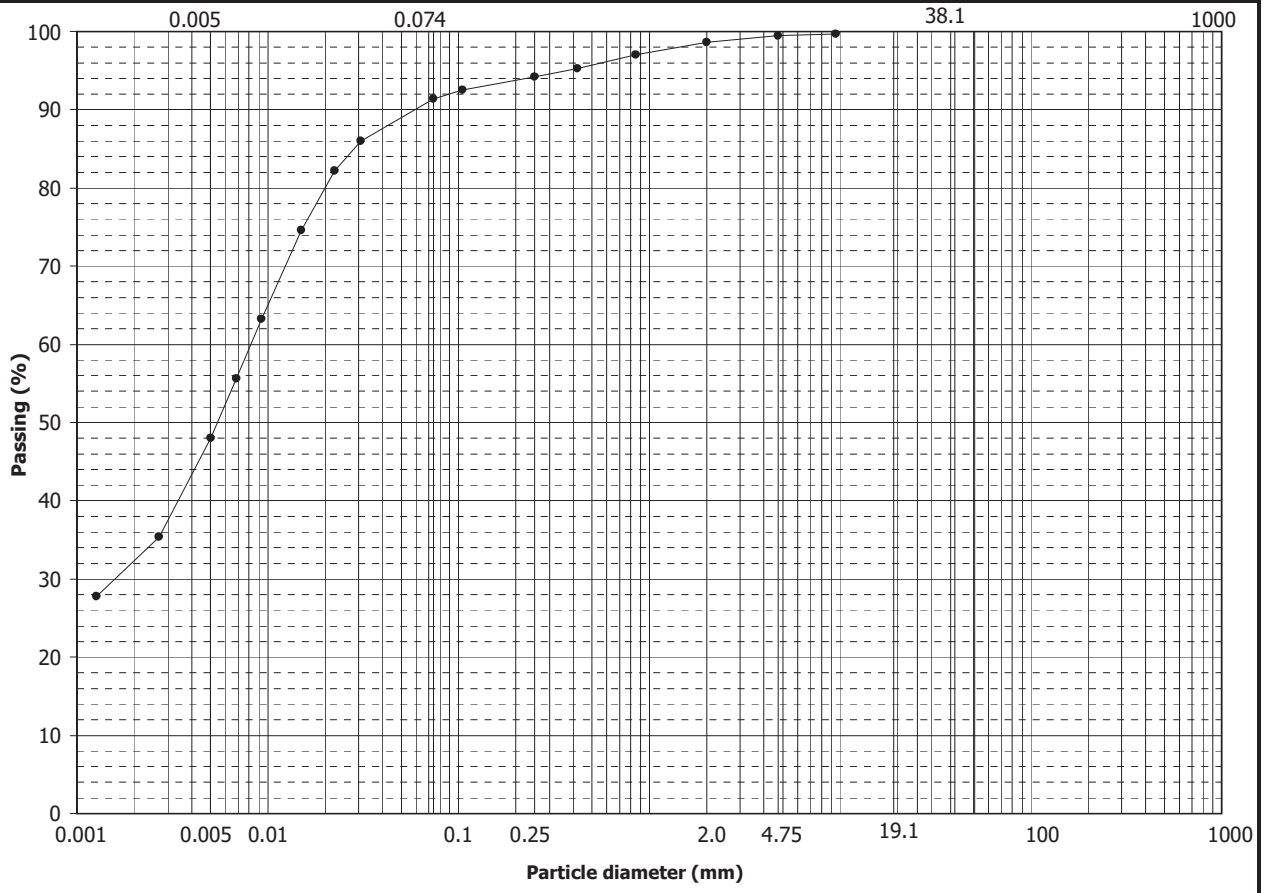
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**11.50 - 12.00**

SPECIFIC GRAVITY : **2.654**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.56	8.02	43.53	47.90	19.10	0.0627	0.0082	0.0055	0.0017	-	-	98.61	95.30	91.43



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = 106.47 gr — Specific Gravity : **2.672**

Wt. of container B-30 = 32.58 gr — Plasticity Index : %

Wt. Of air dry soil W' = 73.89 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-40			NO	A-19			NO	A-57		
WW	54.92	DW	53.84	WW	53.70	DW	52.72	WW	54.45	DW	53.47	Mean value	
DW	53.84	TW	39.24	DW	52.72	TW	39.40	DW	53.47	TW	39.96	w	
Ww	1.08	Ws	14.60	Ww	0.98	Ws	13.32	Ww	0.98	Ws	13.51	7.34	%
w	7.40	%		w	7.36	%		w	7.25	%			

$$W = \frac{100 \times W'}{100 + w} : 68.840 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	43.0	44.0	29	4.494	4.494	2.1199	0.01224	0.0259	41.00	95.18	95.18
2	42.0	43.0	29	4.746	2.373	1.5405	0.01224	0.0189	40.00	92.86	92.86
5	39.0	40.0	29	5.503	1.101	1.0491	0.01224	0.0128	37.00	85.89	85.89
15	34.0	35.0	29	6.765	0.451	0.6716	0.01224	0.0082	32.00	74.29	74.29
30	29.0	30.0	29	8.026	0.268	0.5172	0.01224	0.0063	27.00	62.68	62.68
60	24.0	25.0	29	9.288	0.155	0.3934	0.01224	0.0048	22.00	51.07	51.07
240	18.0	19.0	28	10.802	0.045	0.2121	0.01237	0.0026	16.00	37.14	37.14
1140	13.0	14.0	29	12.063	0.011	0.1029	0.01224	0.0013	11.00	25.54	25.54

P = 100/W = 1.4526

$$Mx = \frac{G_s}{G_s - 1} = 1.5981$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.26	22.02	0.240		0.35	99.65	99.65
0.42	22.35		0.330		0.48	99.52	99.52
0.25	22.41		0.390		0.57	99.43	99.43
0.105	22.56		0.540		0.78	99.22	99.22
0.074	22.79		0.770		1.12	98.88	98.88

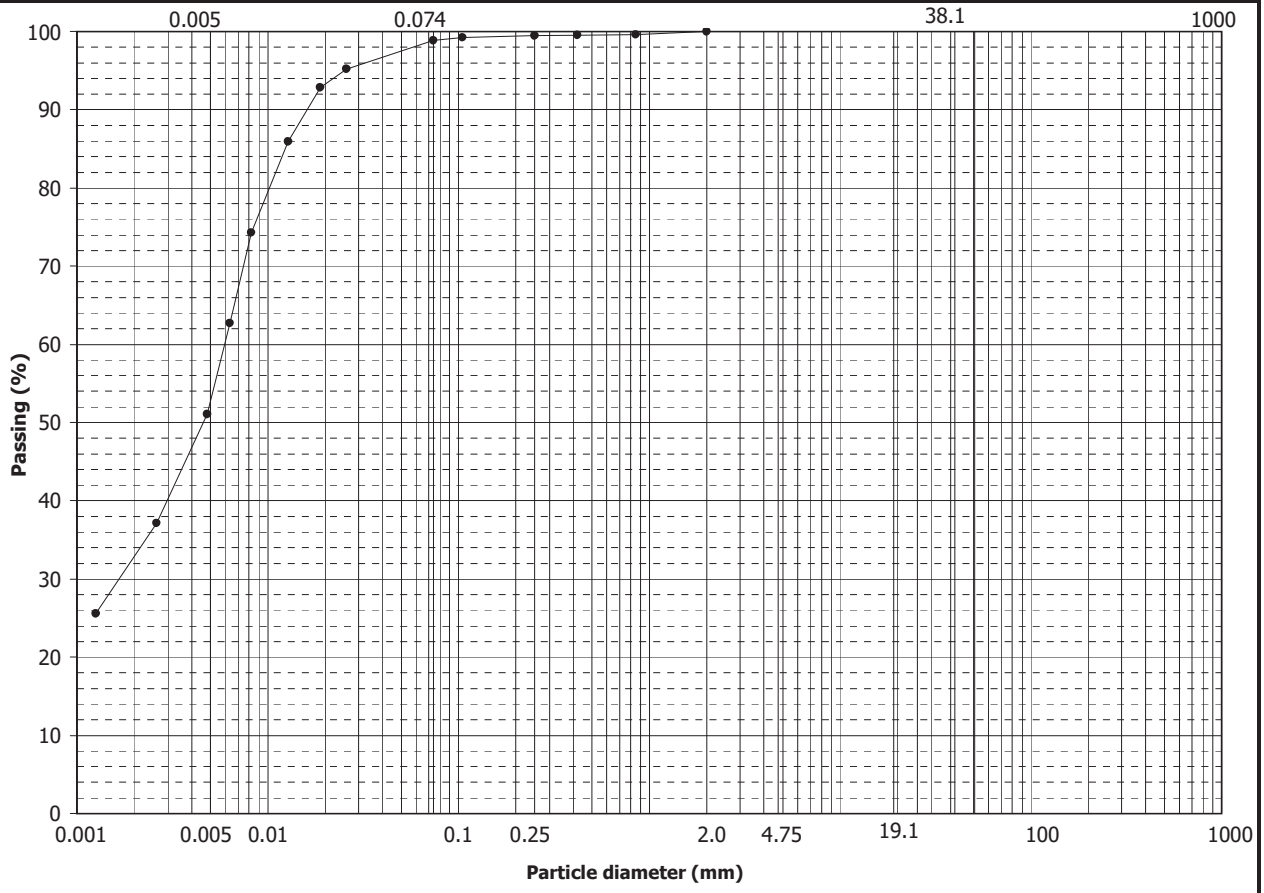
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**13.50 - 14.00**

SPECIFIC GRAVITY : **2.672**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	1.12	46.94	51.94	2.00	0.0164	0.0060	0.0046	0.0018	-	-	100.00	99.52	98.88



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**16.50 - 17.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = 0.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 19	DEPTH	16.50 - 17.00

Wt. (Air dry soil + container) = 111.03 gr — Specific Gravity : 2.666
Wt. of container B-27 = 36.85 gr — Plasticity Index : %
Wt. Of air dry soil W' = 74.18 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-30			NO	A-78			NO	A-57	A-58	
WW	61.92	DW	60.41	WW	61.37	DW	59.87	WW	62.80	DW	61.29	Mean value	
DW	60.41	TW	39.36	DW	59.87	TW	38.37	DW	61.29	TW	39.96	w	
Ww	1.51	Ws	21.05	Ww	1.50	Ws	21.50	Ww	1.51	Ws	21.33	7.08	%
w	7.17	%		w	6.98	%		w	7.08	%			

$$W = \frac{100 \times W'}{100 + w} : 69.278 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	38.0	39.0	29	5.756	5.756	2.3991	0.01226	0.0294	36.00	83.16	83.16
2	36.0	37.0	29	6.260	3.130	1.7692	0.01226	0.0217	34.00	78.54	78.54
5	33.0	34.0	29	7.017	1.403	1.1847	0.01226	0.0145	31.00	71.61	71.61
15	29.0	30.0	29	8.026	0.535	0.7315	0.01226	0.0090	27.00	62.37	62.37
30	26.0	27.0	29	8.783	0.293	0.5411	0.01226	0.0066	24.00	55.44	55.44
60	22.0	23.0	29	9.792	0.163	0.4040	0.01226	0.0050	20.00	46.20	46.20
240	17.0	18.0	28	11.054	0.046	0.2146	0.01239	0.0027	15.00	34.65	34.65
1140	13.0	14.0	29	12.063	0.011	0.1029	0.01226	0.0013	11.00	25.41	25.41

P = 100/W = 1.4435

$$Mx = \frac{G_s}{G_s - 1} = 1.6002$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.56	22.02	1.540		2.22	97.78	97.78
0.42	24.57		2.550		3.68	96.32	96.32
0.25	25.68		3.660		5.28	94.72	94.72
0.105	26.89		4.870		7.03	92.97	92.97
0.074	27.59		5.570		8.04	91.96	91.96

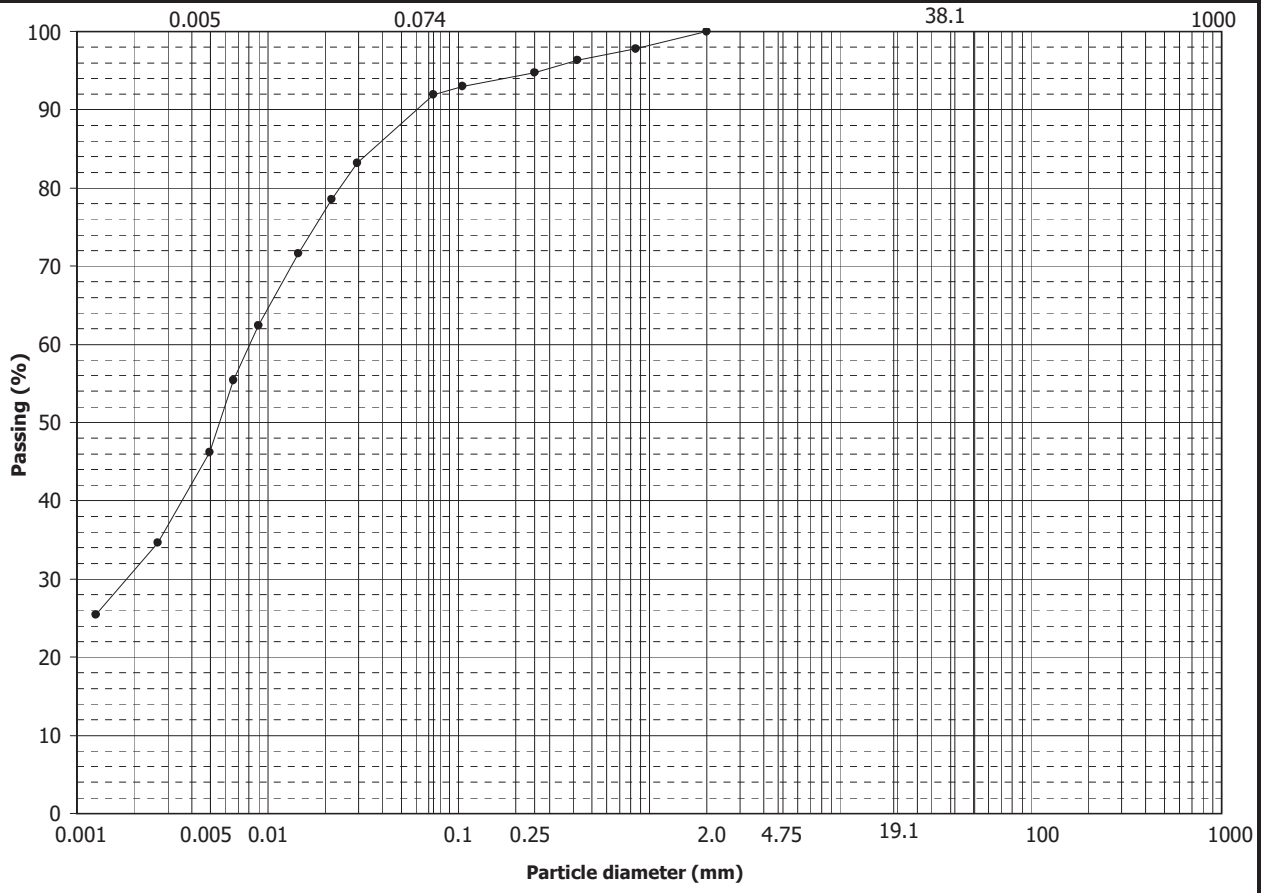
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**16.50 - 17.00**

SPECIFIC GRAVITY : **2.666**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	8.04	45.59	46.37	2.00	0.0641	0.0082	0.0056	0.0020	-	-	100.00	96.32	91.96



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 14, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 19	DEPTH	19.50 - 20.00

Wt. (Air dry soil + container) = 105.18 gr — Specific Gravity : 2.662
Wt. of container B-79 = 34.98 gr — Plasticity Index : %
Wt. Of air dry soil W' = 70.20 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-40			NO	A-19			NO	A-57		
WW	54.73	DW	53.65	WW	53.40	DW	52.44	WW	52.53	DW	51.64	Mean value	
DW	53.65	TW	39.24	DW	52.44	TW	39.40	DW	51.64	TW	39.96	w	
Ww	1.08	Ws	14.41	Ww	0.96	Ws	13.04	Ww	0.89	Ws	11.68	7.49	%
w	7.49	%		w	7.36	%		w	7.62	%			

$$W = \frac{100 \times W'}{100 + w} : 65.307 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	39.0	40.0	29	5.503	5.503	2.3459	0.01227	0.0288	37.00	90.74	90.74
2	38.0	39.0	29	5.756	2.878	1.6964	0.01227	0.0208	36.00	88.29	88.29
5	36.0	37.0	29	6.260	1.252	1.1189	0.01227	0.0137	34.00	83.39	83.39
15	32.0	33.0	29	7.269	0.485	0.6962	0.01227	0.0085	30.00	73.58	73.58
30	28.0	29.0	29	8.279	0.276	0.5253	0.01227	0.0064	26.00	63.77	63.77
60	25.0	26.0	29	9.035	0.151	0.3881	0.01227	0.0048	23.00	56.41	56.41
240	18.0	19.0	28	10.802	0.045	0.2121	0.01241	0.0026	16.00	39.24	39.24
1140	14.0	15.0	29	11.811	0.010	0.1018	0.01227	0.0012	12.00	29.43	29.43

P = 100/W = 1.5312

$$Mx = \frac{G_s}{G_s - 1} = 1.6017$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.06	22.02	1.040		1.59	98.41	98.41
0.42	23.81		1.790		2.74	97.26	97.26
0.25	24.14		2.120		3.25	96.75	96.75
0.105	25.19		3.170		4.85	95.15	95.15
0.074	25.74		3.720		5.70	94.30	94.30

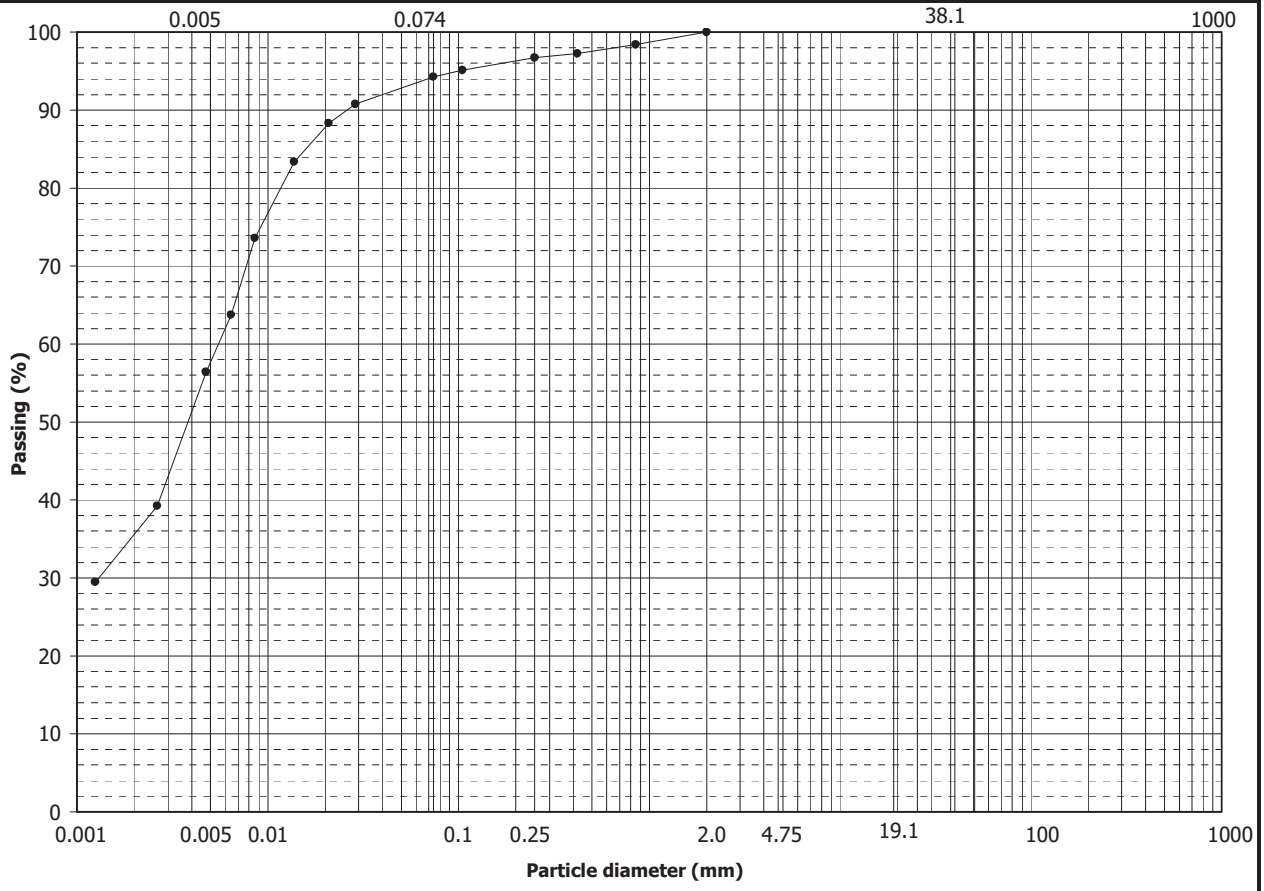
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 14, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 19**	DEPTH	**19.50 - 20.00**

SPECIFIC GRAVITY : **2.662**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	5.70	36.49	57.81	2.00	0.0264	0.0056	0.0040	0.0013	-	-	100.00	97.26	94.30



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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Cb. Sit : Jalan Jendi Barat 27 Malang Telp.: (0341) 362261, Fax.: (0341) 324402; E-mail : divisi_sit@indrakarya.co.id atau lab_geoteknik_ika@yahoo.com

LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		0.50 - 1.00

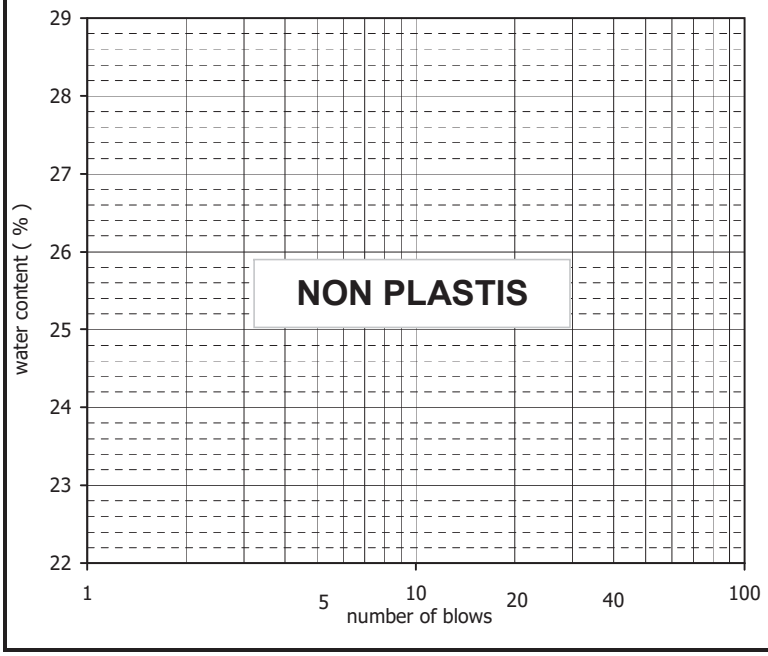
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		1.50 - 2.00

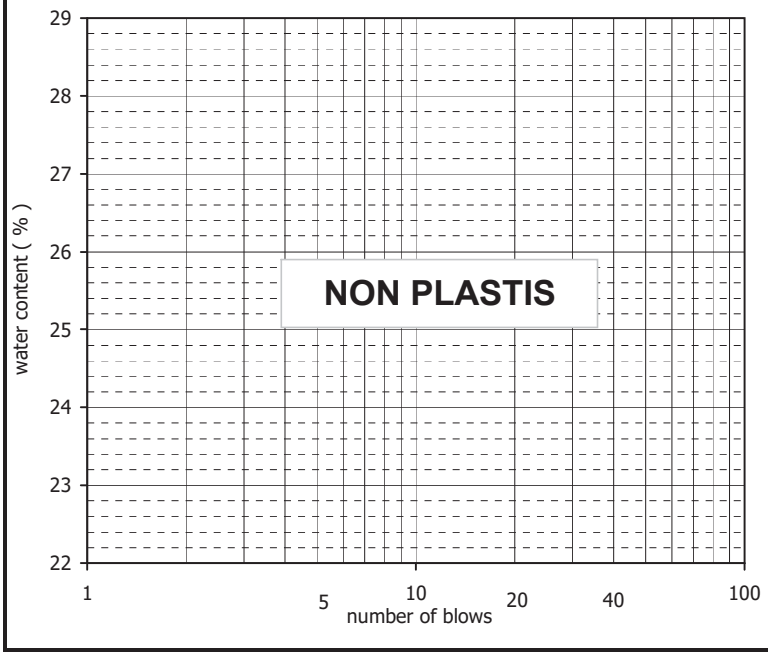
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		2.50 - 3.00

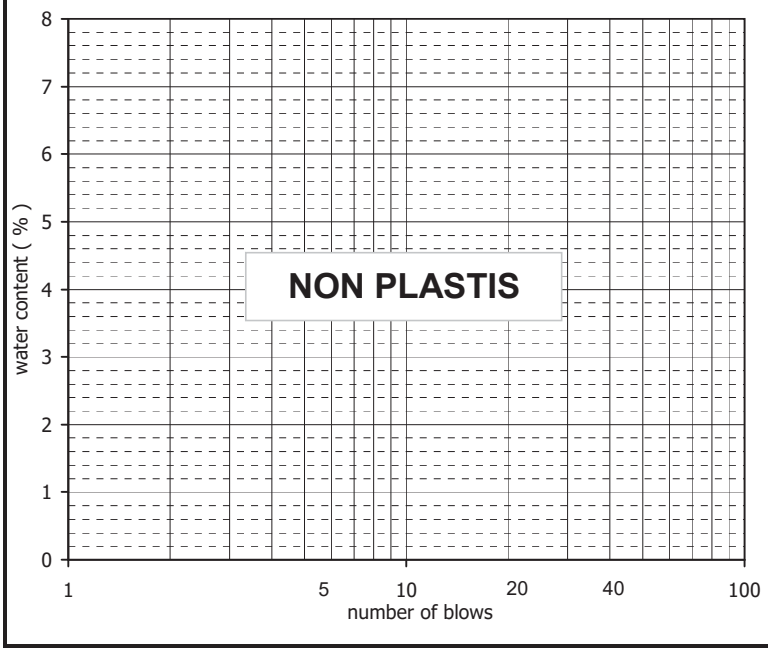
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 8, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		3.50 - 4.00

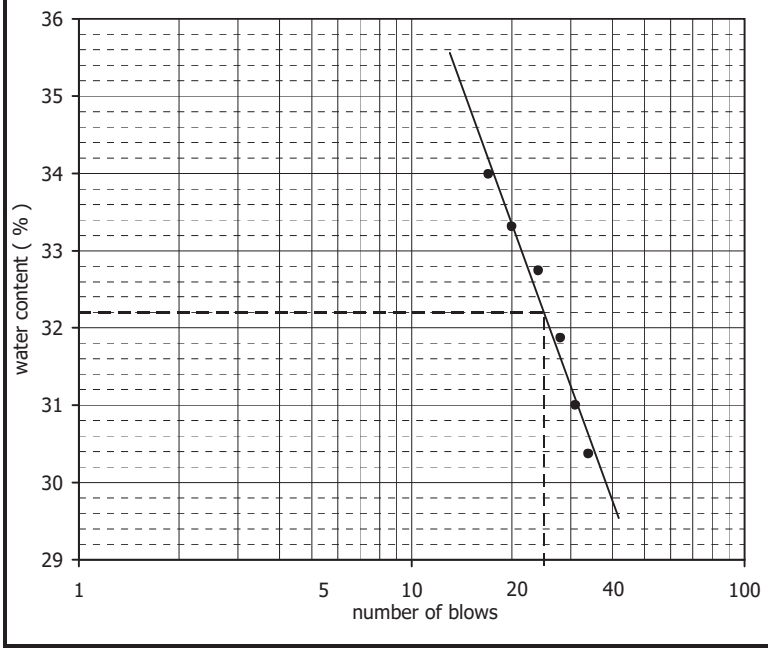
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	J-35			No.	T-53			No.	T-59
WW	53.440	DW	49.000	WW	53.840	DW	49.680	WW	53.380	DW	49.530
DW	49.000	TW	34.380	DW	49.680	TW	36.260	DW	49.530	TW	37.450
Ww	4.440	Ws	14.620	Ww	4.160	Ws	13.420	Ww	3.850	Ws	12.080
	W =		30.37 %		W =		31.00 %		W =		31.87 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	J-60			No.	T-70			No.	L-02
WW	53.550	DW	49.670	WW	57.220	DW	52.680	WW	56.330	DW	52.170
DW	49.670	TW	37.820	DW	52.680	TW	39.050	DW	52.170	TW	39.930
Ww	3.880	Ws	11.850	Ww	4.540	Ws	13.630	Ww	4.160	Ws	12.240
	W =		32.74 %		W =		33.31 %		W =		33.99 %

PLASTIC LIMIT

1				2				3			
		No.	T-87			No.	J-80			No.	T-34
WW	52.800	DW	49.270	WW	52.840	DW	49.150	WW	52.830	DW	49.390
DW	49.270	TW	36.640	DW	49.150	TW	35.670	DW	49.390	TW	37.030
Ww	3.530	Ws	12.630	Ww	3.690	Ws	13.480	Ww	3.440	Ws	12.360
	W =		27.95 %		W =		27.37 %		W =		27.83 %



LIQUID LIMIT	=	32.20	%
PLASTIC LIMIT	=	27.72	%
PLASTICITY INDEX	=	4.48	%
FLOW INDEX	=	11.83	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		4.50 - 5.00

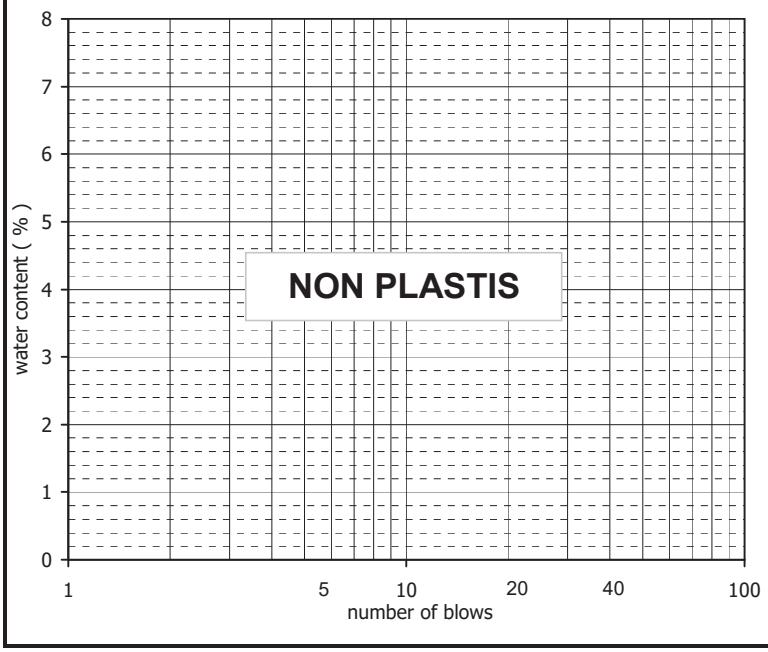
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

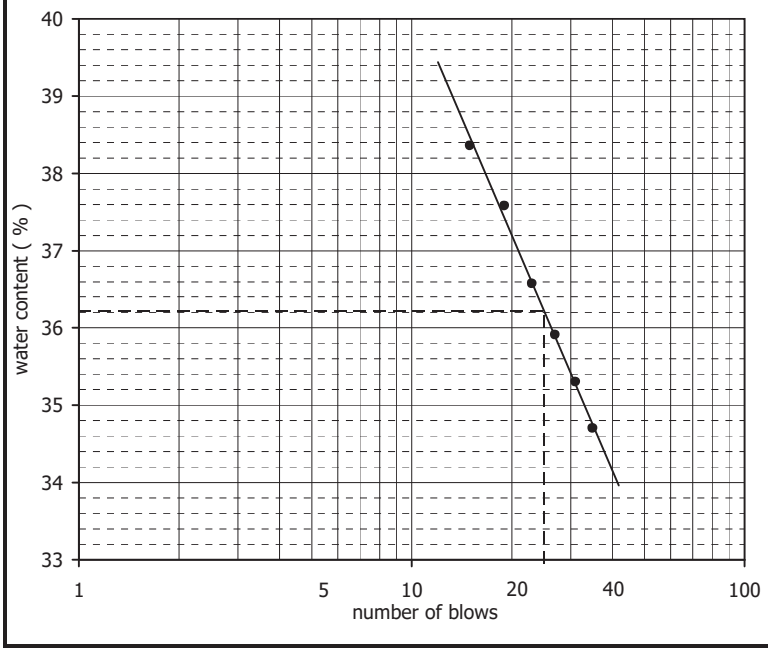
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		5.50 - 6.00

LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	T-08			No.	T-15			No.	T-09
WW	55.570	DW	51.690	WW	52.810	DW	48.990	WW	54.090	DW	49.260
DW	51.690	TW	40.510	DW	48.990	TW	38.170	DW	49.260	TW	35.810
Ww	3.880	Ws	11.180	Ww	3.820	Ws	10.820	Ww	4.830	Ws	13.450
	W =		34.70 %		W =		35.30 %		W =		35.91 %
4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	A-23			No.	T-25			No.	T-32
WW	62.330	DW	55.220	WW	52.990	DW	48.240	WW	54.090	DW	49.840
DW	55.220	TW	35.780	DW	48.240	TW	35.600	DW	49.840	TW	38.760
Ww	7.110	Ws	19.440	Ww	4.750	Ws	12.640	Ww	4.250	Ws	11.080
	W =		36.57 %		W =		37.58 %		W =		38.36 %

PLASTIC LIMIT

1				2				3			
		No.	T-05			No.	A-14			No.	A-24
WW	53.470	DW	50.050	WW	52.650	DW	49.360	WW	48.750	DW	45.620
DW	50.050	TW	37.720	DW	49.360	TW	37.540	DW	45.620	TW	34.290
Ww	3.420	Ws	12.330	Ww	3.290	Ws	11.820	Ww	3.130	Ws	11.330
	W =		27.74 %		W =		27.83 %		W =		27.63 %



LIQUID LIMIT	=	36.23 %
PLASTIC LIMIT	=	27.73 %
PLASTICITY INDEX	=	8.50 %
FLOW INDEX	=	10.06

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

PT INDRA KARYA (PERSERO)
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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 8, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		6.50 - 7.00

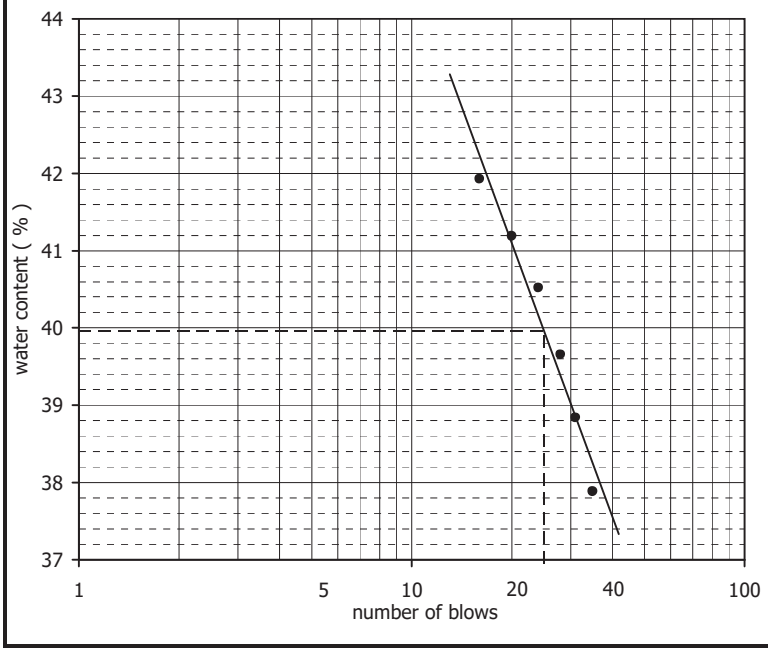
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	J-09			No.	J-48			No.	L-42
WW	56.970	DW	52.340	WW	54.410	DW	49.570	WW	58.050	DW	53.870
DW	52.340	TW	40.120	DW	49.570	TW	37.110	DW	53.870	TW	43.330
Ww	4.630	Ws	12.220	Ww	4.840	Ws	12.460	Ww	4.180	Ws	10.540
	W =	37.89	%		W =	38.84	%		W =	39.66	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	T-67			No.	A-03			No.	T-48
WW	53.540	DW	48.520	WW	56.880	DW	51.270	WW	54.940	DW	49.120
DW	48.520	TW	36.130	DW	51.270	TW	37.650	DW	49.120	TW	35.240
Ww	5.020	Ws	12.390	Ww	5.610	Ws	13.620	Ww	5.820	Ws	13.880
	W =	40.52	%		W =	41.19	%		W =	41.93	%

PLASTIC LIMIT

1				2				3			
		No.	J-19			No.	L-16			No.	J-53
WW	54.320	DW	51.260	WW	55.390	DW	52.460	WW	55.460	DW	52.380
DW	51.260	TW	37.770	DW	52.460	TW	39.330	DW	52.380	TW	38.740
Ww	3.060	Ws	13.490	Ww	2.930	Ws	13.130	Ww	3.080	Ws	13.640
	W =	22.68	%		W =	22.32	%		W =	22.58	%



LIQUID LIMIT	=	39.97	%
PLASTIC LIMIT	=	22.53	%
PLASTICITY INDEX	=	17.44	%
FLOW INDEX	=	11.69	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

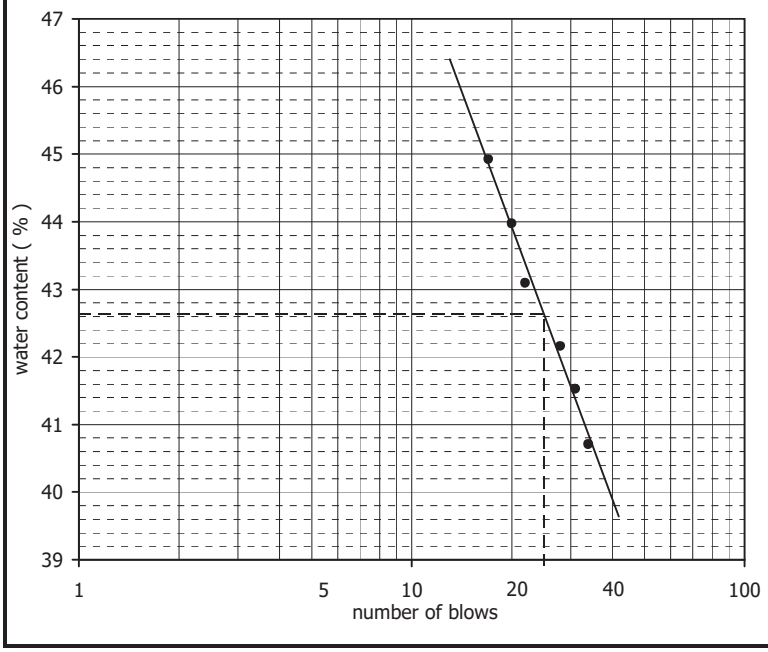
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 8, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		7.50 - 8.00

LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	J-89			No.	J-82			No.	T-84
WW	54.740	DW	49.680	WW	58.390	DW	52.630	WW	58.260	DW	52.480
DW	49.680	TW	37.250	DW	52.630	TW	38.760	DW	52.480	TW	38.770
Ww	5.060	Ws	12.430	Ww	5.760	Ws	13.870	Ww	5.780	Ws	13.710
	W =	40.71	%		W =	41.53	%		W =	42.16	%
4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	A-96			No.	A-103			No.	L-14
WW	57.340	DW	51.480	WW	56.990	DW	51.260	WW	58.000	DW	52.340
DW	51.480	TW	37.880	DW	51.260	TW	38.230	DW	52.340	TW	39.740
Ww	5.860	Ws	13.600	Ww	5.730	Ws	13.030	Ww	5.660	Ws	12.600
	W =	43.09	%		W =	43.98	%		W =	44.92	%

PLASTIC LIMIT

1				2				3			
		No.	T-95			No.	T-06			No.	A-39
WW	52.870	DW	49.630	WW	54.590	DW	51.470	WW	52.430	DW	49.520
DW	49.630	TW	36.060	DW	51.470	TW	38.470	DW	49.520	TW	37.420
Ww	3.240	Ws	13.570	Ww	3.120	Ws	13.000	Ww	2.910	Ws	12.100
	W =	23.88	%		W =	24.00	%		W =	24.05	%



LIQUID LIMIT	=	42.63	%
PLASTIC LIMIT	=	23.98	%
PLASTICITY INDEX	=	18.66	%
FLOW INDEX	=	13.27	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		8.50 - 9.00

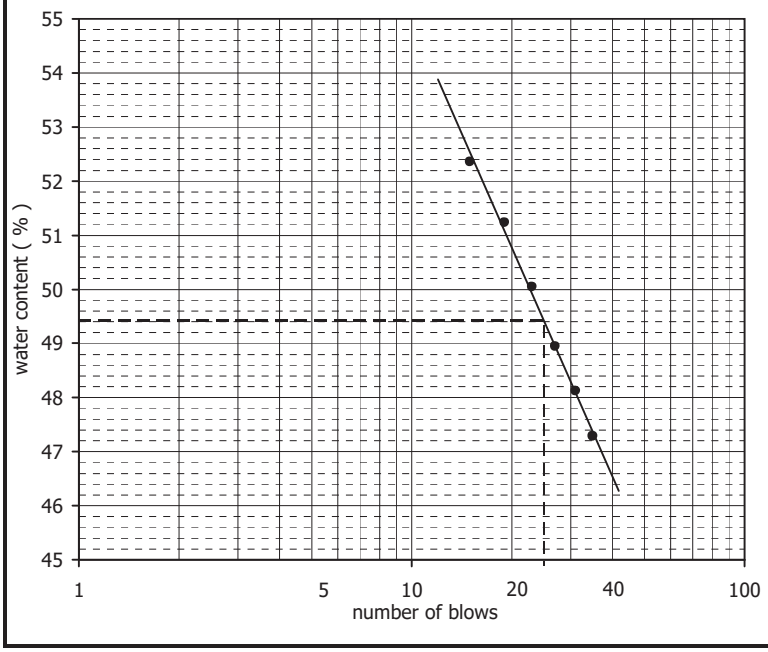
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-11			No.	A-07			No.	T-66
WW	56.810	DW	51.230	WW	58.280	DW	53.020	WW	55.260	DW	49.660
DW	51.230	TW	39.430	DW	53.020	TW	42.090	DW	49.660	TW	38.220
Ww	5.580	Ws	11.800	Ww	5.260	Ws	10.930	Ww	5.600	Ws	11.440
	W =		47.29 %		W =		48.12 %		W =		48.95 %

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	J-75			No.	A-25			No.	A-49
WW	51.280	DW	45.880	WW	59.990	DW	52.980	WW	57.560	DW	51.340
DW	45.880	TW	35.090	DW	52.980	TW	39.300	DW	51.340	TW	39.460
Ww	5.400	Ws	10.790	Ww	7.010	Ws	13.680	Ww	6.220	Ws	11.880
	W =		50.05 %		W =		51.24 %		W =		52.36 %

PLASTIC LIMIT

1				2				3			
		No.	A-63			No.	J-18			No.	A-67
WW	54.730	DW	51.320	WW	52.770	DW	49.150	WW	52.920	DW	49.220
DW	51.320	TW	39.920	DW	49.150	TW	37.000	DW	49.220	TW	36.880
Ww	3.410	Ws	11.400	Ww	3.620	Ws	12.150	Ww	3.700	Ws	12.340
	W =		29.91 %		W =		29.79 %		W =		29.98 %



LIQUID LIMIT	=	49.43	%
PLASTIC LIMIT	=	29.90	%
PLASTICITY INDEX	=	19.53	%
FLOW INDEX	=	13.96	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		9.50 - 10.00

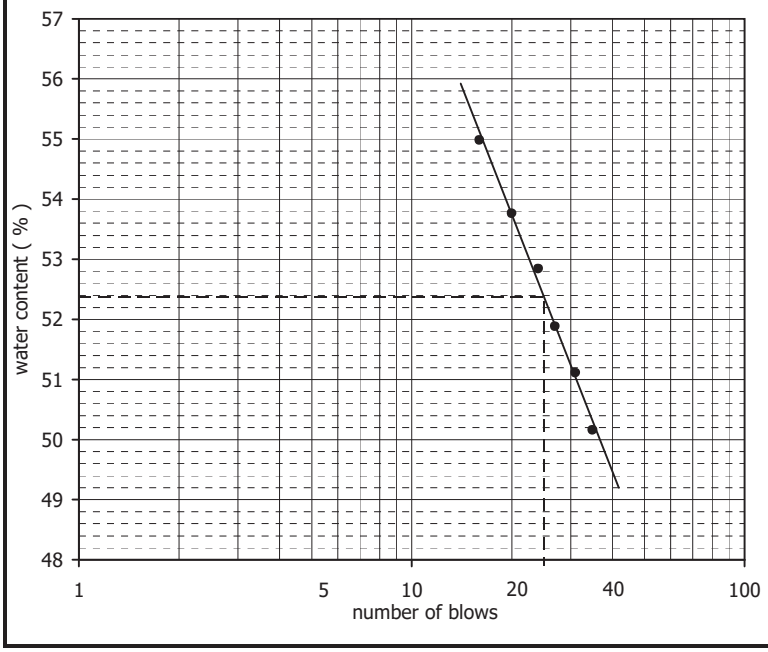
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	T-10			No.	L-36			No.	T-13
WW	57.590	DW	51.230	WW	58.690	DW	52.490	WW	56.150	DW	49.660
DW	51.230	TW	38.550	DW	52.490	TW	40.360	DW	49.660	TW	37.150
Ww	6.360	Ws	12.680	Ww	6.200	Ws	12.130	Ww	6.490	Ws	12.510
	W =		50.16 %		W =		51.11 %		W =		51.88 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	A-72			No.	T-38			No.	L-26
WW	58.870	DW	51.160	WW	58.930	DW	51.570	WW	58.840	DW	51.350
DW	51.160	TW	36.570	DW	51.570	TW	37.880	DW	51.350	TW	37.728
Ww	7.710	Ws	14.590	Ww	7.360	Ws	13.690	Ww	7.490	Ws	13.622
	W =		52.84 %		W =		53.76 %		W =		54.98 %

PLASTIC LIMIT

1				2				3			
		No.	J-22			No.	T-47			No.	A-26
WW	50.010	DW	47.420	WW	47.940	DW	45.210	WW	51.630	DW	48.200
DW	47.420	TW	39.010	DW	45.210	TW	36.270	DW	48.200	TW	37.220
Ww	2.590	Ws	8.410	Ww	2.730	Ws	8.940	Ww	3.430	Ws	10.980
	W =		30.80 %		W =		30.54 %		W =		31.24 %



LIQUID LIMIT	=	52.37	%
PLASTIC LIMIT	=	30.86	%
PLASTICITY INDEX	=	21.52	%
FLOW INDEX	=	14.11	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		11.50 - 12.00

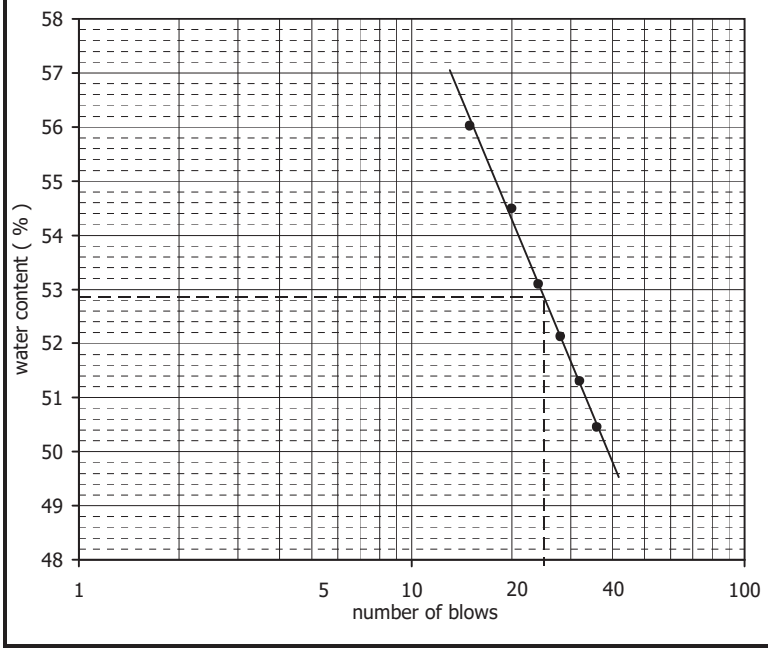
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	J-59			No.	J-63			No.	J-73
WW	57.750	DW	51.120	WW	57.070	DW	50.770	WW	55.800	DW	49.110
DW	51.120	TW	37.980	DW	50.770	TW	38.488	DW	49.110	TW	36.277
Ww	6.630	Ws	13.140	Ww	6.300	Ws	12.282	Ww	6.690	Ws	12.834
	W =	50.46	%		W =	51.30	%		W =	52.13	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			15 x
		No.	L-22			No.	A-66			No.	L-31
WW	57.180	DW	51.160	WW	58.450	DW	51.420	WW	58.940	DW	51.330
DW	51.160	TW	39.820	DW	51.420	TW	38.520	DW	51.330	TW	37.745
Ww	6.020	Ws	11.340	Ww	7.030	Ws	12.900	Ww	7.610	Ws	13.585
	W =	53.09	%		W =	54.50	%		W =	56.02	%

PLASTIC LIMIT

1				2				3			
		No.	T-26			No.	L-32			No.	L-39
WW	51.930	DW	48.660	WW	52.730	DW	49.360	WW	51.520	DW	48.330
DW	48.660	TW	38.090	DW	49.360	TW	38.440	DW	48.330	TW	38.090
Ww	3.270	Ws	10.570	Ww	3.370	Ws	10.920	Ww	3.190	Ws	10.240
	W =	30.94	%		W =	30.86	%		W =	31.15	%



LIQUID LIMIT	=	52.86	%
PLASTIC LIMIT	=	30.98	%
PLASTICITY INDEX	=	21.88	%
FLOW INDEX	=	14.78	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		13.50 - 14.00

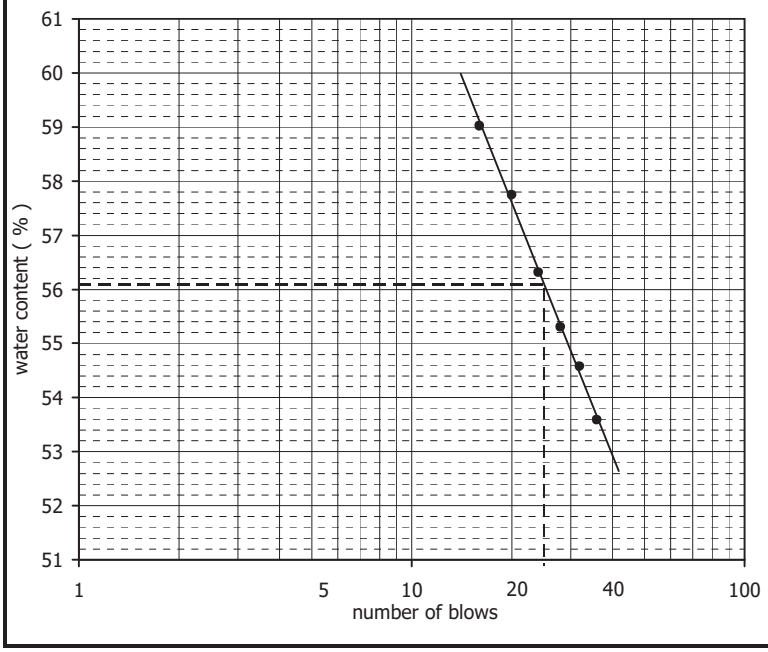
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	J-77			No.	J-36			No.	J-89
WW	56.770	DW	50.650	WW	57.980	DW	51.210	WW	56.430	DW	49.600
DW	50.650	TW	39.230	DW	51.210	TW	38.805	DW	49.600	TW	37.250
Ww	6.120	Ws	11.420	Ww	6.770	Ws	12.405	Ww	6.830	Ws	12.350
	W =	53.59	%		W =	54.57	%		W =	55.30	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	T-90			No.	L-03			No.	J-65
WW	59.570	DW	51.770	WW	58.850	DW	51.210	WW	52.760	DW	45.890
DW	51.770	TW	37.920	DW	51.210	TW	37.980	DW	45.890	TW	34.250
Ww	7.800	Ws	13.850	Ww	7.640	Ws	13.230	Ww	6.870	Ws	11.640
	W =	56.32	%		W =	57.75	%		W =	59.02	%

PLASTIC LIMIT

1				2				3			
		No.	J-27			No.	L-48			No.	A-57
WW	50.190	DW	46.660	WW	51.820	DW	48.060	WW	54.170	DW	50.810
DW	46.660	TW	35.230	DW	48.060	TW	35.940	DW	50.810	TW	39.960
Ww	3.530	Ws	11.430	Ww	3.760	Ws	12.120	Ww	3.360	Ws	10.850
	W =	30.88	%		W =	31.02	%		W =	30.97	%



LIQUID LIMIT	=	56.11	%
PLASTIC LIMIT	=	30.96	%
PLASTICITY INDEX	=	25.15	%
FLOW INDEX	=	15.42	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		16.50 - 17.00

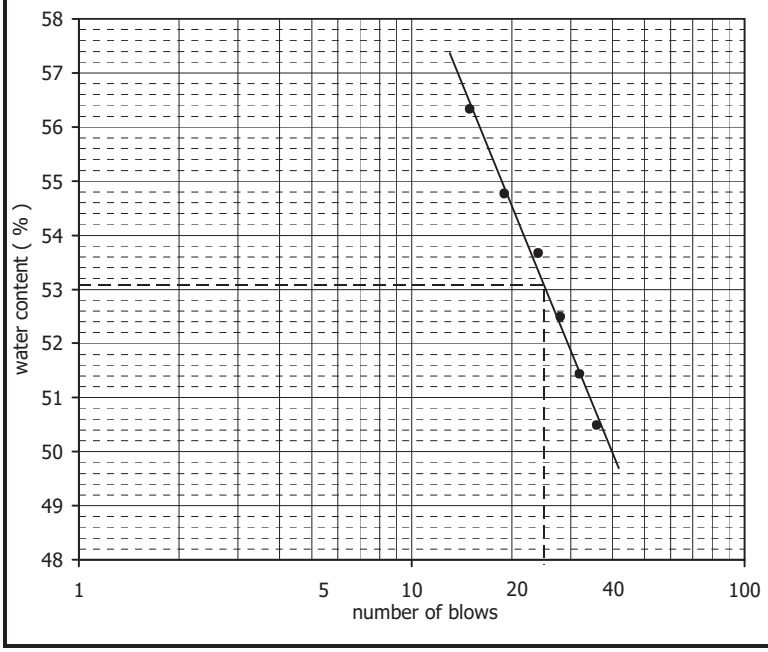
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	A-47			No.	A-65			No.	A-77
WW	56.830	DW	50.130	WW	58.180	DW	51.560	WW	49.770	DW	43.980
DW	50.130	TW	36.860	DW	51.560	TW	38.690	DW	43.980	TW	32.950
Ww	6.700	Ws	13.270	Ww	6.620	Ws	12.870	Ww	5.790	Ws	11.030
	W =		50.49 %		W =		51.44 %		W =		52.49 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	J-31			No.	J-40			No.	A-89
WW	49.920	DW	43.630	WW	58.610	DW	51.430	WW	57.720	DW	50.420
DW	43.630	TW	31.910	DW	51.430	TW	38.320	DW	50.420	TW	37.460
Ww	6.290	Ws	11.720	Ww	7.180	Ws	13.110	Ww	7.300	Ws	12.960
	W =		53.67 %		W =		54.77 %		W =		56.33 %

PLASTIC LIMIT

1				2				3			
		No.	T-62			No.	A-76			No.	L-46
WW	51.040	DW	47.420	WW	48.900	DW	45.660	WW	52.970	DW	49.610
DW	47.420	TW	35.760	DW	45.660	TW	35.160	DW	49.610	TW	38.750
Ww	3.620	Ws	11.660	Ww	3.240	Ws	10.500	Ww	3.360	Ws	10.860
	W =		31.05 %		W =		30.86 %		W =		30.94 %



LIQUID LIMIT	=	53.09	%
PLASTIC LIMIT	=	30.95	%
PLASTICITY INDEX	=	22.14	%
FLOW INDEX	=	15.06	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 19	DEPTH (m)		19.50 - 20.00

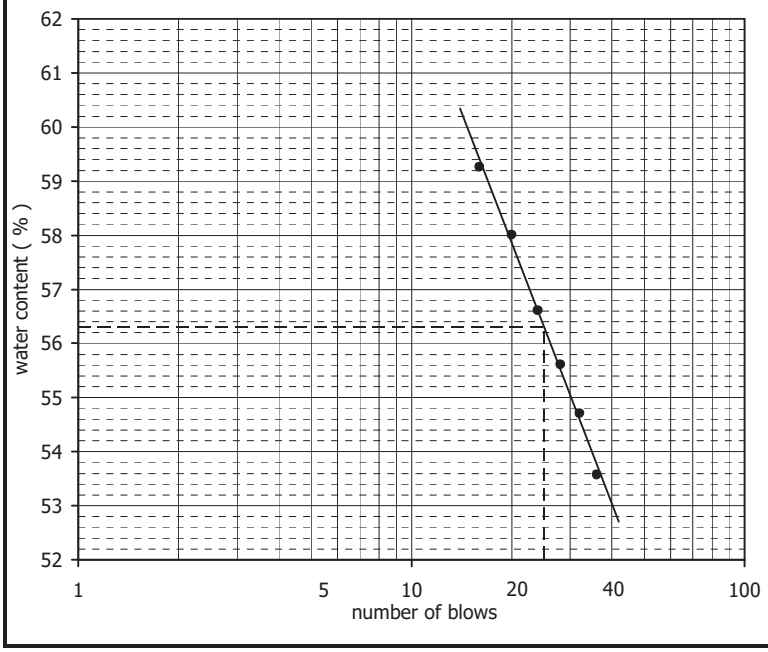
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	A-35			No.	A-48			No.	L-10
WW	58.110	DW	51.820	WW	59.330	DW	52.650	WW	57.880	DW	51.780
DW	51.820	TW	40.080	DW	52.650	TW	40.440	DW	51.780	TW	40.810
Ww	6.290	Ws	11.740	Ww	6.680	Ws	12.210	Ww	6.100	Ws	10.970
	W =		53.58 %		W =		54.71 %		W =		55.61 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	A-104			No.	L-25			No.	J-38
WW	60.600	DW	51.260	WW	58.500	DW	51.150	WW	58.220	DW	50.540
DW	51.260	TW	34.760	DW	51.150	TW	38.480	DW	50.540	TW	37.580
Ww	9.340	Ws	16.500	Ww	7.350	Ws	12.670	Ww	7.680	Ws	12.960
	W =		56.61 %		W =		58.01 %		W =		59.26 %

PLASTIC LIMIT

1				2				3			
		No.	L-18			No.	A-83			No.	J-86
WW	50.130	DW	47.290	WW	50.760	DW	47.010	WW	50.420	DW	47.280
DW	47.290	TW	38.270	DW	47.010	TW	35.150	DW	47.280	TW	37.190
Ww	2.840	Ws	9.020	Ww	3.750	Ws	11.860	Ww	3.140	Ws	10.090
	W =		31.49 %		W =		31.62 %		W =		31.12 %



LIQUID LIMIT	=	56.31	%
PLASTIC LIMIT	=	31.41	%
PLASTICITY INDEX	=	24.90	%
FLOW INDEX	=	16.01	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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SUMMARY OF SOIL TEST

PROJECT			**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**								
LOCATION			**LERO TATALI - DONGGALA**								
SAMPLE No			BAY - 20	BAY - 20	BAY - 20	BAY - 20	BAY - 20	BAY - 20	BAY - 20	BAY - 20	BAY - 20
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	3.41	10.14	8.58	8.25	7.68	14.22	14.61	15.49	15.43
	Specific gravity of soil	*Gs*	2.655	2.729	2.732	2.725	2.710	2.651	2.681	2.648	2.621
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	10.00	37.07	25.44	25.51	48.57	9.97	1.63	0.00	0.00
	Proportion – Sand part	(%)	83.32	49.99	61.66	61.61	35.49	83.41	67.78	57.40	53.59
	Proportion – Silt part	(%)	5.21	9.93	8.98	9.27	12.35	5.05	25.50	27.49	30.59
	Proportion – Clay part	(%)	1.48	3.01	3.92	3.61	3.59	1.57	5.09	15.11	15.82
	Max. diameter	(mm)	19.10	25.40	25.40	25.40	25.40	19.10	9.52	4.75	2.00
	90 % diameter	(mm)	4.7494	21.2248	13.5238	13.5922	22.1513	4.7443	0.6791	1.1561	0.7512
	60 % diameter	(mm)	0.9555	3.3331	1.5574	1.5554	8.1998	0.9605	0.1735	0.1966	0.1294
	50 % diameter	(mm)	0.7186	1.3252	0.8806	0.8711	4.1730	0.7205	0.1146	0.1063	0.0844
	30 % diameter	(mm)	0.4058	0.4670	0.4255	0.4366	0.6680	0.4084	0.0724	0.0321	0.0303
	10 % diameter	(mm)	0.1292	0.0350	0.0383	0.0468	0.0358	0.1306	0.0194	-	-
	Uniformity Coefficient		7.39	95.27	40.68	33.25	229.12	7.35	8.94	-	-
	Passing # 200		6.68	12.93	12.90	12.88	15.94	6.62	30.59	42.60	46.41
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	24.62	25.26
	Plastic limit	*PL* (%)								18.57	20.69
	Plasticity index	*PI* (%)								6.05	4.57
	Flow index									8.08	8.83
	Unified Classification									SC - SM	SC - SM

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**LERO TATALI - DONGGALA**									
SAMPLE No			BAY - 20	BAY - 20	BAY - 20	BAY - 20	BAY - 20				
DEPTH (m)			9.50 - 10.00	11.50 - 12.00	13.50 - 14.00	16.50 - 17.00	18.50 - 19.00				
PROPERTIES	Natural Water Content	(%)	16.58	17.74	15.93	11.55	25.36				
	Specific gravity of soil	*Gs*	2.641	2.652	2.635	2.712	2.681				
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	20.36	0.00	0.00	0.00	0.00				
	Proportion – Sand part	(%)	53.04	52.86	50.05	78.61	20.74				
	Proportion – Silt part	(%)	24.55	42.45	33.71	17.16	61.95				
	Proportion – Clay part	(%)	2.05	4.69	16.24	4.23	17.31				
	Max. diameter	(mm)	19.10	2.00	2.00	2.00	4.75				
	90 % diameter	(mm)	11.7808	0.6995	0.3810	1.4426	0.1692				
	60 % diameter	(mm)	0.2997	0.1478	0.0972	0.5236	0.0474				
	50 % diameter	(mm)	0.1928	0.0877	0.0741	0.3794	0.0336				
	30 % diameter	(mm)	0.0827	0.0424	0.0306	0.1630	0.0173				
	10 % diameter	(mm)	0.0347	0.0135	-	0.0232	-				
	Uniformity Coefficient		8.65	10.96	-	22.58	-				
	Passing # 200		26.60	47.14	49.95	21.39	79.26				
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	26.15	NON PLASTIS	28.82				
	Plastic limit	*PL* (%)			21.39		20.44				
	Plasticity index	*PI* (%)			4.76		8.39				
	Flow index				7.63		9.42				
	Unified Classification				SC - SM		CL				

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	LERO TATALI - DONGGALA

Date	Sample No.& Depth (m)	Average (%)	Calculation					Date	Sample No.& Depth (m)	Average (%)	Calculation				
					No	T-48							No	J-50	
11/02	BAY - 20		WW	94.34	DW	92.39		11/02	BAY - 20		WW	131.01	DW	118.61	
2019	0.50 - 1.00	3.41	DW	92.39	TW	35.24		2019	8.50 - 9.00	15.43	DW	118.61	TW	38.24	
			Ww	1.95	Ws	57.15					Ww	12.40	Ws	80.37	
				WC	(%)	3.41						WC	(%)	15.43	
					No	T-31							No	T-07	
11/02	BAY - 20		WW	104.98	DW	98.81		11/02	BAY - 20		WW	132.37	DW	118.97	
2019	1.50 - 2.00	10.14	DW	98.81	TW	37.94		2019	9.50 - 10.00	16.58	DW	118.97	TW	38.16	
			Ww	6.17	Ws	60.87					Ww	13.40	Ws	80.81	
				WC	(%)	10.14						WC	(%)	16.58	
					No	L-43							No	T-69	
11/02	BAY - 20		WW	138.05	DW	130.15		11/02	BAY - 20		WW	151.00	DW	133.96	
2019	2.50 - 3.00	8.58	DW	130.15	TW	38.07		2019	11.50 - 12.00	17.74	DW	133.96	TW	37.90	
			Ww	7.90	Ws	92.08					Ww	17.04	Ws	96.06	
				WC	(%)	8.58						WC	(%)	17.74	
					No	J-41							No	A-60	
11/02	BAY - 20		WW	119.28	DW	113.00		11/02	BAY - 20		WW	132.60	DW	119.82	
2019	3.50 - 4.00	8.25	DW	113.00	TW	36.92		2019	13.50 - 14.00	15.93	DW	119.82	TW	39.61	
			Ww	6.28	Ws	76.08					Ww	12.78	Ws	80.21	
				WC	(%)	8.25						WC	(%)	15.93	
					No	T-28							No	A-91	
11/02	BAY - 20		WW	107.92	DW	102.78		11/02	BAY - 20		WW	130.50	DW	120.82	
2019	4.50 - 5.00	7.68	DW	102.78	TW	35.85		2019	16.50 - 17.00	11.55	DW	120.82	TW	37.03	
			Ww	5.14	Ws	66.93					Ww	9.68	Ws	83.79	
				WC	(%)	7.68						WC	(%)	11.55	
					No	A-03							No	L-32	
11/02	BAY - 20		WW	116.60	DW	106.77		11/02	BAY - 20		WW	118.31	DW	102.15	
2019	5.50 - 6.00	14.22	DW	106.77	TW	37.65		2019	18.50 - 19.00	25.36	DW	102.15	TW	38.44	
			Ww	9.83	Ws	69.12					Ww	16.16	Ws	63.71	
				WC	(%)	14.22						WC	(%)	25.36	
					No	J-40							No		
11/02	BAY - 20		WW	121.38	DW	110.79					WW		DW		
2019	6.50 - 7.00	14.61	DW	110.79	TW	38.32					DW		TW		
			Ww	10.59	Ws	72.47					Ww		Ws		
				WC	(%)	14.61						WC	(%)		
					No	J-75							No		
11/02	BAY - 20		WW	118.88	DW	107.64					WW		DW		
2019	7.50 - 8.00	15.49	DW	107.64	TW	35.09					DW		TW		
			Ww	11.24	Ws	72.55					Ww		Ws		
				WC	(%)	15.49						WC	(%)		

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				29	11	62	
Weight of Pycnometer		Wf	(gr)	36.900	68.490	41.480	
Weight of (Pycnometer + Water)		Wa	(gr)	135.800	168.640	152.370	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.560	181.290	165.100	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.180	38.020	38.130	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.400	20.240	20.350	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8000	168.6400	152.3700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.640	7.590	7.620	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.670	2.667	2.671	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.656	2.653	2.657	
Average Specific Gravity at 20° C							**2.655**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				6	67	46	
Weight of Pycnometer		Wf	(gr)	65.150	36.820	39.280	
Weight of (Pycnometer + Water)		Wa	(gr)	167.850	137.620	140.310	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	180.730	150.420	153.220	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	37.960	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.180	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.8500	137.6200	140.3100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.390	7.380	7.370	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.743	2.734	2.752	
Coefficient for Temperature Correction K				0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.729	2.720	2.738	
Average Specific Gravity at 20° C							**2.729**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				49	52	43	
Weight of Pycnometer		Wf	(gr)	39.190	52.420	40.060	
Weight of (Pycnometer + Water)		Wa	(gr)	141.110	153.990	142.260	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	154.050	166.960	155.020	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.150	38.160	37.850	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.370	20.380	20.070	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	141.1100	153.9900	142.2600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.430	7.410	7.310	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.742	2.750	2.746	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.727	2.736	2.731	
Average Specific Gravity at 20° C							**2.732**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				15	13	84	
Weight of Pycnometer		Wf	(gr)	77.130	66.070	36.950	
Weight of (Pycnometer + Water)		Wa	(gr)	173.150	167.270	136.980	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	185.990	180.080	149.730	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.010	37.930	37.880	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.230	20.150	20.100	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	173.1500	167.2700	136.9800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.390	7.340	7.350	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.737	2.745	2.735	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.723	2.731	2.721	
Average Specific Gravity at 20° C							**2.725**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				3	86	53	
Weight of Pycnometer		Wf	(gr)	63.340	39.080	52.280	
Weight of (Pycnometer + Water)		Wa	(gr)	166.670	138.850	153.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	179.670	151.610	166.020	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.320	37.960	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.540	20.180	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	166.6700	138.8500	153.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.540	7.420	7.430	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.724	2.720	2.729	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.710	2.706	2.715	
Average Specific Gravity at 20° C							**2.710**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				51	71	82	
Weight of Pycnometer		Wf	(gr)	53.870	39.800	37.300	
Weight of (Pycnometer + Water)		Wa	(gr)	154.280	140.220	137.000	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	166.940	152.920	149.710	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.040	38.120	38.120	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.260	20.340	20.340	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	154.2800	140.2200	137.0000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.600	7.640	7.630	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.666	2.662	2.666	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.652	2.649	2.652	
Average Specific Gravity at 20° C							**2.651**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				17	65	22	
Weight of Pycnometer		Wf	(gr)	64.940	34.080	39.710	
Weight of (Pycnometer + Water)		Wa	(gr)	169.440	134.270	145.030	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.090	147.060	157.840	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.890	38.120	38.150	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.110	20.340	20.370	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.4400	134.2700	145.0300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.460	7.550	7.560	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.696	2.694	2.694	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.682	2.680	2.681	
Average Specific Gravity at 20° C							**2.681**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				33	16	27	
Weight of Pycnometer		Wf	(gr)	37.510	66.000	39.750	
Weight of (Pycnometer + Water)		Wa	(gr)	138.180	169.300	140.000	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.970	181.920	152.590	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.270	37.980	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.490	20.200	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1800	169.3000	140.0000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.700	7.580	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.661	2.665	2.659	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.647	2.651	2.645	
Average Specific Gravity at 20° C							**2.648**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				66	8	58	
Weight of Pycnometer		Wf	(gr)	36.290	67.390	35.070	
Weight of (Pycnometer + Water)		Wa	(gr)	136.280	168.560	145.730	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.860	181.050	158.340	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	37.910	38.110	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.130	20.330	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.2800	168.5600	145.7300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.690	7.640	7.720	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.636	2.635	2.633	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.622	2.621	2.620	
Average Specific Gravity at 20° C							**2.621**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				38	55	59	
Weight of Pycnometer		Wf	(gr)	37.290	51.050	33.640	
Weight of (Pycnometer + Water)		Wa	(gr)	136.940	151.910	144.580	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.430	164.490	157.140	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.840	37.950	37.920	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.060	20.170	20.140	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9400	151.9100	144.5800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.590	7.580	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.650	2.657	2.657	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.636	2.644	2.643	
Average Specific Gravity at 20° C							**2.641**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	11.50 - 12.00

Determination No				1	2	3	4
No of Pycnometer				7	10	70	
Weight of Pycnometer		Wf	(gr)	68.750	67.070	37.010	
Weight of (Pycnometer + Water)		Wa	(gr)	169.400	168.920	136.860	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.150	181.620	149.540	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.220	38.080	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.440	20.300	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.4000	168.9200	136.8600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.690	7.600	7.600	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.658	2.671	2.668	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.644	2.657	2.655	
Average Specific Gravity at 20° C							**2.652**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	13.50 - 14.00

Determination No				1	2	3	4
No of Pycnometer				44	54	76	
Weight of Pycnometer		Wf	(gr)	38.880	51.250	38.610	
Weight of (Pycnometer + Water)		Wa	(gr)	139.990	151.310	139.040	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	152.650	163.950	151.580	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.160	38.040	37.930	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.380	20.260	20.150	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	139.9900	151.3100	139.0400	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.720	7.620	7.610	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.640	2.659	2.648	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.626	2.645	2.634	
Average Specific Gravity at 20° C							**2.635**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	16.50 - 17.00

Determination No				1	2	3	4
No of Pycnometer				56	64	81	
Weight of Pycnometer		Wf	(gr)	52.690	37.070	36.910	
Weight of (Pycnometer + Water)		Wa	(gr)	152.160	148.310	135.890	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.980	161.230	148.690	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.060	38.160	37.990	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.280	20.380	20.210	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	152.1600	148.3100	135.8900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.460	7.460	7.410	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.718	2.732	2.727	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.705	2.718	2.713	
Average Specific Gravity at 20° C							**2.712**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 20	DEPTH	18.50 - 19.00

Determination No				1	2	3	4
No of Pycnometer				77	36	31	
Weight of Pycnometer		Wf	(gr)	39.760	51.080	34.630	
Weight of (Pycnometer + Water)		Wa	(gr)	139.850	151.920	134.510	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	152.660	164.630	147.270	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.120	38.010	38.070	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.340	20.230	20.290	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	139.8500	151.9200	134.5100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.530	7.520	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.701	2.690	2.695	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.687	2.676	2.681	
Average Specific Gravity at 20° C							**2.681**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 403.9 gr
Wt. container No ..... = 44.80 gr
Wt. Of air dry soil W' = 359.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **359.10** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	59.40	44.80	14.60		4.07	95.93
4.75	80.70		35.90		10.00	90.00
2.00	127.10		82.30		22.92	77.08

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	0.50 - 1.00

Wt. (Air dry soil + container) = 153.41 gr — Specific Gravity : 2.655
Wt. of container B-104 = 35.63 gr — Plasticity Index : %
Wt. Of air dry soil W' = 117.78 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 77.08 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-20			NO	L-33			NO	L-37		
WW	62.33	DW	61.55	WW	61.81	DW	61.06	WW	63.23	DW	62.39	Mean value	
DW	61.55	TW	39.35	DW	61.06	TW	39.46	DW	62.39	TW	38.85	w	
Ww	0.78	Ws	22.20	Ww	0.75	Ws	21.60	Ww	0.84	Ws	23.54	3.52	%
w	3.51	%		w	3.47	%		w	3.57	%			

$$W = \frac{100 \times W'}{100 + w} : 113.777 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	7.0	8.0	28	13.577	13.577	3.6847	0.01244	0.0458	5.00	7.05	5.43
2	6.5	7.5	28	13.703	6.852	2.6175	0.01244	0.0325	4.50	6.34	4.89
5	5.5	6.5	28	13.955	2.791	1.6706	0.01244	0.0208	3.50	4.93	3.80
15	4.5	5.5	28	14.208	0.947	0.9732	0.01244	0.0121	2.50	3.52	2.72
30	4.0	5.0	28	14.334	0.478	0.6912	0.01244	0.0086	2.00	2.82	2.17
60	3.5	4.5	28	14.460	0.241	0.4909	0.01244	0.0061	1.50	2.11	1.63
240	3.0	4.0	29	14.586	0.061	0.2465	0.01230	0.0030	1.00	1.41	1.09
1140	2.5	3.5	28	14.712	0.013	0.1136	0.01244	0.0014	0.50	0.70	0.54

P = 100/W = 0.8789

$$Mx = \frac{G_s}{G_s - 1} = 1.6042$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	49.78	22.02	27.760		24.40	75.60	58.27
0.42	89.75		67.730		59.53	40.47	31.20
0.25	110.85		88.830		78.07	21.93	16.90
0.105	123.08		101.060		88.82	11.18	8.62
0.074	125.93		103.910		91.33	8.67	6.68

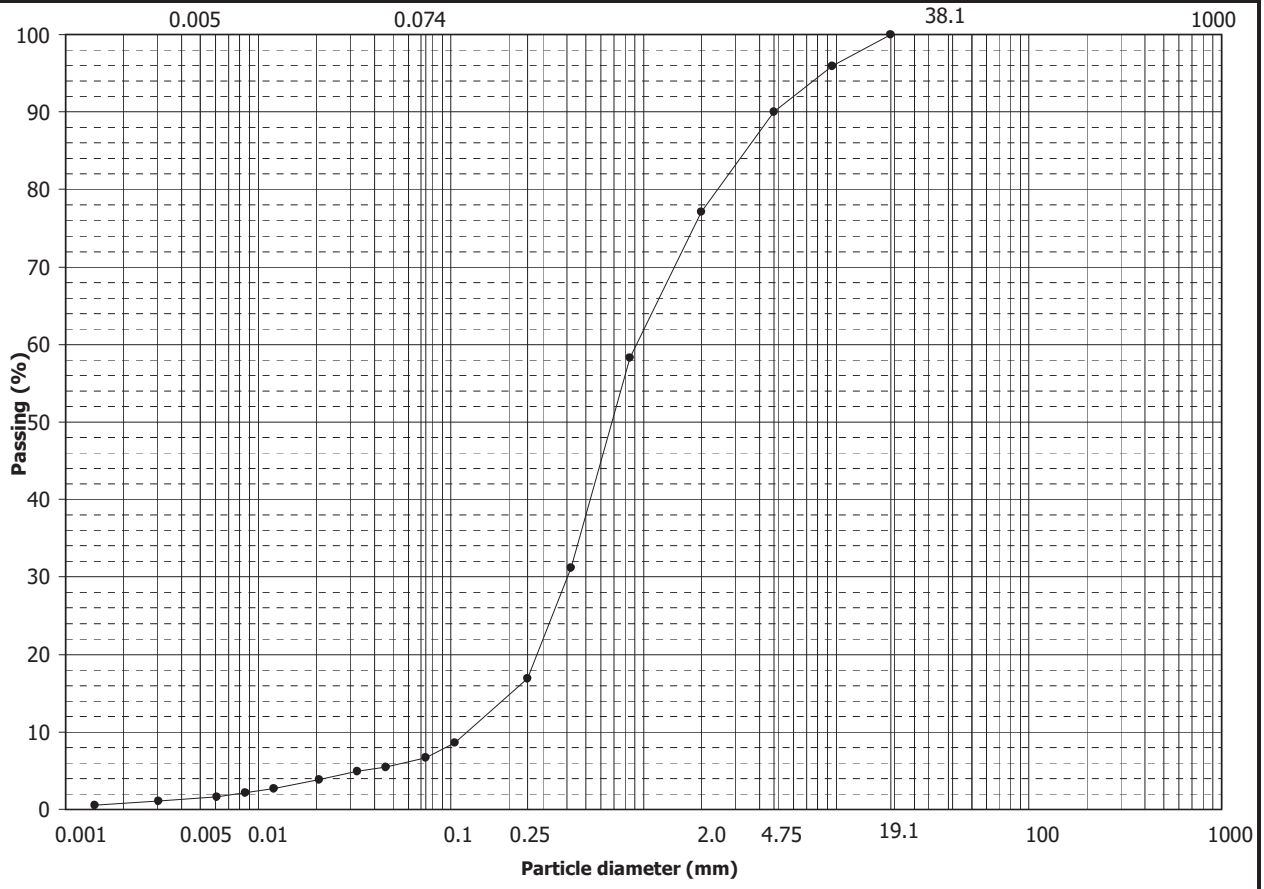
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.655**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
10.00	83.32	5.21	1.48	19.10	4.749	0.9555	0.7186	0.4058	0.1292	7.39	77.08	31.20	6.68



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 406.0 gr
Wt. container No ..... = 36.20 gr
Wt. Of air dry soil W' = 369.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **369.80** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	92.00	36.20	55.80		15.09	84.91
9.52	139.20		103.00		27.85	72.15
4.75	173.30		137.10		37.07	62.93
2.00	194.30		158.10		42.75	57.25

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	1.50 - 2.00

Wt. (Air dry soil + container) = 156.73 gr — Specific Gravity : 2.729
Wt. of container B-100 = 35.43 gr — Plasticity Index : %
Wt. Of air dry soil W' = 121.30 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 57.25 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-10			NO	J-28			NO	J-34		
WW	64.26	DW	61.74	WW	61.99	DW	59.57	WW	63.18	DW	61.06	Mean value	
DW	61.74	TW	36.96	DW	59.57	TW	36.12	DW	61.06	TW	40.29	w	
Ww	2.52	Ws	24.78	Ww	2.42	Ws	23.45	Ww	2.12	Ws	20.77	10.23	%
w	10.17	%		w	10.32	%		w	10.21	%			

$$W = \frac{100 \times W'}{100 + w} : 110.041 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01217	0.0414	13.00	18.65	10.67
2	13.5	14.5	28	11.937	5.968	2.4430	0.01217	0.0297	11.50	16.49	9.44
5	11.5	12.5	28	12.442	2.488	1.5774	0.01217	0.0192	9.50	13.63	7.80
15	9.0	10.0	28	13.072	0.871	0.9335	0.01217	0.0114	7.00	10.04	5.75
30	7.0	8.0	28	13.577	0.453	0.6727	0.01217	0.0082	5.00	7.17	4.11
60	6.0	7.0	28	13.829	0.230	0.4801	0.01217	0.0058	4.00	5.74	3.28
240	4.5	5.5	29	14.208	0.059	0.2433	0.01203	0.0029	2.50	3.59	2.05
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01217	0.0014	1.00	1.43	0.82

P = 100/W = 0.9088

$$Mx = \frac{G_s}{G_s - 1} = 1.5784$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	45.76	22.02	23.740		21.57	78.43	44.90
0.42	77.91		55.890		50.79	49.21	28.17
0.25	93.40		71.380		64.87	35.13	20.11
0.105	104.97		82.950		75.38	24.62	14.09
0.074	107.20		85.180		77.41	22.59	12.93

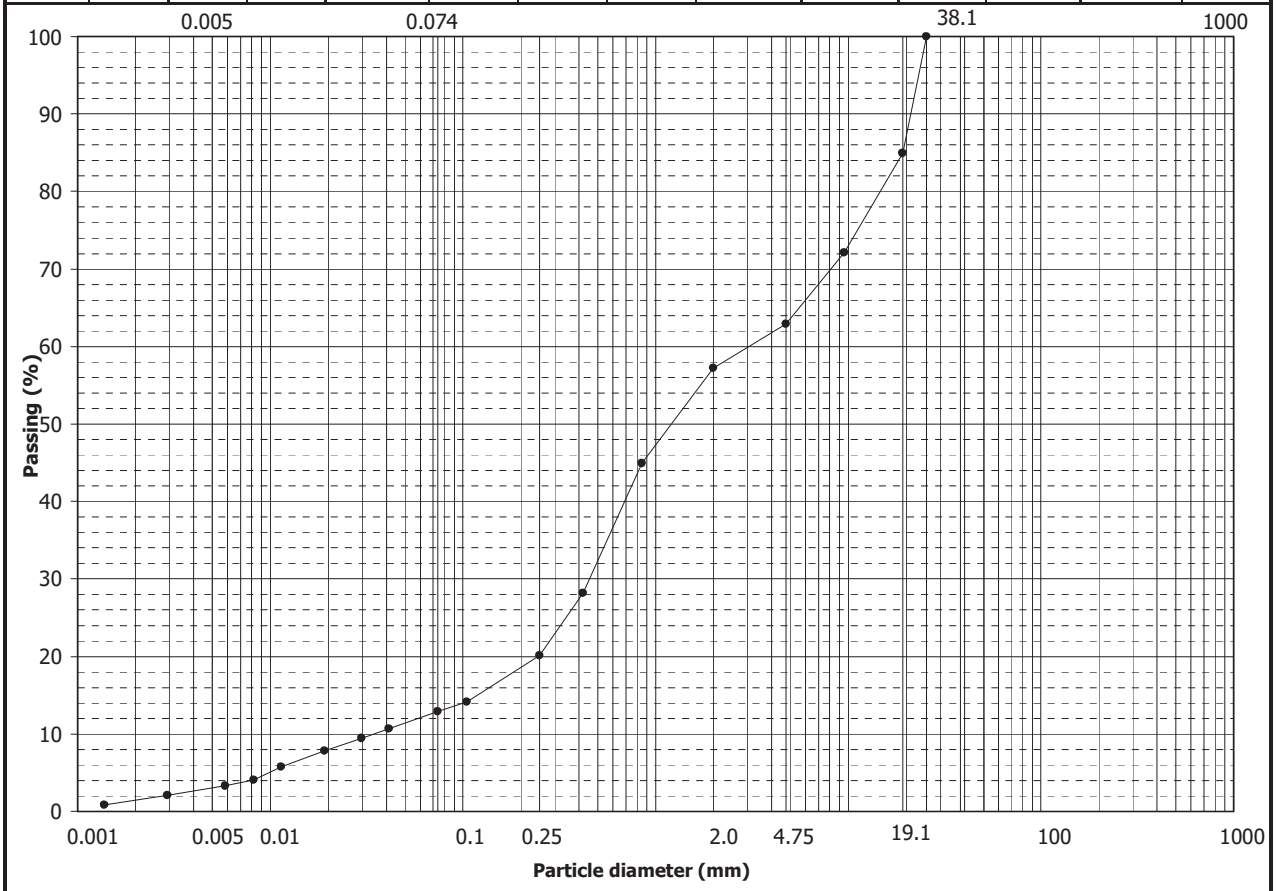
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.729**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
37.07	49.99	9.93	3.01	25.40	21.225	3.3331	1.3252	0.4670	0.0350	95.27	57.25	28.17	12.93



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 458.6 gr
Wt. container No ..... = 35.70 gr
Wt. Of air dry soil W' = 422.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **422.90** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	54.30	35.70	18.60		4.40	95.60
9.52	95.00		59.30		14.02	85.98
4.75	143.30		107.60		25.44	74.56
2.00	177.20		141.50		33.46	66.54

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	2.50 - 3.00

Wt. (Air dry soil + container) = 142.01 gr — Specific Gravity : 2.732
Wt. of container B-37 = 32.04 gr — Plasticity Index : %
Wt. Of air dry soil W' = 109.97 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 66.54 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-34			NO	J-47			NO	J-16		
WW	61.23	DW	59.55	WW	63.00	DW	61.02	WW	61.09	DW	59.38	Mean value	
DW	59.55	TW	40.29	DW	61.02	TW	38.23	DW	59.38	TW	39.56	w	
Ww	1.68	Ws	19.26	Ww	1.98	Ws	22.79	Ww	1.71	Ws	19.82	8.68	%
w	8.72	%		w	8.69	%		w	8.63	%			

$$W = \frac{100 \times W'}{100 + w} : 101.187 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	28	12.315	12.315	3.5093	0.01216	0.0427	10.00	15.59	10.37
2	11.0	12.0	28	12.568	6.284	2.5068	0.01216	0.0305	9.00	14.03	9.34
5	9.5	10.5	28	12.946	2.589	1.6091	0.01216	0.0196	7.50	11.69	7.78
15	8.0	9.0	28	13.325	0.888	0.9425	0.01216	0.0115	6.00	9.35	6.22
30	7.0	8.0	28	13.577	0.453	0.6727	0.01216	0.0082	5.00	7.79	5.19
60	6.0	7.0	28	13.829	0.230	0.4801	0.01216	0.0058	4.00	6.24	4.15
240	5.0	6.0	29	14.081	0.059	0.2422	0.01202	0.0029	3.00	4.68	3.11
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01216	0.0014	2.50	3.90	2.59

P = 100/W = 0.9883

$$Mx = \frac{G_s}{G_s - 1} = 1.5774$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	47.86	22.02	25.840		25.54	74.46	49.55
0.42	77.97		55.950		55.29	44.71	29.75
0.25	90.17		68.150		67.35	32.65	21.73
0.105	100.78		78.760		77.84	22.16	14.75
0.074	103.59		81.570		80.61	19.39	12.90

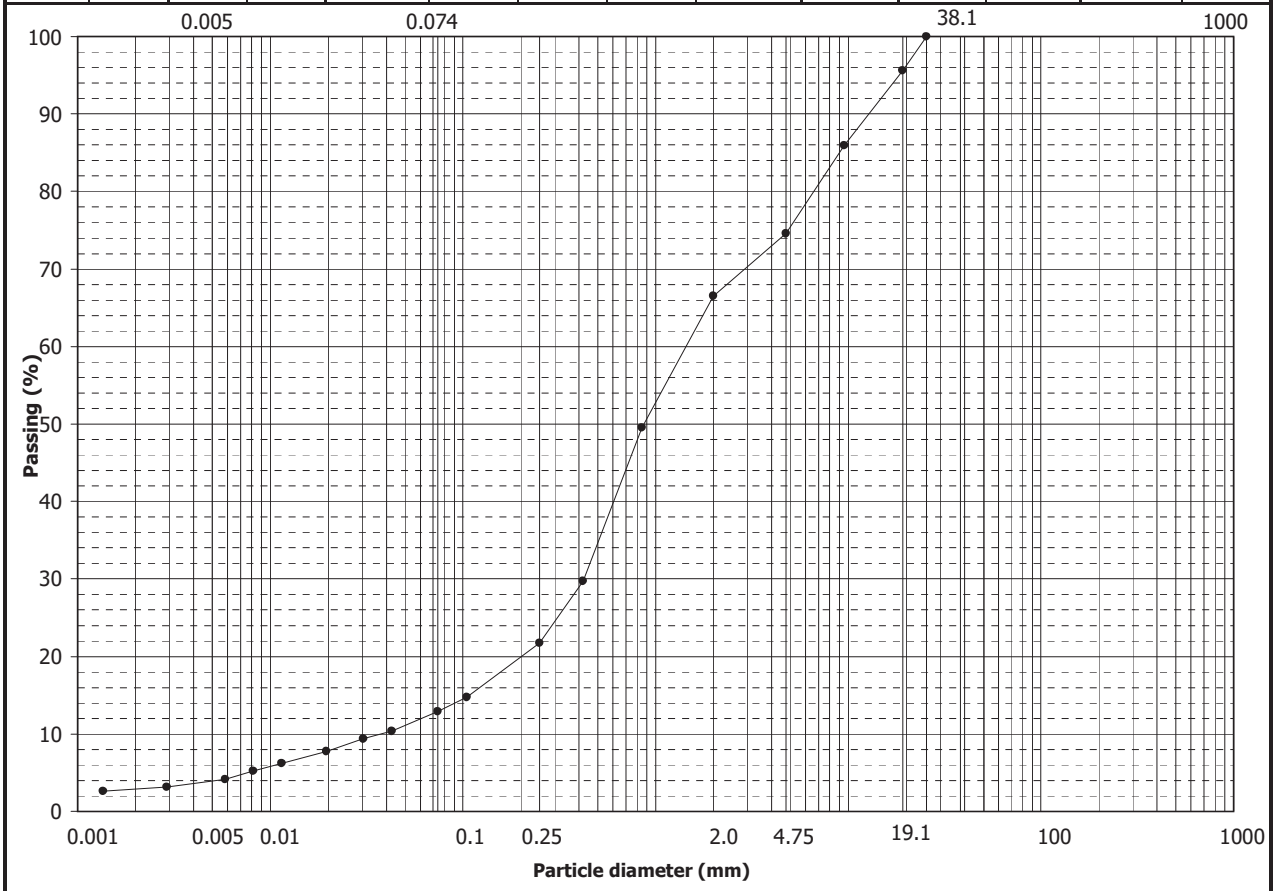
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.732**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
25.44	61.66	8.98	3.92	25.40	13.524	1.5574	0.8806	0.4255	0.0383	40.68	66.54	29.75	12.90



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 464.2 gr
Wt. container No ..... = 94.10 gr
Wt. Of air dry soil W' = 370.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **370.10** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	110.70	94.10	16.60		4.49	95.51
9.52	146.20		52.10		14.08	85.92
4.75	188.50		94.40		25.51	74.49
2.00	218.10		124.00		33.50	66.50

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	3.50 - 4.00

Wt. (Air dry soil + container) = 162.03 gr — Specific Gravity : 2.725
Wt. of container M-76 = 43.16 gr — Plasticity Index : %
Wt. Of air dry soil W' = 118.87 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 66.50 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-25			NO	L-34			NO	L-15		
WW	60.58	DW	58.87	WW	61.94	DW	60.23	WW	63.71	DW	62.05	Mean value	
DW	58.87	TW	38.48	DW	60.23	TW	39.45	DW	62.05	TW	42.18	w	
Ww	1.71	Ws	20.39	Ww	1.71	Ws	20.78	Ww	1.66	Ws	19.87	8.32	%
w	8.39	%		w	8.23	%		w	8.35	%			

$$W = \frac{100 \times W'}{100 + w} : 109.736 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\eta}{980(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	28	12.315	12.315	3.5093	0.01218	0.0427	10.00	14.40	9.57
2	10.5	11.5	28	12.694	6.347	2.5193	0.01218	0.0307	8.50	12.24	8.14
5	9.0	10.0	28	13.072	2.614	1.6169	0.01218	0.0197	7.00	10.08	6.70
15	7.5	8.5	28	13.451	0.897	0.9470	0.01218	0.0115	5.50	7.92	5.26
30	7.0	8.0	28	13.577	0.453	0.6727	0.01218	0.0082	5.00	7.20	4.79
60	6.0	7.0	28	13.829	0.230	0.4801	0.01218	0.0058	4.00	5.76	3.83
240	5.0	6.0	29	14.081	0.059	0.2422	0.01205	0.0029	3.00	4.32	2.87
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01218	0.0014	2.50	3.60	2.39

P = 100/W = 0.9113

$$Mx = \frac{Gs}{Gs - 1} = 1.5797$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	49.75	22.02	27.730		25.27	74.73	49.69
0.42	83.55		61.530		56.07	43.93	29.21
0.25	95.60		73.580		67.05	32.95	21.91
0.105	107.50		85.480		77.90	22.10	14.70
0.074	110.50		88.480		80.63	19.37	12.88

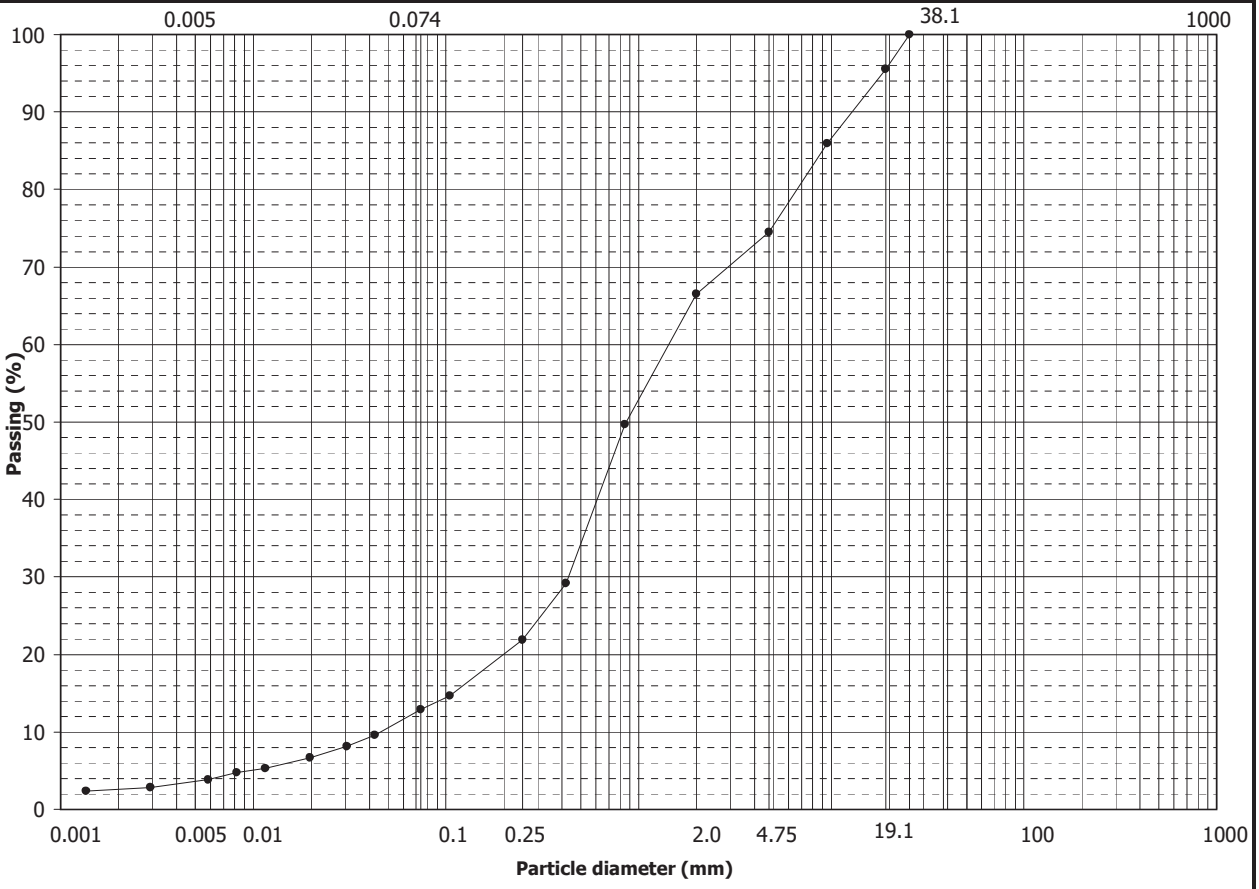
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.725**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
25.51	61.61	9.27	3.61	25.40	13.592	1.5554	0.8711	0.4366	0.0468	33.25	66.50	29.21	12.88



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 557.2 gr
Wt. container No ..... = 33.80 gr
Wt. Of air dry soil W' = 523.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **523.40** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	135.30	33.80	101.50		19.39	80.61
9.52	226.00		192.20		36.72	63.28
4.75	288.00		254.20		48.57	51.43
2.00	339.90		306.10		58.48	41.52

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	4.50 - 5.00

Wt. (Air dry soil + container) = 155.76 gr — Specific Gravity : 2.710
Wt. of container B-04 = 35.14 gr — Plasticity Index : %
Wt. Of air dry soil W' = 120.62 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 41.52 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-25			NO	L-34			NO	L-15		
WW	60.46	DW	58.87	WW	60.76	DW	59.23	WW	64.68	DW	63.05	Mean value	
DW	58.87	TW	38.48	DW	59.23	TW	39.45	DW	63.05	TW	42.18	w	
Ww	1.59	Ws	20.39	Ww	1.53	Ws	19.78	Ww	1.63	Ws	20.87	7.78	%
w	7.80	%		w	7.74	%		w	7.81	%			

$$W = \frac{100 \times W'}{100 + w} : 111.912 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\eta}{980(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.0	21.0	28	10.297	10.297	3.2089	0.01223	0.0393	18.00	25.49	10.58
2	17.0	18.0	28	11.054	5.527	2.3509	0.01223	0.0288	15.00	21.24	8.82
5	14.0	15.0	28	11.811	2.362	1.5369	0.01223	0.0188	12.00	16.99	7.06
15	11.0	12.0	28	12.568	0.838	0.9153	0.01223	0.0112	9.00	12.74	5.29
30	9.5	10.5	28	12.946	0.432	0.6569	0.01223	0.0080	7.50	10.62	4.41
60	8.5	9.5	28	13.198	0.220	0.4690	0.01223	0.0057	6.50	9.20	3.82
240	6.5	7.5	29	13.703	0.057	0.2389	0.01210	0.0029	4.50	6.37	2.65
1140	5.0	6.0	28	14.081	0.012	0.1111	0.01223	0.0014	3.00	4.25	1.76

P = 100/W = 0.8936

$$Mx = \frac{G_s}{G_s - 1} = 1.5848$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	45.75	22.02	23.730		21.20	78.80	32.71
0.42	63.03		41.010		36.64	63.36	26.30
0.25	75.02		53.000		47.36	52.64	21.86
0.105	85.14		63.120		56.40	43.60	18.10
0.074	90.97		68.950		61.61	38.39	15.94

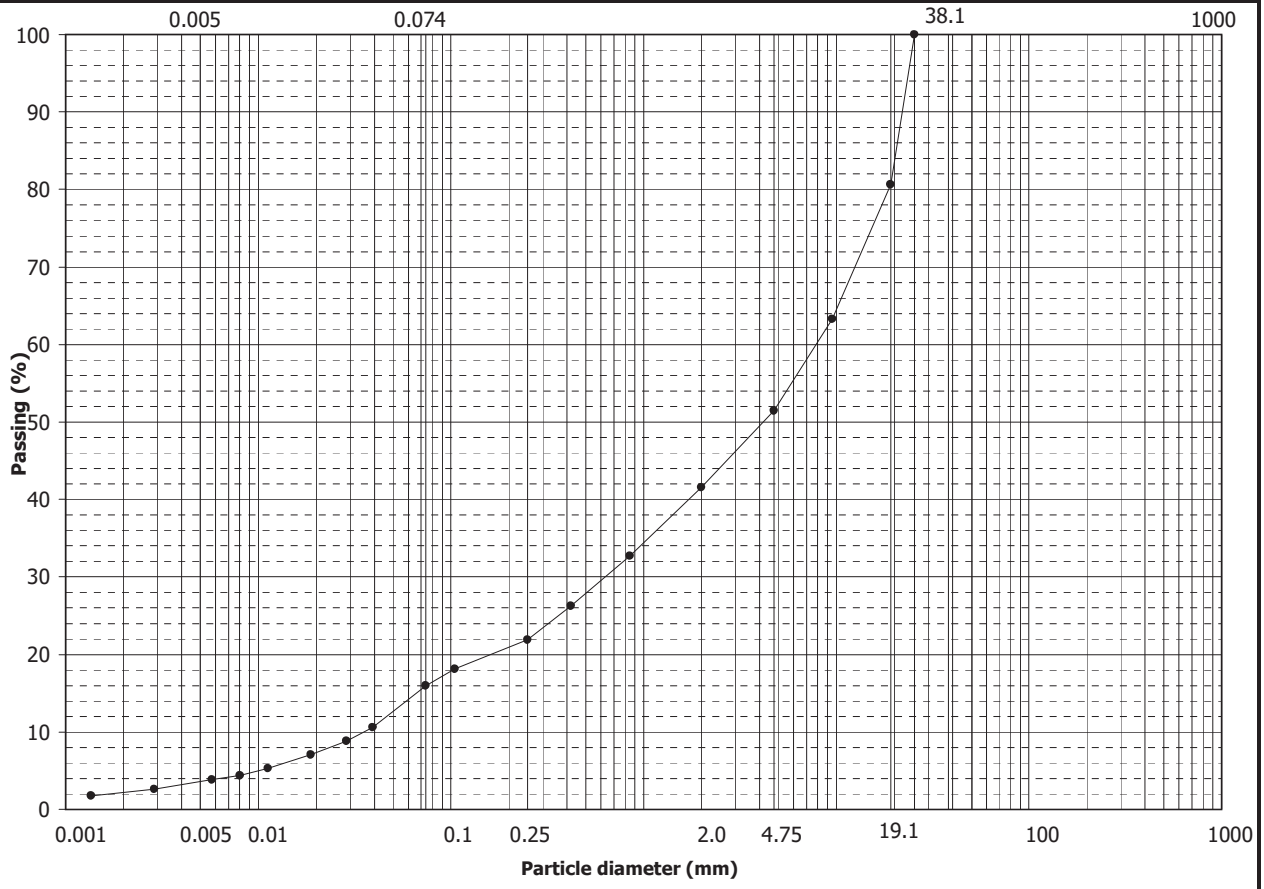
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.710**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
48.57	35.49	12.35	3.59	25.40	22.151	8.1998	4.1730	0.6680	0.0358	229.12	41.52	26.30	15.94



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 492.9 gr
Wt. container No ..... = 46.70 gr
Wt. Of air dry soil W' = 446.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **446.20** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10		46.70				100.00
9.52	65.40		18.70		4.19	95.81
4.75	91.20		44.50		9.97	90.03
2.00	149.30		102.60		22.99	77.01

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	5.50 - 6.00

Wt. (Air dry soil + container) = 163.05 gr — Specific Gravity : 2.651
Wt. of container M-70 = 41.07 gr — Plasticity Index : %
Wt. Of air dry soil W' = 121.98 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 77.01 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-35			NO	L-12			NO	L-27		
WW	61.92	DW	58.87	WW	62.23	DW	59.24	WW	64.59	DW	61.33	Mean value	
DW	58.87	TW	37.53	DW	59.24	TW	38.19	DW	61.33	TW	38.53	w	
Ww	3.05	Ws	21.34	Ww	2.99	Ws	21.05	Ww	3.26	Ws	22.80	14.26	%
w	14.29	%		w	14.20	%		w	14.30	%			

$$W = \frac{100 \times W'}{100 + w} : 106.753 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	6.5	7.5	28	13.703	13.703	3.7018	0.01245	0.0461	4.50	6.77	5.21
2	6.0	7.0	28	13.829	6.915	2.6296	0.01245	0.0327	4.00	6.02	4.63
5	5.0	6.0	28	14.081	2.816	1.6782	0.01245	0.0209	3.00	4.51	3.47
15	4.5	5.5	28	14.208	0.947	0.9732	0.01245	0.0121	2.50	3.76	2.90
30	4.0	5.0	28	14.334	0.478	0.6912	0.01245	0.0086	2.00	3.01	2.32
60	3.5	4.5	28	14.460	0.241	0.4909	0.01245	0.0061	1.50	2.26	1.74
240	3.0	4.0	29	14.586	0.061	0.2465	0.01232	0.0030	1.00	1.50	1.16
1140	2.5	3.5	28	14.712	0.013	0.1136	0.01245	0.0014	0.50	0.75	0.58

P = 100/W = 0.9367

$$Mx = \frac{G_s}{G_s - 1} = 1.6057$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	48.10	22.02	26.080		24.43	75.57	58.19
0.42	85.80		63.780		59.75	40.25	31.00
0.25	106.10		84.080		78.76	21.24	16.35
0.105	116.80		94.780		88.78	11.22	8.64
0.074	119.60		97.580		91.41	8.59	6.62

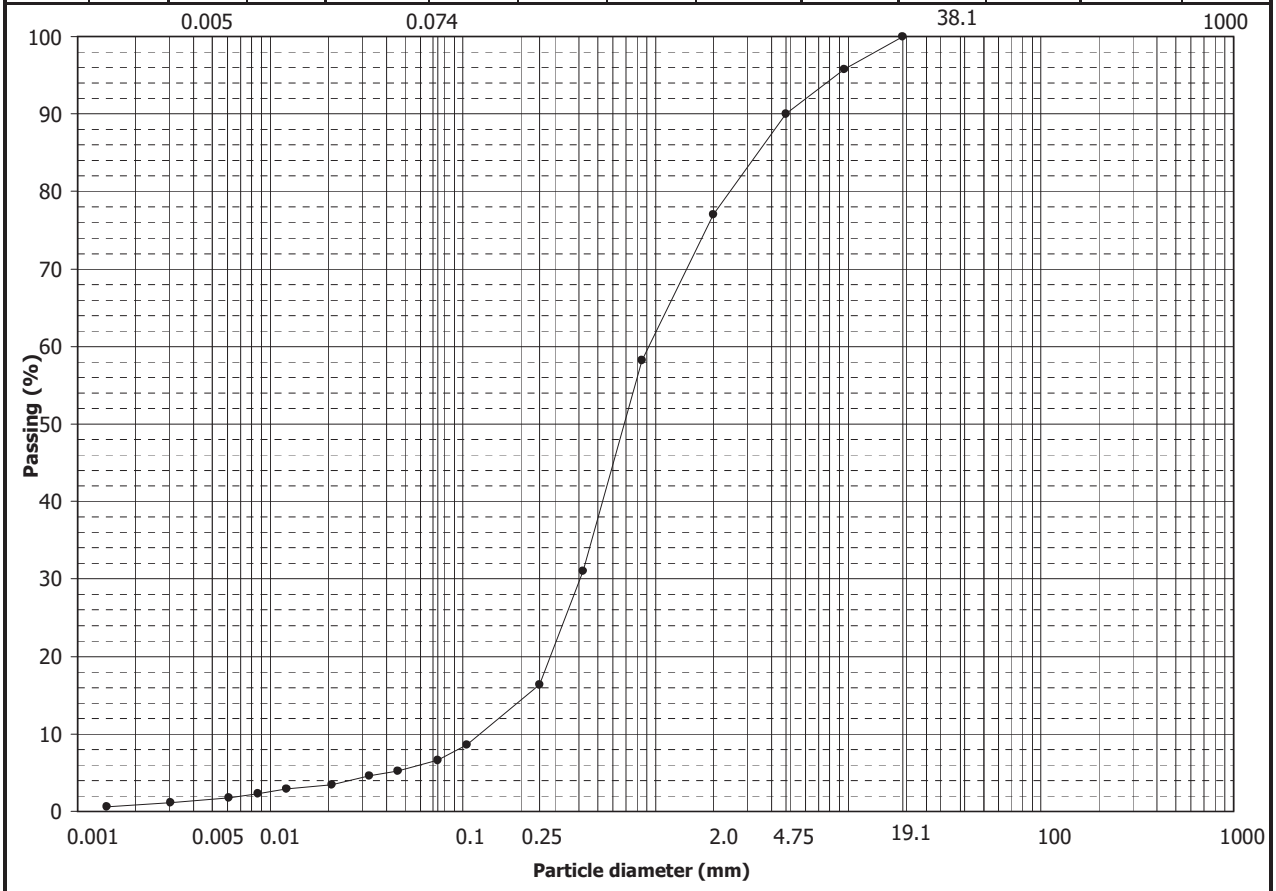
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.651**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
9.97	83.41	5.05	1.57	19.10	4.744	0.960	0.720	0.4084	0.1306	7.35	77.01	31.00	6.62



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 495.8 gr
Wt. container No ..... = 48.20 gr
Wt. Of air dry soil W' = 447.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **447.60** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	55.50	48.20	7.30		1.63	98.37
2.00	71.20		23.00		5.14	94.86

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	6.50 - 7.00

Wt. (Air dry soil + container) = 146.54 gr — Specific Gravity : 2.681
Wt. of container B-58 = 35.71 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.83 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 94.86 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-29			NO	L-42			NO	L-11		
WW	60.05	DW	57.22	WW	65.49	DW	62.66	WW	66.51	DW	63.30	Mean value	
DW	57.22	TW	38.03	DW	62.66	TW	43.33	DW	63.30	TW	41.64	w	
Ww	2.83	Ws	19.19	Ww	2.83	Ws	19.33	Ww	3.21	Ws	21.66	14.74	%
w	14.75	%		w	14.64	%		w	14.82	%			

$$W = \frac{100 \times W'}{100 + w} : 96.596 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.0	15.0	28	11.811	11.811	3.4367	0.01234	0.0424	12.00	19.81	18.79
2	11.0	12.0	28	12.568	6.284	2.5068	0.01234	0.0309	9.00	14.86	14.10
5	8.5	9.5	28	13.198	2.640	1.6247	0.01234	0.0200	6.50	10.73	10.18
15	7.0	8.0	28	13.577	0.905	0.9514	0.01234	0.0117	5.00	8.26	7.83
30	6.0	7.0	28	13.829	0.461	0.6789	0.01234	0.0084	4.00	6.60	6.26
60	5.5	6.5	28	13.955	0.233	0.4823	0.01234	0.0060	3.50	5.78	5.48
240	4.5	5.5	29	14.208	0.059	0.2433	0.01221	0.0030	2.50	4.13	3.92
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01234	0.0014	1.50	2.48	2.35

P = 100/W = 1.0352

$$Mx = \frac{G_s}{G_s - 1} = 1.5949$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	24.59	22.02	2.570		2.66	97.34	92.34
0.42	30.58		8.560		8.86	91.14	86.46
0.25	44.31		22.290		23.08	76.92	72.97
0.105	69.36		47.340		49.01	50.99	48.37
0.074	87.47		65.450		67.76	32.24	30.59

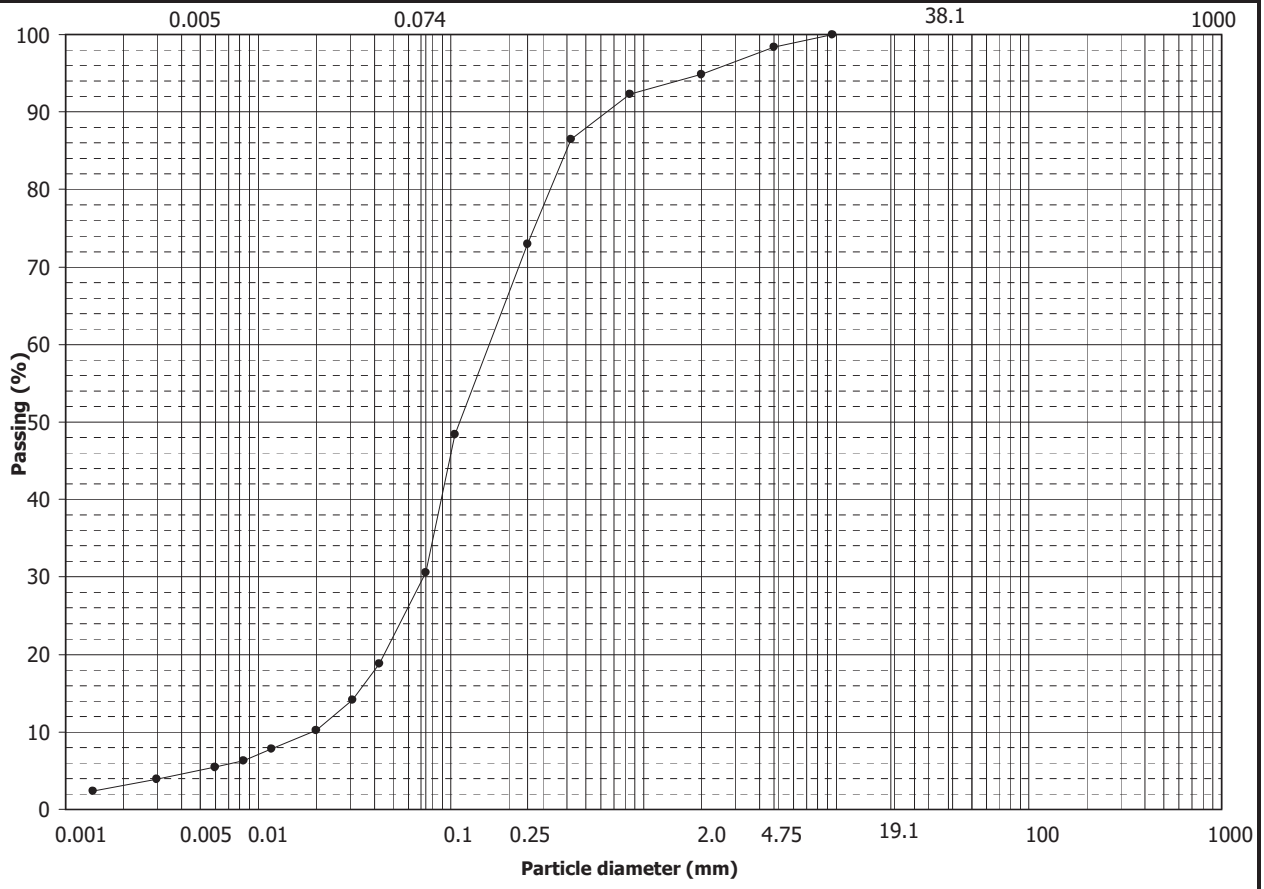
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.681**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
1.63	67.78	25.50	5.09	9.52	0.6791	0.1735	0.1146	0.0724	0.0194	8.94	94.86	86.46	30.59



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 473.5 gr
Wt. container No ..... = 33.11 gr
Wt. Of air dry soil W' = 440.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **440.39** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	45.20	33.11	12.09		2.75	97.25

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	7.50 - 8.00

Wt. (Air dry soil + container) = 163.49 gr — Specific Gravity : 2.648
Wt. of container B-79 = 34.98 gr — Plasticity Index : %
Wt. Of air dry soil W' = 128.51 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 97.25 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-36			NO	J-44			NO	J-21		
WW	61.44	DW	58.39	WW	61.01	DW	57.87	WW	61.74	DW	58.35	Mean value	
DW	58.39	TW	38.80	DW	57.87	TW	37.46	DW	58.35	TW	36.56	w	
Ww	3.05	Ws	19.59	Ww	3.14	Ws	20.41	Ww	3.39	Ws	21.79	15.50	%
w	15.57	%		w	15.38	%		w	15.56	%			

$$W = \frac{100 \times W'}{100 + w} : 111.259 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	25.0	26.0	28	9.035	9.035	3.0059	0.01246	0.0375	23.00	33.22	32.30
2	22.0	23.0	28	9.792	4.896	2.2127	0.01246	0.0276	20.00	28.88	28.09
5	18.5	19.5	28	10.675	2.135	1.4612	0.01246	0.0182	16.50	23.83	23.17
15	15.5	16.5	28	11.432	0.762	0.8730	0.01246	0.0109	13.50	19.50	18.96
30	14.0	15.0	28	11.811	0.394	0.6274	0.01246	0.0078	12.00	17.33	16.85
60	13.0	14.0	28	12.063	0.201	0.4484	0.01246	0.0056	11.00	15.89	15.45
240	11.5	12.5	29	12.442	0.052	0.2277	0.01233	0.0028	9.50	13.72	13.34
1140	10.5	11.5	28	12.694	0.011	0.1055	0.01246	0.0013	8.50	12.28	11.94

P = 100/W = 0.8988

$$Mx = \frac{Gs}{Gs - 1} = 1.6068$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	33.33	22.02	11.310		10.17	89.83	87.37
0.42	44.16		22.140		19.90	80.10	77.90
0.25	57.88		35.860		32.23	67.77	65.91
0.105	76.24		54.220		48.73	51.27	49.86
0.074	84.55		62.530		56.20	43.80	42.60

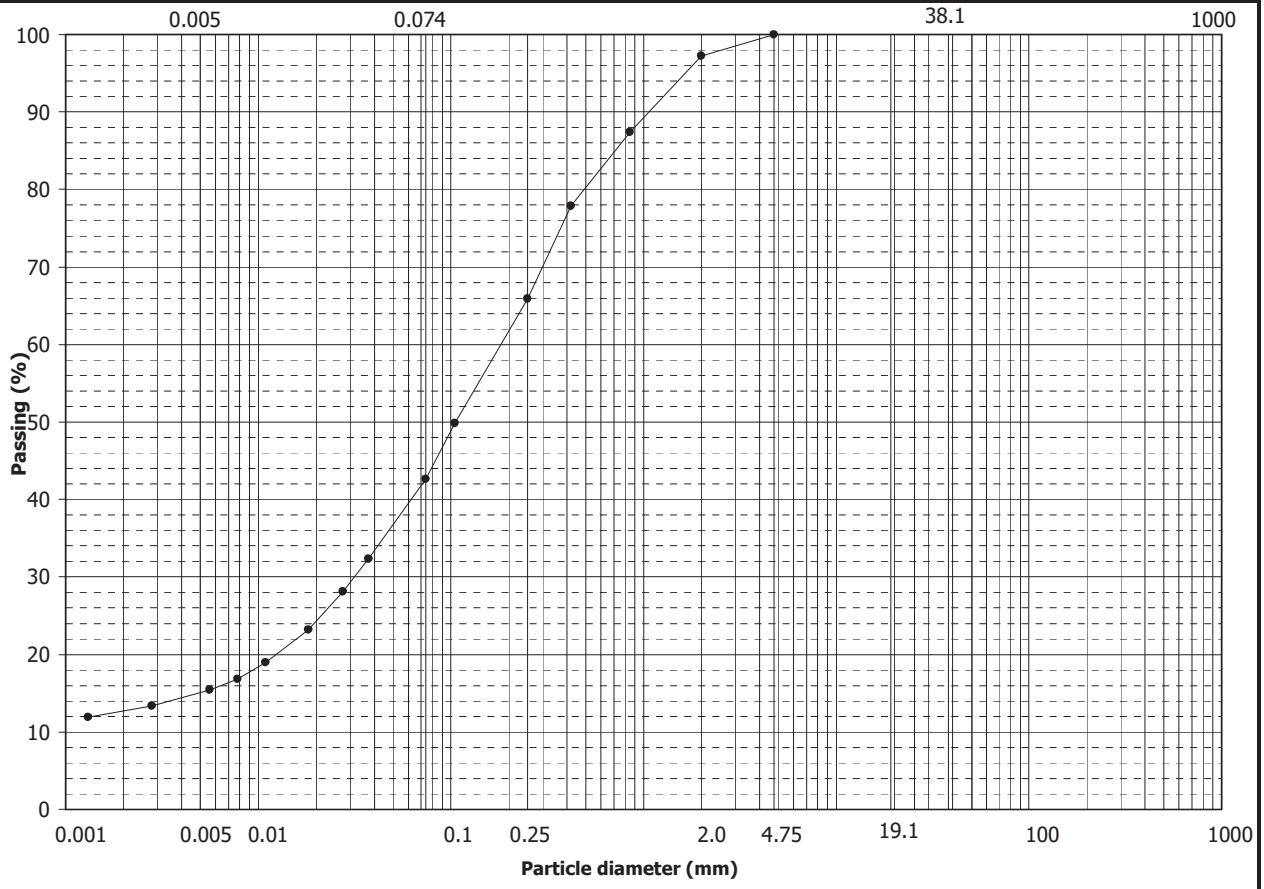
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.648**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	57.40	27.49	15.11	4.75	1.1561	0.1966	0.1063	0.0321	-	-	97.25	77.90	42.60



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	8.50 - 9.00

Wt. (Air dry soil + container) = 134.51 gr — Specific Gravity : 2.621
Wt. of container B-09 = 36.70 gr — Plasticity Index : %
Wt. Of air dry soil W' = 97.81 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-27			NO	L-41			NO	L-18		
WW	61.07	DW	58.05	WW	60.38	DW	57.41	WW	59.50	DW	56.66	Mean value	
DW	58.05	TW	38.53	DW	57.41	TW	38.08	DW	56.66	TW	38.27	w	
Ww	3.02	Ws	19.52	Ww	2.97	Ws	19.33	Ww	2.84	Ws	18.39	15.43	%
w	15.47	%		w	15.36	%		w	15.44	%			

$$W = \frac{100 \times W'}{100 + w} : 84.738 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.0	21.0	28	10.297	10.297	3.2089	0.01256	0.0403	18.00	34.35	34.35
2	17.5	18.5	28	10.928	5.464	2.3375	0.01256	0.0294	15.50	29.58	29.58
5	15.0	16.0	28	11.558	2.312	1.5204	0.01256	0.0191	13.00	24.81	24.81
15	12.5	13.5	28	12.189	0.813	0.9015	0.01256	0.0113	10.50	20.04	20.04
30	11.5	12.5	28	12.442	0.415	0.6440	0.01256	0.0081	9.50	18.13	18.13
60	10.5	11.5	28	12.694	0.212	0.4600	0.01256	0.0058	8.50	16.22	16.22
240	9.5	10.5	29	12.946	0.054	0.2323	0.01243	0.0029	7.50	14.31	14.31
1140	8.5	9.5	28	13.198	0.012	0.1076	0.01256	0.0014	6.50	12.40	12.40

P = 100/W = 1.1801

$$Mx = \frac{G_s}{G_s - 1} = 1.6169$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.30	22.02	6.280		7.41	92.59	92.59
0.42	37.85		15.830		18.68	81.32	81.32
0.25	43.95		21.930		25.88	74.12	74.12
0.105	58.34		36.320		42.86	57.14	57.14
0.074	67.43		45.410		53.59	46.41	46.41

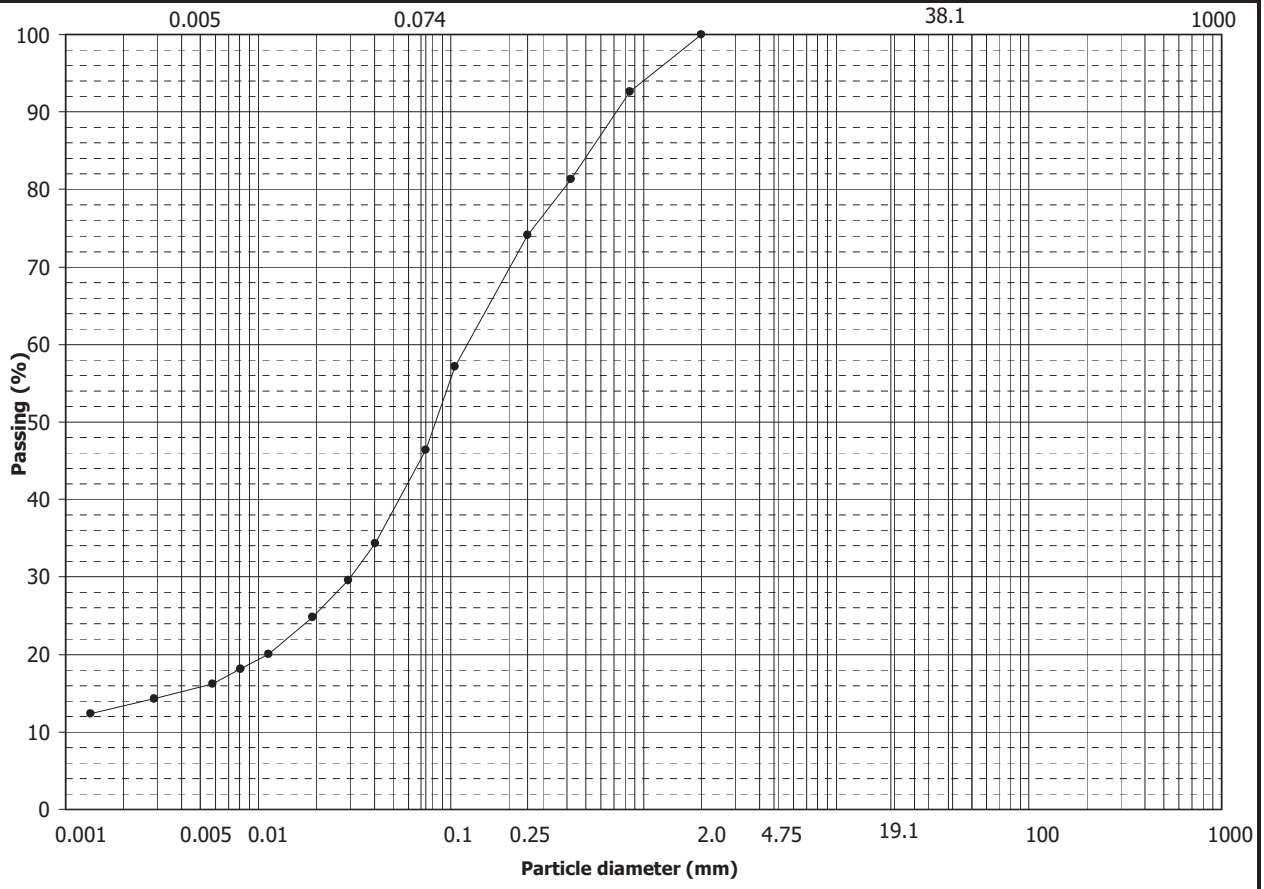
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.621**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	53.59	30.59	15.82	2.00	0.7512	0.1294	0.0844	0.0303	-	-	100.00	81.32	46.41



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**9.50 -10.00**

Wt. (Air dry soil + container) = 589.5 gr
Wt. container No ..... = 33.99 gr
Wt. Of air dry soil W' = 555.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **555.51** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	106.70	33.99	72.71		13.09	86.91
4.75	147.10		113.11		20.36	79.64
2.00	164.20		130.21		23.44	76.56

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	9.50 -10.00

Wt. (Air dry soil + container) = 165.07 gr — Specific Gravity : 2.641
Wt. of container B-67 = 34.55 gr — Plasticity Index : %
Wt. Of air dry soil W' = 130.52 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 76.56 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-25			NO	L-50			NO	L-05		
WW	65.87	DW	61.95	WW	61.64	DW	58.36	WW	62.89	DW	59.46	Mean value	
DW	61.95	TW	38.48	DW	58.36	TW	38.78	DW	59.46	TW	38.86	w	
Ww	3.92	Ws	23.47	Ww	3.28	Ws	19.58	Ww	3.43	Ws	20.60	16.70	%
w	16.70	%		w	16.75	%		w	16.65	%			

$$W = \frac{100 \times W'}{100 + w} : 111.842 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.0	15.0	28	11.811	11.811	3.4367	0.01249	0.0429	12.00	17.27	13.22
2	10.0	11.0	28	12.820	6.410	2.5318	0.01249	0.0316	8.00	11.51	8.81
5	7.0	8.0	28	13.577	2.715	1.6478	0.01249	0.0206	5.00	7.19	5.51
15	5.5	6.5	28	13.955	0.930	0.9645	0.01249	0.0120	3.50	5.04	3.86
30	4.5	5.5	28	14.208	0.474	0.6882	0.01249	0.0086	2.50	3.60	2.75
60	4.0	5.0	28	14.334	0.239	0.4888	0.01249	0.0061	2.00	2.88	2.20
240	3.5	4.5	29	14.460	0.060	0.2455	0.01235	0.0030	1.50	2.16	1.65
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01249	0.0014	1.00	1.44	1.10

P = 100/W = 0.8941

$$Mx = \frac{G_s}{G_s - 1} = 1.6094$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	26.17	22.02	4.150		3.71	96.29	73.72
0.42	36.98		14.960		13.38	86.62	66.32
0.25	50.03		28.010		25.04	74.96	57.39
0.105	77.37		55.350		49.49	50.51	38.67
0.074	95.01		72.990		65.26	34.74	26.60

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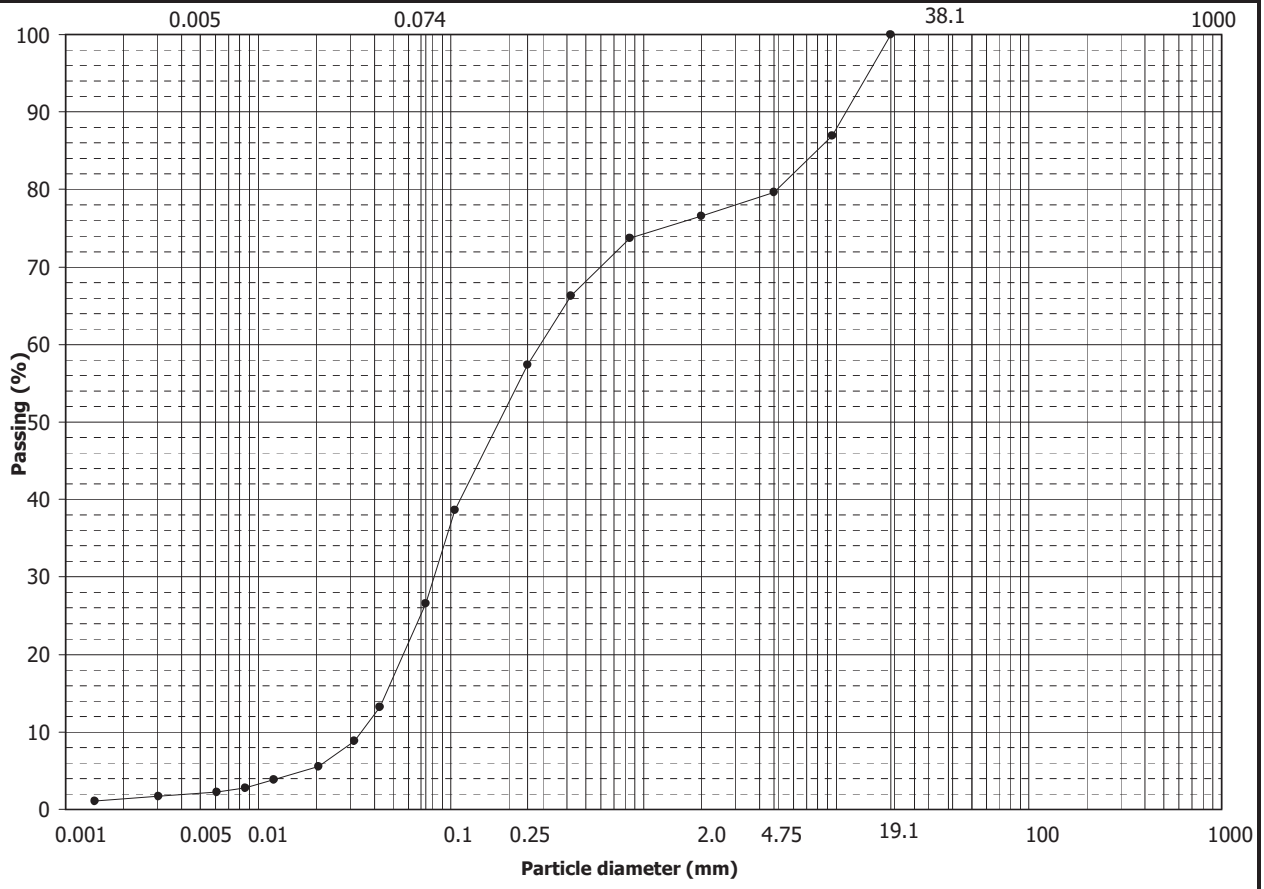
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**9.50 -10.00**

SPECIFIC GRAVITY : **2.641**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
20.36	53.04	24.55	2.05	19.10	11.781	0.2997	0.1928	0.0827	0.0347	8.65	76.56	66.32	26.60



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	11.50 - 12.00

Wt. (Air dry soil + container) = 166.87 gr — Specific Gravity : 2.652
Wt. of container B-53 = 36.44 gr — Plasticity Index : %
Wt. Of air dry soil W' = 130.43 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-19			NO	J-32			NO	J-13		
WW	60.42	DW	56.99	WW	62.22	DW	58.87	WW	62.31	DW	59.06	Mean value	
DW	56.99	TW	37.77	DW	58.87	TW	39.90	DW	59.06	TW	40.75	w	
Ww	3.43	Ws	19.22	Ww	3.35	Ws	18.97	Ww	3.25	Ws	18.31	17.75	%
w	17.85	%		w	17.66	%		w	17.75	%			

$$W = \frac{100 \times W'}{100 + w} : 110.767 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.5	22.5	28	9.919	9.919	3.1494	0.01245	0.0392	19.50	28.26	28.26
2	17.0	18.0	28	11.054	5.527	2.3509	0.01245	0.0293	15.00	21.74	21.74
5	12.0	13.0	28	12.315	2.463	1.5694	0.01245	0.0195	10.00	14.49	14.49
15	8.0	9.0	28	13.325	0.888	0.9425	0.01245	0.0117	6.00	8.70	8.70
30	6.5	7.5	28	13.703	0.457	0.6758	0.01245	0.0084	4.50	6.52	6.52
60	5.5	6.5	28	13.955	0.233	0.4823	0.01245	0.0060	3.50	5.07	5.07
240	4.5	5.5	29	14.208	0.059	0.2433	0.01231	0.0030	2.50	3.62	3.62
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01245	0.0014	1.50	2.17	2.17

P = 100/W = 0.9028

$$Mx = \frac{G_s}{G_s - 1} = 1.6053$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	30.21	22.02	8.190		7.39	92.61	92.61
0.42	38.46		16.440		14.84	85.16	85.16
0.25	49.51		27.490		24.82	75.18	75.18
0.105	73.38		51.360		46.37	53.63	53.63
0.074	80.57		58.550		52.86	47.14	47.14

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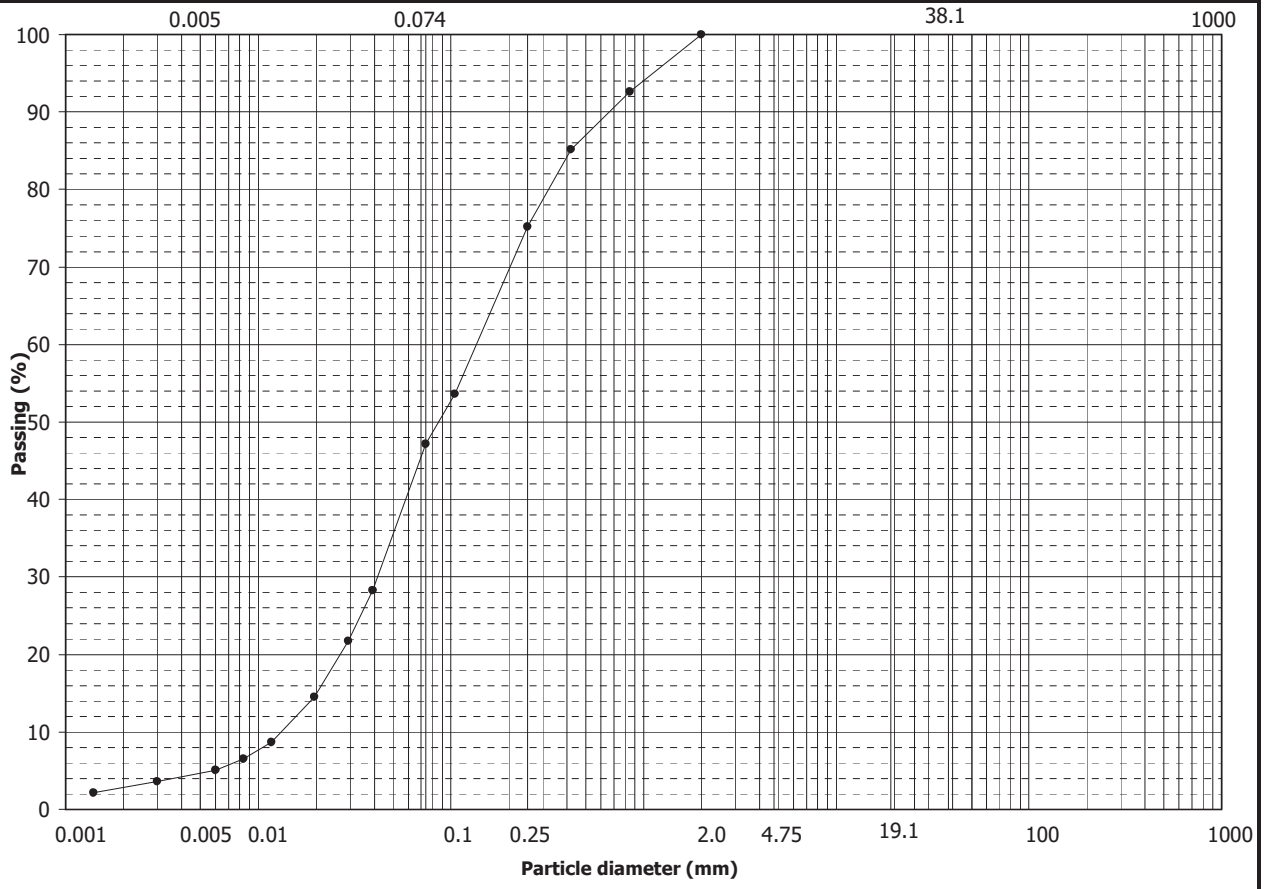
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**11.50 - 12.00**

SPECIFIC GRAVITY : **2.652**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	52.86	42.45	4.69	2.00	0.6995	0.1478	0.0877	0.0424	0.0135	10.96	100.00	85.16	47.14



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	_____ %
w _____	%	w _____	%	w _____	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	13.50 - 14.00

Wt. (Air dry soil + container) = 127.85 gr — Specific Gravity : 2.635
Wt. of container E-42 = 36.60 gr — Plasticity Index : %
Wt. Of air dry soil W' = 91.25 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-11			NO	T-33			NO	L-29		
WW	59.14	DW	57.05	WW	62.00	DW	59.66	WW	60.25	DW	58.09	Mean value	
DW	57.05	TW	37.77	DW	59.66	TW	38.15	DW	58.09	TW	38.03	w	
Ww	2.09	Ws	19.28	Ww	2.34	Ws	21.51	Ww	2.16	Ws	20.06	10.83	%
w	10.84	%		w	10.88	%		w	10.77	%			

$$W = \frac{100 \times W'}{100 + w} : 82.334 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.0	21.0	28	10.297	10.297	3.2089	0.01251	0.0401	18.00	35.23	35.23
2	17.0	18.0	28	11.054	5.527	2.3509	0.01251	0.0294	15.00	29.36	29.36
5	14.5	15.5	28	11.685	2.337	1.5287	0.01251	0.0191	12.50	24.47	24.47
15	12.5	13.5	28	12.189	0.813	0.9015	0.01251	0.0113	10.50	20.55	20.55
30	11.5	12.5	28	12.442	0.415	0.6440	0.01251	0.0081	9.50	18.60	18.60
60	10.5	11.5	28	12.694	0.212	0.4600	0.01251	0.0058	8.50	16.64	16.64
240	9.5	10.5	29	12.946	0.054	0.2323	0.01238	0.0029	7.50	14.68	14.68
1140	8.5	9.5	28	13.198	0.012	0.1076	0.01251	0.0013	6.50	12.72	12.72

P = 100/W = 1.2146

$$Mx = \frac{Gs}{Gs - 1} = 1.6116$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.26	22.02	1.240		1.51	98.49	98.49
0.42	27.85		5.830		7.08	92.92	92.92
0.25	38.32		16.300		19.80	80.20	80.20
0.105	52.19		30.170		36.64	63.36	63.36
0.074	63.23		41.210		50.05	49.95	49.95

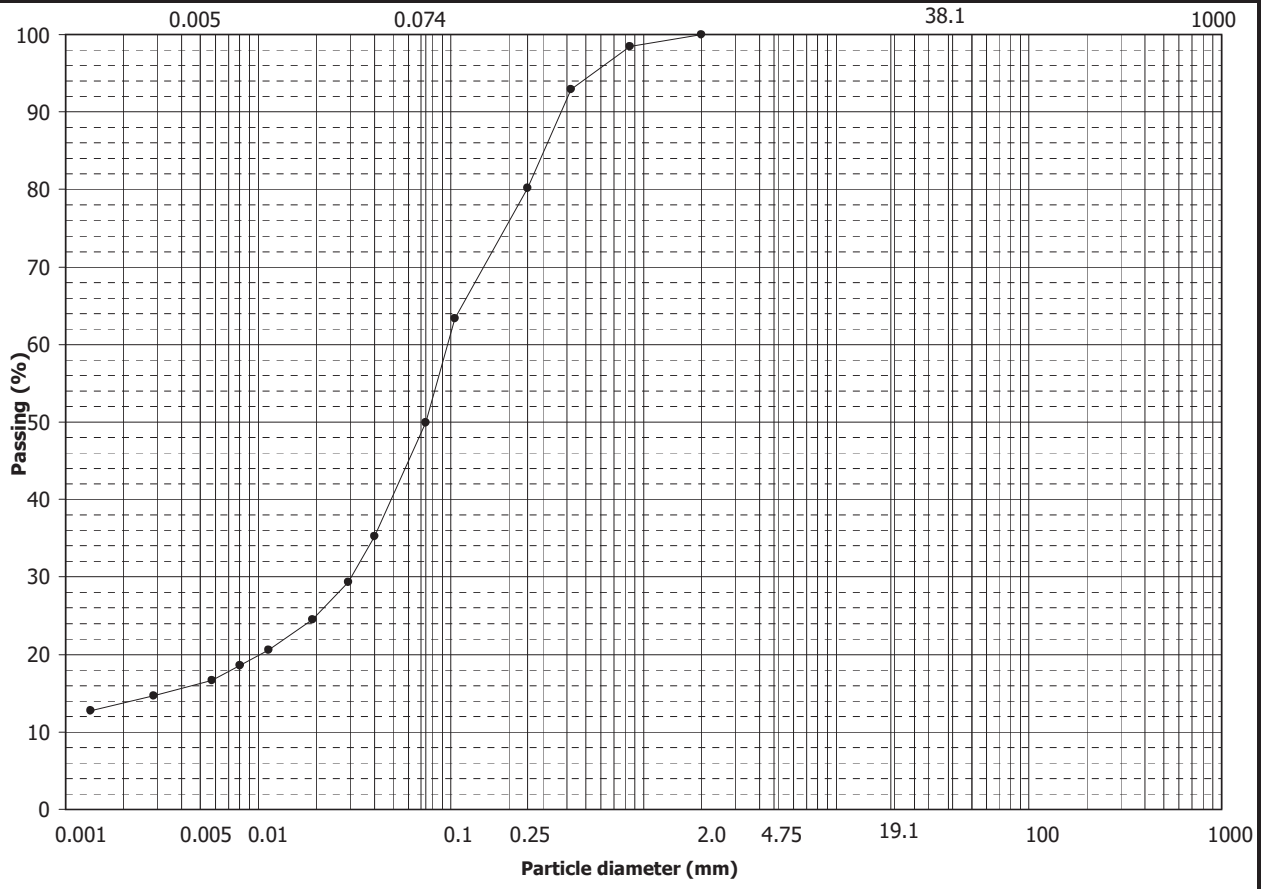
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**13.50 - 14.00**

SPECIFIC GRAVITY : **2.635**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	50.05	33.71	16.24	2.00	0.3810	0.0972	0.0741	0.0306	-	-	100.00	92.92	49.95



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**16.50 - 17.00**

Wt. (Air dry soil + container) = _____ gr
Wt. container No ..... = _____ gr
Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	16.50 - 17.00

Wt. (Air dry soil + container) = 203.15 gr — Specific Gravity : 2.712
Wt. of container H-39 = 91.00 gr — Plasticity Index : %
Wt. Of air dry soil W' = 112.15 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-18			NO	J-23			NO	J-12		
WW	61.92	DW	59.95	WW	60.80	DW	58.87	WW	62.03	DW	60.05	Mean value	
DW	59.95	TW	37.00	DW	58.87	TW	36.20	DW	60.05	TW	37.07	w	
Ww	1.97	Ws	22.95	Ww	1.93	Ws	22.67	Ww	1.98	Ws	22.98	8.57	%
w	8.58	%		w	8.51	%		w	8.62	%			

$$W = \frac{100 \times W'}{100 + w} : 103.296 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	11.5	12.5	28	12.442	12.442	3.5273	0.01223	0.0431	9.50	14.57	14.57
2	9.8	10.8	28	12.946	6.473	2.5442	0.01223	0.0311	7.80	11.96	11.96
5	8.0	9.0	28	13.325	2.665	1.6325	0.01223	0.0200	6.00	9.20	9.20
15	6.5	7.5	28	13.703	0.914	0.9558	0.01223	0.0117	4.50	6.90	6.90
30	5.5	6.5	28	13.955	0.465	0.6820	0.01223	0.0083	3.50	5.37	5.37
60	5.0	6.0	28	14.081	0.235	0.4844	0.01223	0.0059	3.00	4.60	4.60
240	4.0	5.0	29	14.334	0.060	0.2444	0.01209	0.0030	2.00	3.07	3.07
1140	3.0	4.0	28	14.586	0.013	0.1131	0.01223	0.0014	1.00	1.53	1.53

P = 100/W = 0.9681

$$Mx = \frac{G_s}{G_s - 1} = 1.5841$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	43.33	22.02	21.310		20.63	79.37	79.37
0.42	69.69		47.670		46.15	53.85	53.85
0.25	86.36		64.340		62.29	37.71	37.71
0.105	99.64		77.620		75.14	24.86	24.86
0.074	103.22		81.200		78.61	21.39	21.39

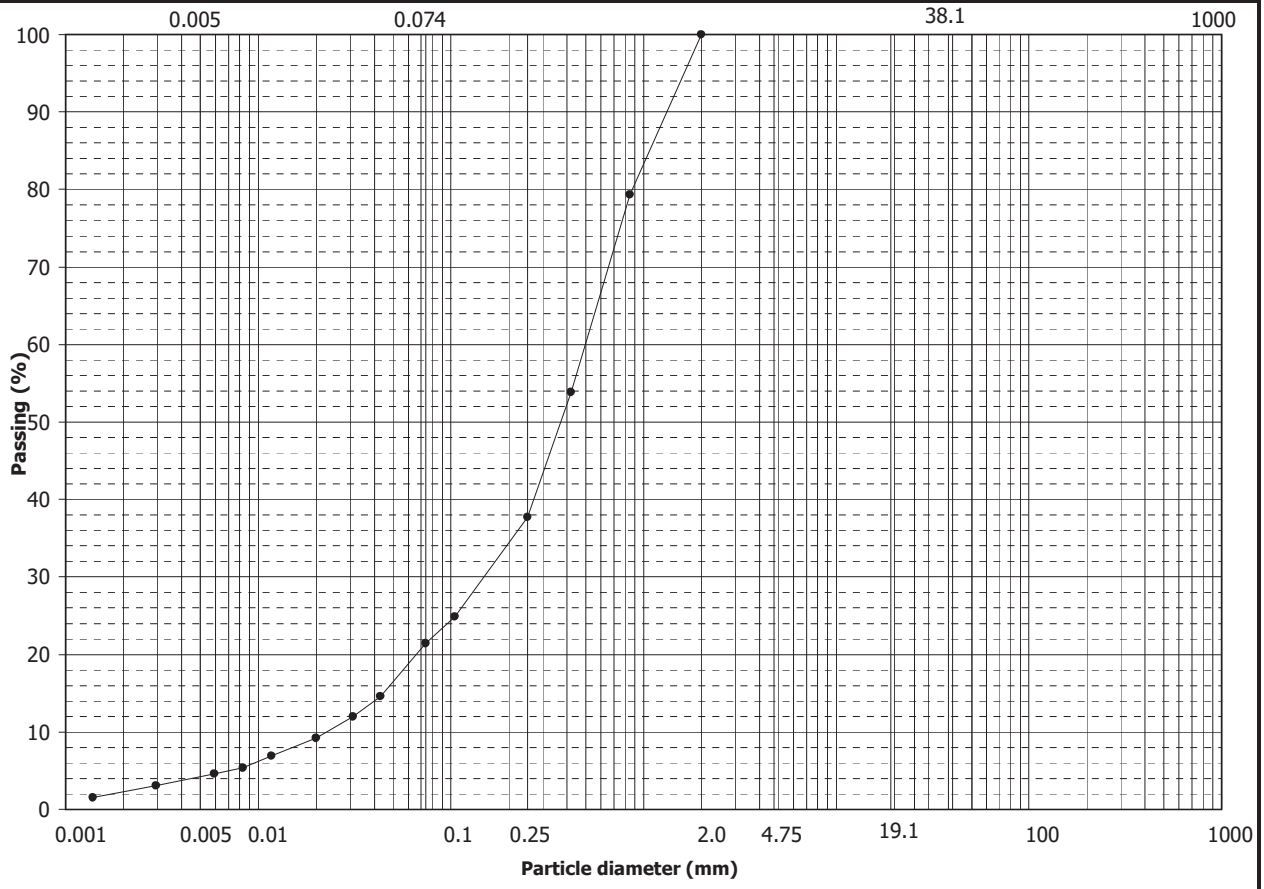
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**16.50 - 17.00**

SPECIFIC GRAVITY : **2.712**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	78.61	17.16	4.23	2.00	1.4426	0.5236	0.3794	0.1630	0.0232	22.58	100.00	53.85	21.39



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**18.50 - 19.00**

Wt. (Air dry soil + container) = 351.7 gr
Wt. container No ..... = 33.11 gr
Wt. Of air dry soil W' = 318.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **318.59** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	35.15	33.11	2.04		0.64	99.36

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	LERO TATARI - DONGGALA	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 20	DEPTH	18.50 - 19.00

Wt. (Air dry soil + container) = 161.52 gr — Specific Gravity : 2.681
Wt. of container E-42 = 36.60 gr — Plasticity Index : %
Wt. Of air dry soil W' = 124.92 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 99.36 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-21			NO	L-38			NO	L-13		
WW	57.33	DW	55.22	WW	58.47	DW	56.45	WW	60.54	DW	58.32	Mean value	
DW	55.22	TW	36.50	DW	56.45	TW	38.85	DW	58.32	TW	38.78	w	
Ww	2.11	Ws	18.72	Ww	2.02	Ws	17.60	Ww	2.22	Ws	19.54	11.37	%
w	11.27	%		w	11.48	%		w	11.36	%			

$$W = \frac{100 \times W'}{100 + w} : 112.167 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	36.0	37.0	28	6.260	6.260	2.5020	0.01234	0.0309	34.00	48.34	48.03
2	29.5	30.5	28	7.900	3.950	1.9875	0.01234	0.0245	27.50	39.10	38.85
5	23.0	24.0	28	9.540	1.908	1.3813	0.01234	0.0170	21.00	29.86	29.67
15	18.0	19.0	28	10.802	0.720	0.8486	0.01234	0.0105	16.00	22.75	22.60
30	16.0	17.0	28	11.306	0.377	0.6139	0.01234	0.0076	14.00	19.91	19.78
60	14.5	15.5	28	11.685	0.195	0.4413	0.01234	0.0054	12.50	17.77	17.66
240	12.5	13.5	29	12.189	0.051	0.2254	0.01221	0.0028	10.50	14.93	14.83
1140	10.5	11.5	28	12.694	0.011	0.1055	0.01234	0.0013	8.50	12.09	12.01

P = 100/W = 0.8915

$$Mx = \frac{Gs}{Gs - 1} = 1.5949$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.30	22.02	1.280		1.14	98.86	98.23
0.42	24.96		2.940		2.62	97.38	96.76
0.25	27.34		5.320		4.74	95.26	94.65
0.105	36.76		14.740		13.14	86.86	86.30
0.074	44.71		22.690		20.23	79.77	79.26

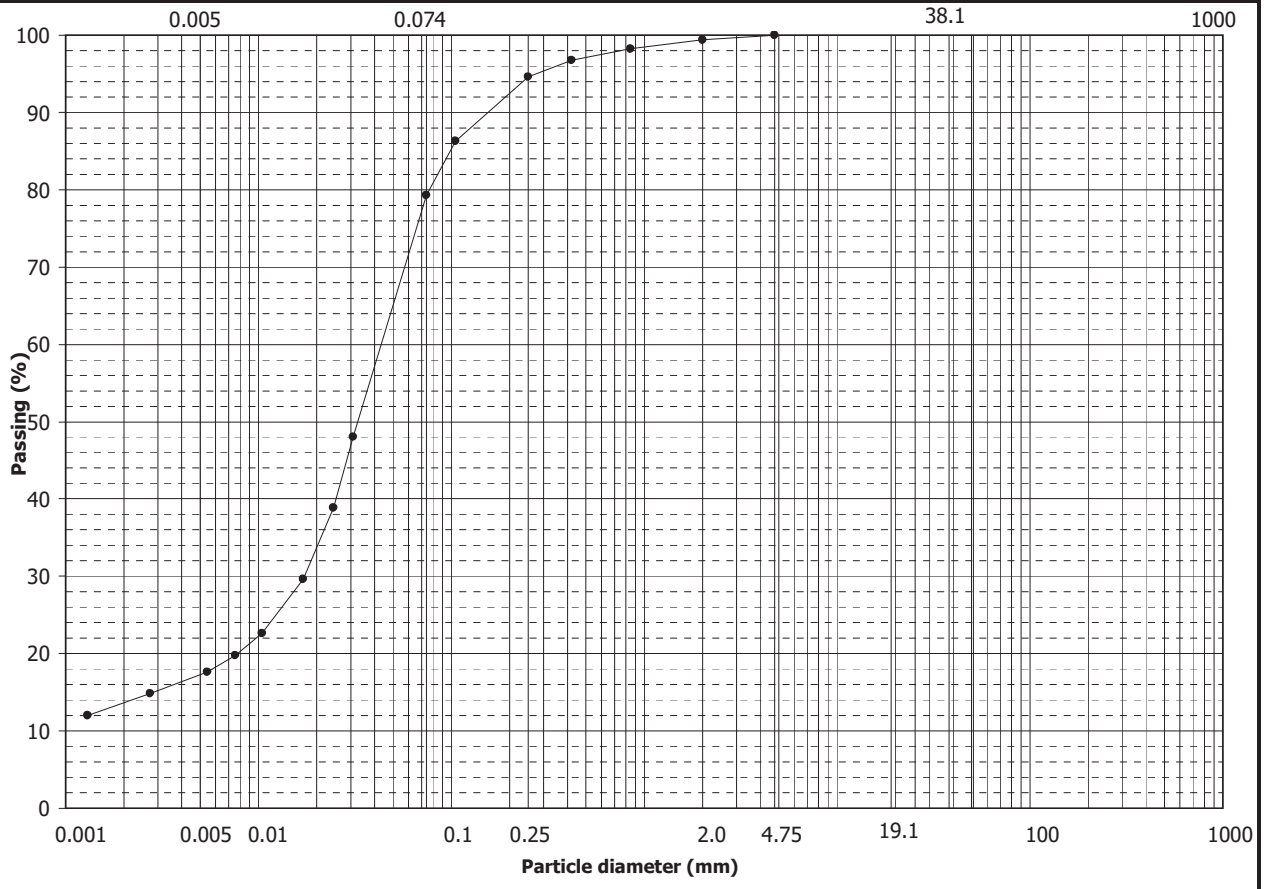
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**LERO TATARI - DONGGALA**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 20**	DEPTH	**18.50 - 19.00**

SPECIFIC GRAVITY : **2.681**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	20.74	61.95	17.31	4.75	0.1692	0.0474	0.0336	0.0173	-	-	99.36	96.76	79.26



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		0.50 - 1.00

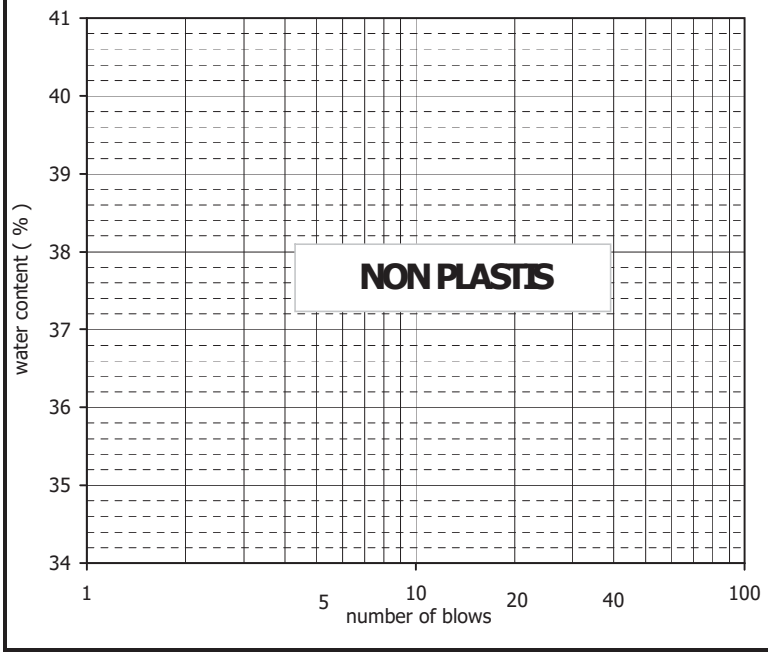
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		1.50 - 2.00

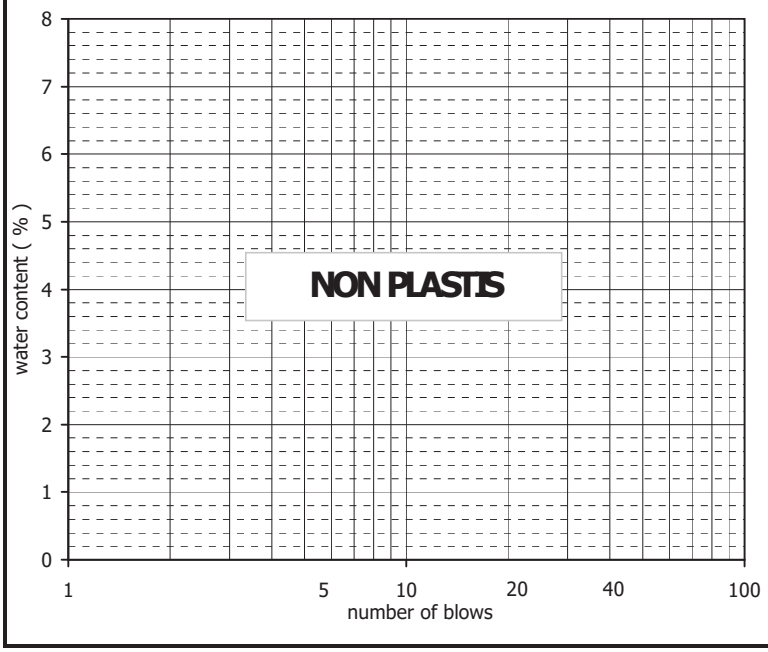
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		2.50 - 3.00

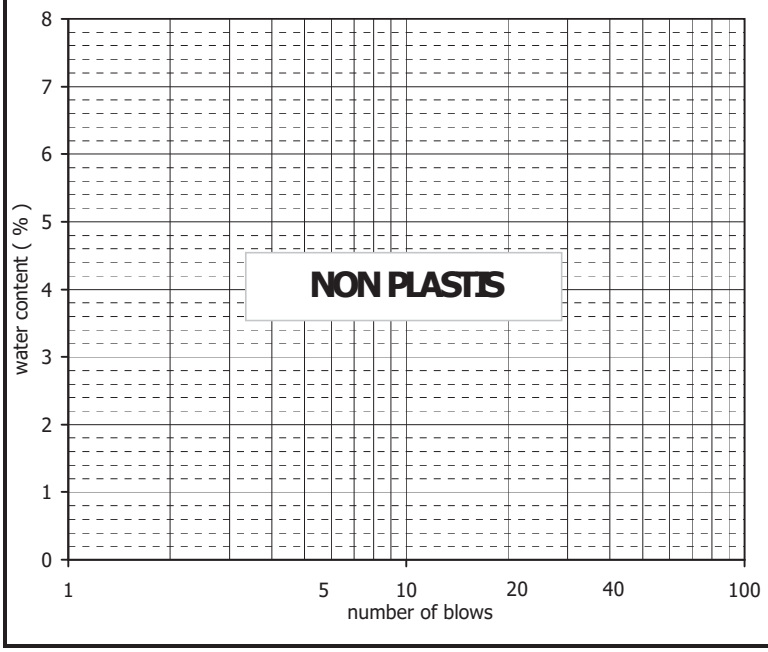
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		3.50 - 4.00

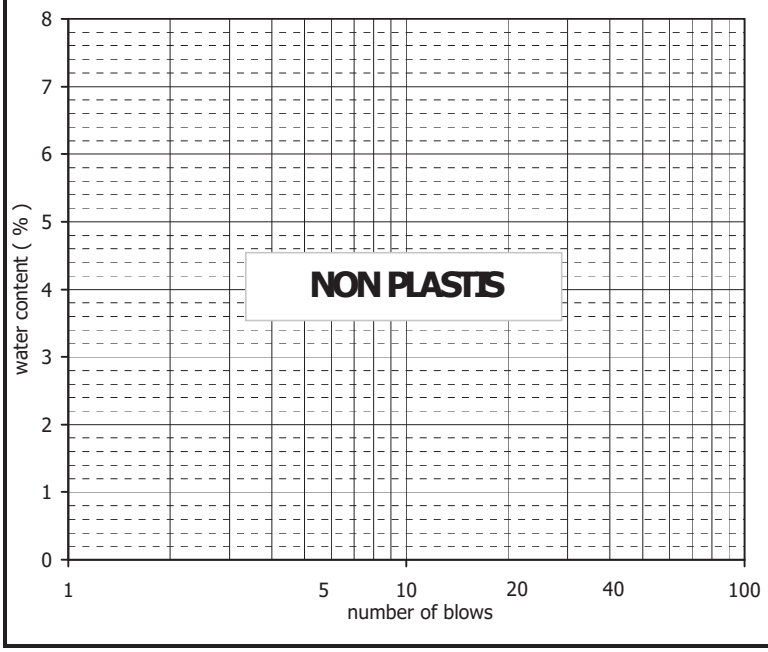
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		4.50 - 5.00

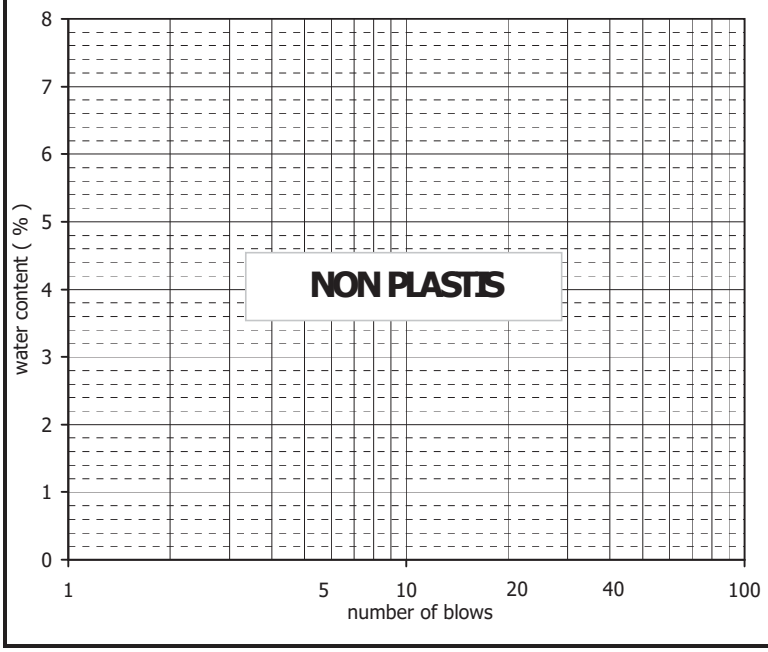
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		5.50 - 6.00

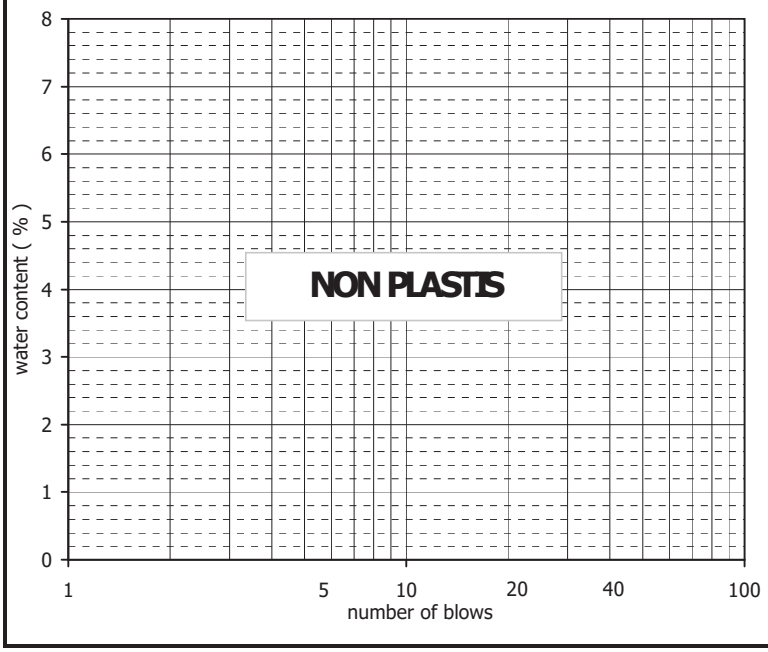
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		6.50 - 7.00

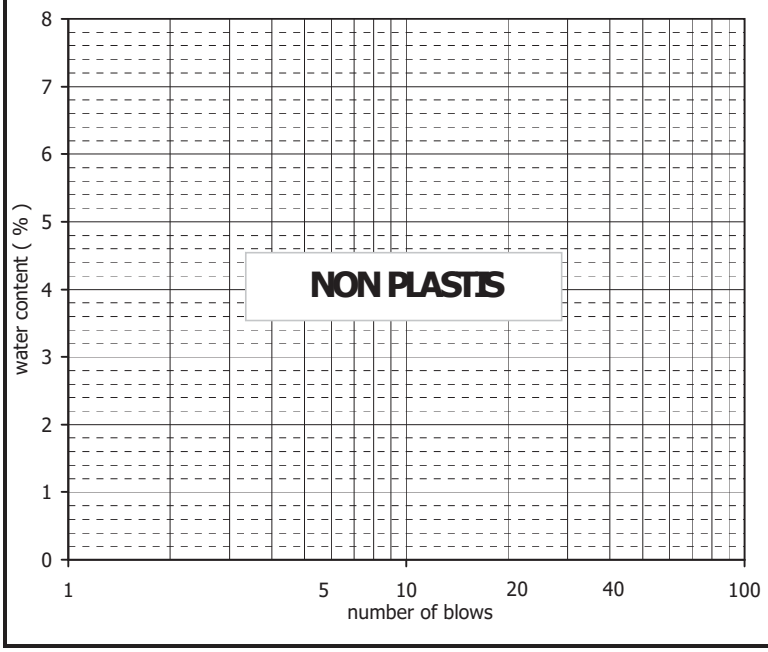
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		7.50 - 8.00

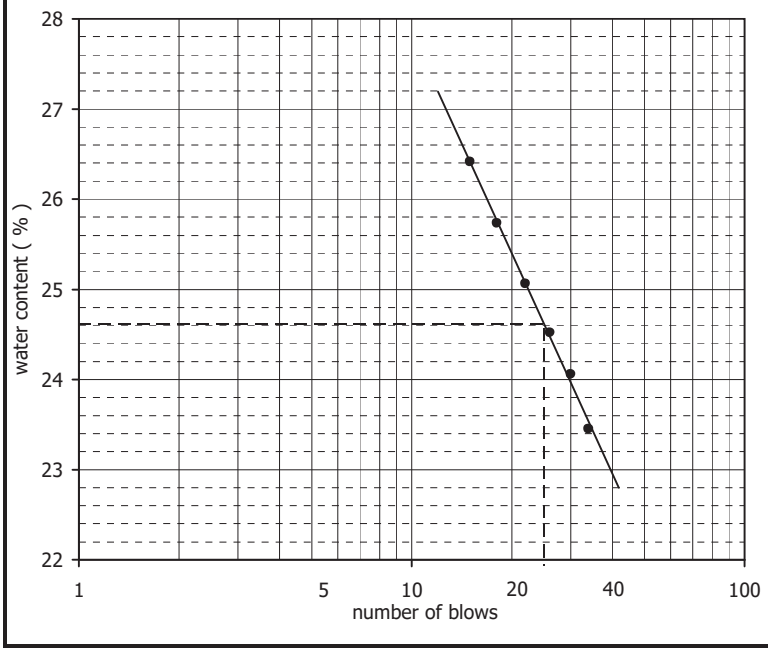
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			30 x	NO. OF BLOWS			26 x
		No.	A-97			No.	L-46			No.	J-08
WW	53.210	DW	49.840	WW	53.290	DW	50.470	WW	55.580	DW	52.750
DW	49.840	TW	35.470	DW	50.470	TW	38.750	DW	52.750	TW	41.210
Ww	3.370	Ws	14.370	Ww	2.820	Ws	11.720	Ww	2.830	Ws	11.540
	W =		23.45 %		W =		24.06 %		W =		24.52 %

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			18 x	NO. OF BLOWS			15 x
		No.	T-07			No.	L-36			No.	J-06
WW	52.530	DW	49.650	WW	55.800	DW	52.640	WW	57.420	DW	53.880
DW	49.650	TW	38.160	DW	52.640	TW	40.360	DW	53.880	TW	40.480
Ww	2.880	Ws	11.490	Ww	3.160	Ws	12.280	Ww	3.540	Ws	13.400
	W =		25.07 %		W =		25.73 %		W =		26.42 %

PLASTIC LIMIT

1				2				3			
		No.	T-01			No.	J-58			No.	J-04
WW	51.840	DW	49.180	WW	56.480	DW	53.810	WW	56.770	DW	53.620
DW	49.180	TW	34.720	DW	53.810	TW	39.570	DW	53.620	TW	36.646
Ww	2.660	Ws	14.460	Ww	2.670	Ws	14.240	Ww	3.150	Ws	16.974
	W =		18.40 %		W =		18.75 %		W =		18.56 %



LIQUID LIMIT	=	24.62	%
PLASTIC LIMIT	=	18.57	%
PLASTICITY INDEX	=	6.05	%
FLOW INDEX	=	8.08	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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Cb. Sit : Jalan Jendi Barat 27 Malang Telp.: (0341) 362261, Fax.: (0341) 324402; E-mail : divisi.sit@indrakarya.co.id atau lab_geoteknik_ika@yahoo.com

LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		8.50 - 9.00

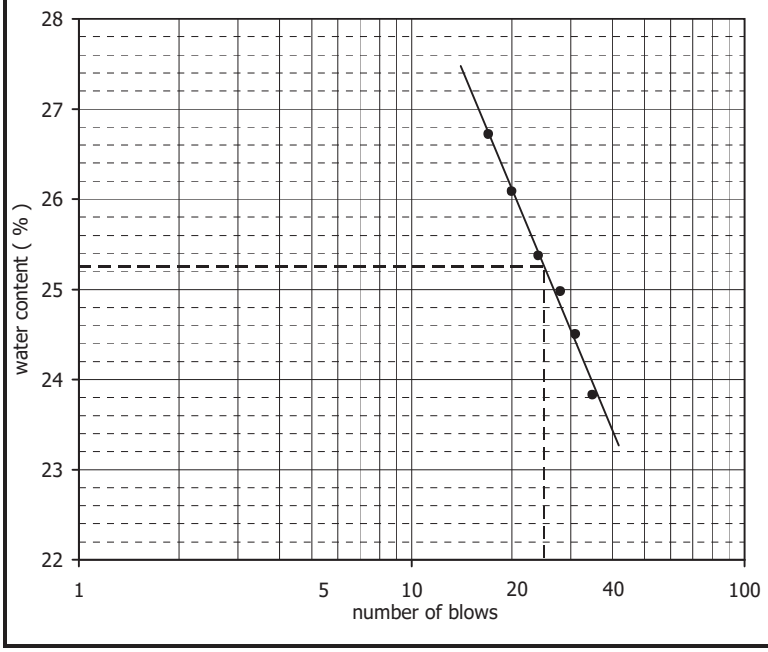
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	A-27			No.	A-87			No.	T-37
WW	55.990	DW	52.990	WW	53.900	DW	51.190	WW	53.470	DW	50.820
DW	52.990	TW	40.400	DW	51.190	TW	40.130	DW	50.820	TW	40.210
Ww	3.000	Ws	12.590	Ww	2.710	Ws	11.060	Ww	2.650	Ws	10.610
	W =		23.83 %		W =		24.50 %		W =		24.98 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	J-59			No.	T-51			No.	A-92
WW	53.840	DW	50.630	WW	54.400	DW	51.094	WW	54.500	DW	51.080
DW	50.630	TW	37.980	DW	51.094	TW	38.420	DW	51.080	TW	38.280
Ww	3.210	Ws	12.650	Ww	3.306	Ws	12.674	Ww	3.420	Ws	12.800
	W =		25.38 %		W =		26.08 %		W =		26.72 %

PLASTIC LIMIT

1				2				3			
		No.	T-13			No.	J-22			No.	A-28
WW	52.850	DW	50.140	WW	56.900	DW	53.850	WW	55.180	DW	52.280
DW	50.140	TW	37.150	DW	53.850	TW	39.010	DW	52.280	TW	38.240
Ww	2.710	Ws	12.990	Ww	3.050	Ws	14.840	Ww	2.900	Ws	14.040
	W =		20.86 %		W =		20.55 %		W =		20.66 %



LIQUID LIMIT	=	25.26	%
PLASTIC LIMIT	=	20.69	%
PLASTICITY INDEX	=	4.57	%
FLOW INDEX	=	8.83	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		9.50 - 10.00

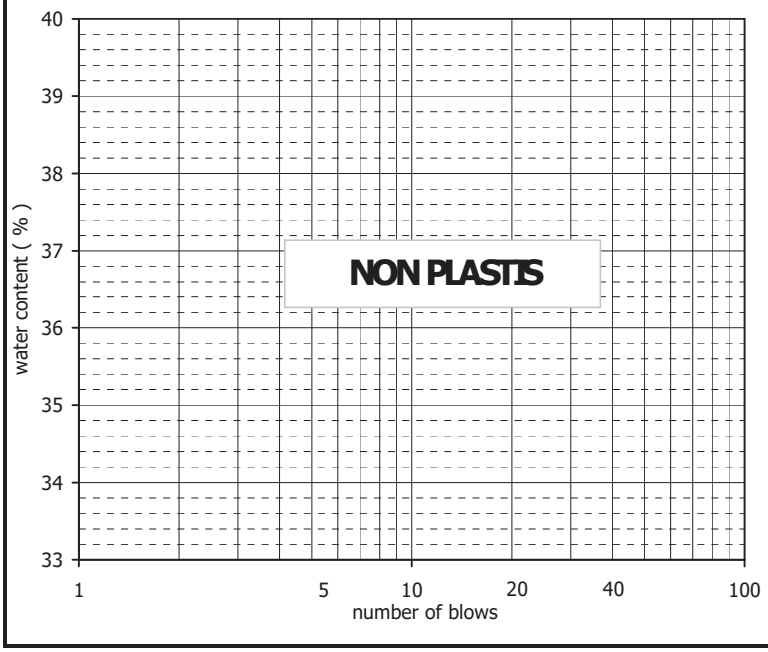
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		11.50 - 12.00

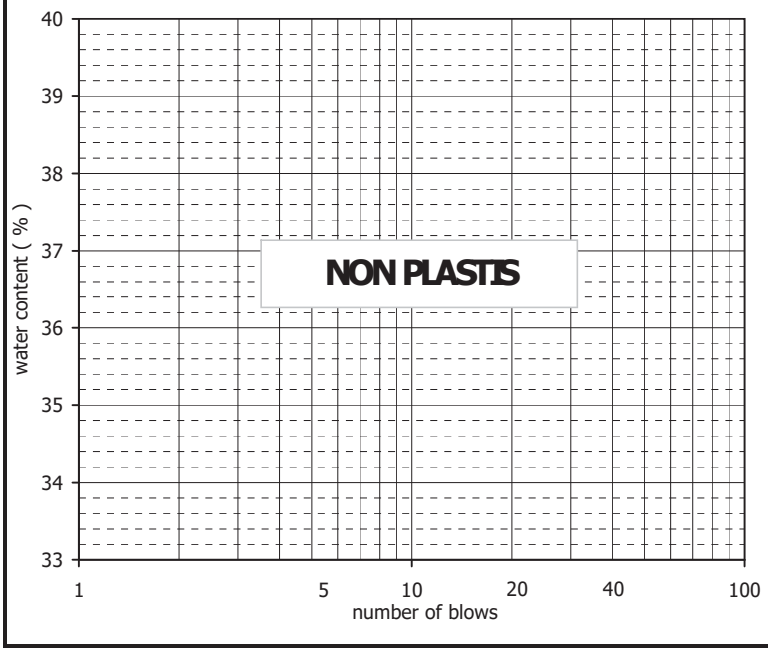
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		13.50 - 14.00

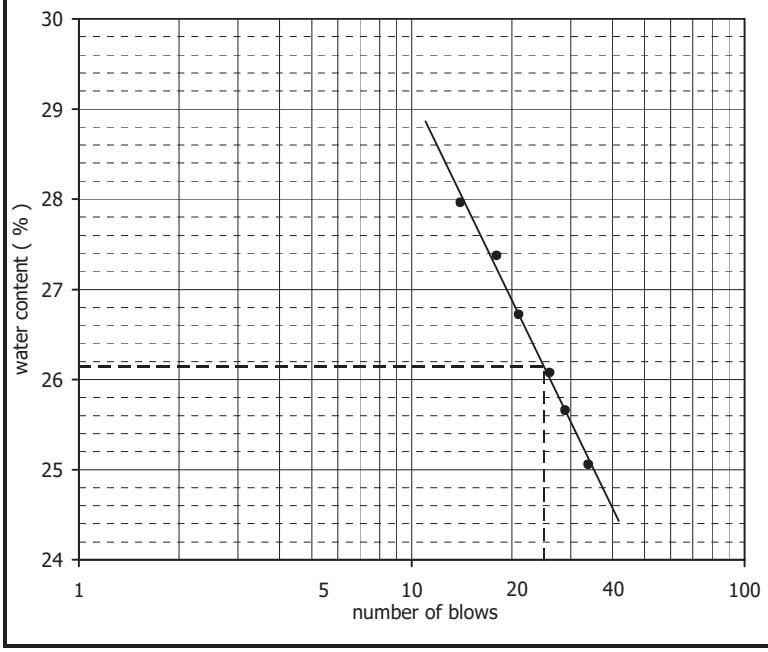
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			29 x	NO. OF BLOWS			26 x
		No.	A-89			No.	J-40			No.	A-18
WW	53.730	DW	50.470	WW	51.250	DW	48.610	WW	54.990	DW	52.070
DW	50.470	TW	37.460	DW	48.610	TW	38.320	DW	52.070	TW	40.870
Ww	3.260	Ws	13.010	Ww	2.640	Ws	10.290	Ww	2.920	Ws	11.200
	W =		25.06 %		W =		25.66 %		W =		26.07 %

4				5				6			
NO. OF BLOWS			21 x	NO. OF BLOWS			18 x	NO. OF BLOWS			14 x
		No.	L-17			No.	J-45			No.	T-15
WW	55.010	DW	51.980	WW	54.740	DW	51.190	WW	54.280	DW	50.760
DW	51.980	TW	40.640	DW	51.190	TW	38.220	DW	50.760	TW	38.170
Ww	3.030	Ws	11.340	Ww	3.550	Ws	12.970	Ww	3.520	Ws	12.590
	W =		26.72 %		W =		27.37 %		W =		27.96 %

PLASTIC LIMIT

1				2				3			
		No.	T-64			No.	T-25			No.	A-25
WW	55.710	DW	52.710	WW	54.310	DW	50.990	WW	54.940	DW	52.180
DW	52.710	TW	38.530	DW	50.990	TW	35.600	DW	52.180	TW	39.300
Ww	3.000	Ws	14.180	Ww	3.320	Ws	15.390	Ww	2.760	Ws	12.880
	W =		21.16 %		W =		21.57 %		W =		21.43 %



LIQUID LIMIT	=	26.15	%
PLASTIC LIMIT	=	21.39	%
PLASTICITY INDEX	=	4.76	%
FLOW INDEX	=	7.63	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		16.50 - 17.00

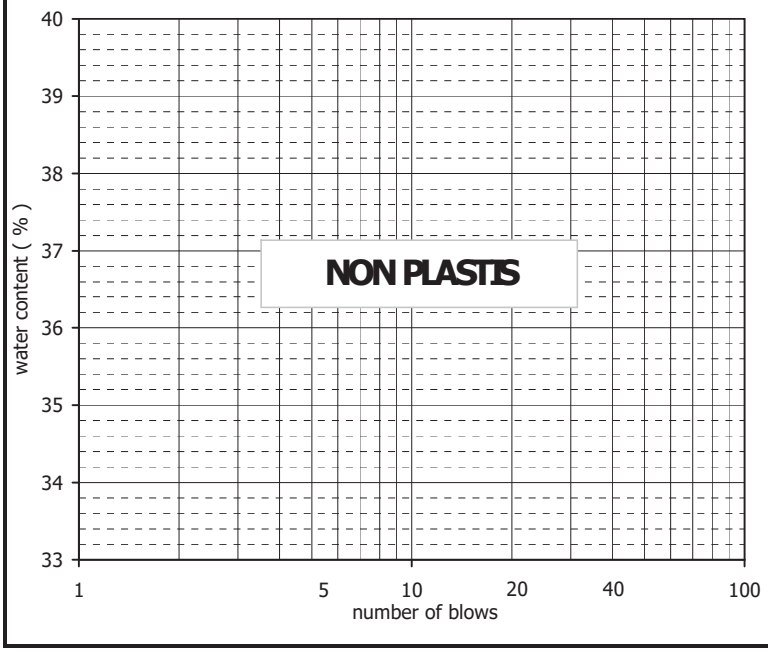
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 18, 2019
LOCATION	:	LERO TATARI - DONGGALA	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 20	DEPTH (m)		18.50 - 19.00

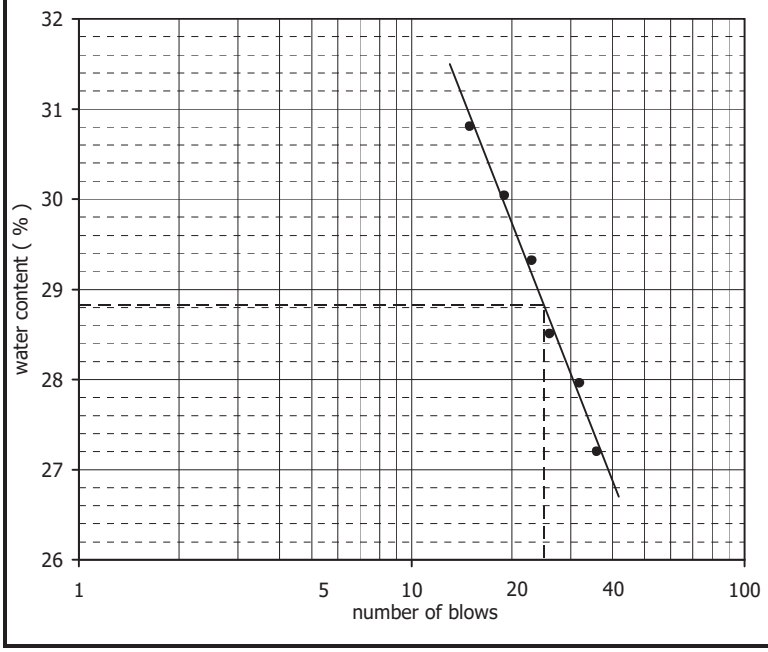
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			26 x
		No.	T-33			No.	T-11			No.	T-22
WW	56.620	DW	52.670	WW	53.010	DW	49.680	WW	55.350	DW	51.510
DW	52.670	TW	38.150	DW	49.680	TW	37.770	DW	51.510	TW	38.040
Ww	3.950	Ws	14.520	Ww	3.330	Ws	11.910	Ww	3.840	Ws	13.470
	W =		27.20 %		W =		27.96 %		W =		28.51 %

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	T-38			No.	J-60			No.	T-68
WW	52.480	DW	49.170	WW	53.490	DW	49.870	WW	54.280	DW	49.850
DW	49.170	TW	37.880	DW	49.870	TW	37.820	DW	49.850	TW	35.470
Ww	3.310	Ws	11.290	Ww	3.620	Ws	12.050	Ww	4.430	Ws	14.380
	W =		29.32 %		W =		30.04 %		W =		30.81 %

PLASTIC LIMIT

1				2				3			
		No.	T-62			No.	A-29			No.	A-40
WW	54.840	DW	51.570	WW	55.980	DW	53.010	WW	56.230	DW	53.340
DW	51.570	TW	35.760	DW	53.010	TW	38.260	DW	53.340	TW	39.240
Ww	3.270	Ws	15.810	Ww	2.970	Ws	14.750	Ww	2.890	Ws	14.100
	W =		20.68 %		W =		20.14 %		W =		20.50 %



LIQUID LIMIT	=	28.82	%
PLASTIC LIMIT	=	20.44	%
PLASTICITY INDEX	=	8.39	%
FLOW INDEX	=	9.42	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**BALAIKOTA - PALU**									
SAMPLE No			BAY - 21	BAY - 21	BAY - 21	BAY - 21	BAY - 21	BAY - 21	BAY - 21	BAY - 21	BAY - 21
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	13.21	11.13	14.28	15.30	16.85	18.08	22.67	13.46	16.61
	Specific gravity of soil	*Gs*	2.655	2.661	2.642	2.627	2.641	2.630	2.670	2.654	2.661
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	25.92	0.00	13.55	20.76	4.73	0.46	0.00	5.25	0.00
	Proportion – Sand part	(%)	48.55	56.24	69.62	47.21	51.68	25.62	34.98	44.92	28.74
	Proportion – Silt part	(%)	20.55	39.36	13.19	24.02	28.71	56.88	57.75	42.03	54.56
	Proportion – Clay part	(%)	4.98	4.39	3.64	8.00	14.88	17.03	7.27	7.80	16.70
	Max. diameter	(mm)	25.40	2.00	19.10	25.40	19.10	9.52	2.00	19.10	4.75
	90 % diameter	(mm)	16.5468	0.5583	7.5515	13.0321	1.8671	0.1927	0.2082	1.7119	0.2186
	60 % diameter	(mm)	1.1721	0.1019	0.7161	0.6957	0.1918	0.0585	0.0696	0.1144	0.0606
	50 % diameter	(mm)	0.5301	0.0847	0.4974	0.2581	0.0973	0.0473	0.0607	0.0746	0.0486
	30 % diameter	(mm)	0.1297	0.0522	0.1714	0.0691	0.0455	0.0230	0.0431	0.0498	0.0242
	10 % diameter	(mm)	0.0218	0.0210	0.0382	0.0121	-	-	0.0106	0.0114	-
	Uniformity Coefficient		53.75	4.86	18.75	57.44	-	-	6.57	9.99	-
	Passing # 200		25.53	43.76	16.83	32.03	43.59	73.91	65.02	49.83	71.26
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	28.55	31.98	27.49	26.67	27.11
	Plastic limit	*PL* (%)					19.70	21.77	22.37	21.64	20.28
	Plasticity index	*PI* (%)					8.85	10.21	5.12	5.03	6.83
	Flow index						8.34	9.48	8.01	7.51	8.07
	Unified Classification						SC	CL	CL - ML	CL - ML	CL - ML

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BUMN
Hadir untuk negeri

ISO 9001 CQMS - 3017003
ISO 14001 CQMS - 3019004
OHSAS 18001 CQMS - 3019027

SUMMARY OF SOIL TEST

PROJECT			**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**								
LOCATION			**BALAIKOTA - PALU**								
SAMPLE No			BAY - 21	BAY - 21	BAY - 21	BAY - 21	BAY - 21	BAY - 21			
DEPTH (m)			9.50 - 10.00	11.50 - 12.00	13.50 - 14.00	15.50 - 16.00	17.50 - 18.00	19.50 - 20.00			
PROPERTIES	Natural Water Content	(%)	13.47	17.03	9.12	13.84	9.69	9.96			
	Specific gravity of soil	*Gs*	2.684	2.669	2.681	2.664	2.674	2.681			
GRAIN SIZE ANALYSIS	Proportion: Gravel part	(%)	8.11	26.55	27.35	34.05	26.12	26.33			
	Proportion: Sand part	(%)	55.51	27.22	42.34	49.05	55.15	58.86			
	Proportion: Silt part	(%)	27.92	34.37	22.01	12.02	14.50	12.05			
	Proportion: Clay part	(%)	8.46	11.86	8.30	4.89	4.23	2.75			
	Max. diameter	(mm)	19.10	19.10	19.10	19.10	19.10	19.10			
	90 % diameter	(mm)	3.2311	14.2782	14.0294	14.5039	13.8389	12.7280			
	60 % diameter	(mm)	0.1833	0.1448	0.7922	2.8051	1.4571	1.7305			
	50 % diameter	(mm)	0.1170	0.0840	0.3191	1.1488	0.7509	0.9056			
	30 % diameter	(mm)	0.0574	0.0421	0.0730	0.2866	0.2238	0.3275			
	10 % diameter	(mm)	0.0082	0.0029	0.0095	0.0279	0.0309	0.0431			
	Uniformity Coefficient		22.45	49.34	82.96	100.48	47.10	40.18			
	Passing # 200		36.38	46.23	30.31	16.91	18.73	14.81			
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS			
	Plastic limit	*PL* (%)									
	Plasticity index	*PI* (%)									
	Flow index										
	Unified Classification										

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BUMN
Hadir untuk negeri

ISO 9001 CCBS-3417003
ISO 14001 CCBS-3418004
OHSAS 18001 CCBS-3418007

NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**
LOCATION	**BALAIKOTA - PALU**

Date	Sample No.& Depth (m)	Average (%)	Calculation											
						No	J-52						No	T-86
11/02 2019	BAY - 21 0.50 - 1.00	13.21	WW	102.63	DW	94.94		WW	117.13	DW	105.26			
			DW	94.94	TW	36.71		DW	105.26	TW	33.80			
			Ww	7.69	Ws	58.23		Ww	11.87	Ws	71.46			
				WC	(%)	13.21			WC	(%)	16.61			
					No	A-86						No	T-61	
11/02 2019	BAY - 21 1.50 - 2.00	11.13	WW	90.38	DW	85.29		WW	115.43	DW	106.24			
			DW	85.29	TW	39.55		DW	106.24	TW	38.03			
			Ww	5.09	Ws	45.74		Ww	9.19	Ws	68.21			
				WC	(%)	11.13			WC	(%)	13.47			
					No	A-105						No	L-18	
11/02 2019	BAY - 21 2.50 - 3.00	14.28	WW	111.95	DW	102.28		WW	99.28	DW	90.40			
			DW	102.28	TW	34.56		DW	90.40	TW	38.27			
			Ww	9.67	Ws	67.72		Ww	8.88	Ws	52.13			
				WC	(%)	14.28			WC	(%)	17.03			
					No	A-18						No	T-21	
11/02 2019	BAY - 21 3.50 - 4.00	15.30	WW	103.79	DW	95.44		WW	100.61	DW	95.37			
			DW	95.44	TW	40.87		DW	95.37	TW	37.91			
			Ww	8.35	Ws	54.57		Ww	5.24	Ws	57.46			
				WC	(%)	15.30			WC	(%)	9.12			
					No	A-103						No	A-89	
11/02 2019	BAY - 21 4.50 - 5.00	16.85	WW	101.21	DW	92.13		WW	116.27	DW	106.69			
			DW	92.13	TW	38.23		DW	106.69	TW	37.46			
			Ww	9.08	Ws	53.90		Ww	9.58	Ws	69.23			
				WC	(%)	16.85			WC	(%)	13.84			
					No	A-92						No	T-32	
11/02 2019	BAY - 21 5.50 - 6.00	18.08	WW	84.72	DW	77.61		WW	136.36	DW	127.74			
			DW	77.61	TW	38.28		DW	127.74	TW	38.76			
			Ww	7.11	Ws	39.33		Ww	8.62	Ws	88.98			
				WC	(%)	18.08			WC	(%)	9.69			
					No	A-24						No	M-33	
11/02 2019	BAY - 21 6.50 - 7.00	22.67	WW	93.22	DW	82.33		WW	308.50	DW	284.30			
			DW	82.33	TW	34.29		DW	284.30	TW	41.40			
			Ww	10.89	Ws	48.04		Ww	24.20	Ws	242.90			
				WC	(%)	22.67			WC	(%)	9.96			
					No	L-47						No		
11/02 2019	BAY - 21 7.50 - 8.00	13.46	WW	114.69	DW	106.24		WW		DW				
			DW	106.24	TW	43.47		DW		TW				
			Ww	8.45	Ws	62.77		Ww		Ws				
				WC	(%)	13.46			WC	(%)				

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				30	25	48	
Weight of Pycnometer		Wf	(gr)	38.460	43.080	37.760	
Weight of (Pycnometer + Water)		Wa	(gr)	138.140	146.430	139.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.000	159.190	151.900	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.370	38.170	38.130	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.590	20.390	20.350	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1400	146.4300	139.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.730	7.630	7.620	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.664	2.672	2.671	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.650	2.659	2.657	
Average Specific Gravity at 20° C							**2.655**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 17, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				27	34	16	
Weight of Pycnometer		Wf	(gr)	39.750	52.710	66.000	
Weight of (Pycnometer + Water)		Wa	(gr)	140.000	152.200	169.300	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	152.830	164.880	182.030	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.260	38.040	38.110	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.480	20.260	20.330	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	140.0000	152.2000	169.3000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.580	7.600	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.677	2.673	2.675	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.663	2.659	2.661	
Average Specific Gravity at 20° C							**2.661**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				2	31	11	
Weight of Pycnometer		Wf	(gr)	66.900	34.630	68.490	
Weight of (Pycnometer + Water)		Wa	(gr)	168.750	134.510	168.640	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.270	146.990	181.150	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.860	37.790	37.850	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.080	20.010	20.070	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.7500	134.5100	168.6400	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.560	7.530	7.560	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.656	2.657	2.655	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.642	2.644	2.641	
Average Specific Gravity at 20° C							**2.642**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				4	49	42	
Weight of Pycnometer		Wf	(gr)	65.900	39.190	39.190	
Weight of (Pycnometer + Water)		Wa	(gr)	167.100	141.110	142.220	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	179.790	153.710	154.880	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.210	38.030	38.180	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.430	20.250	20.400	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.1000	141.1100	142.2200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.740	7.650	7.740	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.640	2.647	2.636	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.626	2.633	2.622	
Average Specific Gravity at 20° C							**2.627**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				40	1	66	
Weight of Pycnometer		Wf	(gr)	52.250	62.150	36.290	
Weight of (Pycnometer + Water)		Wa	(gr)	153.170	165.770	136.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	165.730	178.550	148.860	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.920	38.300	37.960	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.140	20.520	20.180	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	153.1700	165.7700	136.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.580	7.740	7.600	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.657	2.651	2.655	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.643	2.638	2.642	
Average Specific Gravity at 20° C							**2.641**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				23	52	57	
Weight of Pycnometer		Wf	(gr)	43.180	52.420	50.930	
Weight of (Pycnometer + Water)		Wa	(gr)	146.380	153.990	151.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.170	166.630	163.860	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.350	38.120	38.180	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.570	20.340	20.400	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.3800	153.9900	151.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.780	7.700	7.710	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.644	2.642	2.646	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.630	2.628	2.632	
Average Specific Gravity at 20° C							**2.630**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				22	35	32	
Weight of Pycnometer		Wf	(gr)	39.710	37.070	51.260	
Weight of (Pycnometer + Water)		Wa	(gr)	145.030	136.920	151.350	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	157.630	149.820	164.550	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.860	38.330	38.830	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.080	20.550	21.050	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	145.0300	136.9200	151.3500	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.480	7.650	7.850	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.684	2.686	2.682	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.671	2.672	2.668	
Average Specific Gravity at 20° C							**2.670**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				26	24	59	
Weight of Pycnometer		Wf	(gr)	38.840	38.140	33.640	
Weight of (Pycnometer + Water)		Wa	(gr)	138.580	137.560	144.580	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.210	150.090	157.190	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.970	37.840	37.950	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.190	20.060	20.170	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.5800	137.5600	144.5800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.560	7.530	7.560	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.671	2.664	2.668	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.657	2.650	2.654	
Average Specific Gravity at 20° C							**2.654**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				12	15	69	
Weight of Pycnometer		Wf	(gr)	67.220	77.130	36.570	
Weight of (Pycnometer + Water)		Wa	(gr)	169.330	173.150	137.650	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.930	185.780	150.360	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.870	38.000	38.060	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.090	20.220	20.280	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.3300	173.1500	137.6500	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.490	7.590	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.682	2.664	2.679	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.668	2.650	2.665	
Average Specific Gravity at 20° C							**2.661**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				28	36	51	
Weight of Pycnometer		Wf	(gr)	34.010	51.080	53.870	
Weight of (Pycnometer + Water)		Wa	(gr)	135.370	151.920	154.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.190	164.620	167.020	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.160	37.950	38.020	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.380	20.170	20.240	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.3700	151.9200	154.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.560	7.470	7.500	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.696	2.700	2.699	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.682	2.686	2.685	
Average Specific Gravity at 20° C							**2.684**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	11.50 - 12.00

Determination No				1	2	3	4
No of Pycnometer				20	8	75	
Weight of Pycnometer		Wf	(gr)	68.510	67.390	35.700	
Weight of (Pycnometer + Water)		Wa	(gr)	168.600	168.560	135.380	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.390	181.250	148.140	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.150	38.040	38.120	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.370	20.260	20.340	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.6000	168.5600	135.3800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.580	7.570	7.580	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.687	2.676	2.683	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.674	2.663	2.670	
Average Specific Gravity at 20° C							**2.669**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 17, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	13.50 - 14.00

Determination No				1	2	3	4
No of Pycnometer				38	3	74	
Weight of Pycnometer		Wf	(gr)	37.290	63.340	38.550	
Weight of (Pycnometer + Water)		Wa	(gr)	136.940	166.670	138.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.700	179.340	151.360	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.060	37.930	38.030	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.280	20.150	20.250	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9400	166.6700	138.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.520	7.480	7.520	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.697	2.694	2.693	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.683	2.680	2.679	
Average Specific Gravity at 20° C							**2.681**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	15.50 - 16.00

Determination No				1	2	3	4
No of Pycnometer				7	37	67	
Weight of Pycnometer		Wf	(gr)	68.750	50.940	36.820	
Weight of (Pycnometer + Water)		Wa	(gr)	169.400	151.200	137.620	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.950	163.940	150.340	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.840	38.080	38.090	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.060	20.300	20.310	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.4000	151.2000	137.6200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.510	7.560	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.671	2.685	2.676	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.657	2.671	2.662	
Average Specific Gravity at 20° C							**2.664**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	17.50 - 18.00

Determination No				1	2	3	4
No of Pycnometer				14	72	18	
Weight of Pycnometer		Wf	(gr)	69.710	33.250	66.800	
Weight of (Pycnometer + Water)		Wa	(gr)	170.370	133.800	168.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	183.050	146.520	181.370	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.960	38.050	38.070	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.180	20.270	20.290	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	170.3700	133.8000	168.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.550	7.550	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.691	2.685	2.687	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.677	2.671	2.674	
Average Specific Gravity at 20° C							**2.674**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 17, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 21	DEPTH	19.50 - 20.00

Determination No				1	2	3	4
No of Pycnometer				29	5	82	
Weight of Pycnometer		Wf	(gr)	36.900	65.390	37.300	
Weight of (Pycnometer + Water)		Wa	(gr)	135.800	168.330	137.000	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.410	181.070	149.670	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.800	38.070	37.920	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.020	20.290	20.140	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8000	168.3300	137.0000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.410	7.550	7.470	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.702	2.687	2.696	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.688	2.674	2.682	
Average Specific Gravity at 20° C							**2.681**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 280.9 gr
Wt. container No ..... = 33.74 gr
Wt. Of air dry soil W' = 247.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **247.16** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	51.50	33.74	17.76		7.19	92.81
9.52	77.60		43.86		17.75	82.25
4.75	97.80		64.06		25.92	74.08
2.00	117.40		83.66		33.85	66.15

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	0.50 - 1.00

Wt. (Air dry soil + container) = 128.00 gr — Specific Gravity : 2.655
Wt. of container B-99 = 33.74 gr — Plasticity Index : %
Wt. Of air dry soil W' = 94.26 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 66.15 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-15			NO	T-71			NO	T-26		
WW	63.32	DW	62.35	WW	61.11	DW	60.24	WW	60.90	DW	60.01	Mean value	
DW	62.35	TW	38.17	DW	60.24	TW	39.13	DW	60.01	TW	38.09	w	
Ww	0.97	Ws	24.18	Ww	0.87	Ws	21.11	Ww	0.89	Ws	21.92	4.06	%
w	4.01	%		w	4.12	%		w	4.06	%			

$$W = \frac{100 \times W'}{100 + w} : 90.579 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.5	17.5	28	11.180	11.180	3.3437	0.01244	0.0416	14.50	25.68	16.99
2	13.0	14.0	28	12.063	6.032	2.4559	0.01244	0.0305	11.00	19.48	12.89
5	10.0	11.0	28	12.820	2.564	1.6012	0.01244	0.0199	8.00	14.17	9.37
15	8.0	9.0	28	13.325	0.888	0.9425	0.01244	0.0117	6.00	10.63	7.03
30	7.0	8.0	28	13.577	0.453	0.6727	0.01244	0.0084	5.00	8.86	5.86
60	6.5	7.5	28	13.703	0.228	0.4779	0.01244	0.0059	4.50	7.97	5.27
240	5.5	6.5	29	13.955	0.058	0.2411	0.01230	0.0030	3.50	6.20	4.10
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01244	0.0014	2.50	4.43	2.93

P = 100/W = 1.104

$$Mx = \frac{Gs}{Gs - 1} = 1.6042$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	33.72	22.02	11.700		12.92	87.08	57.61
0.42	47.72		25.700		28.37	71.63	47.38
0.25	59.36		37.340		41.22	58.78	38.88
0.105	74.02		52.000		57.41	42.59	28.17
0.074	77.64		55.620		61.41	38.59	25.53

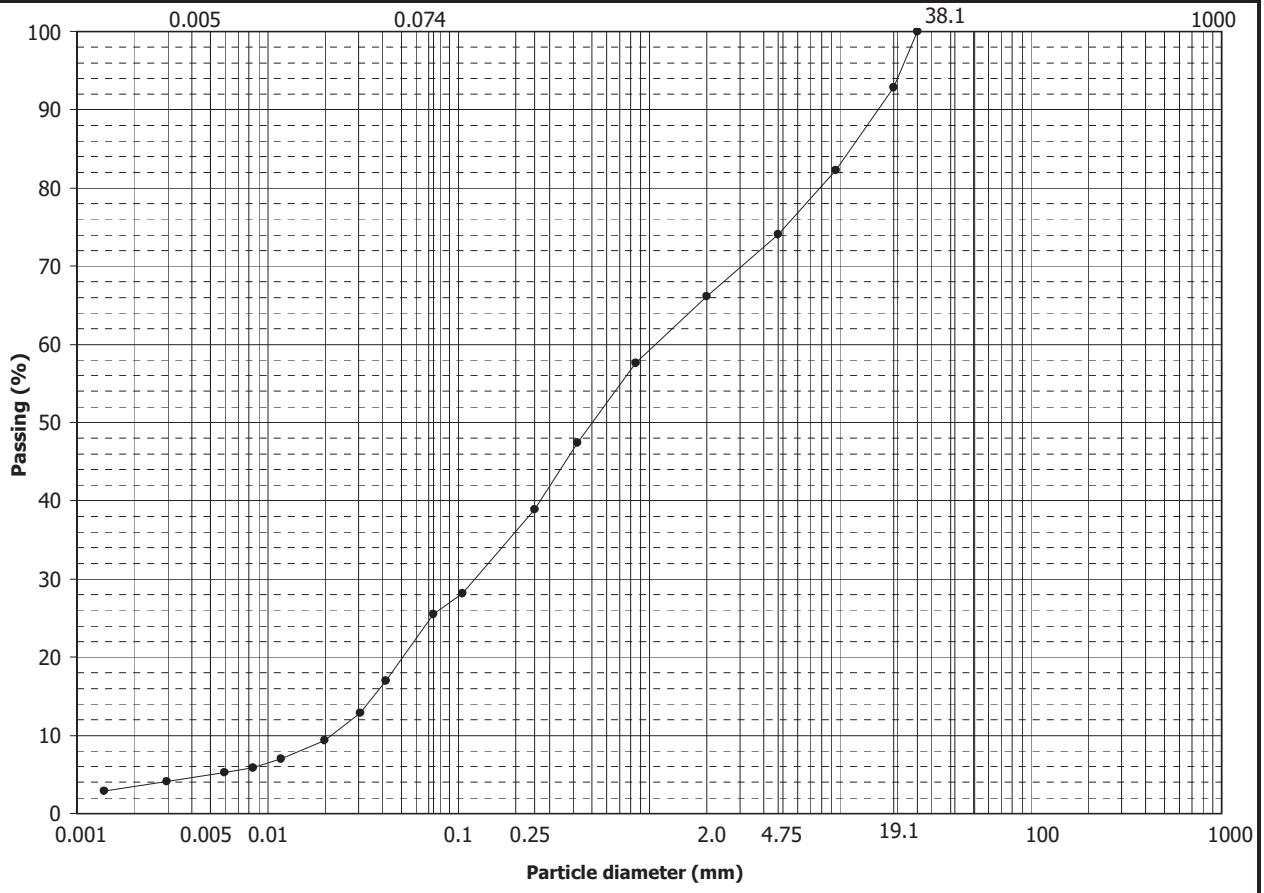
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.655**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
25.92	48.55	20.55	4.98	25.40	16.547	1.1721	0.5301	0.1297	0.0218	53.75	66.15	47.38	25.53



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 136.75 gr — Specific Gravity : **2.661**

Wt. of container B-68 = 33.11 gr — Plasticity Index : %

Wt. Of air dry soil W' = 103.64 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-06			NO	T-63			NO	T-73		
WW	60.81	DW	59.98	WW	60.44	DW	59.45	WW	62.12	DW	61.09	Mean value	
DW	59.98	TW	38.47	DW	59.45	TW	34.18	DW	61.09	TW	34.60	w	
Ww	0.83	Ws	21.51	Ww	0.99	Ws	25.27	Ww	1.03	Ws	26.49	3.89	%
w	3.86	%		w	3.92	%		w	3.89	%			

$$W = \frac{100 \times W'}{100 + w} : 99.761 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.5	17.5	28	11.180	11.180	3.3437	0.01241	0.0415	14.50	23.29	23.29
2	11.5	12.5	28	12.442	6.221	2.4941	0.01241	0.0310	9.50	15.26	15.26
5	8.0	9.0	28	13.325	2.665	1.6325	0.01241	0.0203	6.00	9.64	9.64
15	6.0	7.0	28	13.829	0.922	0.9602	0.01241	0.0119	4.00	6.42	6.42
30	5.5	6.5	28	13.955	0.465	0.6820	0.01241	0.0085	3.50	5.62	5.62
60	5.0	6.0	28	14.081	0.235	0.4844	0.01241	0.0060	3.00	4.82	4.82
240	4.0	5.0	29	14.334	0.060	0.2444	0.01228	0.0030	2.00	3.21	3.21
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01241	0.0014	1.50	2.41	2.41

P = 100/W = 1.0024

$$Mx = \frac{G_s}{G_s - 1} = 1.6020$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	26.27	22.02	4.250		4.26	95.74	95.74
0.42	34.71		12.690		12.72	87.28	87.28
0.25	46.34		24.320		24.38	75.62	75.62
0.105	60.12		38.100		38.19	61.81	61.81
0.074	78.13		56.110		56.24	43.76	43.76

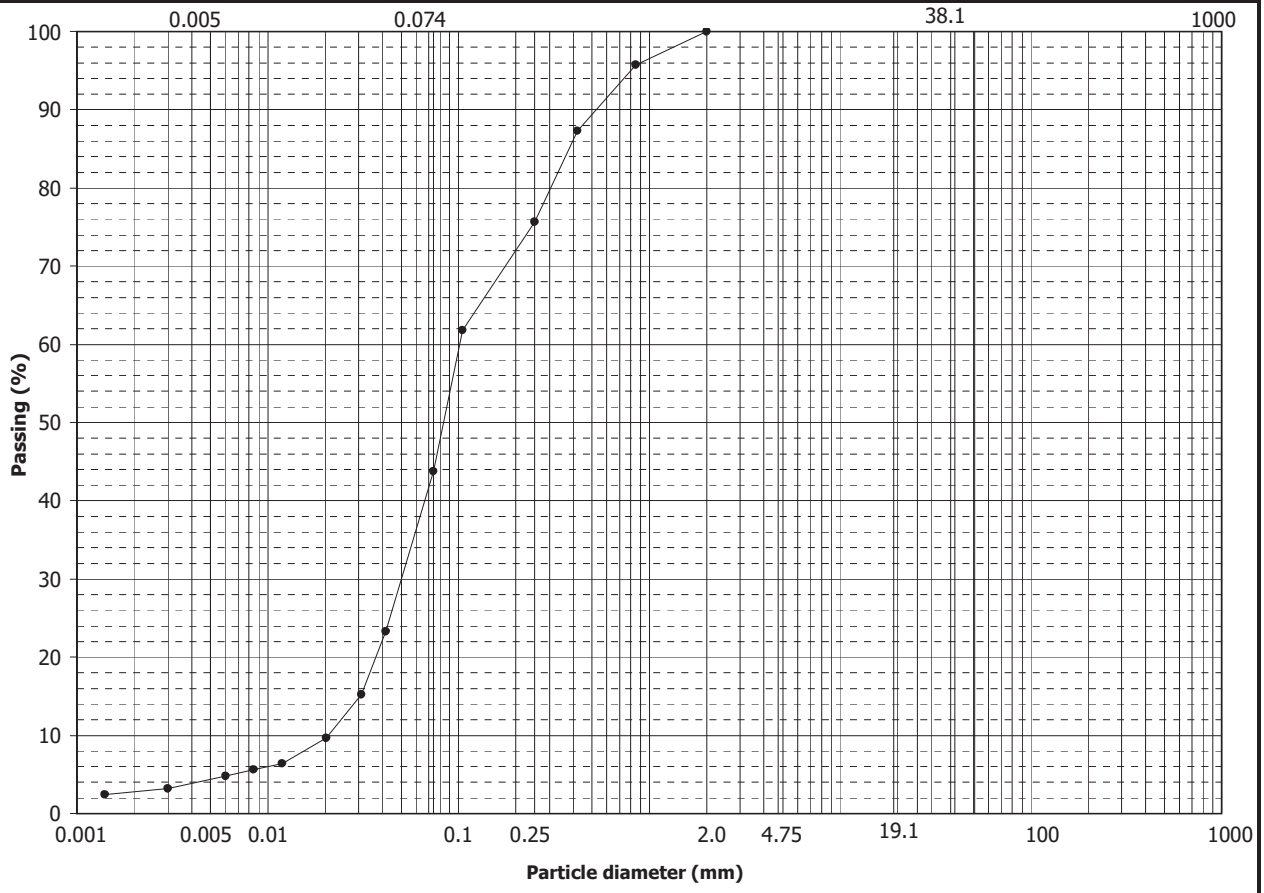
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.661**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	56.24	39.36	4.39	2.00	0.5583	0.1019	0.0847	0.0522	0.0210	4.86	100.00	87.28	43.76



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 295.1 gr
Wt. container No ..... = 35.41 gr
Wt. Of air dry soil W' = 259.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **259.69** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	54.90	35.41	19.49		7.51	92.49
4.75	70.60		35.19		13.55	86.45
2.00	88.90		53.49		20.60	79.40

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	2.50 - 3.00

Wt. (Air dry soil + container) = 135.13 gr — Specific Gravity : 2.642
Wt. of container B-14 = 35.41 gr — Plasticity Index : %
Wt. Of air dry soil W' = 99.72 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 79.40 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-68			NO	T-18			NO	T-75	Mean value	
WW	62.99	DW	61.88	WW	62.15	DW	61.11	WW	63.07	DW	62.01		
DW	61.88	TW	35.47	DW	61.11	TW	36.66	DW	62.01	TW	37.34	w	
Ww	1.11	Ws	26.41	Ww	1.04	Ws	24.45	Ww	1.06	Ws	24.67	4.25	%
w	4.20	%		w	4.25	%		w	4.30	%			

$$W = \frac{100 \times W'}{100 + w} : 95.654 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	10.5	11.5	28	12.694	12.694	3.5628	0.01248	0.0445	8.50	14.30	11.35
2	8.5	9.5	28	13.198	6.599	2.5689	0.01248	0.0321	6.50	10.93	8.68
5	7.0	8.0	28	13.577	2.715	1.6478	0.01248	0.0206	5.00	8.41	6.68
15	6.0	7.0	28	13.829	0.922	0.9602	0.01248	0.0120	4.00	6.73	5.34
30	5.5	6.5	28	13.955	0.465	0.6820	0.01248	0.0085	3.50	5.89	4.67
60	5.0	6.0	28	14.081	0.235	0.4844	0.01248	0.0060	3.00	5.05	4.01
240	4.0	5.0	29	14.334	0.060	0.2444	0.01235	0.0030	2.00	3.36	2.67
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01248	0.0014	1.50	2.52	2.00

P = 100/W = 1.0454

$$Mx = \frac{Gs}{Gs - 1} = 1.6090$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	38.02	22.02	16.000		16.73	83.27	66.12
0.42	61.70		39.680		41.48	58.52	46.46
0.25	73.66		51.640		53.99	46.01	36.54
0.105	88.18		66.160		69.17	30.83	24.48
0.074	97.40		75.380		78.81	21.19	16.83

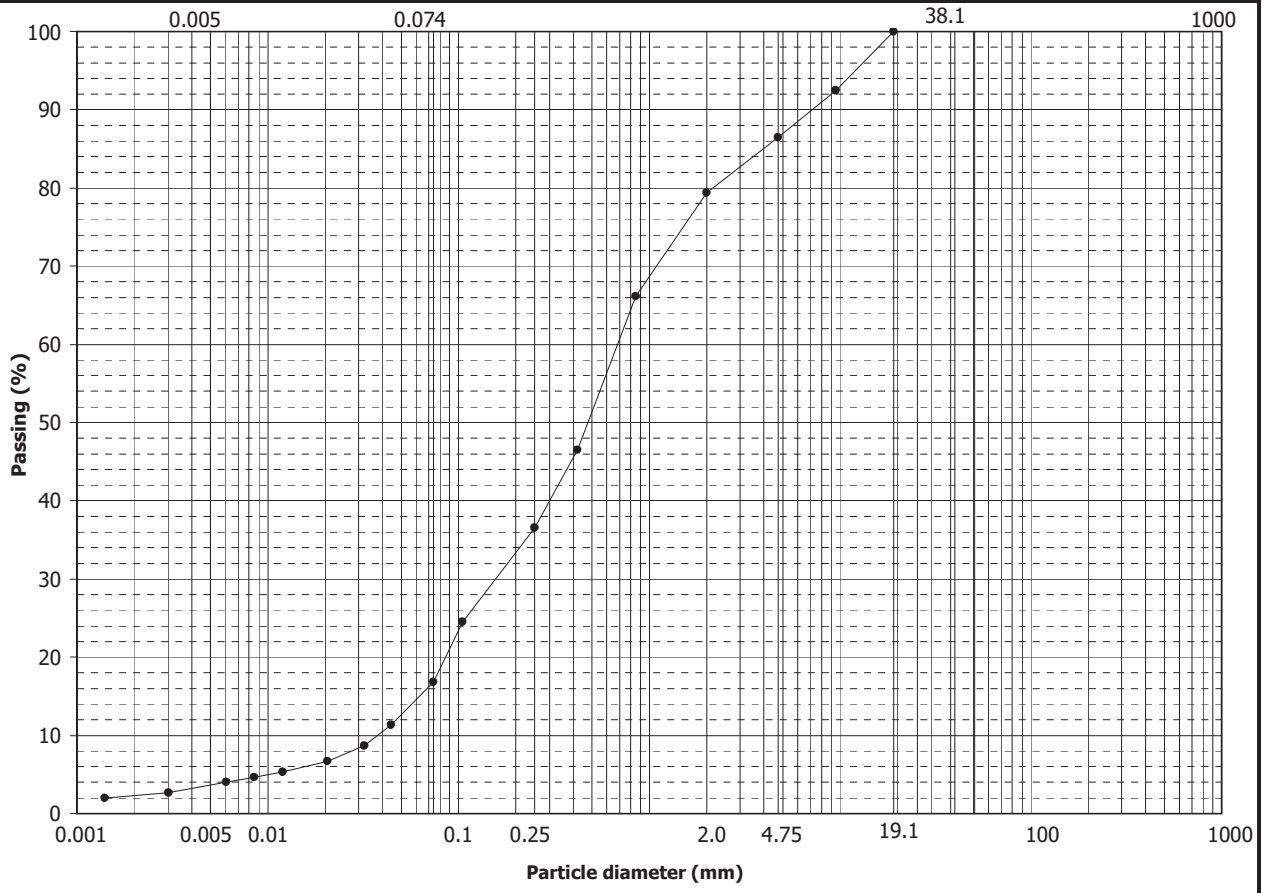
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.642**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
13.55	69.62	13.19	3.64	19.10	7.5515	0.7161	0.4974	0.1714	0.0382	18.75	79.40	46.46	16.83



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 466.4 gr
Wt. container No ..... = 32.91 gr
Wt. Of air dry soil W' = 433.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **433.49** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	52.00	32.91	19.09		4.40	95.60
9.52	90.30		57.39		13.24	86.76
4.75	122.90		89.99		20.76	79.24
2.00	156.20		123.29		28.44	71.56

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	3.50 - 4.00

Wt. (Air dry soil + container) = 114.69 gr — Specific Gravity : 2.627
Wt. of container B-32 = 32.91 gr — Plasticity Index : %
Wt. Of air dry soil W' = 81.78 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 71.56 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-85			NO	T-34			NO	T-24		
WW	63.99	DW	62.00	WW	63.67	DW	61.74	WW	63.23	DW	61.33	Mean value	
DW	62.00	TW	36.77	DW	61.74	TW	37.03	DW	61.33	TW	37.15	w	
Ww	1.99	Ws	25.23	Ww	1.93	Ws	24.71	Ww	1.90	Ws	24.18	7.85	%
w	7.89	%		w	7.81	%		w	7.86	%			

$$W = \frac{100 \times W'}{100 + w} : 75.826 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.5	15.5	28	11.685	11.685	3.4183	0.01254	0.0429	12.50	26.62	19.05
2	12.0	13.0	28	12.315	6.158	2.4815	0.01254	0.0311	10.00	21.29	15.24
5	10.0	11.0	28	12.820	2.564	1.6012	0.01254	0.0201	8.00	17.04	12.19
15	8.5	9.5	28	13.198	0.880	0.9380	0.01254	0.0118	6.50	13.84	9.90
30	8.0	9.0	28	13.325	0.444	0.6664	0.01254	0.0084	6.00	12.78	9.14
60	7.5	8.5	28	13.451	0.224	0.4735	0.01254	0.0059	5.50	11.71	8.38
240	6.5	7.5	29	13.703	0.057	0.2389	0.01241	0.0030	4.50	9.58	6.86
1140	5.5	6.5	28	13.955	0.012	0.1106	0.01254	0.0014	3.50	7.45	5.33

P = 100/W = 1.3188

$$Mx = \frac{Gs}{Gs - 1} = 1.6146$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	31.29	22.02	9.270		12.23	87.77	62.81
0.42	39.59		17.570		23.17	76.83	54.98
0.25	45.13		23.110		30.48	69.52	49.75
0.105	57.55		35.530		46.86	53.14	38.03
0.074	63.91		41.890		55.24	44.76	32.03

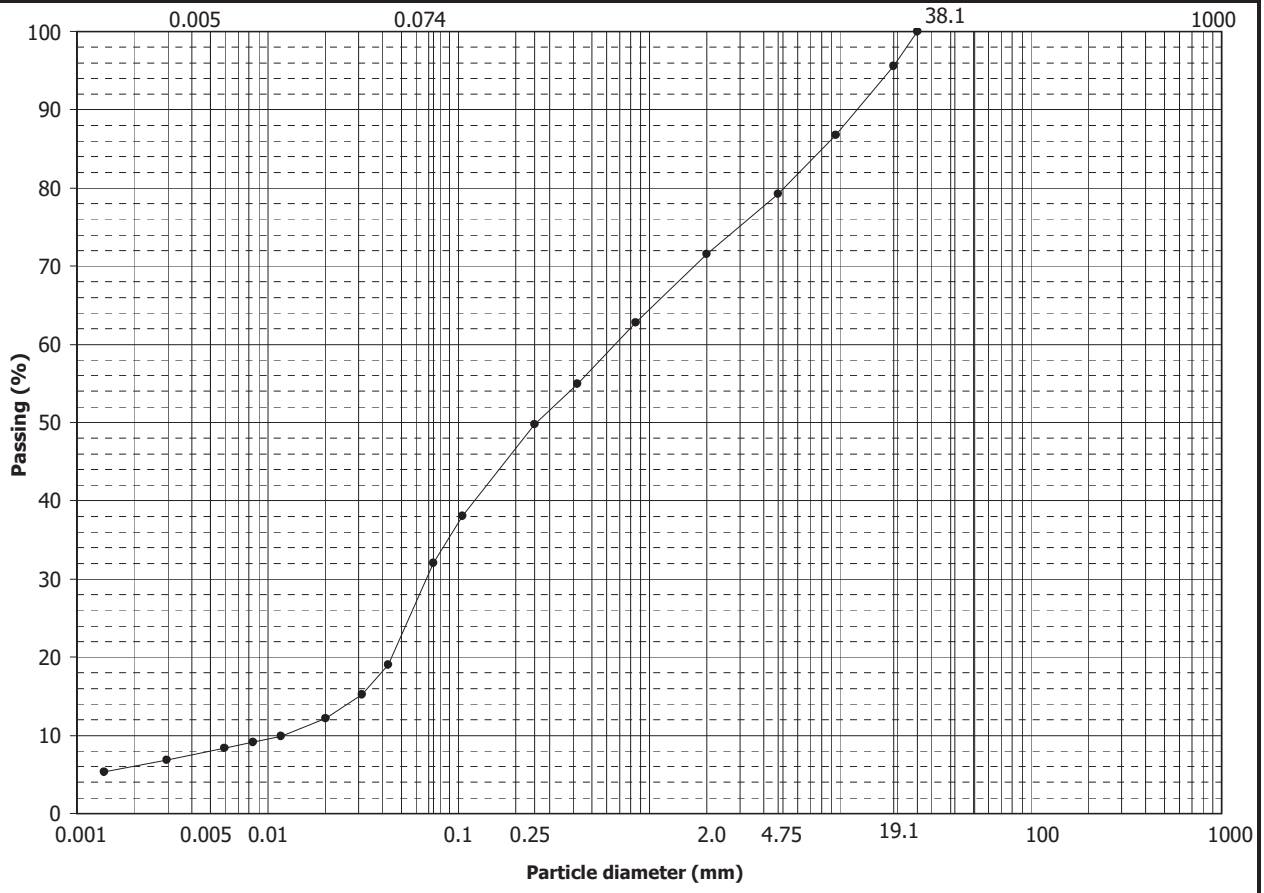
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.627**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
20.76	47.21	24.02	8.00	25.40	13.032	0.6957	0.2581	0.0691	0.0121	57.44	71.56	54.98	32.03



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 374.5 gr
Wt. container No ..... = 43.96 gr
Wt. Of air dry soil W' = 330.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **330.54** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	53.80	43.96	9.84		2.98	97.02
4.75	59.60		15.64		4.73	95.27
2.00	73.40		29.44		8.91	91.09

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	4.50 - 5.00

Wt. (Air dry soil + container) = 107.73 gr — Specific Gravity : 2.641
Wt. of container B-54 = 35.49 gr — Plasticity Index : %
Wt. Of air dry soil W' = 72.24 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 91.09 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-03			NO	T-81			NO	T-40		
WW	61.08	DW	59.56	WW	64.78	DW	62.77	WW	64.53	DW	62.67	Mean value	
DW	59.56	TW	41.03	DW	62.77	TW	38.37	DW	62.67	TW	39.30	w	
Ww	1.52	Ws	18.53	Ww	2.01	Ws	24.40	Ww	1.86	Ws	23.37	8.13	%
w	8.20	%		w	8.24	%		w	7.96	%			

$$W = \frac{100 \times W'}{100 + w} : 66.807 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01249	0.0425	13.00	31.32	28.53
2	13.0	14.0	28	12.063	6.032	2.4559	0.01249	0.0307	11.00	26.50	24.14
5	11.0	12.0	28	12.568	2.514	1.5854	0.01249	0.0198	9.00	21.68	19.75
15	10.0	11.0	28	12.820	0.855	0.9245	0.01249	0.0115	8.00	19.27	17.56
30	9.5	10.5	28	12.946	0.432	0.6569	0.01249	0.0082	7.50	18.07	16.46
60	9.0	10.0	28	13.072	0.218	0.4668	0.01249	0.0058	7.00	16.86	15.36
240	8.0	9.0	29	13.325	0.056	0.2356	0.01235	0.0029	6.00	14.45	13.17
1140	7.5	8.5	28	13.451	0.012	0.1086	0.01249	0.0014	5.50	13.25	12.07

P = 100/W = 1.4969

$$Mx = \frac{G_s}{G_s - 1} = 1.6094$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.96	22.02	6.940		10.39	89.61	81.63
0.42	34.95		12.930		19.35	80.65	73.46
0.25	40.96		18.940		28.35	71.65	65.27
0.105	50.59		28.570		42.77	57.23	52.14
0.074	56.86		34.840		52.15	47.85	43.59

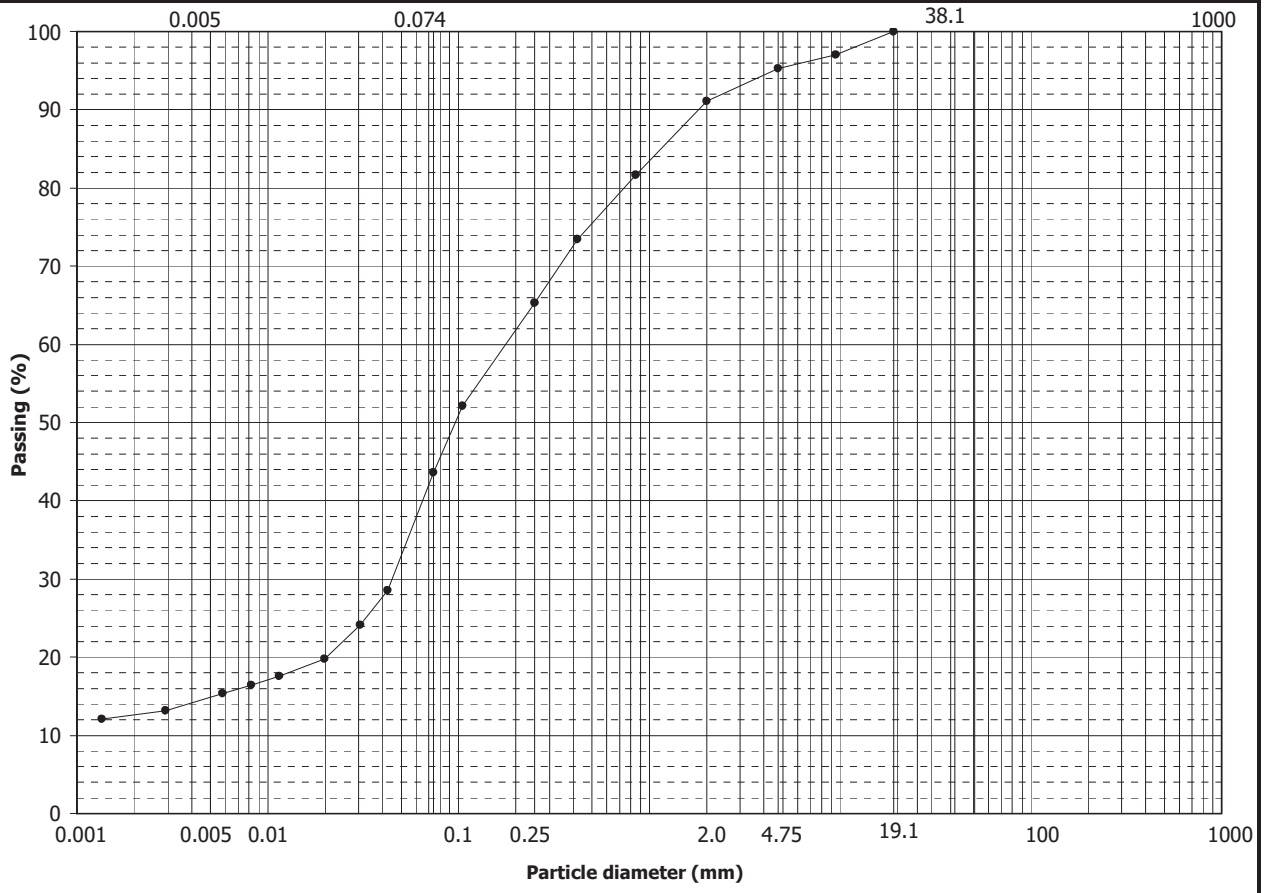
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.641**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
4.73	51.68	28.71	14.88	19.10	1.8671	0.1918	0.0973	0.0455	-	-	91.09	73.46	43.59



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 338.2 gr
Wt. container No ..... = 36.90 gr
Wt. Of air dry soil W' = 301.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **301.30** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52		36.90				100.00
4.75	38.30		1.40		0.46	99.54
2.00	40.10		3.20		1.06	98.94

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	5.50 - 6.00

Wt. (Air dry soil + container) = 143.40 gr — Specific Gravity : 2.630
Wt. of container B-84 = 35.70 gr — Plasticity Index : %
Wt. Of air dry soil W' = 107.70 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 98.94 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-01			NO	A-10			NO	J-60		
WW	63.11	DW	59.33	WW	63.95	DW	59.22	WW	64.69	DW	60.55	Mean value	
DW	59.33	TW	38.40	DW	59.22	TW	33.38	DW	60.55	TW	37.82	w	
Ww	3.78	Ws	20.93	Ww	4.73	Ws	25.84	Ww	4.14	Ws	22.73	18.19	%
w	18.06	%		w	18.30	%		w	18.21	%			

$$W = \frac{100 \times W'}{100 + w} : 91.122 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	25.5	26.5	28	8.909	8.909	2.9849	0.01253	0.0374	23.50	41.61	41.17
2	21.0	22.0	28	10.045	5.022	2.2411	0.01253	0.0281	19.00	33.64	33.29
5	17.5	18.5	28	10.928	2.186	1.4784	0.01253	0.0185	15.50	27.45	27.15
15	15.0	16.0	28	11.558	0.771	0.8778	0.01253	0.0110	13.00	23.02	22.77
30	13.0	14.0	28	12.063	0.402	0.6341	0.01253	0.0079	11.00	19.48	19.27
60	12.0	13.0	28	12.315	0.205	0.4531	0.01253	0.0057	10.00	17.71	17.52
240	10.5	11.5	29	12.694	0.053	0.2300	0.01239	0.0029	8.50	15.05	14.89
1140	9.5	10.5	28	12.946	0.011	0.1066	0.01253	0.0013	7.50	13.28	13.14

P = 100/W = 1.0974

$$Mx = \frac{G_s}{G_s - 1} = 1.6135$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.85	22.02	0.830		0.91	99.09	98.04
0.42	24.66		2.640		2.90	97.10	96.07
0.25	27.80		5.780		6.34	93.66	92.66
0.105	34.00		11.980		13.15	86.85	85.93
0.074	45.07		23.050		25.30	74.70	73.91

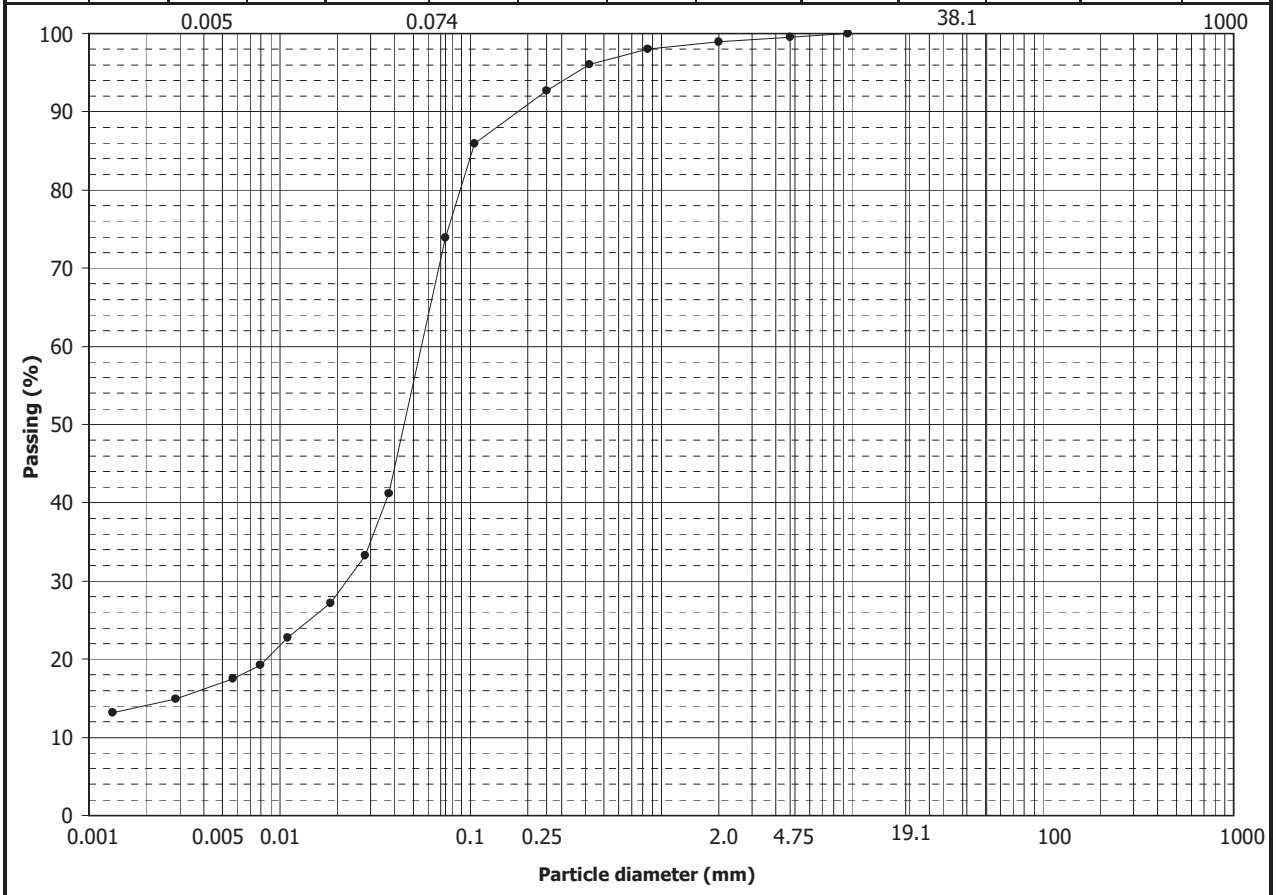
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.630**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.46	25.62	56.88	17.03	9.52	0.1927	0.0585	0.0473	0.0230	-	-	98.94	96.07	73.91



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	6.50 - 7.00

Wt. (Air dry soil + container) = 137.90 gr — Specific Gravity : 2.670
Wt. of container E-76 = 36.50 gr — Plasticity Index : %
Wt. Of air dry soil W' = 101.40 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-14			NO	J-30			NO	J-43		
WW	63.42	DW	58.66	WW	65.28	DW	60.16	WW	65.39	DW	59.98	Mean value	
DW	58.66	TW	37.54	DW	60.16	TW	37.61	DW	59.98	TW	36.94	w	
Ww	4.76	Ws	21.12	Ww	5.12	Ws	22.55	Ww	5.41	Ws	23.04	22.91	%
w	22.54	%		w	22.71	%		w	23.48	%			

$$W = \frac{100 \times W'}{100 + w} : 82.500 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.5	17.5	28	11.180	11.180	3.3437	0.01238	0.0414	14.50	28.10	28.10
2	12.5	13.5	28	12.189	6.095	2.4687	0.01238	0.0306	10.50	20.35	20.35
5	9.5	10.5	28	12.946	2.589	1.6091	0.01238	0.0199	7.50	14.53	14.53
15	7.5	8.5	28	13.451	0.897	0.9470	0.01238	0.0117	5.50	10.66	10.66
30	6.5	7.5	28	13.703	0.457	0.6758	0.01238	0.0084	4.50	8.72	8.72
60	6.0	7.0	28	13.829	0.230	0.4801	0.01238	0.0059	4.00	7.75	7.75
240	5.0	6.0	29	14.081	0.059	0.2422	0.01225	0.0030	3.00	5.81	5.81
1140	4.0	5.0	28	14.334	0.013	0.1121	0.01238	0.0014	2.00	3.88	3.88

P = 100/W = 1.2121

$$Mx = \frac{G_s}{G_s - 1} = 1.5988$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.56	22.02	0.540		0.65	99.35	99.35
0.42	24.01		1.990		2.41	97.59	97.59
0.25	27.94		5.920		7.18	92.82	92.82
0.105	36.03		14.010		16.98	83.02	83.02
0.074	50.88		28.860		34.98	65.02	65.02

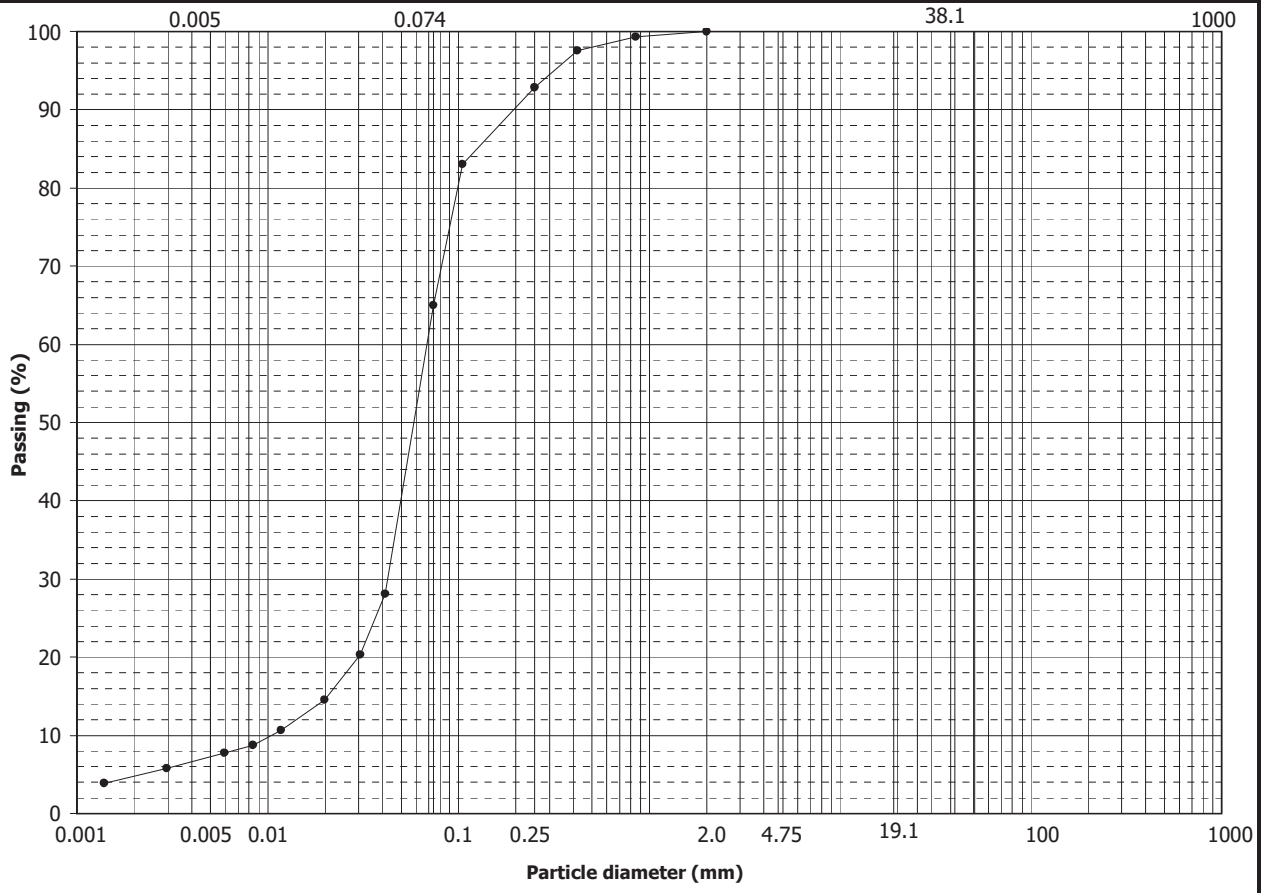
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.670**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	34.98	57.75	7.27	2.00	0.2082	0.0696	0.0607	0.0431	0.0106	6.57	100.00	97.59	65.02



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 436.5 gr
Wt. container No ..... = 42.20 gr
Wt. Of air dry soil W' = 394.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **394.30** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	54.00	42.20	11.80		2.99	97.01
4.75	62.90		20.70		5.25	94.75
2.00	75.60		33.40		8.47	91.53

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	7.50 - 8.00

Wt. (Air dry soil + container) = 126.70 gr — Specific Gravity : 2.654
Wt. of container E-52 = 35.70 gr — Plasticity Index : %
Wt. Of air dry soil W' = 91.00 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 91.53 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-16			NO	T-23			NO	T-17		
WW	65.79	DW	62.69	WW	63.50	DW	60.33	WW	63.22	DW	60.02	Mean value	
DW	62.69	TW	40.00	DW	60.33	TW	37.06	DW	60.02	TW	36.62	w	
Ww	3.10	Ws	22.69	Ww	3.17	Ws	23.27	Ww	3.20	Ws	23.40	13.65	%
w	13.66	%		w	13.62	%		w	13.68	%			

$$W = \frac{100 \times W'}{100 + w} : 80.068 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01244	0.0423	13.00	26.05	23.85
2	11.5	12.5	28	12.442	6.221	2.4941	0.01244	0.0310	9.50	19.04	17.43
5	9.0	10.0	28	13.072	2.614	1.6169	0.01244	0.0201	7.00	14.03	12.84
15	7.5	8.5	28	13.451	0.897	0.9470	0.01244	0.0118	5.50	11.02	10.09
30	7.0	8.0	28	13.577	0.453	0.6727	0.01244	0.0084	5.00	10.02	9.17
60	6.5	7.5	28	13.703	0.228	0.4779	0.01244	0.0059	4.50	9.02	8.25
240	5.5	6.5	29	13.955	0.058	0.2411	0.01230	0.0030	3.50	7.01	6.42
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01244	0.0014	2.50	5.01	4.59

P = 100/W = 1.2489

$$Mx = \frac{G_s}{G_s - 1} = 1.6046$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	27.36	22.02	5.340		6.67	93.33	85.42
0.42	32.13		10.110		12.63	87.37	79.97
0.25	38.83		16.810		20.99	79.01	72.31
0.105	50.35		28.330		35.38	64.62	59.14
0.074	58.50		36.480		45.56	54.44	49.83

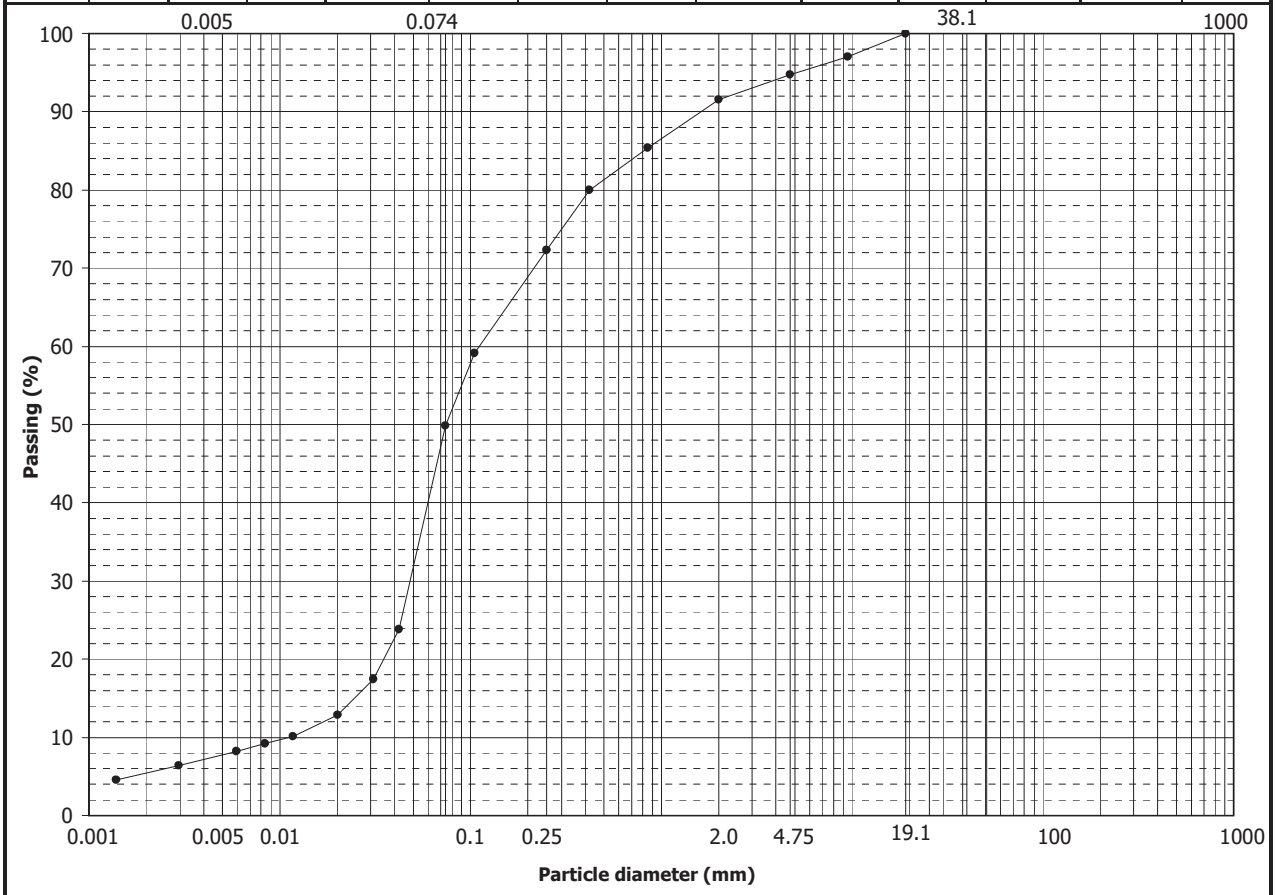
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.654**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
5.25	44.92	42.03	7.80	19.10	1.7119	0.1144	0.0746	0.0498	0.0114	9.99	91.53	79.97	49.83



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 328.8 gr
Wt. container No ..... = 40.70 gr
Wt. Of air dry soil W' = 288.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **288.10** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	40.88	40.70	0.18		0.06	99.94

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	8.50 - 9.00

Wt. (Air dry soil + container) = 138.39 gr — Specific Gravity : 2.661
Wt. of container M-36 = 40.67 gr — Plasticity Index : %
Wt. Of air dry soil W' = 97.72 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 99.94 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-12			NO	J-23			NO	J-17		
WW	63.07	DW	59.33	WW	62.21	DW	58.44	WW	63.81	DW	60.05	Mean value	
DW	59.33	TW	37.07	DW	58.44	TW	36.20	DW	60.05	TW	37.60	w	
Ww	3.74	Ws	22.26	Ww	3.77	Ws	22.24	Ww	3.76	Ws	22.45	16.83	%
w	16.80	%		w	16.95	%		w	16.75	%			

$$W = \frac{100 \times W'}{100 + w} : 83.640 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	23.5	24.5	28	9.414	9.414	3.0682	0.01241	0.0381	21.50	41.18	41.16
2	19.0	20.0	28	10.549	5.275	2.2967	0.01241	0.0285	17.00	32.56	32.54
5	16.0	17.0	28	11.306	2.261	1.5037	0.01241	0.0187	14.00	26.82	26.80
15	13.5	14.5	28	11.937	0.796	0.8921	0.01241	0.0111	11.50	22.03	22.01
30	12.0	13.0	28	12.315	0.411	0.6407	0.01241	0.0080	10.00	19.15	19.14
60	11.0	12.0	28	12.568	0.209	0.4577	0.01241	0.0057	9.00	17.24	17.23
240	9.5	10.5	29	12.946	0.054	0.2323	0.01228	0.0029	7.50	14.37	14.36
1140	8.5	9.5	28	13.198	0.012	0.1076	0.01241	0.0013	6.50	12.45	12.44

P = 100/W = 1.1956

$$Mx = \frac{G_s}{G_s - 1} = 1.6020$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.33	22.02	1.310		1.57	98.43	98.37
0.42	25.46		3.440		4.11	95.89	95.83
0.25	28.93		6.910		8.26	91.74	91.68
0.105	35.43		13.410		16.03	83.97	83.91
0.074	46.02		24.000		28.69	71.31	71.26

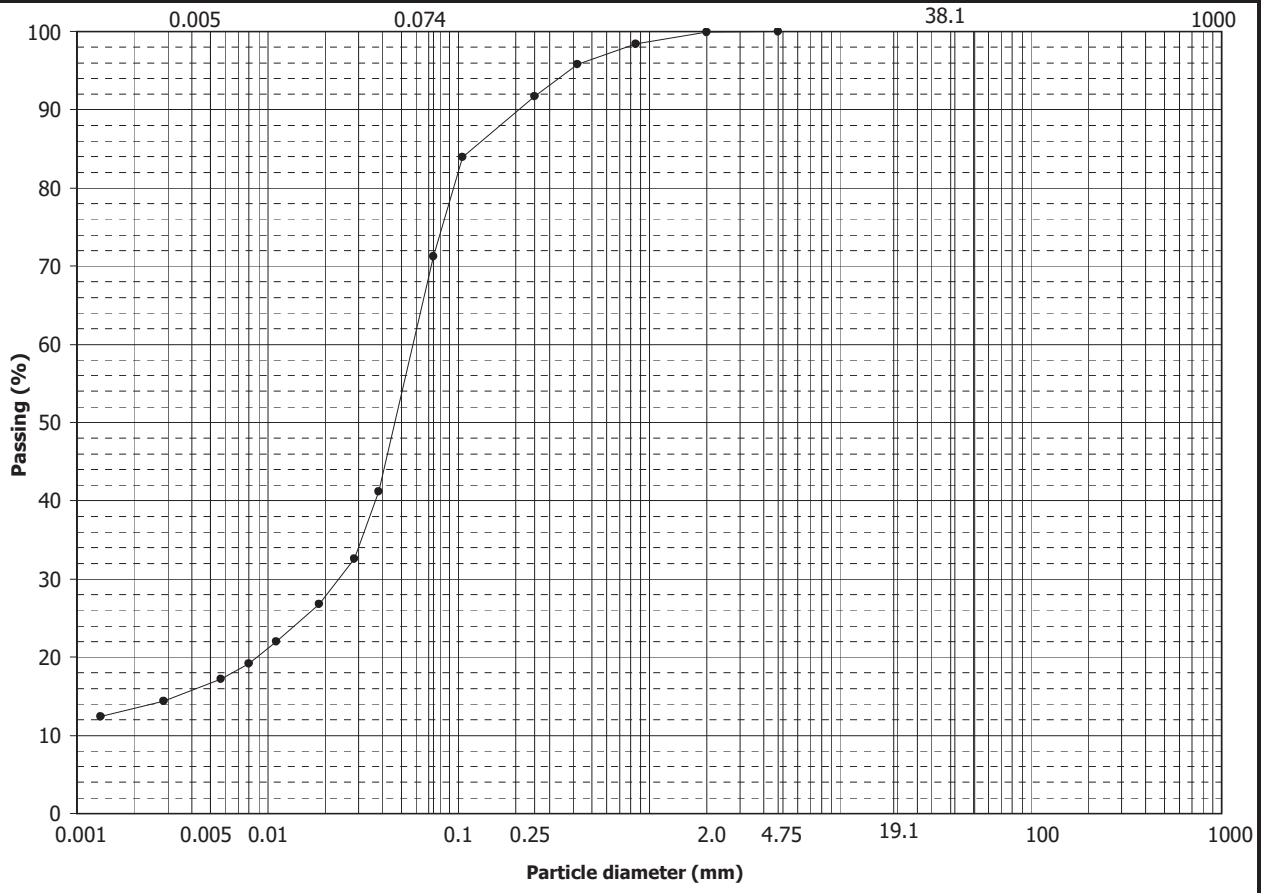
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.661**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	28.74	54.56	16.70	4.75	0.2186	0.0606	0.0486	0.0242	-	-	99.94	95.83	71.26



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 544.2 gr
Wt. container No ..... = 42.20 gr
Wt. Of air dry soil W' = 502.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **502.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	61.00	42.20	18.80		3.75	96.25
4.75	82.90		40.70		8.11	91.89
2.00	100.10		57.90		11.53	88.47

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	9.50 - 10.00

Wt. (Air dry soil + container) = 173.91 gr — Specific Gravity : 2.684
Wt. of container M-75 = 45.25 gr — Plasticity Index : %
Wt. Of air dry soil W' = 128.66 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 88.47 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-19			NO	L-38			NO	T-28		
WW	64.19	DW	61.08	WW	63.63	DW	60.68	WW	63.02	DW	59.76	Mean value	
DW	61.08	TW	38.23	DW	60.68	TW	38.85	DW	59.76	TW	35.85	w	
Ww	3.11	Ws	22.85	Ww	2.95	Ws	21.83	Ww	3.26	Ws	23.91	13.59	%
w	13.61	%		w	13.51	%		w	13.63	%			

$$W = \frac{100 \times W'}{100 + w} : 113.271 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.5	21.5	28	10.171	10.171	3.1892	0.01233	0.0393	18.50	26.03	23.03
2	17.0	18.0	28	11.054	5.527	2.3509	0.01233	0.0290	15.00	21.11	18.67
5	13.5	14.5	28	11.937	2.387	1.5451	0.01233	0.0190	11.50	16.18	14.32
15	11.0	12.0	28	12.568	0.838	0.9153	0.01233	0.0113	9.00	12.66	11.20
30	10.0	11.0	28	12.820	0.427	0.6537	0.01233	0.0081	8.00	11.26	9.96
60	9.0	10.0	28	13.072	0.218	0.4668	0.01233	0.0058	7.00	9.85	8.71
240	8.0	9.0	29	13.325	0.056	0.2356	0.01219	0.0029	6.00	8.44	7.47
1140	7.0	8.0	28	13.577	0.012	0.1091	0.01233	0.0013	5.00	7.04	6.22

P = 100/W = 0.8828

$$Mx = \frac{G_s}{G_s - 1} = 1.5938$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	26.52	22.02	4.500		3.97	96.03	84.95
0.42	33.93		11.910		10.51	89.49	79.16
0.25	45.60		23.580		20.82	79.18	70.05
0.105	73.58		51.560		45.52	54.48	48.20
0.074	88.71		66.690		58.88	41.12	36.38

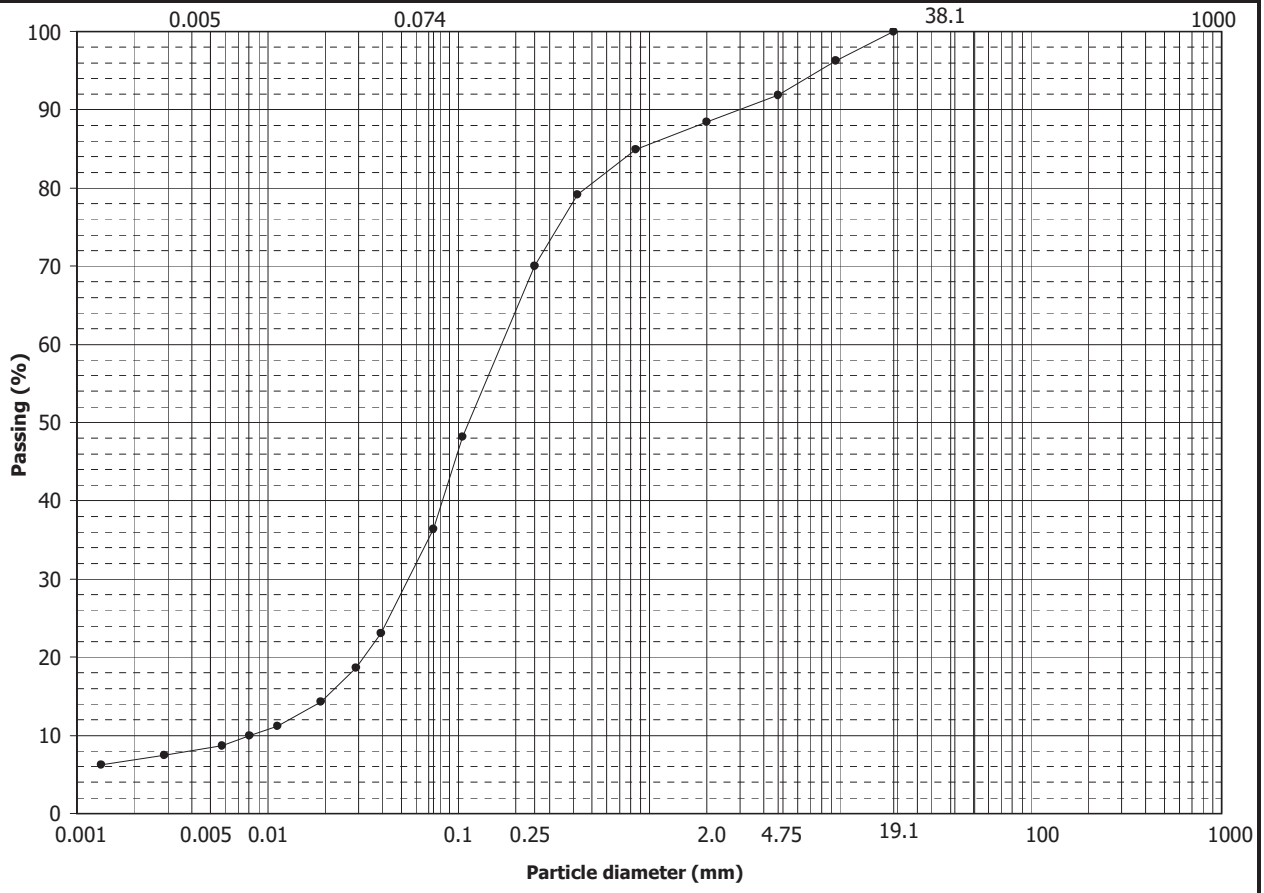
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.684**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
8.11	55.51	27.92	8.46	19.10	3.2311	0.1833	0.1170	0.0574	0.0082	22.45	88.47	79.16	36.38



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = 248.1 gr
Wt. container No ..... = 35.70 gr
Wt. Of air dry soil W' = 212.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **212.40** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	77.90	35.70	42.20		19.87	80.13
4.75	92.10		56.40		26.55	73.45
2.00	97.10		61.40		28.91	71.09

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	11.50 - 12.00

Wt. (Air dry soil + container) = 151.59 gr — Specific Gravity : 2.669
Wt. of container E-26 = 37.10 gr — Plasticity Index : %
Wt. Of air dry soil W' = 114.49 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 71.09 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-70			NO	A-41			NO	T-92		
WW	65.00	DW	61.17	WW	65.01	DW	61.03	WW	62.38	DW	58.22	Mean value	
DW	61.17	TW	39.05	DW	61.03	TW	38.08	DW	58.22	TW	34.13	w	
Ww	3.83	Ws	22.12	Ww	3.98	Ws	22.95	Ww	4.16	Ws	24.09	17.31	%
w	17.31	%		w	17.34	%		w	17.27	%			

$$W = \frac{100 \times W'}{100 + w} : 97.597 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	25.5	26.5	28	8.909	8.909	2.9849	0.01238	0.0370	23.50	38.51	27.37
2	21.0	22.0	28	10.045	5.022	2.2411	0.01238	0.0278	19.00	31.13	22.13
5	17.5	18.5	28	10.928	2.186	1.4784	0.01238	0.0183	15.50	25.40	18.06
15	15.0	16.0	28	11.558	0.771	0.8778	0.01238	0.0109	13.00	21.30	15.14
30	14.0	15.0	28	11.811	0.394	0.6274	0.01238	0.0078	12.00	19.66	13.98
60	12.5	13.5	28	12.189	0.203	0.4507	0.01238	0.0056	10.50	17.20	12.23
240	10.5	11.5	29	12.694	0.053	0.2300	0.01225	0.0028	8.50	13.93	9.90
1140	9.0	10.0	28	13.072	0.011	0.1071	0.01238	0.0013	7.00	11.47	8.15

P = 100/W = 1.0246

$$Mx = \frac{G_s}{G_s - 1} = 1.5992$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.04	22.02	1.020		1.05	98.95	70.35
0.42	24.88		2.860		2.93	97.07	69.01
0.25	29.57		7.550		7.74	92.26	65.59
0.105	40.15		18.130		18.58	81.42	57.89
0.074	56.15		34.130		34.97	65.03	46.23

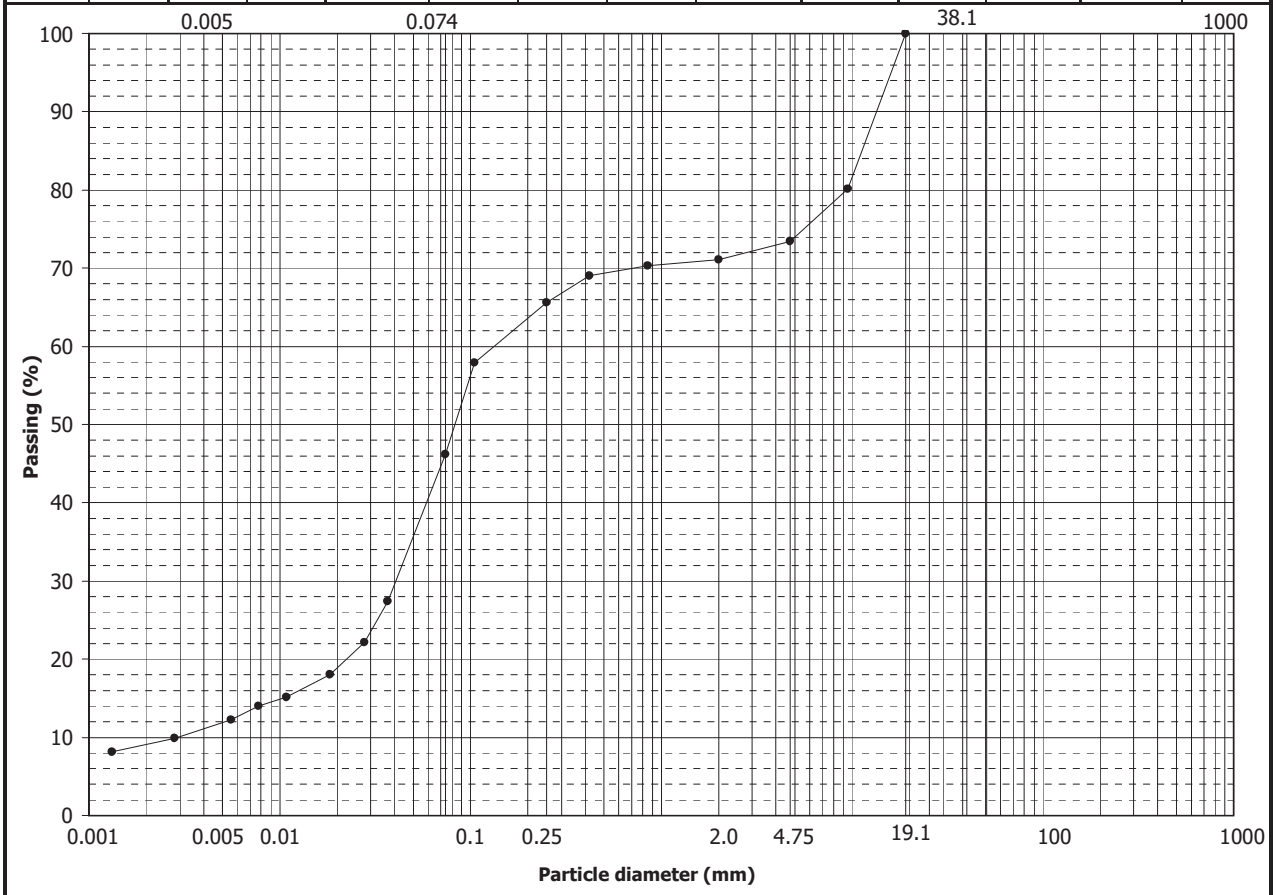
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**11.50 - 12.00**

SPECIFIC GRAVITY : **2.669**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
26.55	27.22	34.37	11.86	19.10	14.278	0.1448	0.0840	0.0421	0.0029	49.34	71.09	69.01	46.23



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = 453.9 gr

Wt. container No ..... = 43.70 gr

Wt. Of air dry soil W' = 410.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **410.20** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	121.20	43.70	77.50		18.89	81.11
4.75	155.90		112.20		27.35	72.65
2.00	182.20		138.50		33.76	66.24

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	13.50 - 14.00

Wt. (Air dry soil + container) = 164.91 gr — Specific Gravity : 2.681
Wt. of container M-26 = 43.25 gr — Plasticity Index : %
Wt. Of air dry soil W' = 121.66 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 66.24 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-62			NO	A-63			NO	A-11		
WW	61.99	DW	59.72	WW	64.28	DW	62.16	WW	65.03	DW	62.89	Mean value	
DW	59.72	TW	35.76	DW	62.16	TW	39.92	DW	62.89	TW	40.14	w	
Ww	2.27	Ws	23.96	Ww	2.12	Ws	22.24	Ww	2.14	Ws	22.75	9.47	%
w	9.47	%		w	9.53	%		w	9.41	%			

$$W = \frac{100 \times W'}{100 + w} : 111.134 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	22.5	23.5	28	9.666	9.666	3.1091	0.01234	0.0384	20.50	29.42	19.49
2	19.0	20.0	28	10.549	5.275	2.2967	0.01234	0.0283	17.00	24.40	16.16
5	15.5	16.5	28	11.432	2.286	1.5121	0.01234	0.0187	13.50	19.37	12.83
15	13.0	14.0	28	12.063	0.804	0.8968	0.01234	0.0111	11.00	15.79	10.46
30	12.0	13.0	28	12.315	0.411	0.6407	0.01234	0.0079	10.00	14.35	9.51
60	11.0	12.0	28	12.568	0.209	0.4577	0.01234	0.0056	9.00	12.92	8.55
240	9.5	10.5	29	12.946	0.054	0.2323	0.01221	0.0028	7.50	10.76	7.13
1140	8.0	9.0	28	13.325	0.012	0.1081	0.01234	0.0013	6.00	8.61	5.70

P = 100/W = 0.8998

$$Mx = \frac{G_s}{G_s - 1} = 1.5949$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	30.95	22.02	8.930		8.04	91.96	60.91
0.42	42.36		20.340		18.30	81.70	54.11
0.25	53.99		31.970		28.77	71.23	47.18
0.105	72.79		50.770		45.68	54.32	35.98
0.074	82.30		60.280		54.24	45.76	30.31

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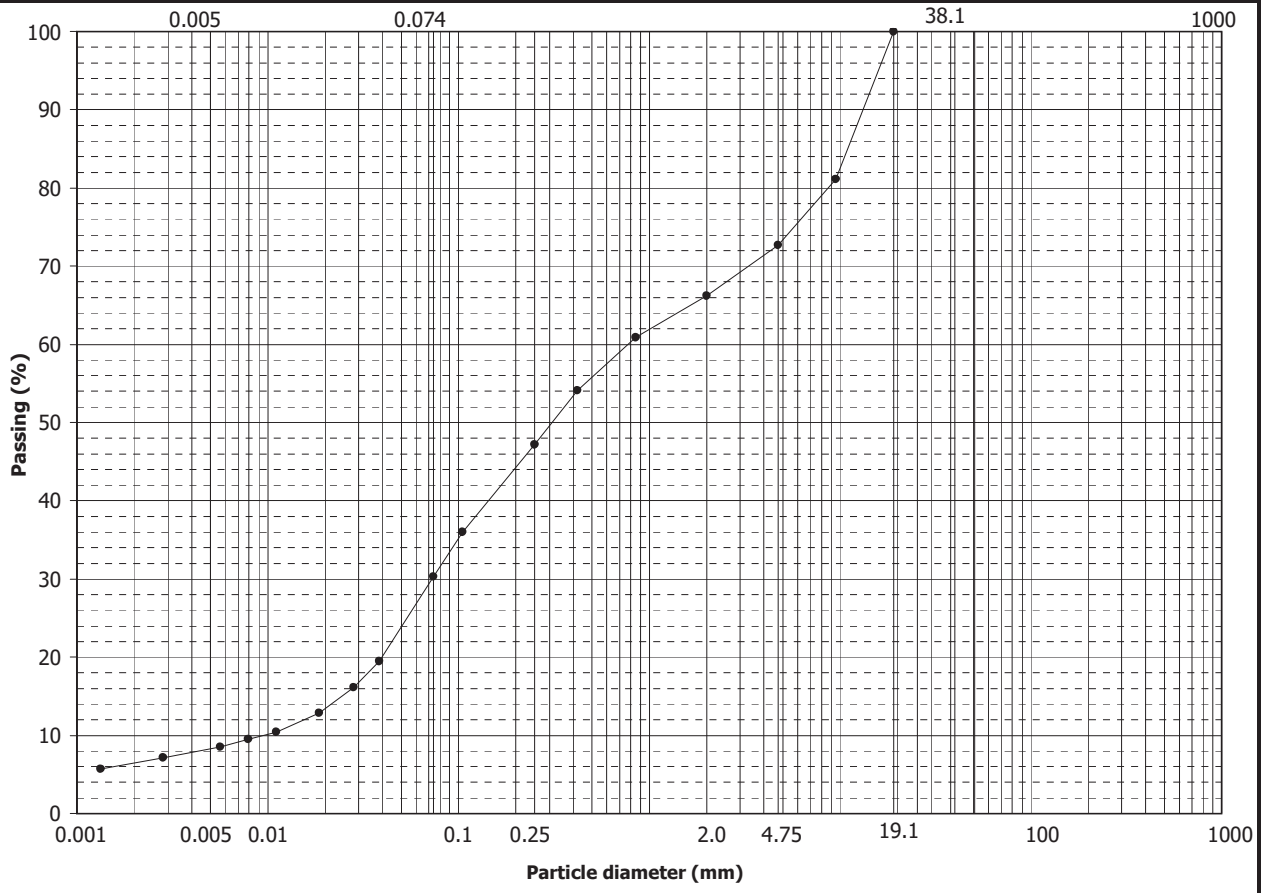
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**13.50 - 14.00**

SPECIFIC GRAVITY : **2.681**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
27.35	42.34	22.01	8.30	19.10	14.029	0.7922	0.3191	0.0730	0.0095	82.96	66.24	54.11	30.31



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 524.2 gr
Wt. container No ..... = 47.80 gr
Wt. Of air dry soil W' = 476.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **476.40** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	147.10	47.80	99.30		20.84	79.16
4.75	210.00		162.20		34.05	65.95
2.00	250.10		202.30		42.46	57.54

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	15.50 - 16.00

Wt. (Air dry soil + container) = 172.61 gr — Specific Gravity : 2.664
Wt. of container M-6 = 51.02 gr — Plasticity Index : %
Wt. Of air dry soil W' = 121.59 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 57.54 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-53			NO	L-18			NO	L-22		
WW	63.44	DW	60.03	WW	65.16	DW	61.88	WW	65.32	DW	62.19	Mean value	
DW	60.03	TW	35.63	DW	61.88	TW	38.27	DW	62.19	TW	39.82	w	
Ww	3.41	Ws	24.40	Ww	3.28	Ws	23.61	Ww	3.13	Ws	22.37	13.95	%
w	13.98	%		w	13.89	%		w	13.99	%			

$$W = \frac{100 \times W'}{100 + w} : 106.702 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	28	11.306	11.306	3.3625	0.01240	0.0417	14.00	21.01	12.09
2	14.0	15.0	28	11.811	5.905	2.4301	0.01240	0.0301	12.00	18.00	10.36
5	12.0	13.0	28	12.315	2.463	1.5694	0.01240	0.0195	10.00	15.00	8.63
15	10.0	11.0	28	12.820	0.855	0.9245	0.01240	0.0115	8.00	12.00	6.91
30	9.0	10.0	28	13.072	0.436	0.6601	0.01240	0.0082	7.00	10.50	6.04
60	8.0	9.0	28	13.325	0.222	0.4712	0.01240	0.0058	6.00	9.00	5.18
240	6.5	7.5	29	13.703	0.057	0.2389	0.01227	0.0029	4.50	6.75	3.88
1140	5.0	6.0	28	14.081	0.012	0.1111	0.01240	0.0014	3.00	4.50	2.59

P = 100/W = 0.9372

$$Mx = \frac{G_s}{G_s - 1} = 1.6010$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	40.90	22.02	18.880		17.69	82.31	47.36
0.42	65.24		43.220		40.51	59.49	34.23
0.25	75.24		53.220		49.88	50.12	28.84
0.105	91.19		69.170		64.83	35.17	20.24
0.074	97.37		75.350		70.62	29.38	16.91

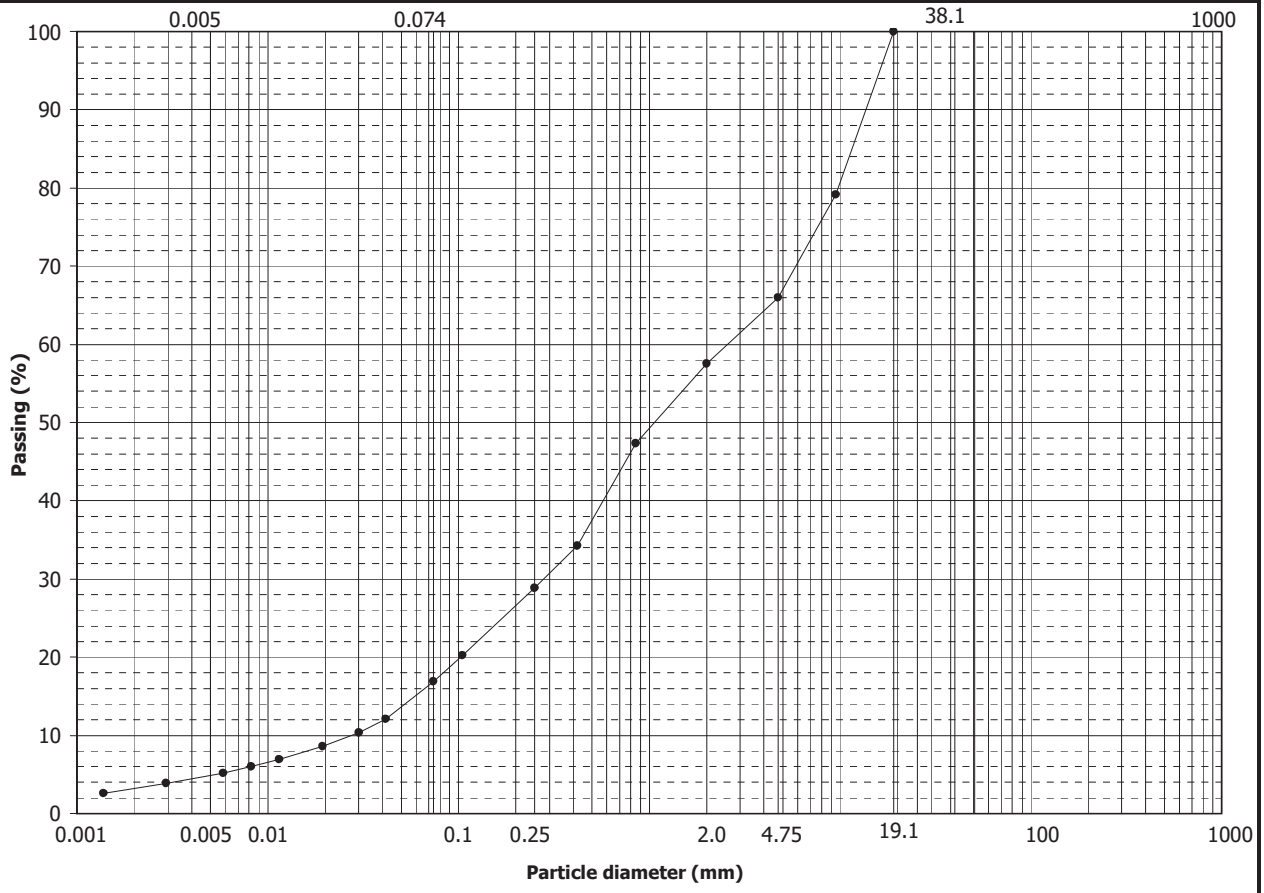
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**15.50 - 16.00**

SPECIFIC GRAVITY : **2.664**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
34.05	49.05	12.02	4.89	19.10	14.504	2.8051	1.1488	0.2866	0.0279	100.48	57.54	34.23	16.91



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**17.50 - 18.00**

Wt. (Air dry soil + container) = 422.9 gr
Wt. container No ..... = 124.70 gr
Wt. Of air dry soil W' = 298.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **298.20** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10					0.00	100.00
9.52	179.00	124.70	54.30		18.21	81.79
4.75	202.60		77.90		26.12	73.88
2.00	226.50		101.80		34.14	65.86

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	17.50 - 18.00

Wt. (Air dry soil + container) = 158.22 gr — Specific Gravity : 2.674
Wt. of container M-32 = 41.92 gr — Plasticity Index : %
Wt. Of air dry soil W' = 116.30 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 65.86 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-49			NO	A-61			NO	A-46		
WW	65.67	DW	63.33	WW	63.52	DW	61.16	WW	64.31	DW	61.82	Mean value	
DW	63.33	TW	39.46	DW	61.16	TW	37.03	DW	61.82	TW	36.43	w	
Ww	2.34	Ws	23.87	Ww	2.36	Ws	24.13	Ww	2.49	Ws	25.39	9.80	%
w	9.80	%		w	9.78	%		w	9.81	%			

$$W = \frac{100 \times W'}{100 + w} : 105.923 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	28	11.558	11.558	3.3998	0.01236	0.0420	13.00	19.60	12.91
2	12.0	13.0	28	12.315	6.158	2.4815	0.01236	0.0307	10.00	15.08	9.93
5	10.0	11.0	28	12.820	2.564	1.6012	0.01236	0.0198	8.00	12.06	7.95
15	8.5	9.5	28	13.198	0.880	0.9380	0.01236	0.0116	6.50	9.80	6.46
30	7.5	8.5	28	13.451	0.448	0.6696	0.01236	0.0083	5.50	8.29	5.46
60	6.5	7.5	28	13.703	0.228	0.4779	0.01236	0.0059	4.50	6.79	4.47
240	5.5	6.5	29	13.955	0.058	0.2411	0.01223	0.0029	3.50	5.28	3.48
1140	4.5	5.5	28	14.208	0.012	0.1116	0.01236	0.0014	2.50	3.77	2.48

P = 100/W = 0.9441

$$Mx = \frac{G_s}{G_s - 1} = 1.5974$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	41.99	22.02	19.970		18.85	81.15	53.44
0.42	66.04		44.020		41.56	58.44	38.49
0.25	77.15		55.130		52.05	47.95	31.58
0.105	91.26		69.240		65.37	34.63	22.81
0.074	97.82		75.800		71.56	28.44	18.73

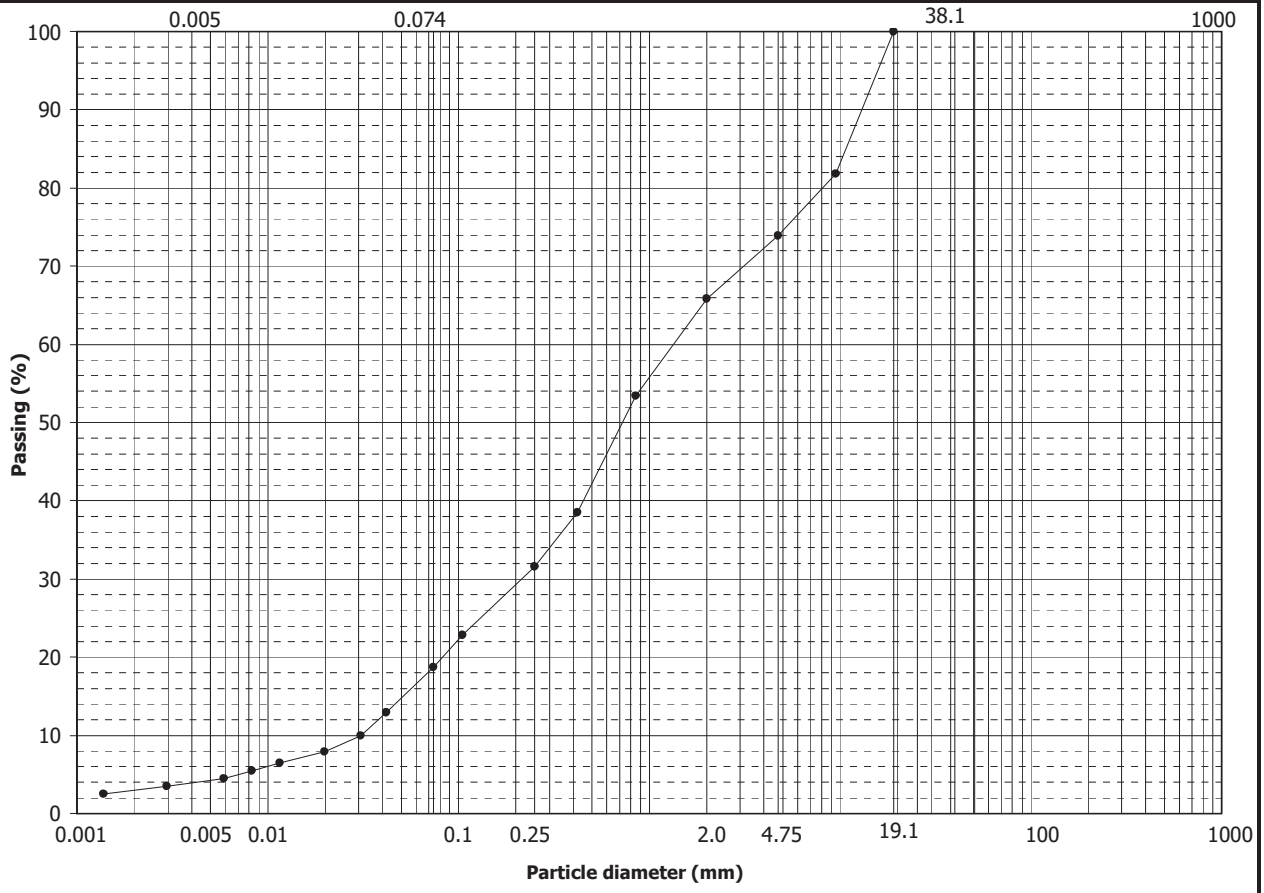
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**17.50 - 18.00**

SPECIFIC GRAVITY : **2.674**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
26.12	55.15	14.50	4.23	19.10	13.839	1.4571	0.7509	0.2238	0.0309	47.10	65.86	38.49	18.73



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = 287.5 gr
Wt. container No ..... = 41.40 gr
Wt. Of air dry soil W' = 246.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **246.10** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10					0.00	100.00
9.52	78.40	41.40	37.00		15.03	84.97
4.75	106.20		64.80		26.33	73.67
2.00	131.80		90.40		36.73	63.27

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	BALAI KOTA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 21	DEPTH	19.50 - 20.00

Wt. (Air dry soil + container) = 155.74 gr — Specific Gravity : 2.681
Wt. of container M-80 = 44.99 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.75 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 63.27 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-84			NO	A-17			NO	T-88		
WW	65.35	DW	62.89	WW	63.52	DW	61.02	WW	64.41	DW	61.96	Mean value	
DW	62.89	TW	38.77	DW	61.02	TW	36.39	DW	61.96	TW	37.92	w	
Ww	2.46	Ws	24.12	Ww	2.50	Ws	24.63	Ww	2.45	Ws	24.04	10.18	%
w	10.20	%		w	10.15	%		w	10.19	%			

$$W = \frac{100 \times W'}{100 + w} : 100.517 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	28	12.315	12.315	3.5093	0.01234	0.0433	10.00	15.87	10.04
2	10.0	11.0	28	12.820	6.410	2.5318	0.01234	0.0312	8.00	12.69	8.03
5	8.5	9.5	28	13.198	2.640	1.6247	0.01234	0.0200	6.50	10.31	6.52
15	7.0	8.0	28	13.577	0.905	0.9514	0.01234	0.0117	5.00	7.93	5.02
30	6.0	7.0	28	13.829	0.461	0.6789	0.01234	0.0084	4.00	6.35	4.02
60	5.0	6.0	28	14.081	0.235	0.4844	0.01234	0.0060	3.00	4.76	3.01
240	4.0	5.0	29	14.334	0.060	0.2444	0.01221	0.0030	2.00	3.17	2.01
1140	3.5	4.5	28	14.460	0.013	0.1126	0.01234	0.0014	1.50	2.38	1.51

P = 100/W = 0.9949

$$Mx = \frac{G_s}{G_s - 1} = 1.5949$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	44.17	22.02	22.150		22.04	77.96	49.33
0.42	68.35		46.330		46.09	53.91	34.11
0.25	80.34		58.320		58.02	41.98	26.56
0.105	95.08		73.060		72.68	27.32	17.28
0.074	99.01		76.990		76.59	23.41	14.81

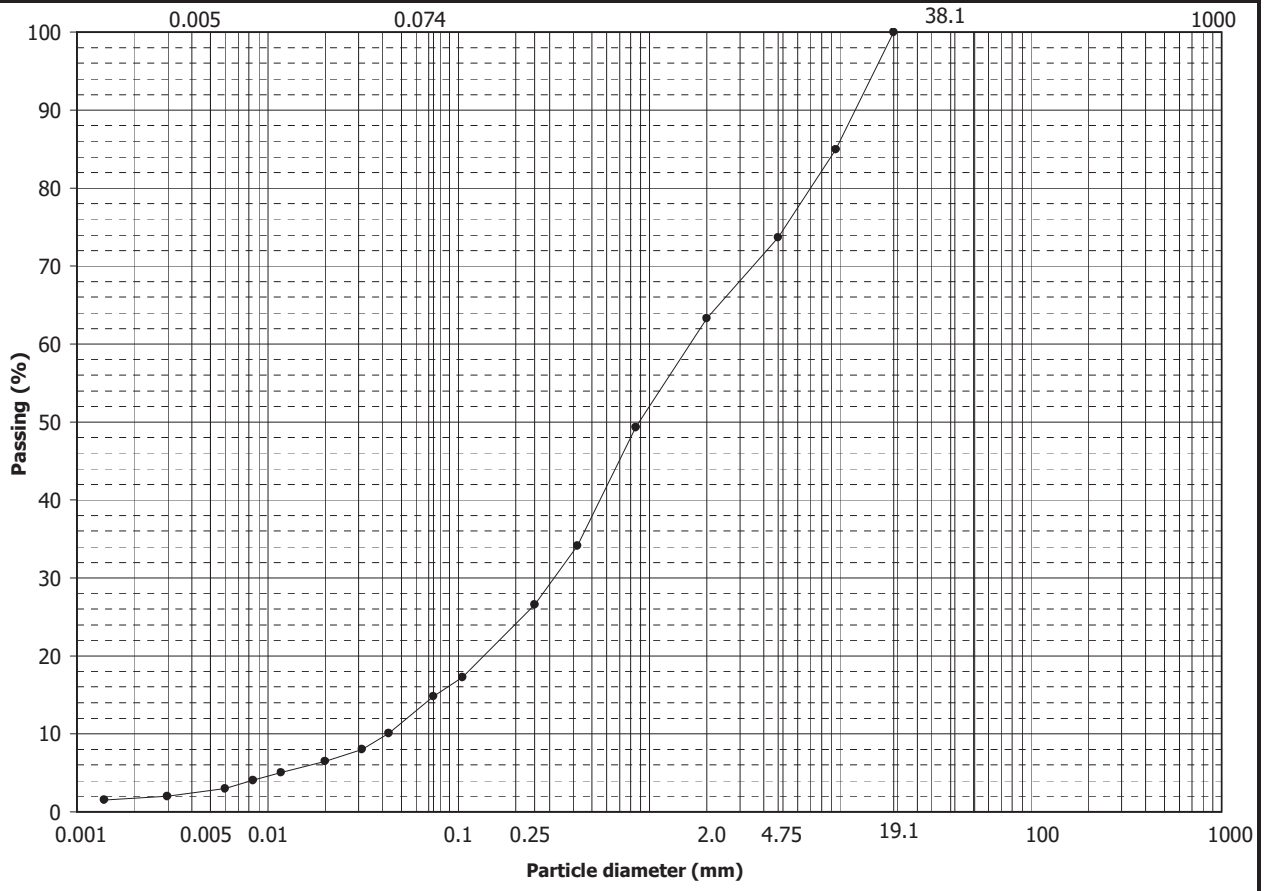
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**BALAI KOTA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 21**	DEPTH	**19.50 - 20.00**

SPECIFIC GRAVITY : **2.681**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
26.33	58.86	12.05	2.75	19.10	12.728	1.7305	0.9056	0.3275	0.0431	40.18	63.27	34.11	14.81



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		0.50 - 1.00

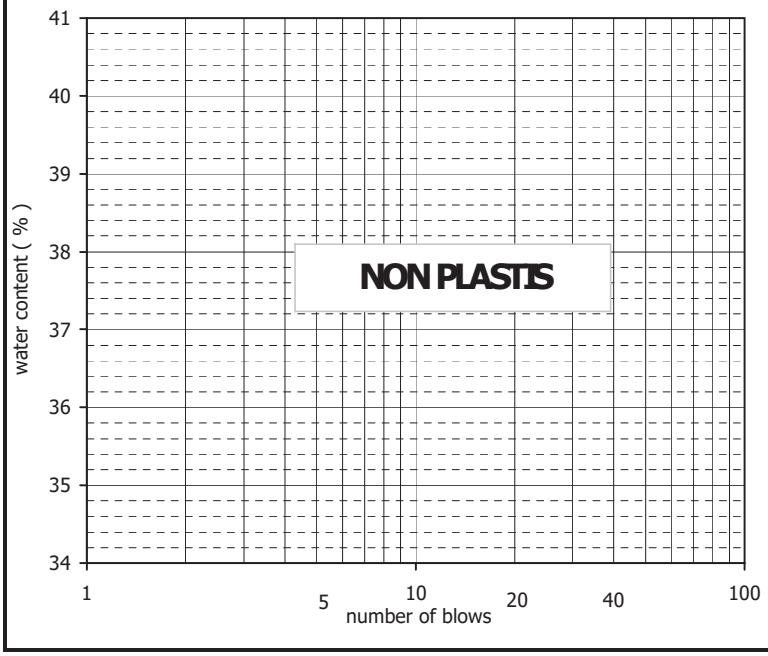
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		1.50 - 2.00

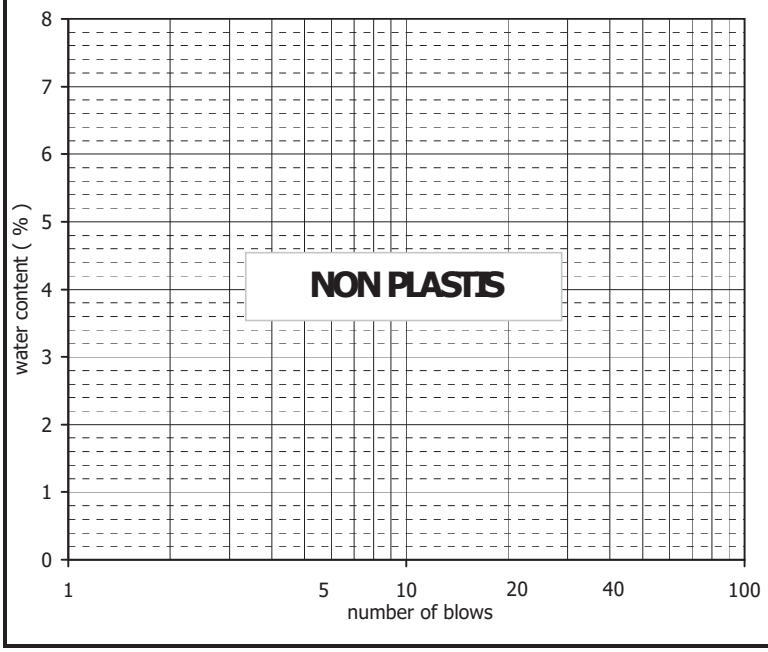
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		2.50 - 3.00

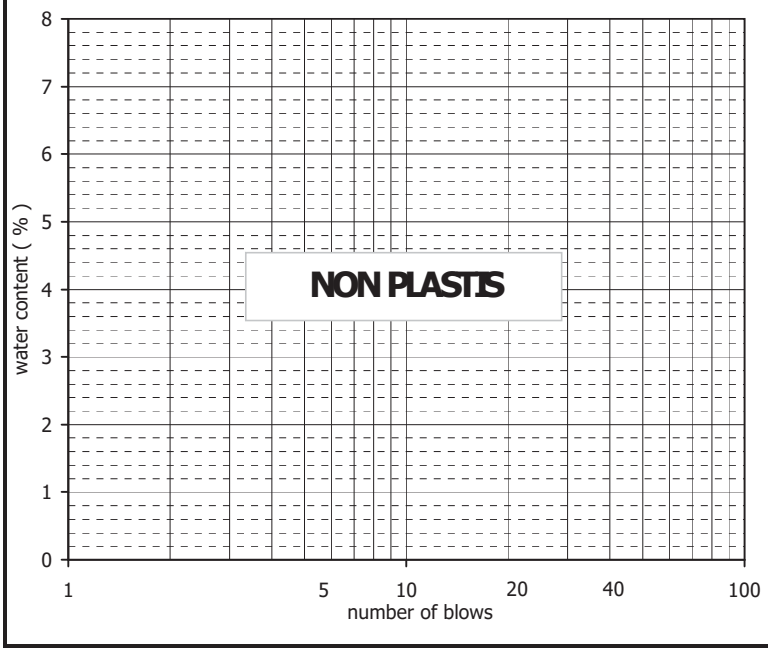
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		3.50 - 4.00

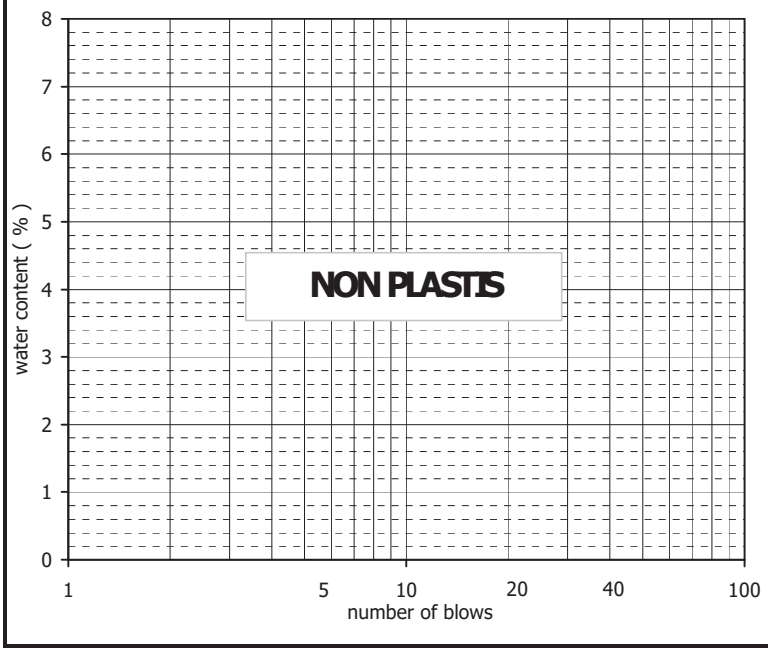
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		4.50 - 5.00

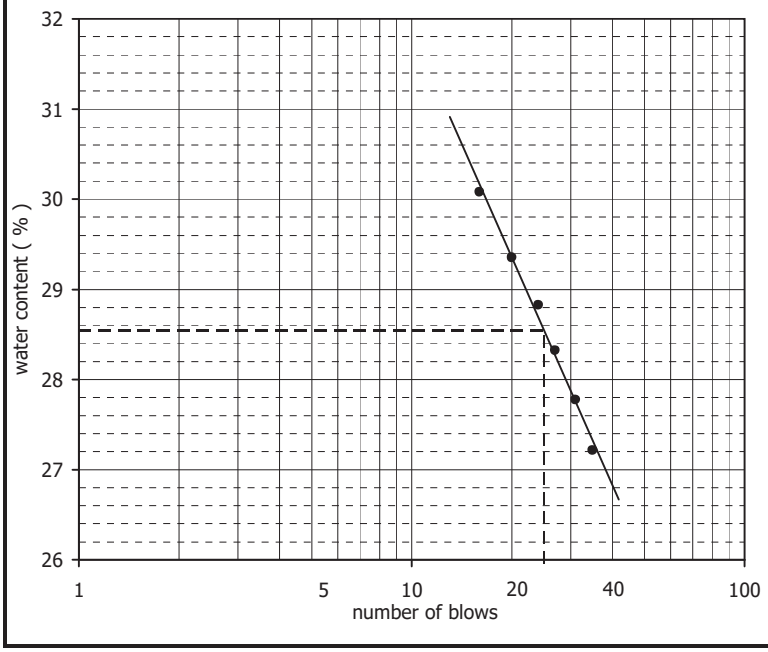
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-77			No.	A-59			No.	A-76
WW	55.310	DW	51.870	WW	55.750	DW	52.220	WW	52.330	DW	48.540
DW	51.870	TW	39.230	DW	52.220	TW	39.510	DW	48.540	TW	35.160
Ww	3.440	Ws	12.640	Ww	3.530	Ws	12.710	Ww	3.790	Ws	13.380
	W =		27.22 %		W =		27.77 %		W =		28.33 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	A-75			No.	J-30			No.	L-11
WW	60.370	DW	55.620	WW	53.740	DW	50.080	WW	59.890	DW	55.670
DW	55.620	TW	39.140	DW	50.080	TW	37.612	DW	55.670	TW	41.640
Ww	4.750	Ws	16.480	Ww	3.660	Ws	12.468	Ww	4.220	Ws	14.030
	W =		28.82 %		W =		29.36 %		W =		30.08 %

PLASTIC LIMIT

1				2				3			
		No.	T-08			No.	L-46			No.	J-90
WW	59.620	DW	56.460	WW	54.030	DW	51.530	WW	54.320	DW	51.820
DW	56.460	TW	40.510	DW	51.530	TW	38.750	DW	51.820	TW	39.140
Ww	3.160	Ws	15.950	Ww	2.500	Ws	12.780	Ww	2.500	Ws	12.680
	W =		19.81 %		W =		19.56 %		W =		19.72 %



LIQUID LIMIT	=	28.55	%
PLASTIC LIMIT	=	19.70	%
PLASTICITY INDEX	=	8.85	%
FLOW INDEX	=	8.34	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

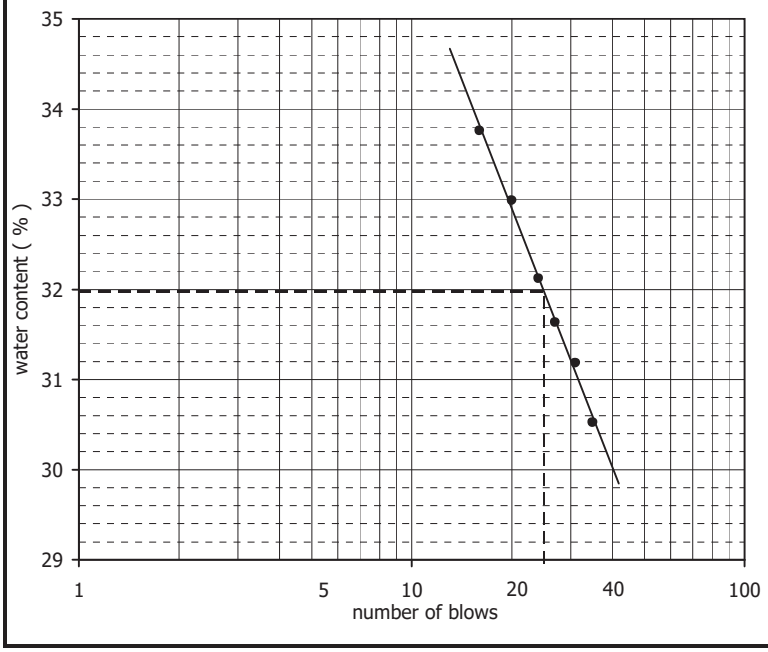
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		5.50 - 6.00

LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	L-26			No.	A-21			No.	T-26
WW	56.200	DW	51.880	WW	57.380	DW	52.980	WW	53.320	DW	49.660
DW	51.880	TW	37.728	DW	52.980	TW	38.870	DW	49.660	TW	38.090
Ww	4.320	Ws	14.152	Ww	4.400	Ws	14.110	Ww	3.660	Ws	11.570
	W =		30.53 %		W =		31.18 %		W =		31.63 %
4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	T-50			No.	T-35			No.	A-63
WW	55.320	DW	51.160	WW	55.070	DW	51.270	WW	58.660	DW	53.930
DW	51.160	TW	38.210	DW	51.270	TW	39.750	DW	53.930	TW	39.920
Ww	4.160	Ws	12.950	Ww	3.800	Ws	11.520	Ww	4.730	Ws	14.010
	W =		32.12 %		W =		32.99 %		W =		33.76 %

PLASTIC LIMIT

1				2				3			
		No.	A-25			No.	T-38			No.	A-05
WW	55.060	DW	52.250	WW	55.180	DW	52.050	WW	54.990	DW	52.100
DW	52.250	TW	39.300	DW	52.050	TW	37.880	DW	52.100	TW	38.670
Ww	2.810	Ws	12.950	Ww	3.130	Ws	14.170	Ww	2.890	Ws	13.430
	W =		21.70 %		W =		22.09 %		W =		21.52 %



LIQUID LIMIT	=	31.98 %
PLASTIC LIMIT	=	21.77 %
PLASTICITY INDEX	=	10.21 %
FLOW INDEX	=	9.48

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

PT INDRA KARYA (PERSERO)
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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		6.50 - 7.00

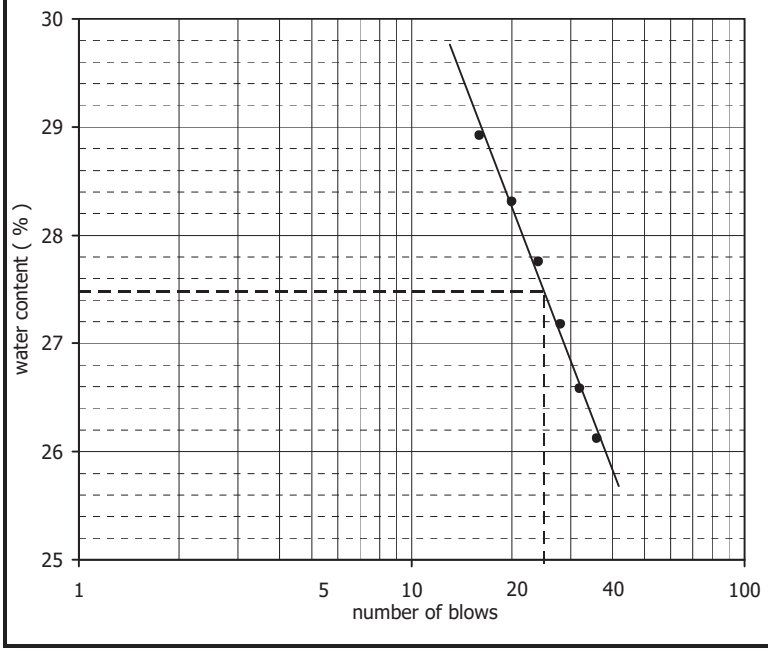
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	T-70			No.	T-47			No.	L-19
WW	55.370	DW	51.990	WW	55.220	DW	51.240	WW	54.280	DW	50.850
DW	51.990	TW	39.050	DW	51.240	TW	36.270	DW	50.850	TW	38.230
Ww	3.380	Ws	12.940	Ww	3.980	Ws	14.970	Ww	3.430	Ws	12.620
	W =		26.12 %		W =		26.59 %		W =		27.18 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	T-28			No.	T-72			No.	A-80
WW	58.220	DW	53.360	WW	51.550	DW	47.490	WW	54.690	DW	51.060
DW	53.360	TW	35.850	DW	47.490	TW	33.150	DW	51.060	TW	38.510
Ww	4.860	Ws	17.510	Ww	4.060	Ws	14.340	Ww	3.630	Ws	12.550
	W =		27.76 %		W =		28.31 %		W =		28.92 %

PLASTIC LIMIT

1				2				3			
		No.	T-32			No.	L-06			No.	T-81
WW	52.400	DW	49.930	WW	54.170	DW	50.890	WW	53.460	DW	50.690
DW	49.930	TW	38.760	DW	50.890	TW	36.320	DW	50.690	TW	38.370
Ww	2.470	Ws	11.170	Ww	3.280	Ws	14.570	Ww	2.770	Ws	12.320
	W =		22.11 %		W =		22.51 %		W =		22.48 %



LIQUID LIMIT	=	27.49	%
PLASTIC LIMIT	=	22.37	%
PLASTICITY INDEX	=	5.12	%
FLOW INDEX	=	8.01	

REMARKS :

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TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		7.50 - 8.00

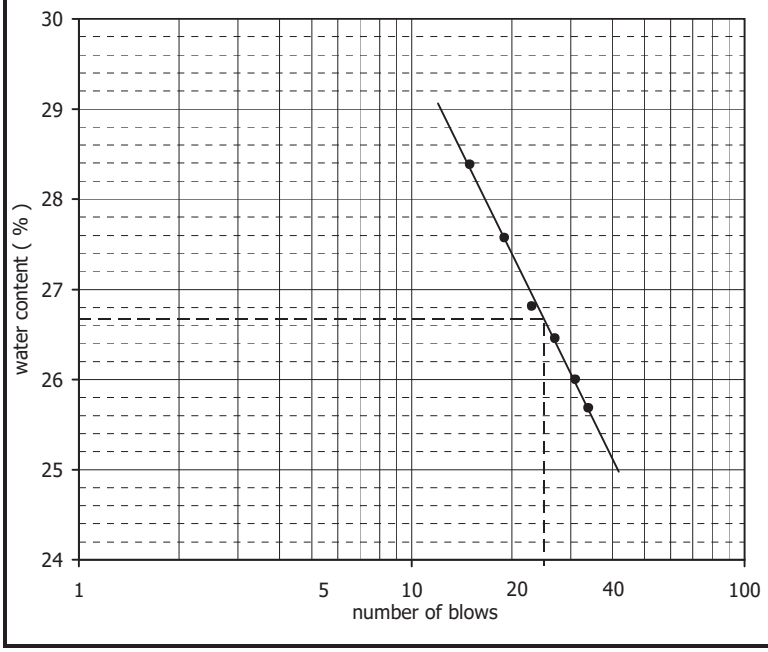
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-37			No.	J-42			No.	A-55
WW	52.130	DW	48.830	WW	54.510	DW	51.330	WW	59.710	DW	55.990
DW	48.830	TW	35.980	DW	51.330	TW	39.100	DW	55.990	TW	41.930
Ww	3.300	Ws	12.850	Ww	3.180	Ws	12.230	Ww	3.720	Ws	14.060
	W =		25.68 %		W =		26.00 %		W =		26.46 %

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	A-35			No.	A-77			No.	T-23
WW	57.770	DW	54.030	WW	52.430	DW	48.220	WW	54.520	DW	50.660
DW	54.030	TW	40.080	DW	48.220	TW	32.950	DW	50.660	TW	37.060
Ww	3.740	Ws	13.950	Ww	4.210	Ws	15.270	Ww	3.860	Ws	13.600
	W =		26.81 %		W =		27.57 %		W =		28.38 %

PLASTIC LIMIT

1				2				3			
		No.	J-47			No.	A-62			No.	T-93
WW	53.370	DW	50.670	WW	51.940	DW	49.370	WW	53.060	DW	50.110
DW	50.670	TW	38.230	DW	49.370	TW	37.440	DW	50.110	TW	36.500
Ww	2.700	Ws	12.440	Ww	2.570	Ws	11.930	Ww	2.950	Ws	13.610
	W =		21.70 %		W =		21.54 %		W =		21.68 %



LIQUID LIMIT	=	26.67	%
PLASTIC LIMIT	=	21.64	%
PLASTICITY INDEX	=	5.03	%
FLOW INDEX	=	7.51	

REMARKS :

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TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		8.50 - 9.00

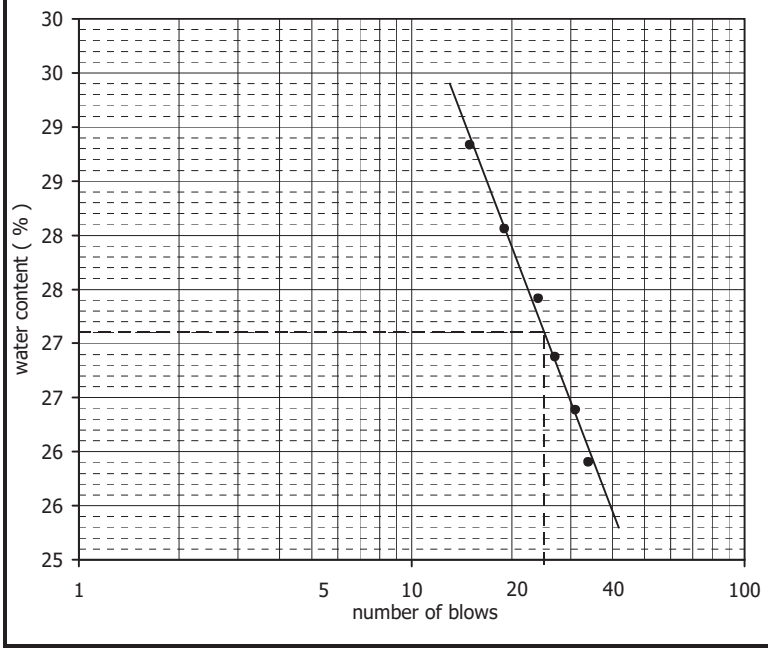
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-72			No.	J-21			No.	J-26
WW	51.030	DW	47.590	WW	55.240	DW	51.340	WW	55.370	DW	51.820
DW	47.590	TW	34.310	DW	51.340	TW	36.559	DW	51.820	TW	38.610
Ww	3.440	Ws	13.280	Ww	3.900	Ws	14.781	Ww	3.550	Ws	13.210
	W =		25.90 %		W =		26.39 %		W =		26.87 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	J-40			No.	J-79			No.	A-03
WW	58.910	DW	54.480	WW	55.130	DW	51.020	WW	57.400	DW	52.980
DW	54.480	TW	38.320	DW	51.020	TW	36.373	DW	52.980	TW	37.650
Ww	4.430	Ws	16.160	Ww	4.110	Ws	14.647	Ww	4.420	Ws	15.330
	W =		27.41 %		W =		28.06 %		W =		28.83 %

PLASTIC LIMIT

1				2				3			
		No.	T-59			No.	T-48			No.	A-72
WW	51.340	DW	49.020	WW	52.780	DW	49.790	WW	53.380	DW	50.550
DW	49.020	TW	37.450	DW	49.790	TW	35.240	DW	50.550	TW	36.570
Ww	2.320	Ws	11.570	Ww	2.990	Ws	14.550	Ww	2.830	Ws	13.980
	W =		20.05 %		W =		20.55 %		W =		20.24 %



LIQUID LIMIT	=	27.11	%
PLASTIC LIMIT	=	20.28	%
PLASTICITY INDEX	=	6.83	%
FLOW INDEX	=	8.07	

REMARKS :

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TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		9.50 - 10.00

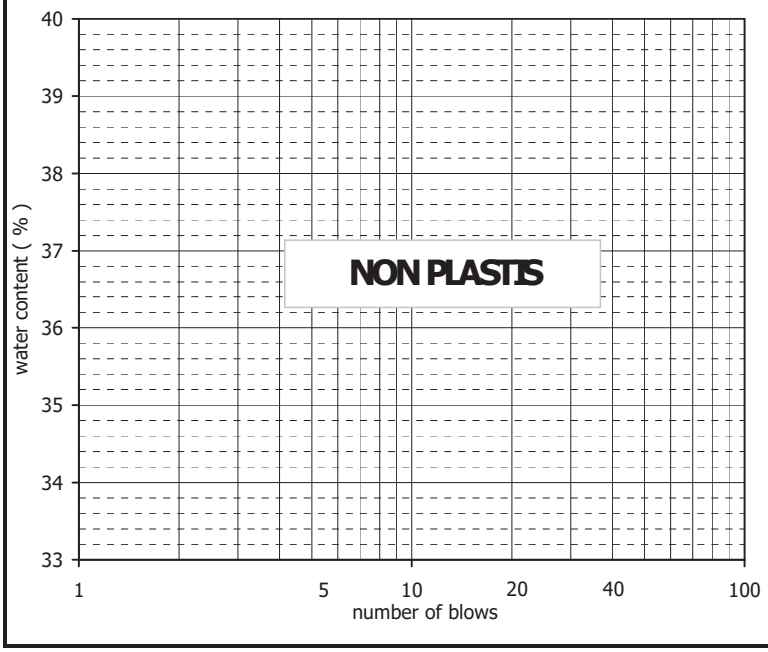
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		11.50 - 12.00

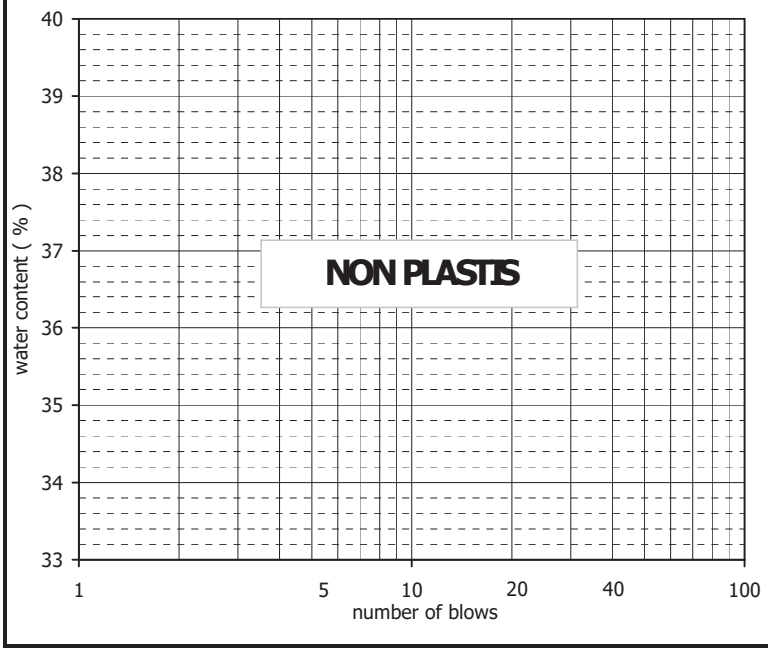
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		13.50 - 14.00

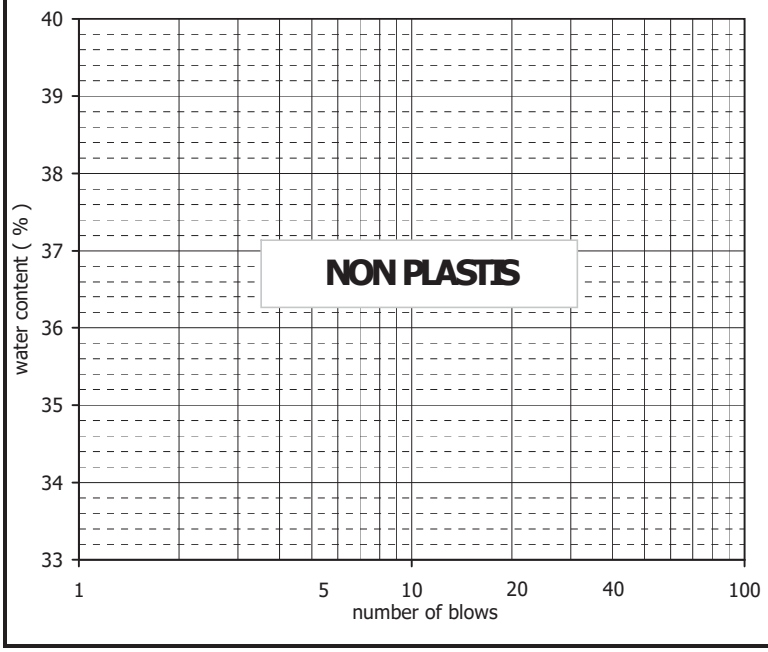
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		15.50 - 16.00

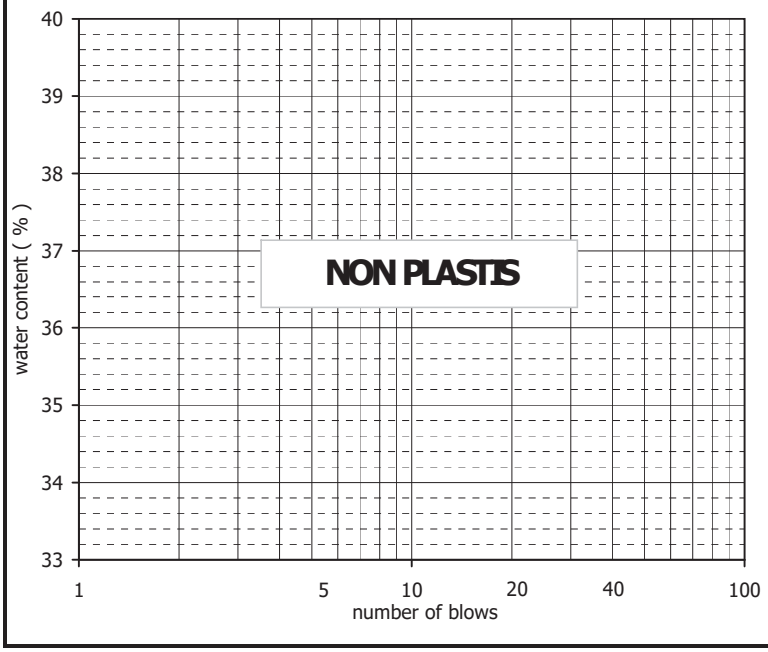
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

PT INDRA KARYA (PERSERO)
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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)		17.50 - 18.00

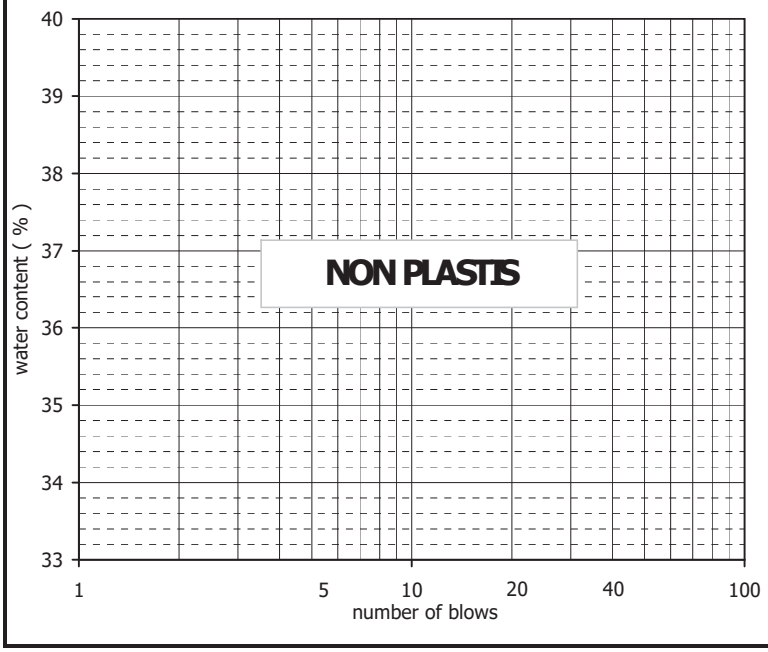
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

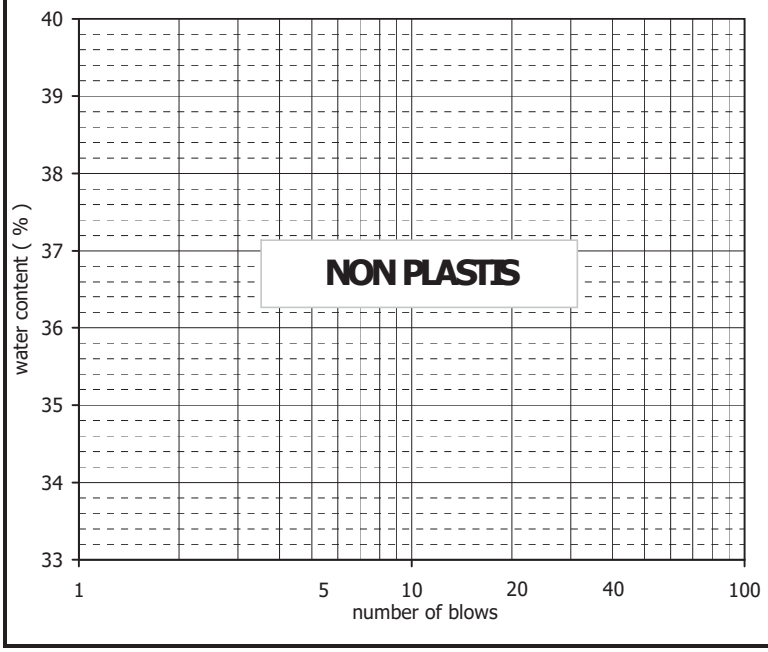
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 19, 2019
LOCATION	:	BALAI KOTA - PALU	TESTED BY	REDY ARIANTO
SAMPLE NO.	:	BAY - 21	DEPTH (m)	19.50 - 20.00

LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %
4	**5**	**6**
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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BUMN
Hadir untuk negeri

ISO 9001 CQMS - 3617003
ISO 14001 CQMS - 3618004
OHSAS 18001 CQMS - 3619027

SUMMARY OF SOIL TEST

PROJECT			**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**								
LOCATION			**SILAE - PALU**								
SAMPLE No			BAY - 22	BAY - 22	BAY - 22	BAY - 22	BAY - 22	BAY - 22	BAY - 22	BAY - 22	BAY - 22
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	13.39	13.09	10.64	17.76	17.73	12.46	12.41	21.51	22.78
	Specific gravity of soil	*Gs*	2.703	2.712	2.721	2.709	2.693	2.733	2.719	2.721	2.701
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	11.85	30.04	38.41	1.82	0.00	17.58	15.00	6.12	6.91
	Proportion — Sand part	(%)	57.45	56.35	39.88	59.38	61.01	61.72	63.92	46.60	46.28
	Proportion — Silt part	(%)	23.32	11.23	16.72	24.03	24.88	15.07	14.61	27.79	26.92
	Proportion — Clay part	(%)	7.39	2.38	4.99	14.78	14.11	5.63	6.47	19.49	19.89
	Max. diameter	(mm)	9.52	25.40	25.40	9.52	4.75	25.40	19.10	19.10	19.10
	90 % diameter	(mm)	5.4946	18.7290	21.5730	1.6268	1.5000	9.1902	7.7294	2.5031	3.0628
	60 % diameter	(mm)	0.6274	1.9037	4.0284	0.2989	0.2760	1.6148	1.4497	0.1904	0.1960
	50 % diameter	(mm)	0.3420	1.1910	1.2411	0.1627	0.1523	1.1282	0.8960	0.0897	0.0923
	30 % diameter	(mm)	0.0712	0.4333	0.1952	0.0365	0.0342	0.3066	0.2628	0.0183	0.0187
	10 % diameter	(mm)	0.0085	0.0394	0.0157	0.0019	0.0022	0.0142	0.0101	-	-
	Uniformity Coefficient		73.81	48.28	256.17	161.29	124.73	113.60	143.31	-	-
	Passing # 200		30.70	13.61	21.71	38.81	38.99	20.69	21.08	47.28	46.81
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	31.11	31.93
	Plastic limit	*PL* (%)								25.31	24.86
	Plasticity index	*PI* (%)								5.80	7.07
	Flow index									10.68	11.06
	Unified Classification									CL - ML	ML

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**										
LOCATION		**SILAE - PALU**										
SAMPLE No				BAY - 22	BAY - 22	BAY - 22	BAY - 22	BAY - 22	BAY - 22	BAY - 22		
DEPTH (m)				9.50 - 10.00	12.50 - 13.00	13.50 - 14.00	15.50 - 16.00	17.50 - 18.00	19.50 - 20.00	22.50 - 23.00		
PROPERTIES	Natural Water Content		(%)	22.85	26.27	23.08	14.71	17.76	39.20	26.12		
	Specific gravity of soil		*Gs*	2.711	2.699	2.726	2.697	2.716	2.701	2.716		
GRAIN SIZE ANALYSIS	Proportion	Gravel part	(%)	16.34	12.01	12.78	3.22	24.61	0.00	2.59		
		Sand part	(%)	53.75	45.21	65.94	65.30	50.65	38.88	41.78		
		Silt part	(%)	23.08	25.01	15.59	15.17	21.88	22.96	29.30		
		Clay part	(%)	6.83	17.78	5.69	16.31	2.85	38.16	26.32		
	Max. diameter		(mm)	19.10	25.40	38.10	19.10	38.10	4.75	19.10		
	90 % diameter		(mm)	10.3124	6.5391	7.5134	1.5154	15.9817	3.1330	1.2765		
	60 % diameter		(mm)	0.2368	0.2577	0.6074	0.3925	1.0361	0.0687	0.1039		
	50 % diameter		(mm)	0.1695	0.1322	0.3406	0.2726	0.4046	0.0260	0.0491		
	30 % diameter		(mm)	0.0743	0.0249	0.1271	0.0568	0.1026	0.0013	0.0072		
	10 % diameter		(mm)	0.0114	-	0.0154	0.0019	0.0215	-	-		
	Uniformity Coefficient			20.86	-	39.42	203.49	48.17	-	-		
	Passing # 200			29.91	42.79	21.28	31.48	24.73	61.12	55.62		
CONSISTENCY	Liquid limit	*LL*	(%)	NON PLASTIS	30.89	NON PLASTIS	29.32	NON PLASTIS	52.15	32.18		
	Plastic limit	*PL*	(%)		20.87		20.96		30.30	26.64		
	Plasticity index	*PI*	(%)		10.03		8.35		21.85	5.55		
	Flow index				10.82		8.41		15.23	10.06		
	Unified Classification				CL		SC		MH	CL - ML		

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BUMN
Hadir untuk negeri

ISO 9001 CCBS-3417003
ISO 14001 CCBS-3418004
OHSAS 18001 CCBS-3418027

NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	SILAE - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	J-72								No	J-86	
04/02	BAY - 22		WW	119.68	DW	109.60			04/02	BAY - 22		WW	107.30	DW	94.29		
2019	0.50 - 1.00	13.39	DW	109.60	TW	34.31			2019	8.50 - 9.00	22.78	DW	94.29	TW	37.19		
			Ww	10.08	Ws	75.29						Ww	13.01	Ws	57.10		
				WC	(%)	13.39							WC	(%)	22.78		
					No	T-28								No	T-61		
04/02	BAY - 22		WW	93.12	DW	86.49			04/02	BAY - 22		WW	105.93	DW	93.30		
2019	1.50 - 2.00	13.09	DW	86.49	TW	35.85			2019	9.50 - 10.00	22.85	DW	93.30	TW	38.03		
			Ww	6.63	Ws	50.64						Ww	12.63	Ws	55.27		
				WC	(%)	13.09							WC	(%)	22.85		
					No	T-72								No	A-62		
04/02	BAY - 22		WW	138.31	DW	128.20			04/02	BAY - 22		WW	100.80	DW	87.62		
2019	2.50 - 3.00	10.64	DW	128.20	TW	33.15			2019	12.50 - 13.00	26.27	DW	87.62	TW	37.44		
			Ww	10.11	Ws	95.05						Ww	13.18	Ws	50.18		
				WC	(%)	10.64							WC	(%)	26.27		
					No	J-08								No	J-37		
04/02	BAY - 22		WW	120.70	DW	108.71			04/02	BAY - 22		WW	121.47	DW	105.44		
2019	3.50 - 4.00	17.76	DW	108.71	TW	41.21			2019	13.50 - 14.00	23.08	DW	105.44	TW	35.98		
			Ww	11.99	Ws	67.50						Ww	16.03	Ws	69.46		
				WC	(%)	17.76							WC	(%)	23.08		
					No	A-29								No	A-13		
04/02	BAY - 22		WW	118.62	DW	106.52			04/02	BAY - 22		WW	100.33	DW	92.23		
2019	4.50 - 5.00	17.73	DW	106.52	TW	38.26			2019	15.50 - 16.00	14.71	DW	92.23	TW	37.18		
			Ww	12.10	Ws	68.26						Ww	8.10	Ws	55.05		
				WC	(%)	17.73							WC	(%)	14.71		
					No	T-48								No	A-91		
04/02	BAY - 22		WW	121.37	DW	111.83			04/02	BAY - 22		WW	103.27	DW	93.28		
2019	5.50 - 6.00	12.46	DW	111.83	TW	35.24			2019	17.50 - 18.00	17.76	DW	93.28	TW	37.03		
			Ww	9.54	Ws	76.59						Ww	9.99	Ws	56.25		
				WC	(%)	12.46							WC	(%)	17.76		
					No	A-54								No	A-26		
04/02	BAY - 22		WW	132.71	DW	122.19			04/02	BAY - 22		WW	132.38	DW	105.58		
2019	6.50 - 7.00	12.41	DW	122.19	TW	37.44			2019	19.50 - 20.00	39.20	DW	105.58	TW	37.22		
			Ww	10.52	Ws	84.75						Ww	26.80	Ws	68.36		
				WC	(%)	12.41							WC	(%)	39.20		
					No	T-02								No	A-28		
04/02	BAY - 22		WW	103.63	DW	91.90			04/02	BAY - 22		WW	108.07	DW	93.61		
2019	7.50 - 8.00	21.51	DW	91.90	TW	37.37			2019	22.50 - 23.00	26.12	DW	93.61	TW	38.24		
			Ww	11.73	Ws	54.53						Ww	14.46	Ws	55.37		
				WC	(%)	21.51							WC	(%)	26.12		

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				41	71	59	
Weight of Pycnometer		Wf	(gr)	35.950	39.800	33.640	
Weight of (Pycnometer + Water)		Wa	(gr)	137.160	140.220	144.580	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.820	152.980	157.300	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.850	37.960	37.880	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.070	20.180	20.100	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.1600	140.2200	144.5800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.410	7.420	7.380	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.709	2.720	2.724	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.695	2.706	2.710	
Average Specific Gravity at 20° C							**2.703**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				32	46	63	
Weight of Pycnometer		Wf	(gr)	51.260	39.280	45.527	
Weight of (Pycnometer + Water)		Wa	(gr)	151.350	140.310	149.488	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.050	153.110	162.210	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.820	38.020	37.870	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.040	20.240	20.090	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.3500	140.3100	149.4884	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.340	7.440	7.368	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.730	2.720	2.727	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.716	2.706	2.712	
Average Specific Gravity at 20° C							**2.712**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				39	30	53	
Weight of Pycnometer		Wf	(gr)	36.940	38.460	52.280	
Weight of (Pycnometer + Water)		Wa	(gr)	136.930	138.140	153.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.910	151.370	166.160	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.230	38.640	38.260	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.450	20.860	20.480	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9300	138.1400	153.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.470	7.630	7.490	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.738	2.734	2.734	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.724	2.720	2.720	
Average Specific Gravity at 20° C							**2.721**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				5	34	62	
Weight of Pycnometer		Wf	(gr)	65.390	52.710	41.480	
Weight of (Pycnometer + Water)		Wa	(gr)	168.330	152.200	152.370	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.050	164.990	165.160	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.890	37.970	38.010	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.110	20.190	20.230	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.3300	152.2000	152.3700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.390	7.400	7.440	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.721	2.728	2.719	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.707	2.714	2.705	
Average Specific Gravity at 20° C							**2.709**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				68	56	49	
Weight of Pycnometer		Wf	(gr)	34.650	52.690	39.190	
Weight of (Pycnometer + Water)		Wa	(gr)	134.460	152.160	141.110	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	147.170	164.920	153.850	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.930	38.030	37.980	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.150	20.250	20.200	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	134.4600	152.1600	141.1100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.440	7.490	7.460	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.708	2.704	2.708	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.694	2.690	2.694	
Average Specific Gravity at 20° C							**2.693**

Remarks

SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 11, 2019
LOCATION	**SILAE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				31	47	66	
Weight of Pycnometer		Wf	(gr)	34.630	40.660	36.290	
Weight of (Pycnometer + Water)		Wa	(gr)	134.510	142.080	136.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	147.400	154.920	149.050	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.040	37.980	37.860	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.260	20.200	20.080	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	134.5100	142.0800	136.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.370	7.360	7.310	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.749	2.745	2.747	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.735	2.730	2.733	
Average Specific Gravity at 20° C							**2.733**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				74	42	67	
Weight of Pycnometer		Wf	(gr)	38.550	39.190	36.820	
Weight of (Pycnometer + Water)		Wa	(gr)	138.630	142.220	137.620	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.500	155.020	150.490	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	37.980	38.090	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.200	20.310	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.6300	142.2200	137.6200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.400	7.400	7.440	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.739	2.730	2.730	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.725	2.716	2.716	
Average Specific Gravity at 20° C							**2.719**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				52	73	11	
Weight of Pycnometer		Wf	(gr)	52.420	34.550	68.490	
Weight of (Pycnometer + Water)		Wa	(gr)	153.990	135.120	168.640	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	166.790	147.990	181.380	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.960	38.090	37.840	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.180	20.310	20.060	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	153.9900	135.1200	168.6400	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.380	7.440	7.320	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.734	2.730	2.740	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.720	2.716	2.726	
Average Specific Gravity at 20° C							**2.721**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				60	48	72	
Weight of Pycnometer		Wf	(gr)	43.180	37.760	33.250	
Weight of (Pycnometer + Water)		Wa	(gr)	146.610	139.170	133.800	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.400	151.880	146.480	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.030	37.920	37.830	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.250	20.140	20.050	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.6100	139.1700	133.8000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.460	7.430	7.370	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.714	2.711	2.720	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.701	2.697	2.706	
Average Specific Gravity at 20° C							**2.701**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 11, 2019
LOCATION	**SILAE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				33	36	55	
Weight of Pycnometer		Wf	(gr)	37.510	51.080	51.050	
Weight of (Pycnometer + Water)		Wa	(gr)	138.180	151.920	151.910	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.860	164.920	164.600	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.790	38.350	37.820	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.010	20.570	20.040	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1800	151.9200	151.9100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.330	7.570	7.350	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.730	2.717	2.727	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.716	2.703	2.713	
Average Specific Gravity at 20° C							**2.711**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	12.50 - 13.00

Determination No				1	2	3	4
No of Pycnometer				21	61	45	
Weight of Pycnometer		Wf	(gr)	40.730	37.700	37.860	
Weight of (Pycnometer + Water)		Wa	(gr)	145.610	146.520	139.180	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	158.400	159.270	151.860	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.030	37.990	37.850	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.250	20.210	20.070	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	145.6100	146.5200	139.1800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.460	7.460	7.390	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.714	2.709	2.716	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.701	2.695	2.702	
Average Specific Gravity at 20° C							**2.699**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 11, 2019
LOCATION	**SILAE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	13.50 - 14.00

Determination No				1	2	3	4
No of Pycnometer				43	70	58	
Weight of Pycnometer		Wf	(gr)	40.060	37.010	35.070	
Weight of (Pycnometer + Water)		Wa	(gr)	142.260	136.860	145.730	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	154.980	149.610	158.480	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.790	37.890	37.850	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.010	20.110	20.070	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	142.2600	136.8600	145.7300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.290	7.360	7.320	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.745	2.732	2.742	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.731	2.718	2.728	
Average Specific Gravity at 20° C							**2.726**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 11, 2019
LOCATION	SILAE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	15.50 - 16.00

Determination No				1	2	3	4
No of Pycnometer				6	26	50	
Weight of Pycnometer		Wf	(gr)	65.150	38.840	52.650	
Weight of (Pycnometer + Water)		Wa	(gr)	167.850	138.580	154.080	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	180.990	151.480	166.910	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.600	38.200	38.130	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.820	20.420	20.350	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.8500	138.5800	154.0800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.680	7.520	7.520	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.711	2.715	2.706	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.697	2.701	2.692	
Average Specific Gravity at 20° C							**2.697**

Remarks

SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 11, 2019
LOCATION	**SILAE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	17.50 - 18.00

Determination No				1	2	3	4
No of Pycnometer				37	69	44	
Weight of Pycnometer		Wf	(gr)	50.940	36.570	38.880	
Weight of (Pycnometer + Water)		Wa	(gr)	151.200	137.650	139.990	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	163.980	150.380	152.830	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.950	37.860	38.050	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.170	20.080	20.270	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.2000	137.6500	139.9900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.390	7.350	7.430	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.729	2.732	2.728	
Coefficient for Temperature Correction K				0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.715	2.718	2.714	
Average Specific Gravity at 20° C							**2.716**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 11, 2019
LOCATION	**SILAE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	19.50 - 20.00

Determination No				1	2	3	4
No of Pycnometer				29	16	54	
Weight of Pycnometer		Wf	(gr)	36.900	66.000	51.250	
Weight of (Pycnometer + Water)		Wa	(gr)	135.800	169.300	151.310	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.660	182.370	164.210	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.120	38.500	38.190	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.340	20.720	20.410	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8000	169.3000	151.3100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.480	7.650	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.719	2.708	2.718	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.705	2.695	2.704	
Average Specific Gravity at 20° C							**2.701**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 11, 2019
LOCATION	**SILAE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 22	DEPTH	22.50 - 23.00

Determination No				1	2	3	4
No of Pycnometer				2	24	51	
Weight of Pycnometer		Wf	(gr)	66.900	38.140	53.870	
Weight of (Pycnometer + Water)		Wa	(gr)	168.750	137.560	154.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.740	150.840	167.060	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.270	38.710	37.980	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.490	20.930	20.200	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.7500	137.5600	154.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.650	7.420	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.732	2.736	2.722	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.718	2.722	2.708	
Average Specific Gravity at 20° C							**2.716**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 500.0 gr
Wt. container No ..... = 43.96 gr
Wt. Of air dry soil W' = 456.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **456.04** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	98.00	43.96	54.04		11.85	88.15
2.00	144.00		100.04		21.94	78.06

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	SILAE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 22	DEPTH	0.50 - 1.00

Wt. (Air dry soil + container) = 140.32 gr — Specific Gravity : 2.703
Wt. of container B-18 = 34.51 gr — Plasticity Index : %
Wt. Of air dry soil W' = 105.81 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 78.06 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-20			NO	L-33			NO	L-37		
WW	55.57	DW	55.09	WW	55.71	DW	55.24	WW	54.94	DW	54.39	Mean value	
DW	55.09	TW	39.35	DW	55.24	TW	39.46	DW	54.39	TW	38.85	w	
Ww	0.48	Ws	15.74	Ww	0.47	Ws	15.78	Ww	0.55	Ws	15.54	3.19	%
w	3.05	%		w	2.98	%		w	3.54	%			

$$W = \frac{100 \times W'}{100 + w} : 102.540 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.0	21.0	29	10.297	10.297	3.2089	0.01213	0.0389	18.00	27.86	21.75
2	17.0	18.0	29	11.054	5.527	2.3509	0.01213	0.0285	15.00	23.22	18.12
5	14.0	15.0	29	11.811	2.362	1.5369	0.01213	0.0186	12.00	18.57	14.50
15	11.5	12.5	29	12.442	0.829	0.9107	0.01213	0.0110	9.50	14.70	11.48
30	10.0	11.0	29	12.820	0.427	0.6537	0.01213	0.0079	8.00	12.38	9.67
60	8.5	9.5	29	13.198	0.220	0.4690	0.01213	0.0057	6.50	10.06	7.85
240	6.5	7.5	28	13.703	0.057	0.2389	0.01226	0.0029	4.50	6.97	5.44
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01213	0.0013	3.50	5.42	4.23

P = 100/W = 0.9752

$$Mx = \frac{Gs}{Gs - 1} = 1.5872$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	36.93	22.02	14.910		14.54	85.46	66.71
0.42	53.96		31.940		31.15	68.85	53.75
0.25	64.69		42.670		41.61	58.39	45.58
0.105	77.32		55.300		53.93	46.07	35.96
0.074	84.23		62.210		60.67	39.33	30.70

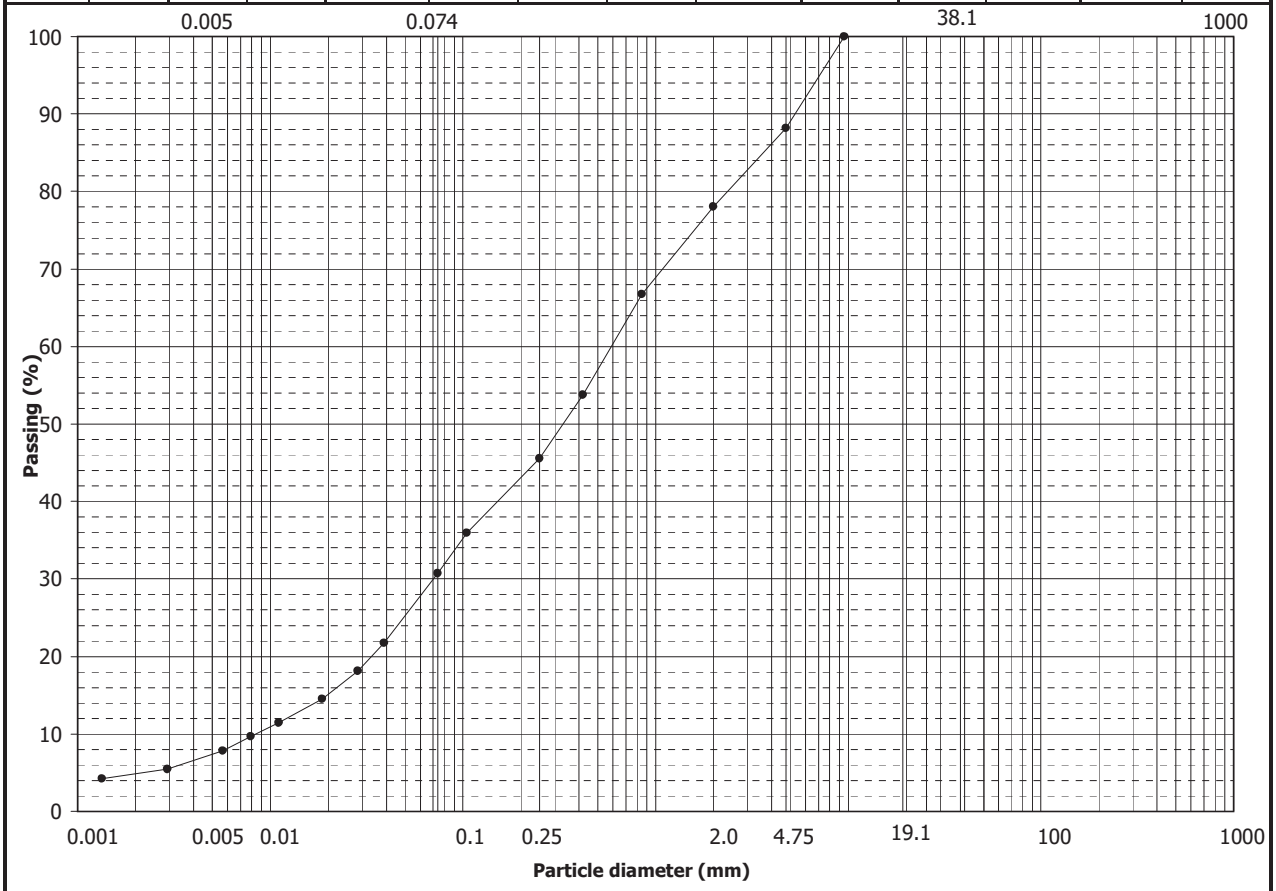
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.703**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
11.85	57.45	23.32	7.39	9.52	5.495	0.6274	0.3420	0.0712	0.0085	73.81	78.06	53.75	30.70



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 594.0 gr
Wt. container No ..... = 49.11 gr
Wt. Of air dry soil W' = 544.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **544.89** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	101.50	49.11	52.39		9.61	90.39
9.52	155.70		106.59		19.56	80.44
4.75	212.80		163.69		30.04	69.96
2.00	259.70		210.59		38.65	61.35

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 152.50 gr — Specific Gravity : **2.712**

Wt. of container B-35 = 35.92 gr — Plasticity Index : %

Wt. Of air dry soil W' = 116.58 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 61.35 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-10			NO	J-28			NO	J-30		
WW	52.18	DW	51.74	WW	51.00	DW	50.57	WW	53.18	DW	52.66	Mean value	
DW	51.74	TW	36.96	DW	50.57	TW	36.12	DW	52.66	TW	37.61	w	
Ww	0.44	Ws	14.78	Ww	0.43	Ws	14.45	Ww	0.52	Ws	15.05	3.14	%
w	2.98	%		w	2.98	%		w	3.46	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : \quad 113.035 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	14.0	15.0	29	11.811	11.811	3.4367	0.01209	0.0416	12.00	16.82	10.32
2	12.0	13.0	29	12.315	6.158	2.4815	0.01209	0.0300	10.00	14.01	8.60
5	10.0	11.0	29	12.820	2.564	1.6012	0.01209	0.0194	8.00	11.21	6.88
15	8.0	9.0	29	13.325	0.888	0.9425	0.01209	0.0114	6.00	8.41	5.16
30	6.0	7.0	29	13.829	0.461	0.6789	0.01209	0.0082	4.00	5.61	3.44
60	5.0	6.0	29	14.081	0.235	0.4844	0.01209	0.0059	3.00	4.20	2.58
240	4.0	5.0	28	14.334	0.060	0.2444	0.01223	0.0030	2.00	2.80	1.72
1140	3.5	4.5	29	14.460	0.013	0.1126	0.01209	0.0014	1.50	2.10	1.29

P = 100/W = 0.8847

$$Mx = \frac{G_s}{G_s - 1} = \quad 1.5841$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	51.75	22.02	29.730		26.30	73.70	45.22
0.42	80.68		58.660		51.90	48.10	29.51
0.25	92.07		70.050		61.97	38.03	23.33
0.105	104.63		82.610		73.08	26.92	16.51
0.074	109.98		87.960		77.82	22.18	13.61

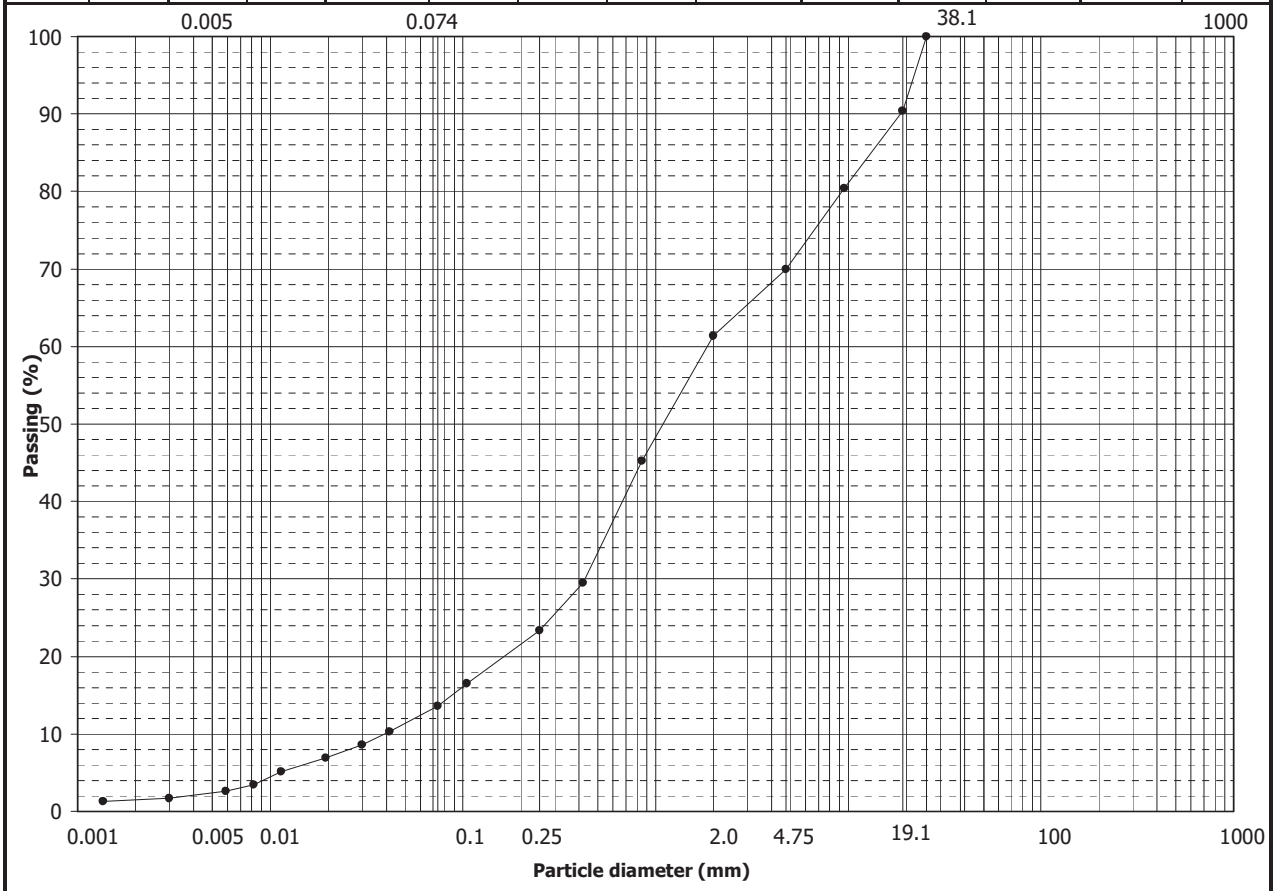
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.712**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
30.04	56.35	11.23	2.38	25.40	18.729	1.9037	1.1910	0.4333	0.0394	48.28	61.35	29.51	13.61



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 809.0 gr

Wt. container No ..... = 43.96 gr

Wt. Of air dry soil W' = 765.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **765.04** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	169.90	43.96	125.94		16.46	83.54
9.52	263.90		219.94		28.75	71.25
4.75	337.80		293.84		38.41	61.59
2.00	384.20		340.24		44.47	55.53

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	SILAE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 22	DEPTH	2.50 - 3.00

Wt. (Air dry soil + container) = 137.97 gr — Specific Gravity : 2.721
Wt. of container B-81 = 36.41 gr — Plasticity Index : %
Wt. Of air dry soil W' = 101.56 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 55.53 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-32			NO	J-35			NO	J-36		
WW	56.27	DW	55.86	WW	48.48	DW	48.13	WW	54.81	DW	54.33	Mean value	
DW	55.86	TW	39.90	DW	48.13	TW	34.38	DW	54.33	TW	38.80	w	
Ww	0.41	Ws	15.96	Ww	0.35	Ws	13.75	Ww	0.48	Ws	15.53	2.74	%
w	2.57	%		w	2.55	%		w	3.09	%			

$$W = \frac{100 \times W'}{100 + w} : 98.856 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	29	10.549	10.549	3.2480	0.01206	0.0392	17.00	27.19	15.10
2	17.0	18.0	29	11.054	5.527	2.3509	0.01206	0.0284	15.00	23.99	13.32
5	14.0	15.0	29	11.811	2.362	1.5369	0.01206	0.0185	12.00	19.19	10.66
15	12.0	13.0	29	12.315	0.821	0.9061	0.01206	0.0109	10.00	15.99	8.88
30	10.0	11.0	29	12.820	0.427	0.6537	0.01206	0.0079	8.00	12.79	7.10
60	8.0	9.0	29	13.325	0.222	0.4712	0.01206	0.0057	6.00	9.60	5.33
240	6.0	7.0	28	13.829	0.058	0.2400	0.01219	0.0029	4.00	6.40	3.55
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01206	0.0013	3.50	5.60	3.11

P = 100/W = 1.0116

$$Mx = \frac{Gs}{Gs - 1} = 1.5811$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	36.93	22.02	14.910		15.08	84.92	47.15
0.42	52.96		30.940		31.30	68.70	38.15
0.25	62.69		40.670		41.14	58.86	32.68
0.105	75.32		53.300		53.92	46.08	25.59
0.074	82.23		60.210		60.91	39.09	21.71

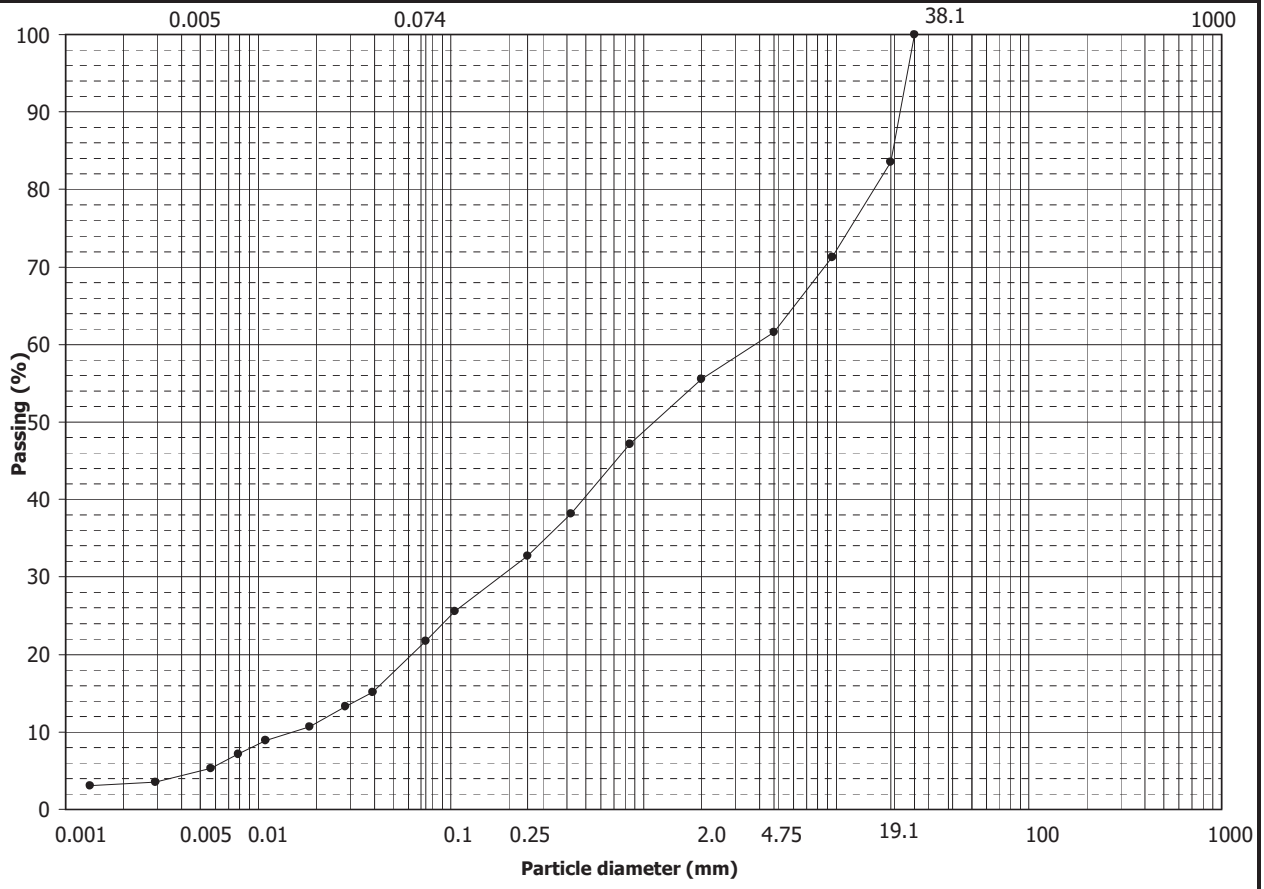
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.721**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
38.41	39.88	16.72	4.99	25.40	21.573	4.0284	1.2411	0.1952	0.0157	256.17	55.53	38.15	21.71



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 684.0 gr
Wt. container No ..... = 44.69 gr
Wt. Of air dry soil W' = 639.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **639.31** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	56.31	44.69	11.62		1.82	98.18
2.00	81.63		36.94		5.78	94.22

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 118.44 gr — Specific Gravity : **2.709**

Wt. of container M-78 = 44.11 gr — Plasticity Index : %

Wt. Of air dry soil W' = 74.33 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 94.22 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-49			NO	J-55			NO	J-42		
WW	56.95	DW	56.50	WW	56.36	DW	55.92	WW	55.25	DW	54.74	Mean value	
DW	56.50	TW	40.36	DW	55.92	TW	39.94	DW	54.74	TW	39.10	w	
Ww	0.45	Ws	16.14	Ww	0.44	Ws	15.98	Ww	0.51	Ws	15.64	2.93	%
w	2.79	%		w	2.75	%		w	3.26	%			

$$W = \frac{100 \times W'}{100 + w} : 72.211 \text{ gr}$$

II. Hydrometer Analysis

Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	29	11.054	11.054	3.3247	0.01210	0.0402	15.00	32.93	31.02
2	15.5	16.5	29	11.432	5.716	2.3909	0.01210	0.0289	13.50	29.63	27.92
5	14.0	15.0	29	11.811	2.362	1.5369	0.01210	0.0186	12.00	26.34	24.82
15	12.0	13.0	29	12.315	0.821	0.9061	0.01210	0.0110	10.00	21.95	20.68
30	10.5	11.5	29	12.694	0.423	0.6505	0.01210	0.0079	8.50	18.66	17.58
60	9.5	10.5	29	12.946	0.216	0.4645	0.01210	0.0056	7.50	16.46	15.51
240	7.5	8.5	28	13.451	0.056	0.2367	0.01224	0.0029	5.50	12.07	11.38
1140	6.5	7.5	29	13.703	0.012	0.1096	0.01210	0.0013	4.50	9.88	9.31

P = 100/W = 1.3848

$$Mx = \frac{Gs}{Gs - 1} = 1.5851$$

III. Sieve analysis

Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	31.99	22.02	9.970		13.81	86.19	81.21
0.42	42.86		20.840		28.86	71.14	67.03
0.25	50.42		28.400		39.33	60.67	57.17
0.105	59.54		37.520		51.96	48.04	45.27
0.074	64.49		42.470		58.81	41.19	38.81

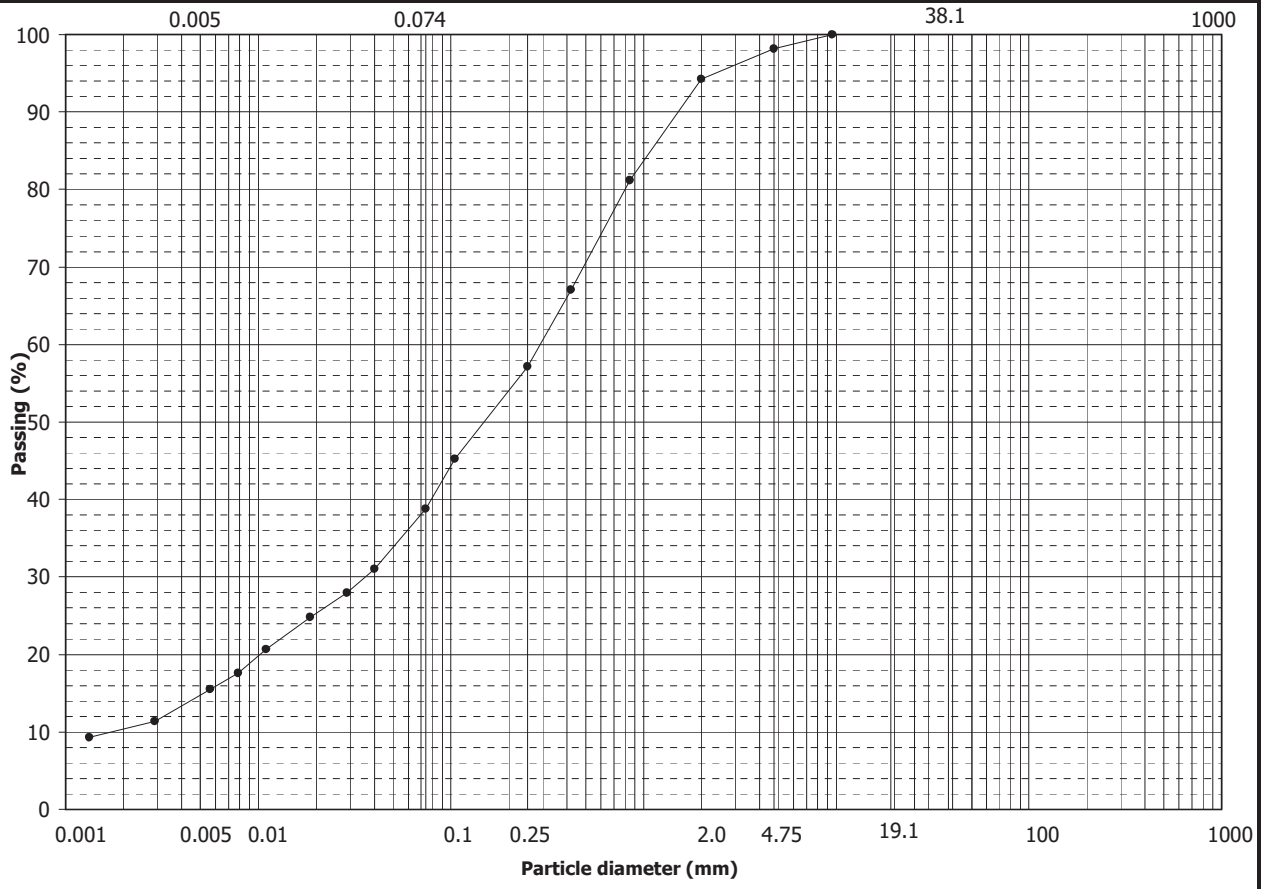
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.709**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
1.82	59.38	24.03	14.78	9.52	1.627	0.2989	0.1627	0.0365	0.0019	161.29	94.22	67.03	38.81



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 350.0 gr
Wt. container No ..... = 38.67 gr
Wt. Of air dry soil W' = 311.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **311.33** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	51.00	38.67	12.33		3.96	96.04

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	4.50 - 5.00	**4.50 - 5.00**

Wt. (Air dry soil + container) = 101.30 gr — Specific Gravity : **2.693**

Wt. of container E-78 = 37.40 gr — Plasticity Index : %

Wt. Of air dry soil W' = 63.90 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 96.04

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-21			NO	L-34			NO	L-13		
WW	51.50	DW	51.10	WW	55.66	DW	55.23	WW	54.80	DW	54.29	Mean value	
DW	51.10	TW	36.50	DW	55.23	TW	39.45	DW	54.29	TW	38.78	w	
Ww	0.40	Ws	14.60	Ww	0.43	Ws	15.78	Ww	0.51	Ws	15.51	2.92	%
w	2.74	%		w	2.72	%		w	3.29	%			

$$W = \frac{100 \times W'}{100 + w} : 62.089 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	29	11.558	11.558	3.3998	0.01216	0.0413	13.00	33.31	31.99
2	13.5	14.5	29	11.937	5.968	2.4430	0.01216	0.0297	11.50	29.46	28.30
5	11.5	12.5	29	12.442	2.488	1.5774	0.01216	0.0192	9.50	24.34	23.37
15	10.0	11.0	29	12.820	0.855	0.9245	0.01216	0.0112	8.00	20.50	19.68
30	9.0	10.0	29	13.072	0.436	0.6601	0.01216	0.0080	7.00	17.93	17.22
60	8.0	9.0	29	13.325	0.222	0.4712	0.01216	0.0057	6.00	15.37	14.76
240	6.5	7.5	28	13.703	0.057	0.2389	0.01229	0.0029	4.50	11.53	11.07
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01216	0.0013	3.50	8.97	8.61

P = 100/W = 1.6106

$$Mx = \frac{G_s}{G_s - 1} = 1.5907$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	31.00	22.02	8.980		14.46	85.54	82.15
0.42	40.00		17.980		28.96	71.04	68.23
0.25	46.28		24.260		39.07	60.93	58.51
0.105	54.45		32.430		52.23	47.77	45.88
0.074	58.90		36.880		59.40	40.60	38.99

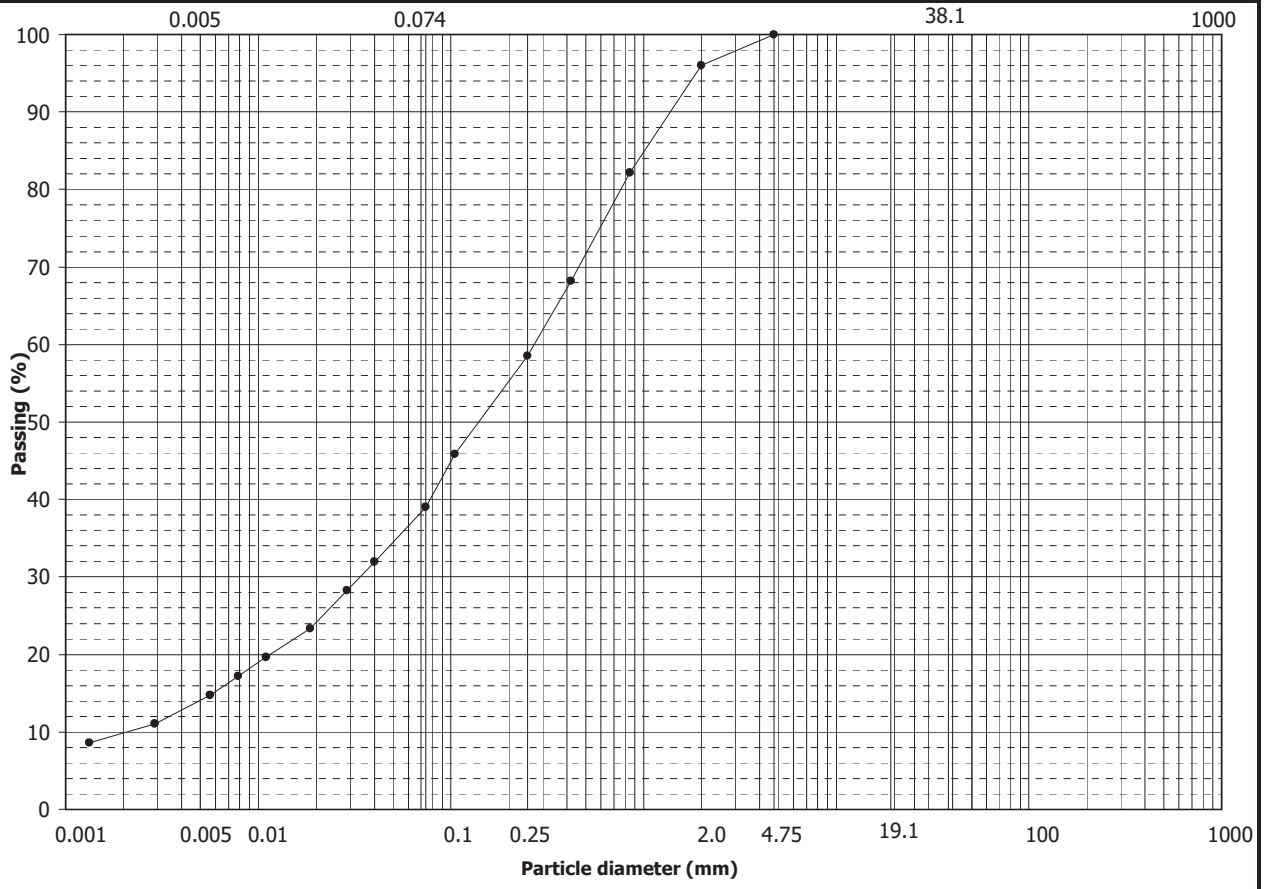
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.693**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	61.01	24.88	14.11	4.75	1.500	0.2760	0.1523	0.0342	0.0022	124.73	96.04	68.23	38.99



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 491.0 gr

Wt. container No ..... = 44.13 gr

Wt. Of air dry soil W' = 446.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **446.87** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	55.40	44.13	11.27		2.52	97.48
9.52	86.30		42.17		9.44	90.56
4.75	122.70		78.57		17.58	82.42
2.00	187.50		143.37		32.08	67.92

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 109.36 gr — Specific Gravity : **2.733**

Wt. of container B-93 = 35.10 gr — Plasticity Index : %

Wt. Of air dry soil W' = 74.26 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 67.92 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-40			NO	J-47			NO	J-91		
WW	54.09	DW	53.65	WW	53.75	DW	53.32	WW	53.02	DW	52.51	Mean value	
DW	53.65	TW	38.32	DW	53.32	TW	38.23	DW	52.51	TW	37.51	w	
Ww	0.44	Ws	15.33	Ww	0.43	Ws	15.09	Ww	0.51	Ws	15.00	3.04	%
w	2.87	%		w	2.85	%		w	3.40	%			

$$W = \frac{100 \times W'}{100 + w} : 72.069 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	13.5	14.5	29	11.937	11.937	3.4550	0.01202	0.0415	11.50	25.16	17.09
2	12.0	13.0	29	12.315	6.158	2.4815	0.01202	0.0298	10.00	21.88	14.86
5	10.0	11.0	29	12.820	2.564	1.6012	0.01202	0.0192	8.00	17.51	11.89
15	8.0	9.0	29	13.325	0.888	0.9425	0.01202	0.0113	6.00	13.13	8.92
30	7.0	8.0	29	13.577	0.453	0.6727	0.01202	0.0081	5.00	10.94	7.43
60	6.0	7.0	29	13.829	0.230	0.4801	0.01202	0.0058	4.00	8.75	5.94
240	5.0	6.0	28	14.081	0.059	0.2422	0.01215	0.0029	3.00	6.56	4.46
1140	4.5	5.5	29	14.208	0.012	0.1116	0.01202	0.0013	2.50	5.47	3.72

P = 100/W = 1.3876

$$Mx = \frac{Gs}{Gs - 1} = 1.5770$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	47.10	22.02	25.080		34.80	65.20	44.28
0.42	57.70		35.680		49.51	50.49	34.29
0.25	64.53		42.510		58.99	41.01	27.86
0.105	70.40		48.380		67.13	32.87	22.32
0.074	72.13		50.110		69.53	30.47	20.69

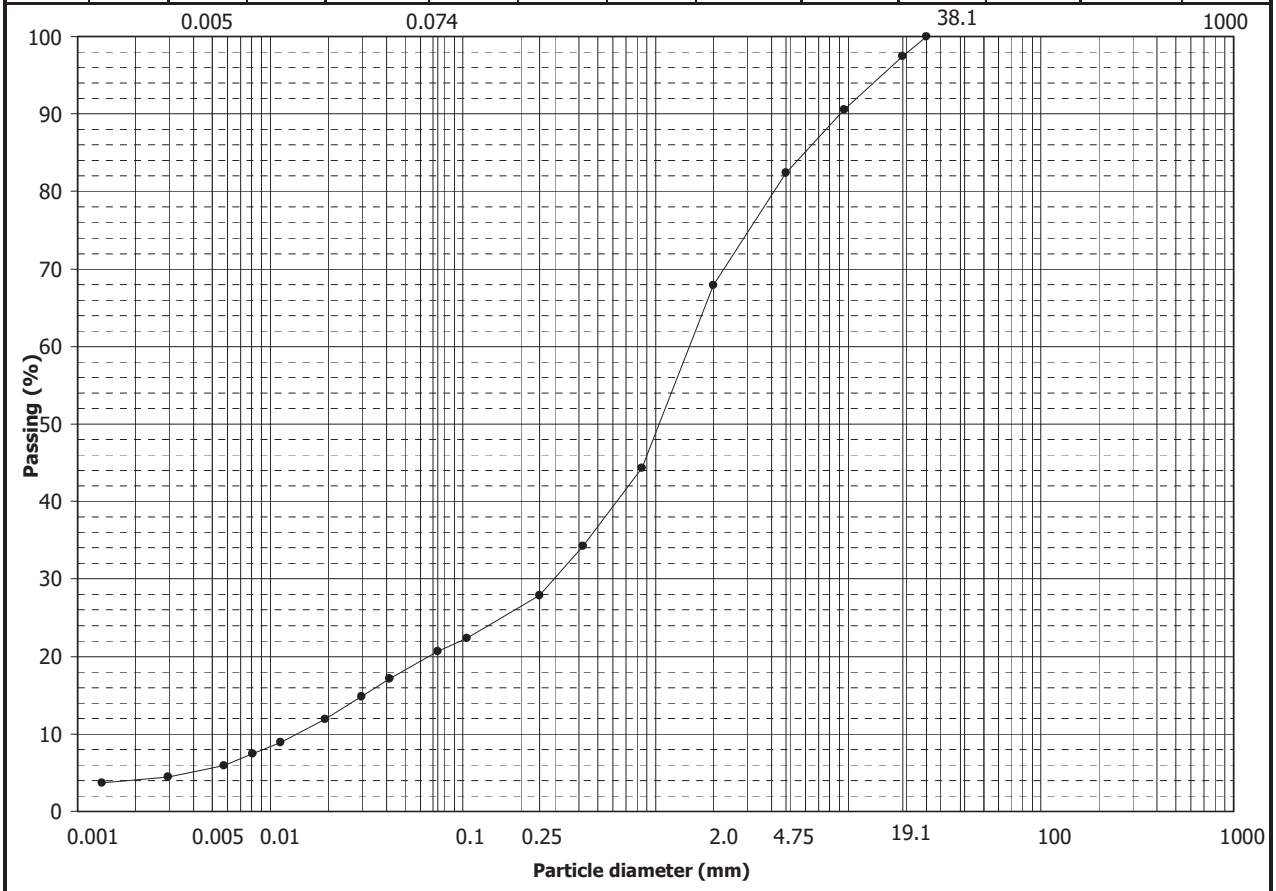
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.733**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
17.58	61.72	15.07	5.63	25.40	9.1902	1.6148	1.1282	0.3066	0.0142	113.60	67.92	34.29	20.69



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 576.0 gr
Wt. container No ..... = 38.38 gr
Wt. Of air dry soil W' = 537.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **537.62** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	76.00	38.38	37.62		7.00	93.00
4.75	119.00		80.62		15.00	85.00
2.00	200.00		161.62		30.06	69.94

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	6.50 - 7.00	**6.50 - 7.00**

Wt. (Air dry soil + container) = 142.90 gr — Specific Gravity : **2.719**

Wt. of container B-39 = 35.05 gr — Plasticity Index : %

Wt. Of air dry soil W' = 107.85 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 69.94 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-24			NO	J-43			NO	J-13		
WW	46.96	DW	46.58	WW	52.14	DW	51.72	WW	57.61	DW	57.05	Mean value	
DW	46.58	TW	33.27	DW	51.72	TW	36.94	DW	57.05	TW	40.75	w	
Ww	0.38	Ws	13.31	Ww	0.42	Ws	14.78	Ww	0.56	Ws	16.30	3.04	%
w	2.86	%		w	2.84	%		w	3.44	%			

$$W = \frac{100 \times W'}{100 + w} : 104.664 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	29	10.549	10.549	3.2480	0.01207	0.0392	17.00	25.69	17.97
2	17.0	18.0	29	11.054	5.527	2.3509	0.01207	0.0284	15.00	22.67	15.85
5	15.0	16.0	29	11.558	2.312	1.5204	0.01207	0.0184	13.00	19.65	13.74
15	12.0	13.0	29	12.315	0.821	0.9061	0.01207	0.0109	10.00	15.11	10.57
30	10.0	11.0	29	12.820	0.427	0.6537	0.01207	0.0079	8.00	12.09	8.46
60	8.5	9.5	29	13.198	0.220	0.4690	0.01207	0.0057	6.50	9.82	6.87
240	6.5	7.5	28	13.703	0.057	0.2389	0.01220	0.0029	4.50	6.80	4.76
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01207	0.0013	3.50	5.29	3.70

P = 100/W = 0.9554

$$Mx = \frac{G_s}{G_s - 1} = 1.5817$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	53.10	22.02	31.080		29.70	70.30	49.17
0.42	72.70		50.680		48.42	51.58	36.07
0.25	82.53		60.510		57.81	42.19	29.50
0.105	92.90		70.880		67.72	32.28	22.57
0.074	95.13		73.110		69.85	30.15	21.08

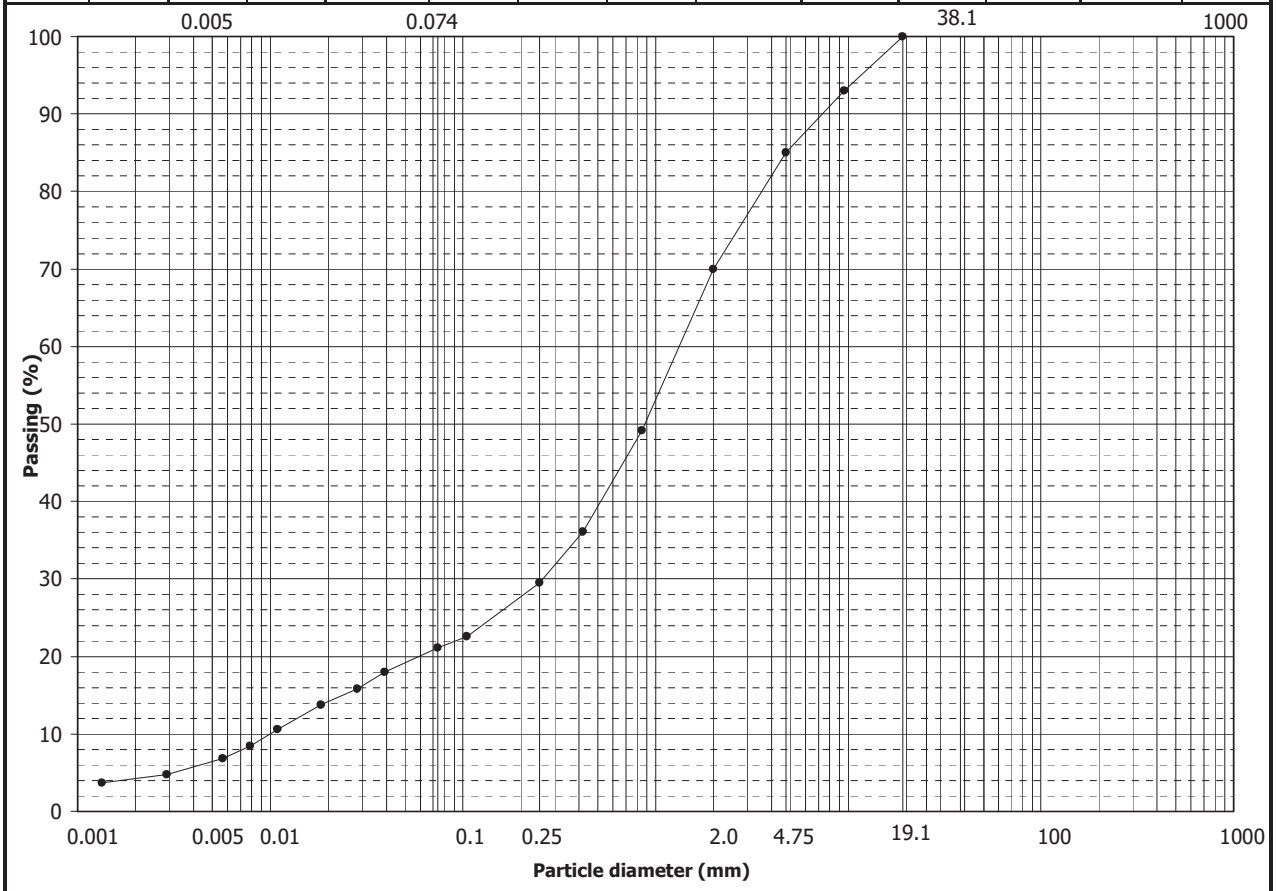
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.719**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
15.00	63.92	14.61	6.47	19.10	7.7294	1.4497	0.8960	0.2628	0.0101	143.31	69.94	36.07	21.08



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 396.0 gr
Wt. container No ..... = 38.10 gr
Wt. Of air dry soil W' = 357.9 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **357.90** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	49.00	38.10	10.90		3.05	96.95
4.75	60.00		21.90		6.12	93.88
2.00	77.00		38.90		10.87	89.13

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 101.60 gr — Specific Gravity : **2.721**

Wt. of container B-49 = 35.90 gr — Plasticity Index : %

Wt. Of air dry soil W' = 65.70 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 89.13 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-35			NO	L-38			NO	L-22		
WW	53.05	DW	52.54	WW	54.91	DW	54.39	WW	56.37	DW	55.75	Mean value	
DW	52.54	TW	37.53	DW	54.39	TW	38.85	DW	55.75	TW	39.82	w	
Ww	0.51	Ws	15.01	Ww	0.52	Ws	15.54	Ww	0.62	Ws	15.93	3.55	%
w	3.40	%		w	3.35	%		w	3.89	%			

$$W = \frac{100 \times W'}{100 + w} : 63.450 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	29	10.549	10.549	3.2480	0.01206	0.0392	17.00	42.36	37.76
2	17.5	18.5	29	10.928	5.464	2.3375	0.01206	0.0282	15.50	38.62	34.42
5	15.5	16.5	29	11.432	2.286	1.5121	0.01206	0.0182	13.50	33.64	29.98
15	13.5	14.5	29	11.937	0.796	0.8921	0.01206	0.0108	11.50	28.66	25.54
30	12.0	13.0	29	12.315	0.411	0.6407	0.01206	0.0077	10.00	24.92	22.21
60	11.0	12.0	29	12.568	0.209	0.4577	0.01206	0.0055	9.00	22.43	19.99
240	9.5	10.5	28	12.946	0.054	0.2323	0.01219	0.0028	7.50	18.69	16.66
1140	8.0	9.0	29	13.325	0.012	0.1081	0.01206	0.0013	6.00	14.95	13.33

P = 100/W = 1.576

$$Mx = \frac{G_s}{G_s - 1} = 1.5811$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	28.59	22.02	6.570		10.35	89.65	79.90
0.42	34.08		12.060		19.01	80.99	72.19
0.25	39.10		17.080		26.92	73.08	65.14
0.105	48.00		25.980		40.95	59.05	52.64
0.074	51.81		29.790		46.95	53.05	47.28

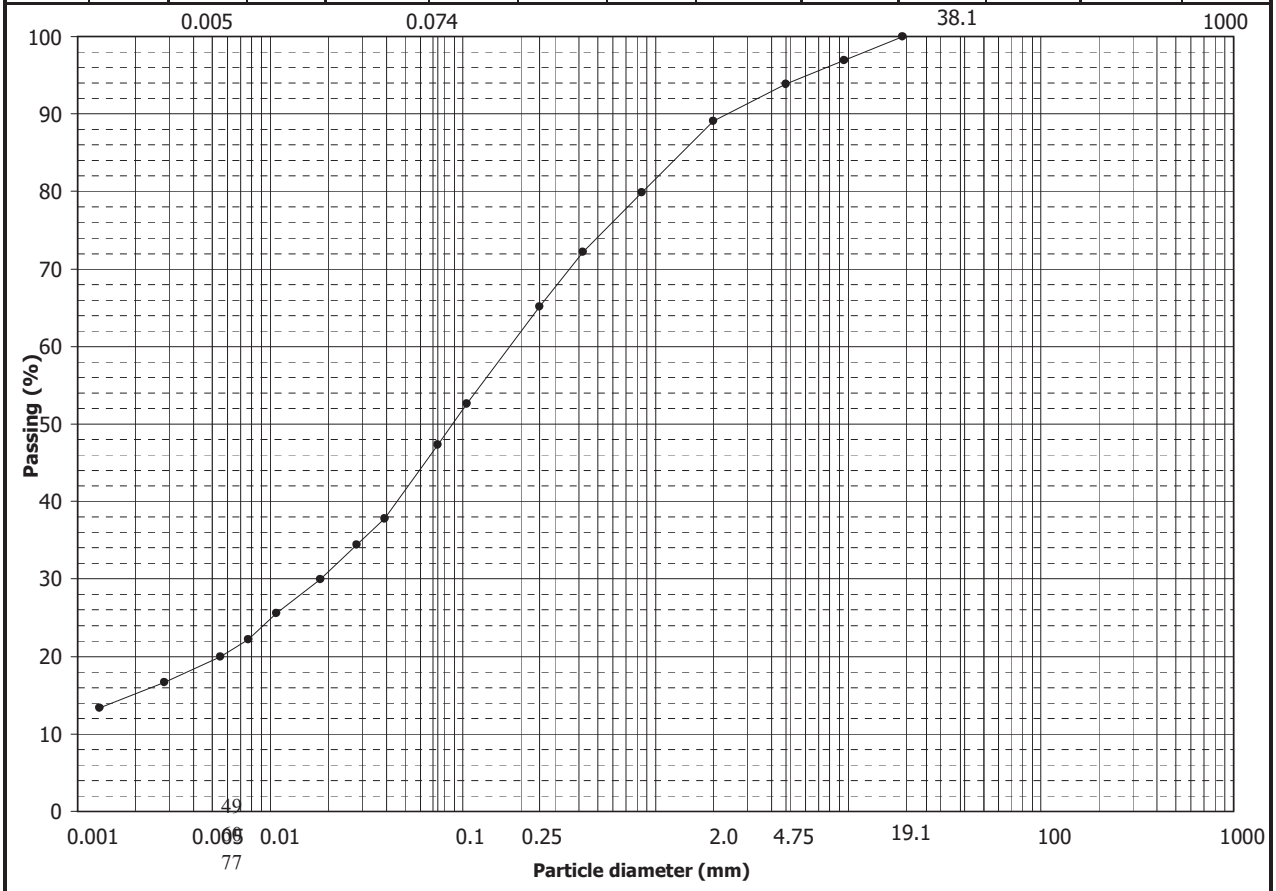
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.721**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
6.12	46.60	27.79	19.49	19.10	2.5031	0.1904	0.0897	0.0183	-	-	89.13	72.19	47.28



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 375.0 gr
Wt. container No ..... = 37.70 gr
Wt. Of air dry soil W' = 337.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **337.30** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	51.00	37.70	13.30		3.94	96.06
4.75	61.00		23.30		6.91	93.09
2.00	78.00		40.30		11.95	88.05

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = 106.01 gr — Specific Gravity : **2.701**

Wt. of container B-95 = 35.17 gr — Plasticity Index : %

Wt. Of air dry soil W' = 70.84 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 88.05 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-25			NO	J-44			NO	J-14		
WW	50.99	DW	50.47	WW	52.97	DW	52.44	WW	49.86	DW	49.28	Mean value	
DW	50.47	TW	36.05	DW	52.44	TW	37.46	DW	49.28	TW	35.20	w	
Ww	0.52	Ws	14.42	Ww	0.53	Ws	14.98	Ww	0.58	Ws	14.08	3.75	%
w	3.61	%		w	3.54	%		w	4.12	%			

$$W = \frac{100 \times W'}{100 + w} : 68.277 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.5	21.5	29	10.171	10.171	3.1892	0.01213	0.0387	18.50	43.02	37.88
2	19.0	20.0	29	10.549	5.275	2.2967	0.01213	0.0279	17.00	39.54	34.81
5	16.5	17.5	29	11.180	2.236	1.4953	0.01213	0.0181	14.50	33.72	29.69
15	14.5	15.5	29	11.685	0.779	0.8826	0.01213	0.0107	12.50	29.07	25.60
30	13.0	14.0	29	12.063	0.402	0.6341	0.01213	0.0077	11.00	25.58	22.53
60	12.0	13.0	29	12.315	0.205	0.4531	0.01213	0.0055	10.00	23.26	20.48
240	10.0	11.0	28	12.820	0.053	0.2311	0.01227	0.0028	8.00	18.61	16.38
1140	8.0	9.0	29	13.325	0.012	0.1081	0.01213	0.0013	6.00	13.95	12.29

P = 100/W = 1.4646

$$Mx = \frac{G_s}{G_s - 1} = 1.5879$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	29.40	22.02	7.380		10.81	89.19	78.53
0.42	35.10		13.080		19.16	80.84	71.18
0.25	40.20		18.180		26.63	73.37	64.61
0.105	49.80		27.780		40.69	59.31	52.23
0.074	54.00		31.980		46.84	53.16	46.81

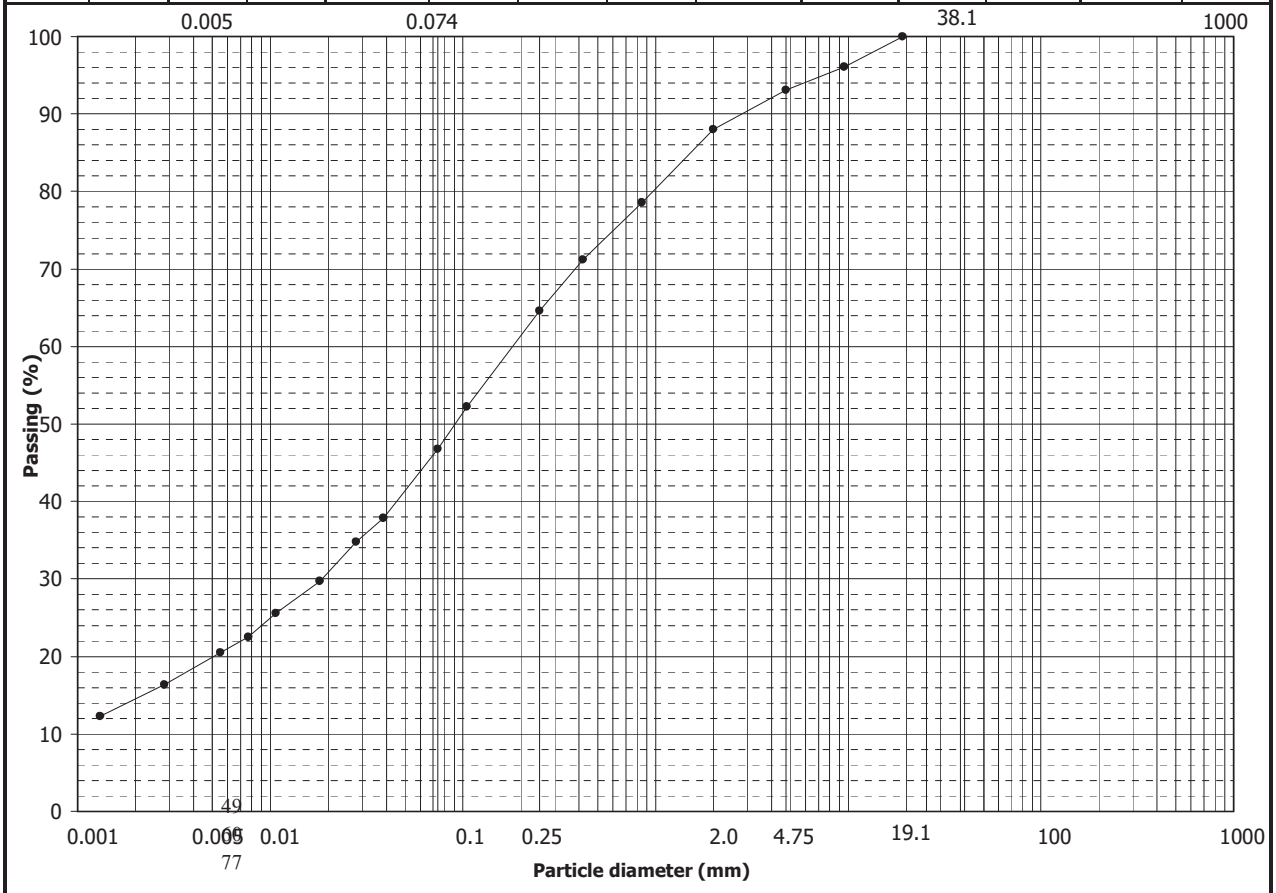
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.701**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
6.91	46.28	26.92	19.89	19.10	3.0628	0.1960	0.0923	0.0187	-	-	88.05	71.18	46.81



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = 654.0 gr
Wt. container No ..... = 39.51 gr
Wt. Of air dry soil W' = 614.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **614.49** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	106.50	39.51	66.99		10.90	89.10
4.75	139.90		100.39		16.34	83.66
2.00	165.50		125.99		20.50	79.50

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	SILAE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 22	DEPTH	9.50 - 10.00

Wt. (Air dry soil + container) = 139.90 gr — Specific Gravity : 2.711
Wt. of container M-77 = 48.20 gr — Plasticity Index : %
Wt. Of air dry soil W' = 91.70 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 79.50 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-02			NO	J-12			NO	J-23		
WW	57.00	DW	56.42	WW	52.43	DW	51.90	WW	51.29	DW	50.69	Mean value	
DW	56.42	TW	40.30	DW	51.90	TW	37.07	DW	50.69	TW	36.20	w	
Ww	0.58	Ws	16.12	Ww	0.53	Ws	14.83	Ww	0.60	Ws	14.49	3.77	%
w	3.60	%		w	3.57	%		w	4.14	%			

$$W = \frac{100 \times W'}{100 + w} : 88.367 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	29	11.558	11.558	3.3998	0.01210	0.0411	13.00	23.31	18.53
2	13.0	14.0	29	12.063	6.032	2.4559	0.01210	0.0297	11.00	19.72	15.68
5	11.0	12.0	29	12.568	2.514	1.5854	0.01210	0.0192	9.00	16.14	12.83
15	9.0	10.0	29	13.072	0.871	0.9335	0.01210	0.0113	7.00	12.55	9.98
30	8.0	9.0	29	13.325	0.444	0.6664	0.01210	0.0081	6.00	10.76	8.55
60	7.0	8.0	29	13.577	0.226	0.4757	0.01210	0.0058	5.00	8.97	7.13
240	6.0	7.0	28	13.829	0.058	0.2400	0.01223	0.0029	4.00	7.17	5.70
1140	5.0	6.0	29	14.081	0.012	0.1111	0.01210	0.0013	3.00	5.38	4.28

P = 100/W = 1.1316

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5845$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	27.52	22.02	5.500		6.22	93.78	74.55
0.42	35.11		13.090		14.81	85.19	67.72
0.25	41.52		19.500		22.07	77.93	61.95
0.105	65.45		43.430		49.15	50.85	40.43
0.074	77.14		55.120		62.38	37.62	29.91

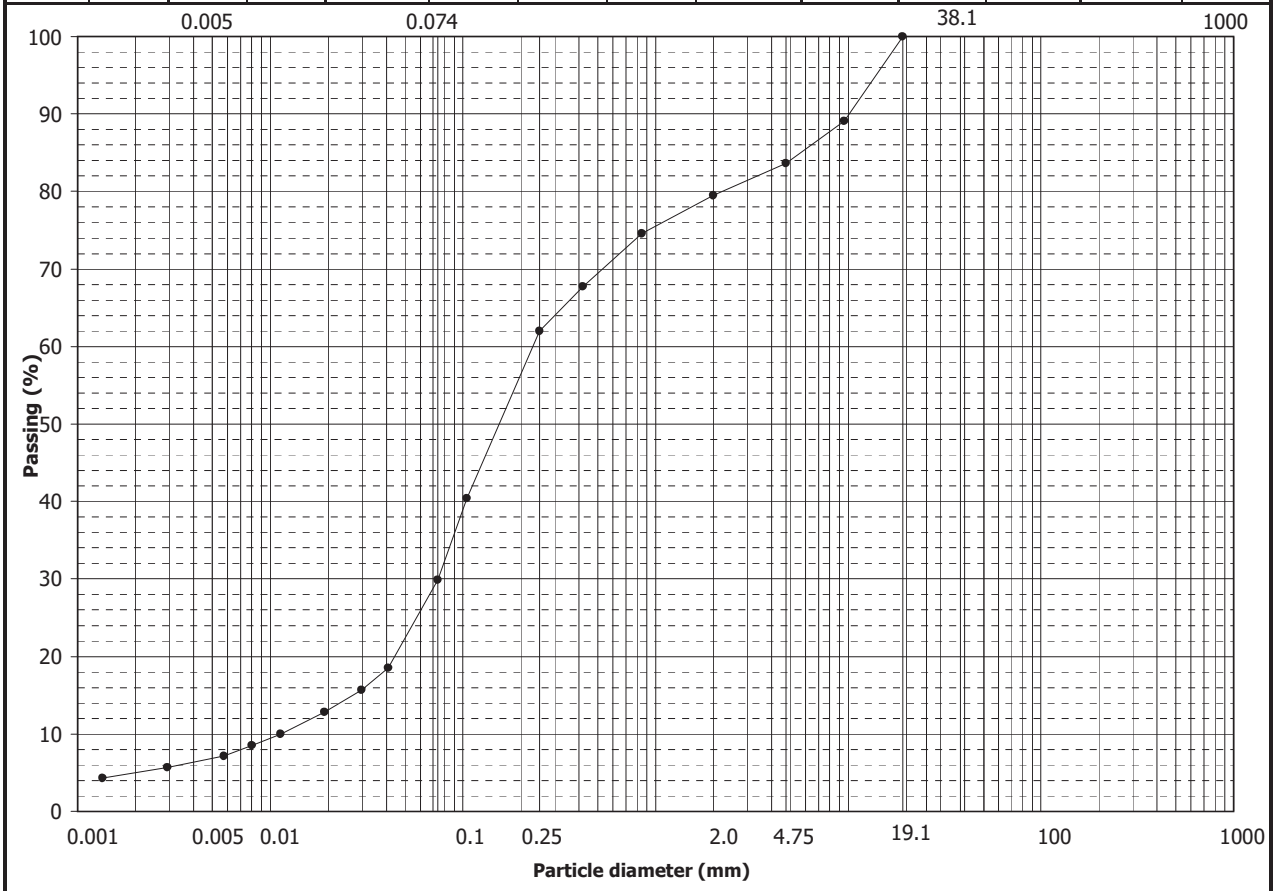
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.711**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
16.34	53.75	23.08	6.83	19.10	10.312	0.2368	0.1695	0.0743	0.0114	20.86	79.50	67.72	29.91



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**12.50 - 13.00**

Wt. (Air dry soil + container) = 490.0 gr
Wt. container No ..... = 46.79 gr
Wt. Of air dry soil W' = 443.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **443.21** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	54.90	46.79	8.11		1.83	98.17
9.52	76.30		29.51		6.66	93.34
4.75	100.00		53.21		12.01	87.99
2.00	132.90		86.11		19.43	80.57

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	SILAE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 22	DEPTH	12.50 - 13.00

Wt. (Air dry soil + container) = 108.80 gr — Specific Gravity : 2.699
Wt. of container B-94 = 35.84 gr — Plasticity Index : %
Wt. Of air dry soil W' = 72.96 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 80.57 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-04			NO	L-05			NO	L-15		
WW	55.41	DW	54.75	WW	55.04	DW	54.40	WW	59.84	DW	59.05	Mean value	
DW	54.75	TW	39.11	DW	54.40	TW	38.86	DW	59.05	TW	42.18	w	
Ww	0.66	Ws	15.64	Ww	0.64	Ws	15.54	Ww	0.79	Ws	16.87	4.34	%
w	4.22	%		w	4.12	%		w	4.68	%			

$$W = \frac{100 \times W'}{100 + w} : 69.925 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.0	22.0	29	10.045	10.045	3.1693	0.01214	0.0385	19.00	43.16	34.78
2	19.0	20.0	29	10.549	5.275	2.2967	0.01214	0.0279	17.00	38.62	31.12
5	17.0	18.0	29	11.054	2.211	1.4869	0.01214	0.0181	15.00	34.08	27.46
15	15.0	16.0	29	11.558	0.771	0.8778	0.01214	0.0107	13.00	29.53	23.80
30	13.5	14.5	29	11.937	0.398	0.6308	0.01214	0.0077	11.50	26.13	21.05
60	12.0	13.0	29	12.315	0.205	0.4531	0.01214	0.0055	10.00	22.72	18.30
240	10.0	11.0	28	12.820	0.053	0.2311	0.01227	0.0028	8.00	18.17	14.64
1140	8.0	9.0	29	13.325	0.012	0.1081	0.01214	0.0013	6.00	13.63	10.98

P = 100/W = 1.4301

$$Mx = \frac{G_s}{G_s - 1} = 1.5886$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	29.59	22.02	7.570		10.83	89.17	71.85
0.42	35.08		13.060		18.68	81.32	65.52
0.25	40.10		18.080		25.86	74.14	59.74
0.105	50.50		28.480		40.73	59.27	47.76
0.074	54.81		32.790		46.89	53.11	42.79

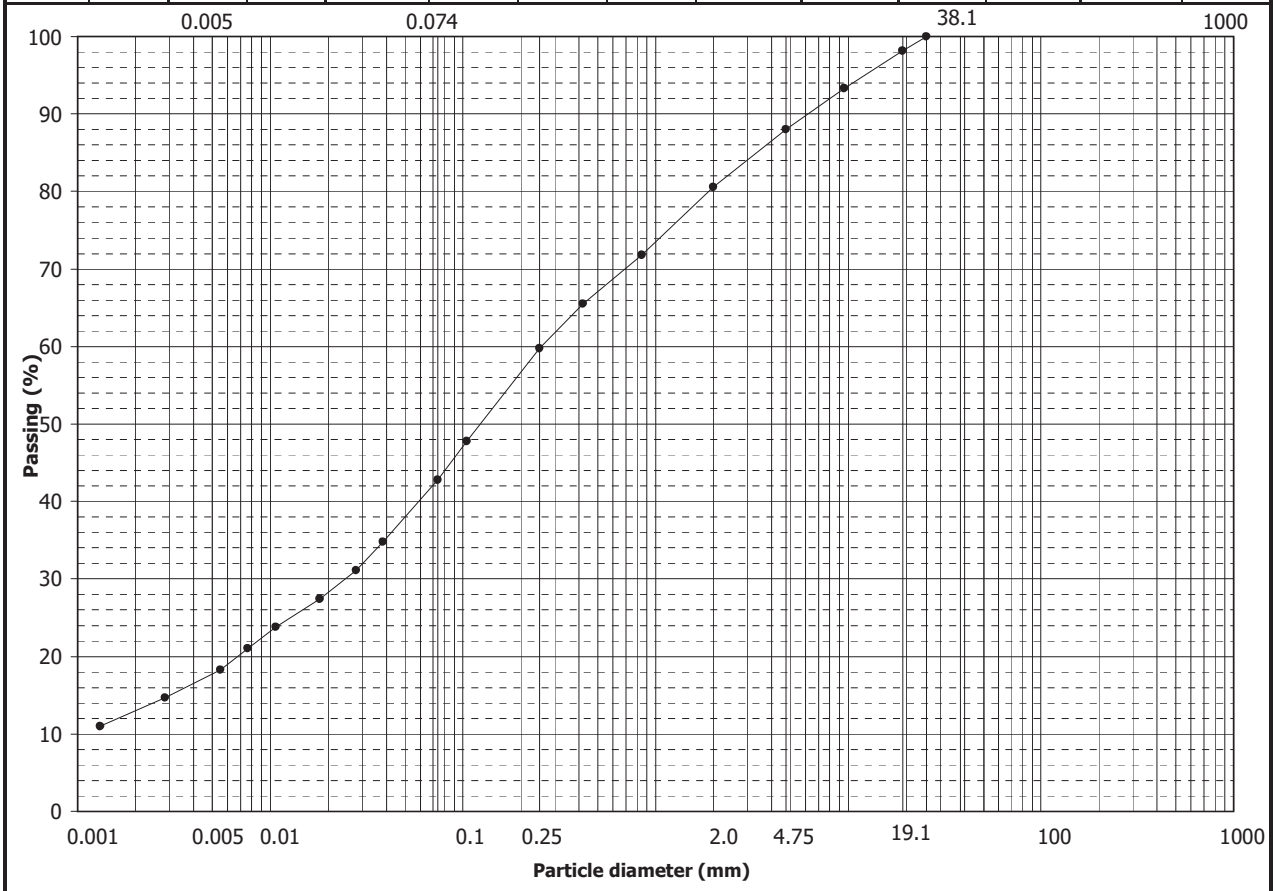
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**12.50 - 13.00**

SPECIFIC GRAVITY : **2.699**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
12.01	45.21	25.01	17.78	25.40	6.5391	0.2577	0.1322	0.0249	-	-	80.57	65.52	42.79



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = 817.0 gr

Wt. container No ..... = 65.54 gr

Wt. Of air dry soil W' = 751.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **751.46** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						100.00
25.40	76.30	65.54	10.76		1.43	98.57
19.10	91.10		25.56		3.40	96.60
9.52	125.50		59.96		7.98	92.02
4.75	161.60		96.06		12.78	87.22
2.00	223.10		157.56		20.97	79.03

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**13.50 - 14.00**

Wt. (Air dry soil + container) = 138.50 gr — Specific Gravity : **2.726**

Wt. of container B-90 = 34.36 gr — Plasticity Index : %

Wt. Of air dry soil W' = 104.14 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 79.03 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-26			NO	J-32			NO	J-72		
WW	61.10	DW	60.32	WW	61.76	DW	61.02	WW	56.37	DW	55.64	Mean value	
DW	60.32	TW	38.61	DW	61.02	TW	39.90	DW	55.64	TW	34.31	w	
Ww	0.78	Ws	21.71	Ww	0.74	Ws	21.12	Ww	0.73	Ws	21.33	3.51	%
w	3.59	%		w	3.50	%		w	3.42	%			

$$W = \frac{100 \times W'}{100 + w} : 100.612 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	29	11.558	11.558	3.3998	0.01204	0.0410	13.00	20.41	16.13
2	13.0	14.0	29	12.063	6.032	2.4559	0.01204	0.0296	11.00	17.27	13.65
5	11.0	12.0	29	12.568	2.514	1.5854	0.01204	0.0191	9.00	14.13	11.17
15	9.0	10.0	29	13.072	0.871	0.9335	0.01204	0.0112	7.00	10.99	8.68
30	8.0	9.0	29	13.325	0.444	0.6664	0.01204	0.0080	6.00	9.42	7.44
60	7.0	8.0	29	13.577	0.226	0.4757	0.01204	0.0057	5.00	7.85	6.20
240	5.0	6.0	28	14.081	0.059	0.2422	0.01218	0.0029	3.00	4.71	3.72
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01204	0.0014	2.00	3.14	2.48

P = 100/W = 0.9939

$$Mx = \frac{G_s}{G_s - 1} = 1.5794$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	37.32	22.02	15.300		15.21	84.79	67.01
0.42	53.15		31.130		30.94	69.06	54.58
0.25	65.64		43.620		43.35	56.65	44.77
0.105	87.82		65.800		65.40	34.60	27.35
0.074	95.54		73.520		73.07	26.93	21.28

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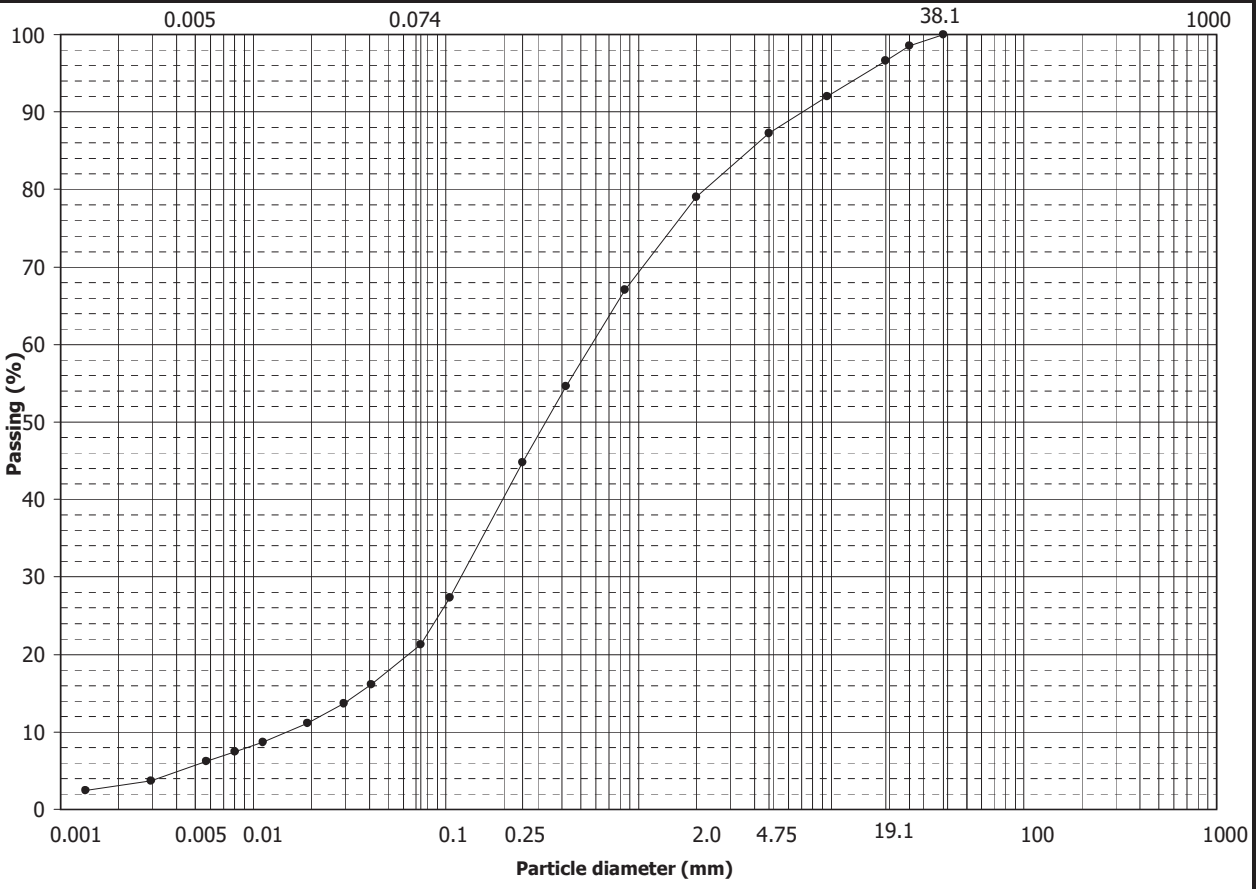
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Hadir untuk negeri

RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**13.50 - 14.00**

SPECIFIC GRAVITY : **2.726**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
12.78	65.94	15.59	5.69	38.10	7.5134	0.6074	0.3406	0.1271	0.0154	39.42	79.03	54.58	21.28



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 514.0 gr
Wt. container No ..... = 41.40 gr
Wt. Of air dry soil W' = 472.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **472.60** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	47.70	41.40	6.30		1.33	98.67
4.75	56.60		15.20		3.22	96.78
2.00	72.80		31.40		6.64	93.36

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	SILAE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 22	DEPTH	15.50 - 16.00

Wt. (Air dry soil + container) = 141.96 gr — Specific Gravity : 2.697
Wt. of container M-55 = 42.17 gr — Plasticity Index : %
Wt. Of air dry soil W' = 99.79 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 93.36 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-01			NO	L-11			NO	L-18		
WW	52.14	DW	51.66	WW	58.84	DW	58.30	WW	54.16	DW	53.58	Mean value	
DW	51.66	TW	36.90	DW	58.30	TW	41.64	DW	53.58	TW	38.27	w	
Ww	0.48	Ws	14.76	Ww	0.54	Ws	16.66	Ww	0.58	Ws	15.31	3.43	%
w	3.25	%		w	3.24	%		w	3.79	%			

$$W = \frac{100 \times W'}{100 + w} : 96.483 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	20.5	21.5	29	10.171	10.171	3.1892	0.01215	0.0387	18.50	30.47	28.45
2	20.0	21.0	29	10.297	5.148	2.2690	0.01215	0.0276	18.00	29.65	27.68
5	19.0	20.0	29	10.549	2.110	1.4525	0.01215	0.0176	17.00	28.00	26.14
15	17.0	18.0	29	11.054	0.737	0.8584	0.01215	0.0104	15.00	24.71	23.07
30	15.0	16.0	29	11.558	0.385	0.6207	0.01215	0.0075	13.00	21.41	19.99
60	13.0	14.0	29	12.063	0.201	0.4484	0.01215	0.0054	11.00	18.12	16.92
240	10.0	11.0	28	12.820	0.053	0.2311	0.01228	0.0028	8.00	13.18	12.30
1140	7.5	8.5	29	13.451	0.012	0.1086	0.01215	0.0013	5.50	9.06	8.46

P = 100/W = 1.0364

$$Mx = \frac{Gs}{Gs - 1} = 1.5893$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	30.25	22.02	8.230		8.53	91.47	85.39
0.42	54.12		32.100		33.27	66.73	62.30
0.25	68.78		46.760		48.46	51.54	48.11
0.105	82.09		60.070		62.26	37.74	35.23
0.074	85.97		63.950		66.28	33.72	31.48

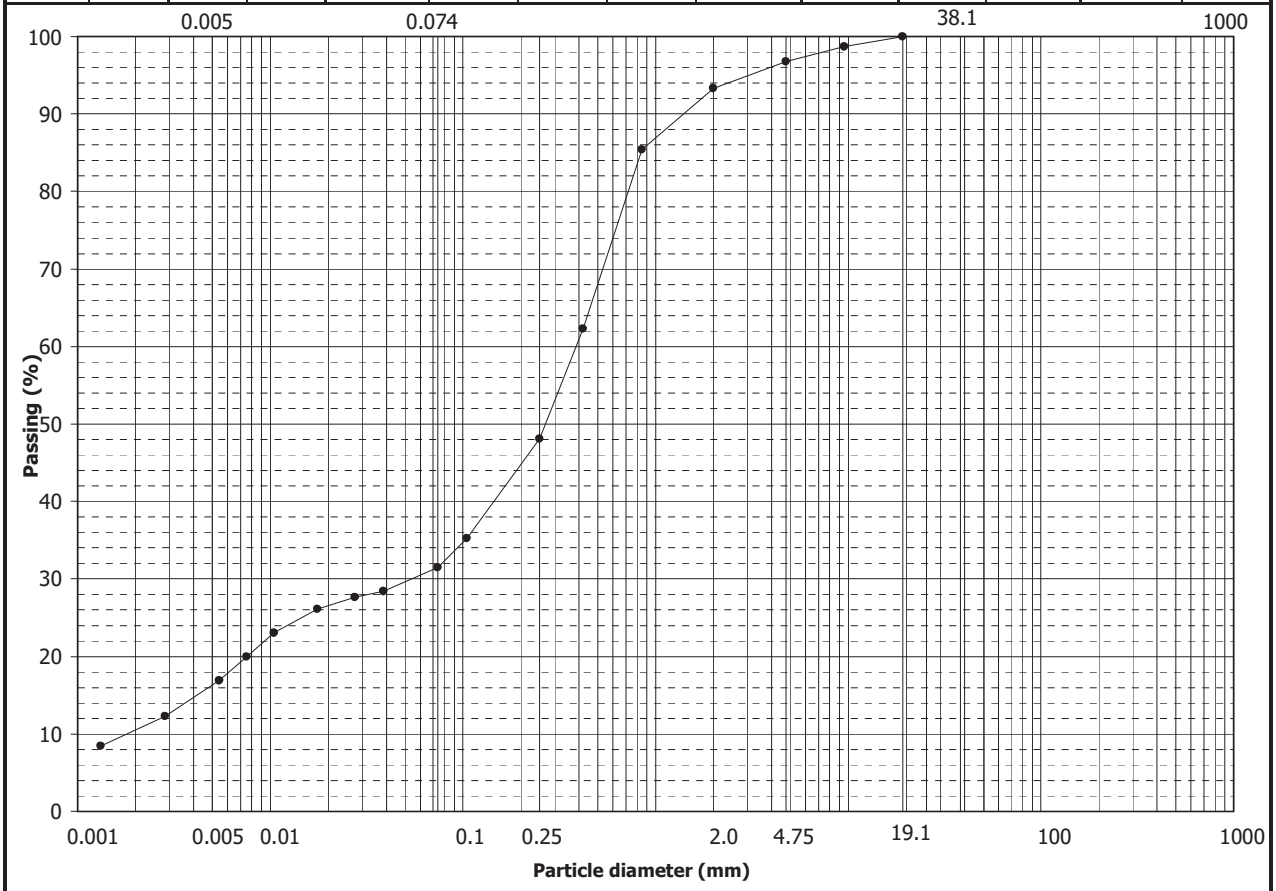
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**15.50 - 16.00**

SPECIFIC GRAVITY : **2.697**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
3.22	65.30	15.17	16.31	19.10	1.5154	0.3925	0.2726	0.0568	0.0019	203.49	93.36	62.30	31.48



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**17.50 - 18.00**

Wt. (Air dry soil + container) = 567.0 gr
Wt. container No ..... = 67.57 gr
Wt. Of air dry soil W' = 499.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **499.43** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						100.00
25.40	87.30	67.57	19.73		3.95	96.05
19.10	104.20		36.63		7.33	92.67
9.52	145.10		77.53		15.52	84.48
4.75	190.50		122.93		24.61	75.39
2.00	231.60		164.03		32.84	67.16

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	SILAE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 22	DEPTH	17.50 - 18.00

Wt. (Air dry soil + container) = 140.73 gr — Specific Gravity : 2.716
Wt. of container B-31 = 33.69 gr — Plasticity Index : %
Wt. Of air dry soil W' = 107.04 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 67.16 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-80			NO	J-15			NO	J-87		
WW	57.80	DW	56.98	WW	58.92	DW	58.14	WW	58.97	DW	58.14	Mean value	
DW	56.98	TW	35.67	DW	58.14	TW	37.95	DW	58.14	TW	37.14	w	
Ww	0.82	Ws	21.31	Ww	0.78	Ws	20.19	Ww	0.83	Ws	21.00	3.89	%
w	3.85	%		w	3.86	%		w	3.95	%			

$$W = \frac{100 \times W'}{100 + w} : 103.034 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	29	11.054	11.054	3.3247	0.01208	0.0402	15.00	23.04	15.47
2	14.0	15.0	29	11.811	5.905	2.4301	0.01208	0.0294	12.00	18.43	12.38
5	11.0	12.0	29	12.568	2.514	1.5854	0.01208	0.0192	9.00	13.83	9.28
15	8.0	9.0	29	13.325	0.888	0.9425	0.01208	0.0114	6.00	9.22	6.19
30	6.0	7.0	29	13.829	0.461	0.6789	0.01208	0.0082	4.00	6.14	4.13
60	5.0	6.0	29	14.081	0.235	0.4844	0.01208	0.0059	3.00	4.61	3.09
240	4.0	5.0	28	14.334	0.060	0.2444	0.01221	0.0030	2.00	3.07	2.06
1140	3.0	4.0	29	14.586	0.013	0.1131	0.01208	0.0014	1.00	1.54	1.03

P = 100/W = 0.9706

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5828$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	35.12	22.02	13.100		12.71	87.29	58.62
0.42	47.36		25.340		24.59	75.41	50.64
0.25	58.21		36.190		35.12	64.88	43.57
0.105	78.36		56.340		54.68	45.32	30.43
0.074	87.11		65.090		63.17	36.83	24.73

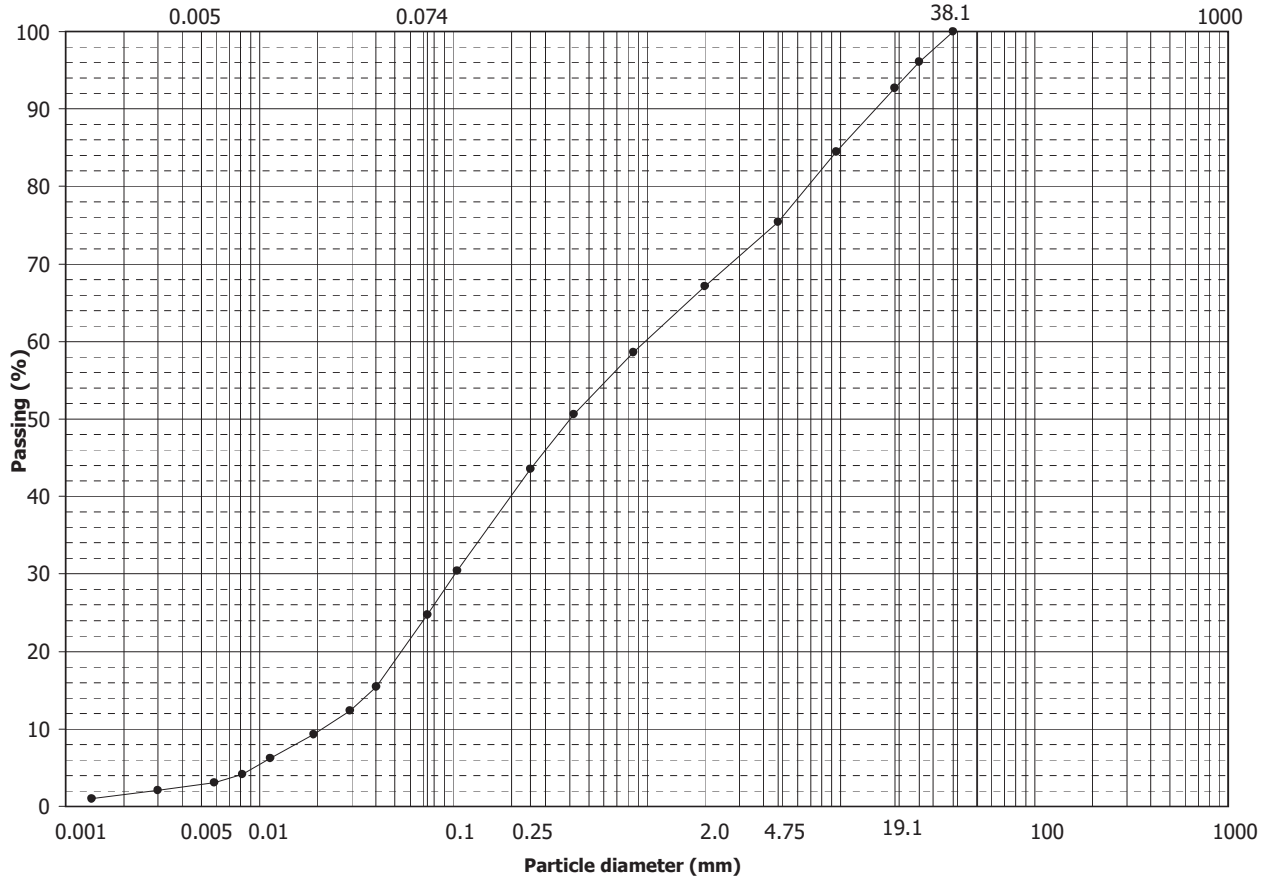
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**17.50 - 18.00**

SPECIFIC GRAVITY : **2.716**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
24.61	50.65	21.88	2.85	38.10	15.9817	1.0361	0.4046	0.1026	0.0215	48.17	67.16	50.64	24.73



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**19.50 - 20.00**

Wt. (Air dry soil + container) = 586.0 gr
Wt. container No ..... = 47.79 gr
Wt. Of air dry soil W' = 538.2 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **538.21** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	139.32	47.79	91.53		17.01	82.99

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	SILAE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 22	DEPTH	19.50 - 20.00

Wt. (Air dry soil + container) = 110.64 gr — Specific Gravity : 2.701
Wt. of container M-28 = 44.50 gr — Plasticity Index : %
Wt. Of air dry soil W' = 66.14 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 82.99 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-59			NO	J-66			NO	J-72		
WW	54.13	DW	53.17	WW	53.75	DW	52.80	WW	48.97	DW	48.03	Mean value	
DW	53.17	TW	37.98	DW	52.80	TW	37.71	DW	48.03	TW	34.31	w	
Ww	0.96	Ws	15.19	Ww	0.95	Ws	15.09	Ww	0.94	Ws	13.72	6.49	%
w	6.32	%		w	6.30	%		w	6.85	%			

$$W = \frac{100 \times W'}{100 + w} : 62.109 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	27.0	28.0	29	8.531	8.531	2.9208	0.01213	0.0354	25.00	63.92	53.05
2	25.5	26.5	29	8.909	4.455	2.1106	0.01213	0.0256	23.50	60.08	49.86
5	24.0	25.0	29	9.288	1.858	1.3629	0.01213	0.0165	22.00	56.25	46.68
15	22.0	23.0	29	9.792	0.653	0.8080	0.01213	0.0098	20.00	51.13	42.44
30	21.0	22.0	29	10.045	0.335	0.5786	0.01213	0.0070	19.00	48.58	40.31
60	20.0	21.0	29	10.297	0.172	0.4143	0.01213	0.0050	18.00	46.02	38.19
240	18.0	19.0	28	10.802	0.045	0.2121	0.01227	0.0026	16.00	40.91	33.95
1140	16.0	17.0	29	11.306	0.010	0.0996	0.01213	0.0012	14.00	35.79	29.71

P = 100/W = 1.6101

$$Mx = \frac{G_s}{G_s - 1} = 1.5879$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	27.21	22.02	5.190		8.36	91.64	76.06
0.42	29.06		7.040		11.33	88.67	73.59
0.25	30.65		8.630		13.89	86.11	71.46
0.105	35.72		13.700		22.06	77.94	64.69
0.074	38.39		16.370		26.36	73.64	61.12

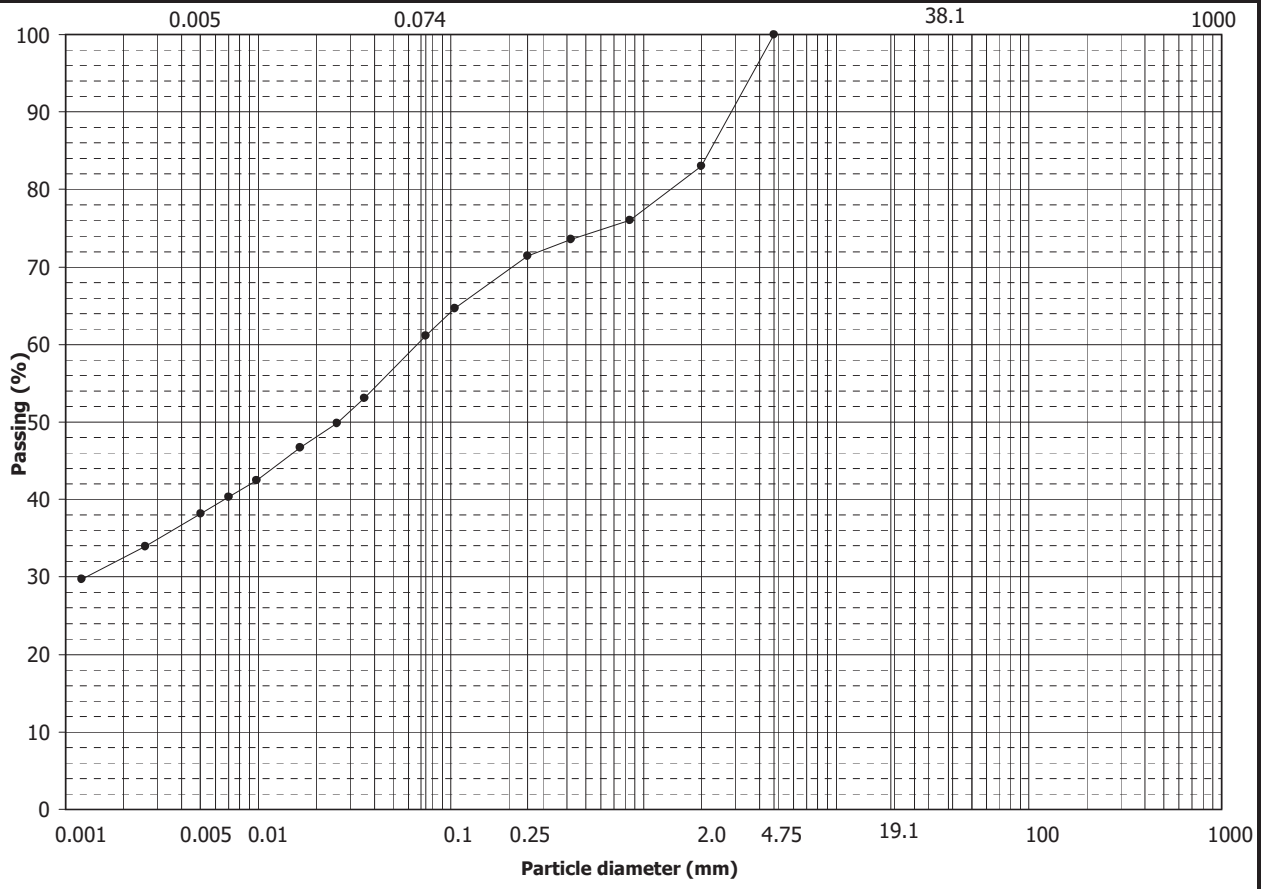
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**19.50 - 20.00**

SPECIFIC GRAVITY : **2.701**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	38.88	22.96	38.16	4.75	3.133	0.0687	0.0260	0.0013	-	-	82.99	73.59	61.12



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**22.50 - 23.00**

Wt. (Air dry soil + container) = 520.0 gr
Wt. container No ..... = 40.67 gr
Wt. Of air dry soil W' = 479.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **479.33** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	48.50	40.67	7.83		1.63	98.37
4.75	53.10		12.43		2.59	97.41
2.00	64.60		23.93		4.99	95.01

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**22.50 - 23.00**

Wt. (Air dry soil + container) = 103.58 gr — Specific Gravity : **2.716**

Wt. of container B-01 = 33.97 gr — Plasticity Index : %

Wt. Of air dry soil W' = 69.61 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 95.01 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-19			NO	L-44			NO	L-12		
WW	54.16	DW	53.52	WW	58.95	DW	58.26	WW	54.17	DW	53.46	Mean value	
DW	53.52	TW	38.23	DW	58.26	TW	41.61	DW	53.46	TW	38.19	w	
Ww	0.64	Ws	15.29	Ww	0.69	Ws	16.65	Ww	0.71	Ws	15.27	4.33	%
w	4.19	%		w	4.14	%		w	4.65	%			

$$W = \frac{100 \times W'}{100 + w} : 66.723 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	23.0	24.0	29	9.540	9.540	3.0887	0.01208	0.0373	21.00	49.81	47.33
2	21.5	22.5	29	9.919	4.959	2.2269	0.01208	0.0269	19.50	46.26	43.95
5	19.5	20.5	29	10.423	2.085	1.4438	0.01208	0.0174	17.50	41.51	39.44
15	17.0	18.0	29	11.054	0.737	0.8584	0.01208	0.0104	15.00	35.58	33.81
30	15.5	16.5	29	11.432	0.381	0.6173	0.01208	0.0075	13.50	32.02	30.42
60	14.0	15.0	29	11.811	0.197	0.4437	0.01208	0.0054	12.00	28.47	27.04
240	11.0	12.0	28	12.568	0.052	0.2288	0.01221	0.0028	9.00	21.35	20.28
1140	8.0	9.0	29	13.325	0.012	0.1081	0.01208	0.0013	6.00	14.23	13.52

P = 100/W = 1.4987

$$Mx = \frac{Gs}{Gs - 1} = 1.5828$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	27.61	22.02	5.590		8.38	91.62	87.05
0.42	32.92		10.900		16.34	83.66	79.49
0.25	38.13		16.110		24.14	75.86	72.07
0.105	46.49		24.470		36.67	63.33	60.16
0.074	49.68		27.660		41.45	58.55	55.62

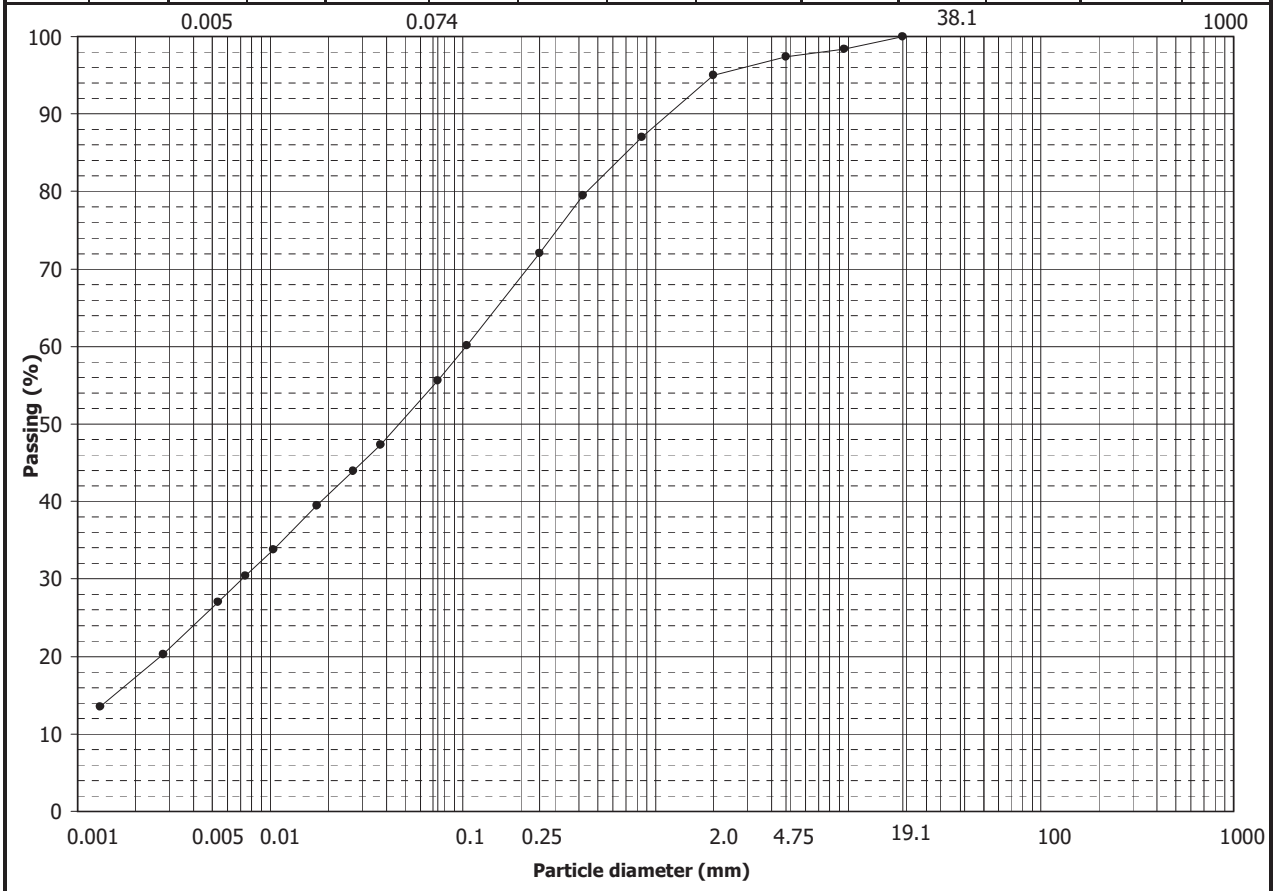
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 15, 2019
LOCATION	**SILAE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 22**	DEPTH	**22.50 - 23.00**

SPECIFIC GRAVITY : **2.716**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
2.59	41.78	29.30	26.32	19.10	1.2765	0.1039	0.0491	0.0072	-	-	95.01	79.49	55.62



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

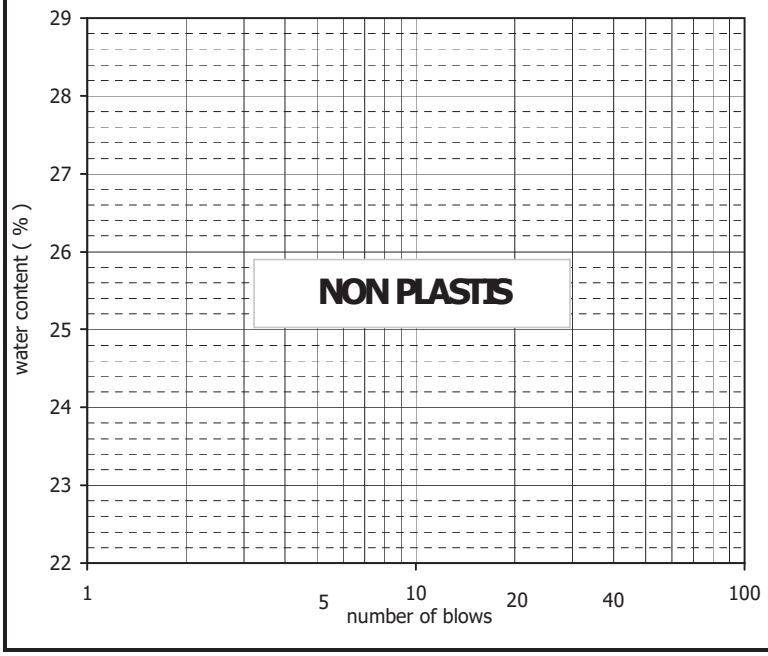
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY	REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)	0.50 - 1.00

LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %
4	**5**	**6**
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		1.50 - 2.00

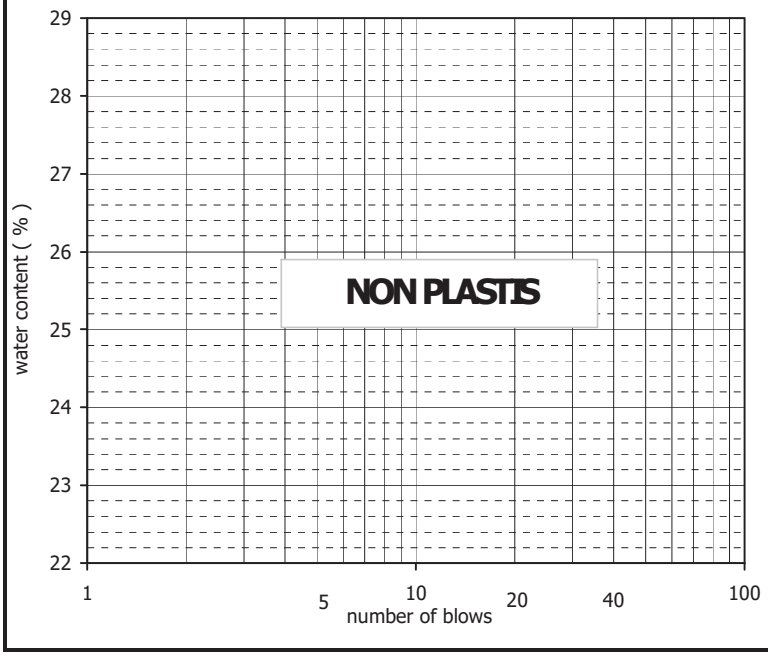
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		2.50 - 3.00

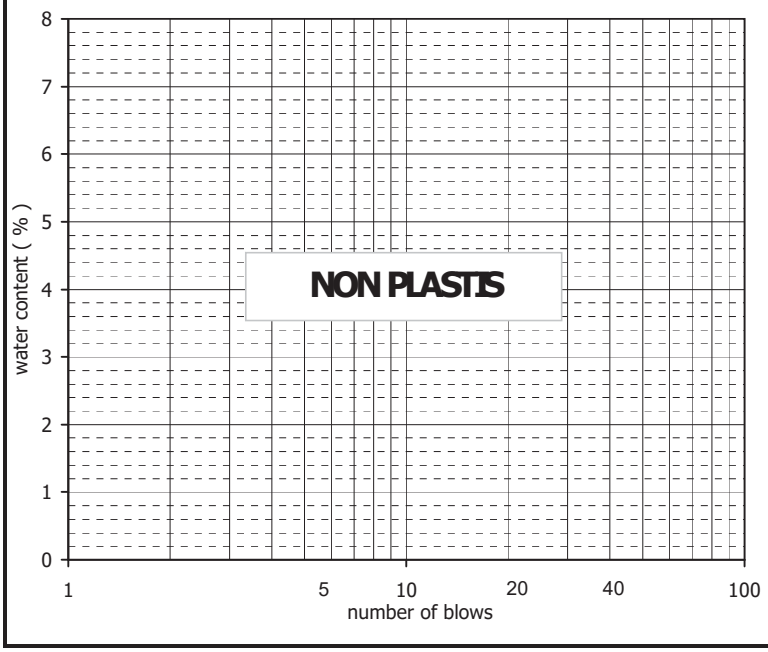
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		3.50 - 4.00

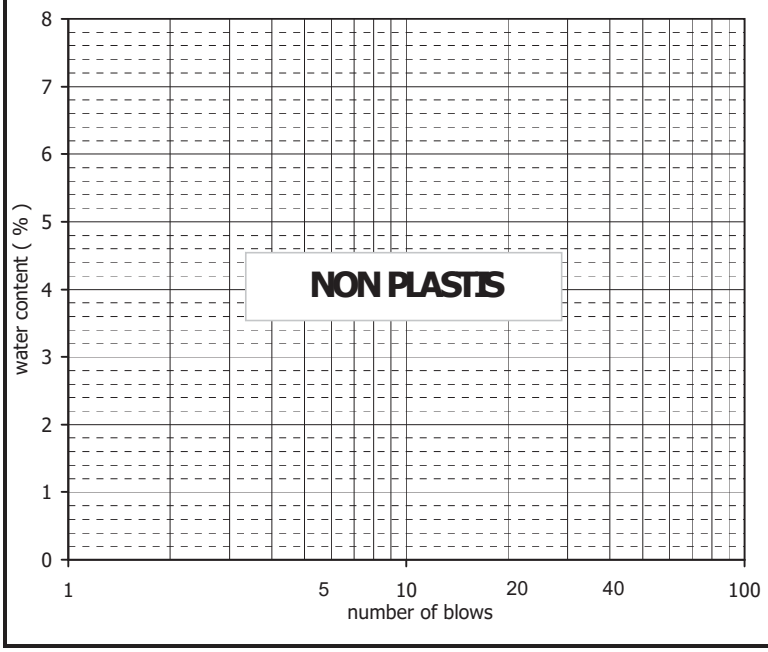
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		4.50 - 5.00

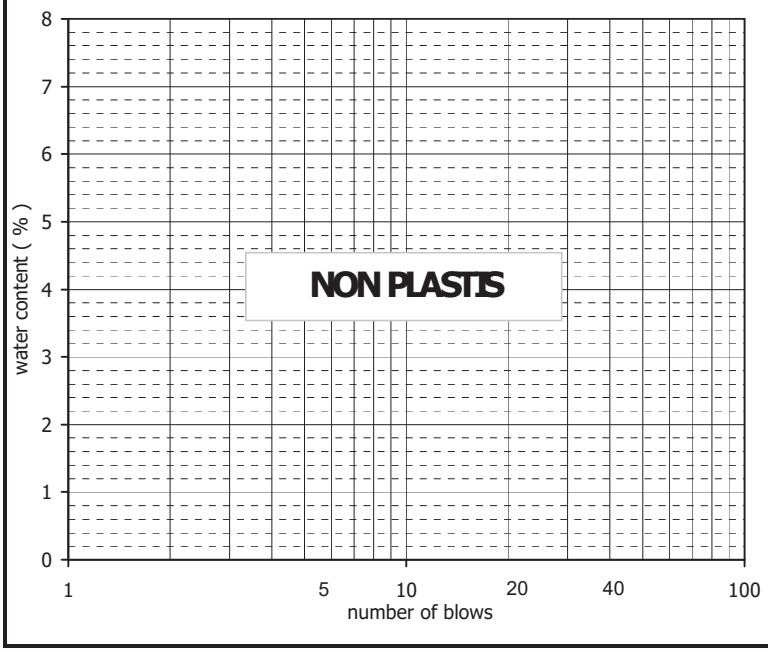
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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Cb. Sit : Jalan Jendi Barat 27 Malang Telp.: (0341) 362261, Fax.: (0341) 324402; E-mail : divisi.sit@indrakarya.co.id atau lab_geoteknik_ika@yahoo.com

LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		4.50 - 5.00

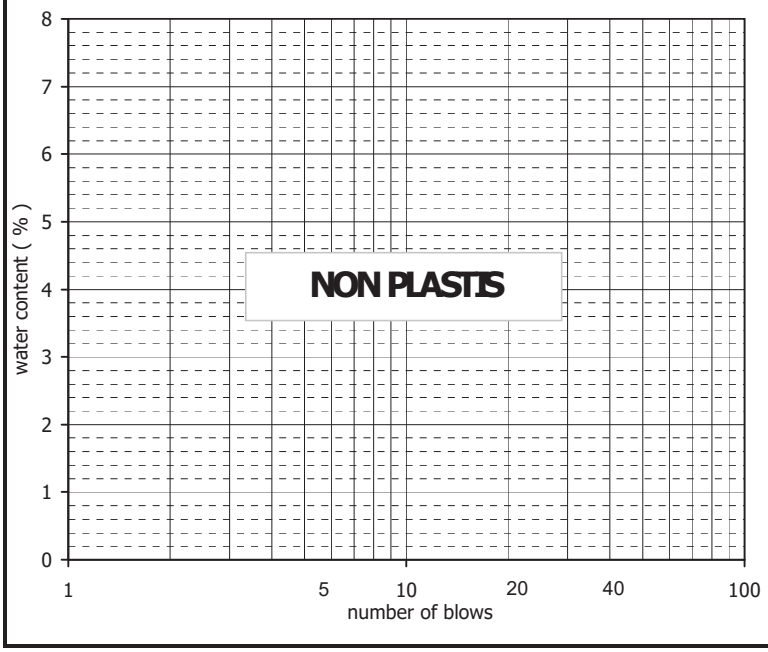
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		6.50 - 7.00

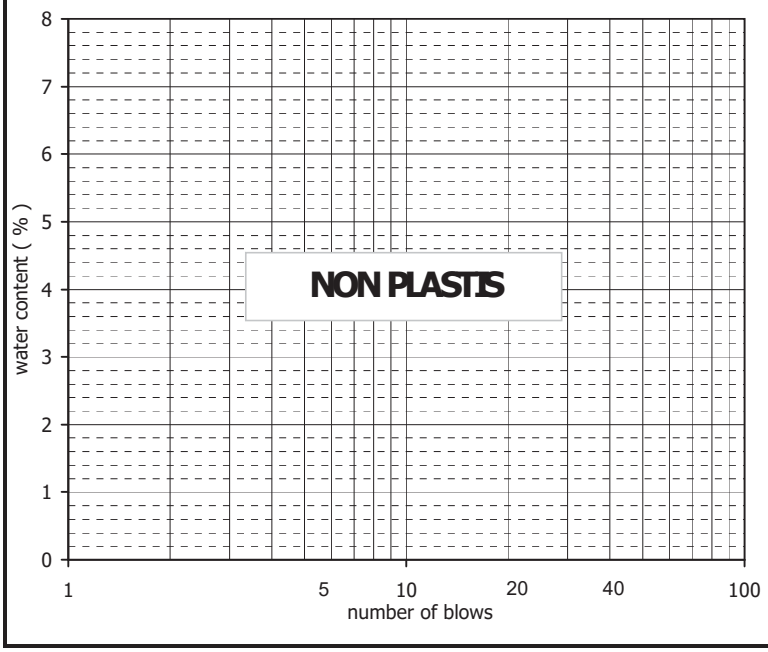
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 8, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		7.50 - 8.00

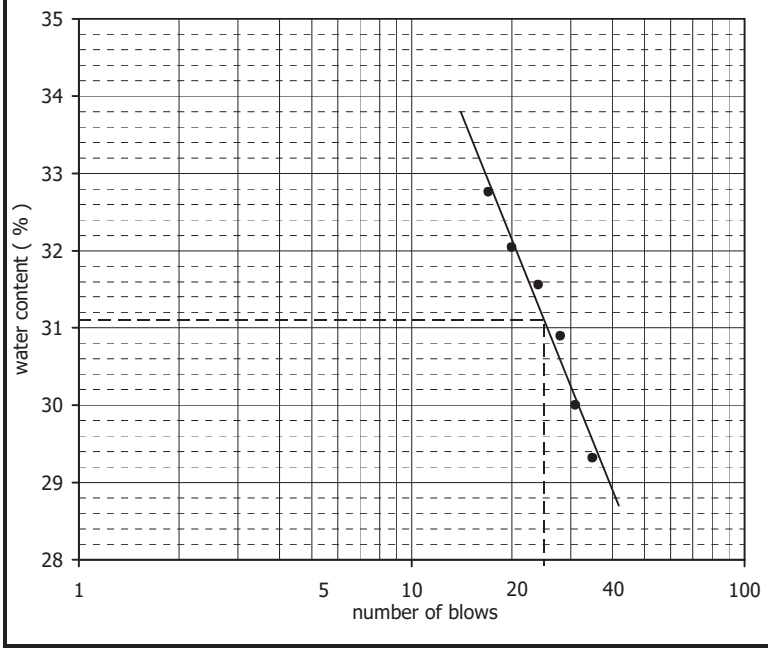
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	A-35			No.	J-03			No.	J-21
WW	48.770	DW	46.800	WW	53.350	DW	50.110	WW	55.580	DW	51.090
DW	46.800	TW	40.080	DW	50.110	TW	39.310	DW	51.090	TW	36.559
Ww	1.970	Ws	6.720	Ww	3.240	Ws	10.800	Ww	4.490	Ws	14.531
	W =		29.32 %		W =		30.00 %		W =		30.90 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	J-01			No.	J-11			No.	L-23
WW	55.490	DW	51.470	WW	57.150	DW	52.850	WW	45.630	DW	43.540
DW	51.470	TW	38.731	DW	52.850	TW	39.430	DW	43.540	TW	37.160
Ww	4.020	Ws	12.739	Ww	4.300	Ws	13.420	Ww	2.090	Ws	6.380
	W =		31.56 %		W =		32.04 %		W =		32.76 %

PLASTIC LIMIT

1				2				3			
		No.	T-19			No.	L-34			No.	A-70
WW	60.160	DW	55.900	WW	58.630	DW	54.780	WW	60.030	DW	55.520
DW	55.900	TW	39.080	DW	54.780	TW	39.450	DW	55.520	TW	37.830
Ww	4.260	Ws	16.820	Ww	3.850	Ws	15.330	Ww	4.510	Ws	17.690
	W =		25.33 %		W =		25.11 %		W =		25.49 %



LIQUID LIMIT	=	31.11	%
PLASTIC LIMIT	=	25.31	%
PLASTICITY INDEX	=	5.80	%
FLOW INDEX	=	10.68	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 8, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		8.50 - 9.00

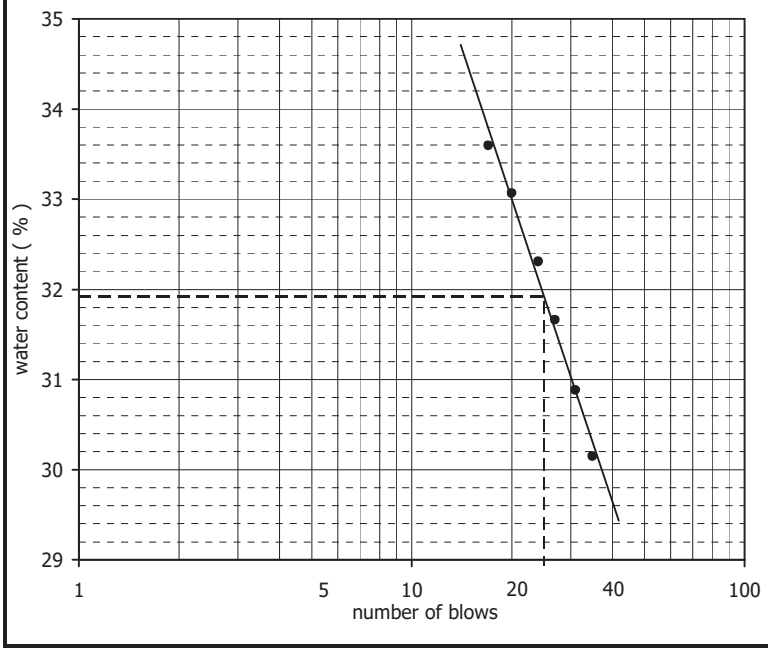
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	A-08			No.	J-64			No.	A-07
WW	53.530	DW	50.120	WW	55.470	DW	51.110	WW	58.640	DW	54.660
DW	50.120	TW	38.810	DW	51.110	TW	36.990	DW	54.660	TW	42.090
Ww	3.410	Ws	11.310	Ww	4.360	Ws	14.120	Ww	3.980	Ws	12.570
	W =		30.15 %		W =		30.88 %		W =		31.66 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	J-89			No.	L-11			No.	T-82
WW	52.730	DW	48.950	WW	56.410	DW	52.740	WW	53.770	DW	49.940
DW	48.950	TW	37.250	DW	52.740	TW	41.640	DW	49.940	TW	38.540
Ww	3.780	Ws	11.700	Ww	3.670	Ws	11.100	Ww	3.830	Ws	11.400
	W =		32.31 %		W =		33.06 %		W =		33.60 %

PLASTIC LIMIT

1				2				3			
		No.	T-63			No.	T-72			No.	J-89
WW	52.140	DW	48.550	WW	51.920	DW	48.200	WW	55.720	DW	52.040
DW	48.550	TW	34.180	DW	48.200	TW	33.150	DW	52.040	TW	37.250
Ww	3.590	Ws	14.370	Ww	3.720	Ws	15.050	Ww	3.680	Ws	14.790
	W =		24.98 %		W =		24.72 %		W =		24.88 %



LIQUID LIMIT	=	31.93	%
PLASTIC LIMIT	=	24.86	%
PLASTICITY INDEX	=	7.07	%
FLOW INDEX	=	11.06	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		9.50 - 10.00

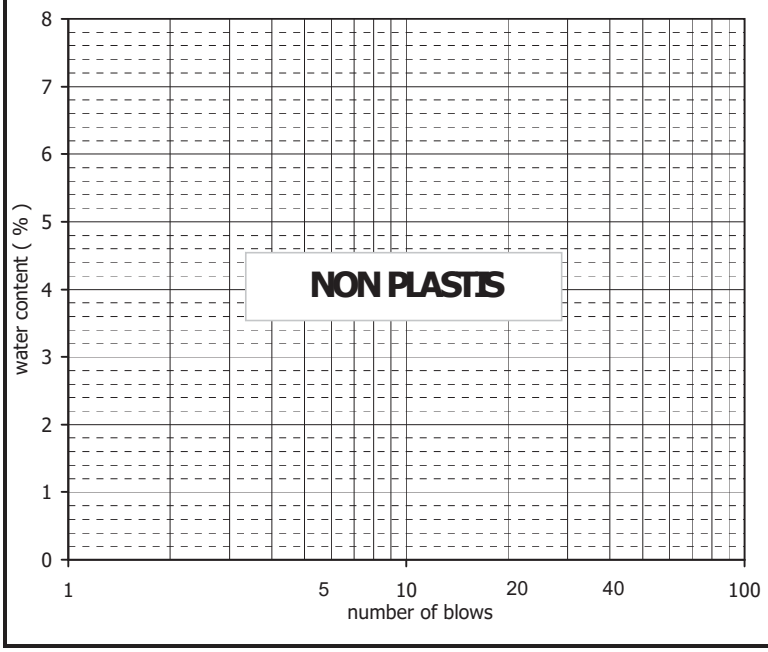
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 8, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		12.50 - 13.00

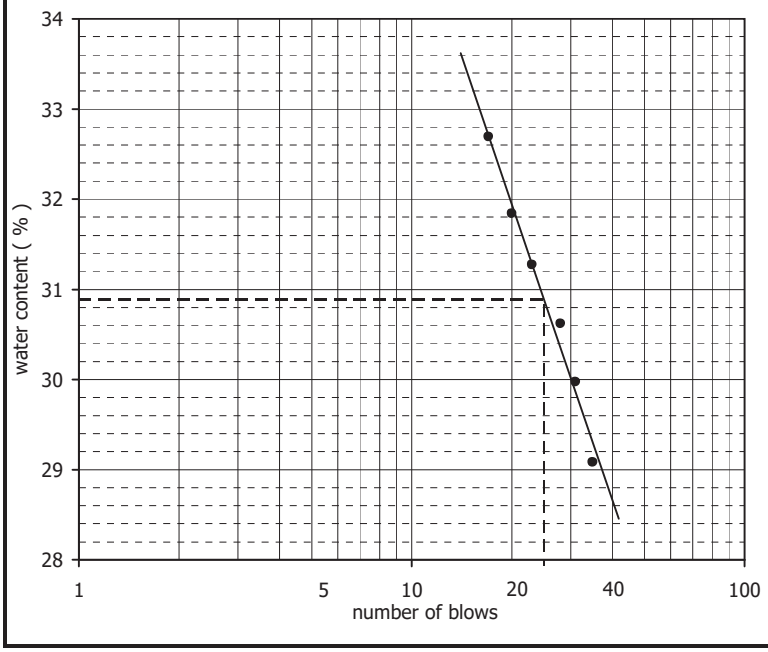
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	J-47			No.	J-52			No.	T-11
WW	53.010	DW	49.680	WW	53.490	DW	49.620	WW	53.170	DW	49.560
DW	49.680	TW	38.230	DW	49.620	TW	36.710	DW	49.560	TW	37.770
Ww	3.330	Ws	11.450	Ww	3.870	Ws	12.910	Ww	3.610	Ws	11.790
	W =		29.08 %		W =		29.98 %		W =		30.62 %

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	T-37			No.	J-78			No.	T-68
WW	56.160	DW	52.360	WW	53.940	DW	49.820	WW	53.450	DW	49.020
DW	52.360	TW	40.210	DW	49.820	TW	36.880	DW	49.020	TW	35.470
Ww	3.800	Ws	12.150	Ww	4.120	Ws	12.940	Ww	4.430	Ws	13.550
	W =		31.28 %		W =		31.84 %		W =		32.69 %

PLASTIC LIMIT

1				2				3			
		No.	A-104			No.	T-77			No.	T-54
WW	51.960	DW	49.010	WW	55.380	DW	52.670	WW	52.500	DW	49.610
DW	49.010	TW	34.760	DW	52.670	TW	39.670	DW	49.610	TW	35.880
Ww	2.950	Ws	14.250	Ww	2.710	Ws	13.000	Ww	2.890	Ws	13.730
	W =		20.70 %		W =		20.85 %		W =		21.05 %



LIQUID LIMIT	=	30.89	%
PLASTIC LIMIT	=	20.87	%
PLASTICITY INDEX	=	10.03	%
FLOW INDEX	=	10.82	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		13.50 - 14.00

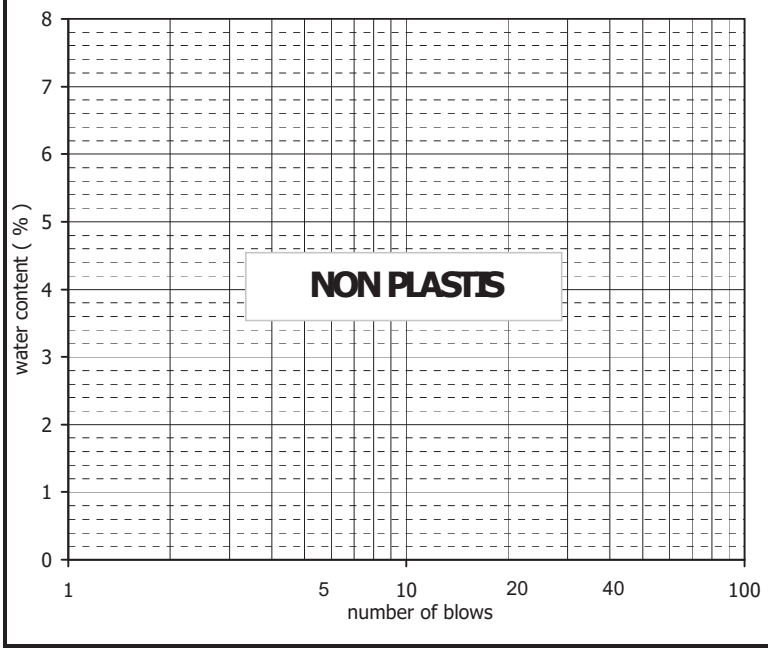
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		15.50 - 16.00

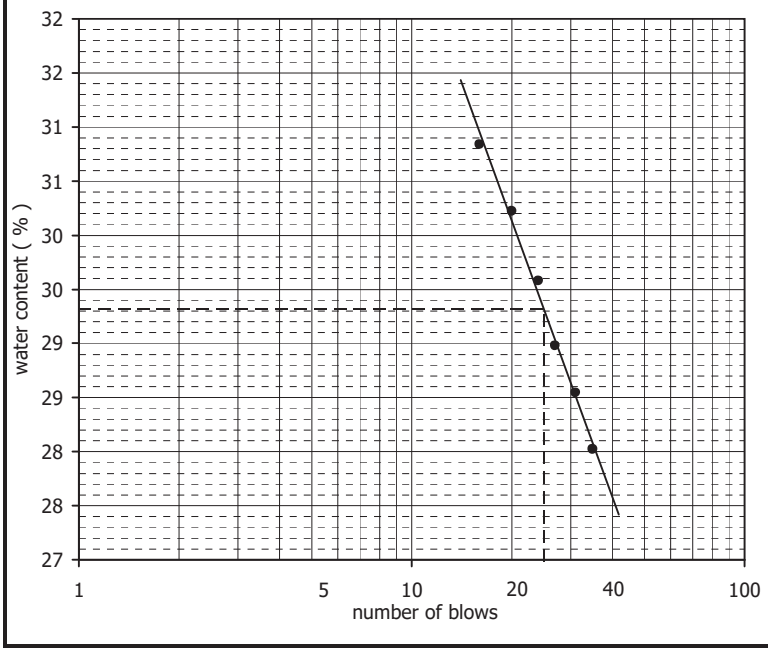
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	T-16			No.	A-10			No.	T-11
WW	55.350	DW	51.990	WW	48.600	DW	45.220	WW	54.460	DW	50.710
DW	51.990	TW	40.000	DW	45.220	TW	33.380	DW	50.710	TW	37.770
Ww	3.360	Ws	11.990	Ww	3.380	Ws	11.840	Ww	3.750	Ws	12.940
	W =	28.02	%		W =	28.55	%		W =	28.98	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	L-14			No.	L-17			No.	T-30
WW	61.030	DW	56.170	WW	56.280	DW	52.650	WW	55.130	DW	51.170
DW	56.170	TW	39.740	DW	52.650	TW	40.640	DW	51.170	TW	38.330
Ww	4.860	Ws	16.430	Ww	3.630	Ws	12.010	Ww	3.960	Ws	12.840
	W =	29.58	%		W =	30.22	%		W =	30.84	%

PLASTIC LIMIT

1				2				3			
		No.	T-29			No.	T-86			No.	A-91
WW	52.820	DW	49.970	WW	49.950	DW	47.140	WW	50.600	DW	48.260
DW	49.970	TW	36.390	DW	47.140	TW	33.800	DW	48.260	TW	37.030
Ww	2.850	Ws	13.580	Ww	2.810	Ws	13.340	Ww	2.340	Ws	11.230
	W =	20.99	%		W =	21.06	%		W =	20.84	%



LIQUID LIMIT	=	29.32	%
PLASTIC LIMIT	=	20.96	%
PLASTICITY INDEX	=	8.35	%
FLOW INDEX	=	8.41	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		17.50 - 18.00

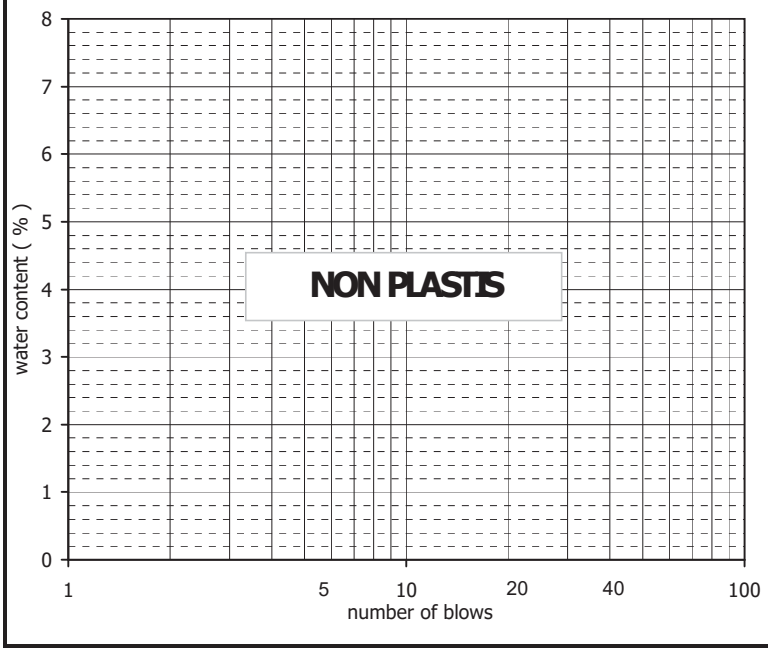
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		19.50 - 20.00

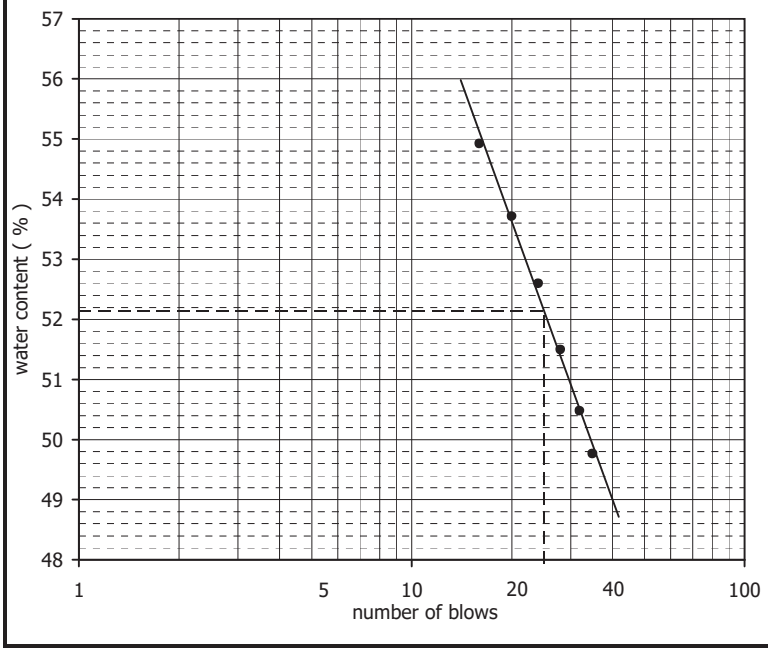
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	A-35			No.	L-20			No.	T-85
WW	59.190	DW	52.840	WW	58.220	DW	51.890	WW	54.980	DW	48.790
DW	52.840	TW	40.080	DW	51.890	TW	39.350	DW	48.790	TW	36.770
Ww	6.350	Ws	12.760	Ww	6.330	Ws	12.540	Ww	6.190	Ws	12.020
	W =	49.76	%		W =	50.48	%		W =	51.50	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	T-67			No.	T-96			No.	T-52
WW	50.230	DW	45.370	WW	57.710	DW	50.260	WW	55.690	DW	48.330
DW	45.370	TW	36.130	DW	50.260	TW	36.390	DW	48.330	TW	34.930
Ww	4.860	Ws	9.240	Ww	7.450	Ws	13.870	Ww	7.360	Ws	13.400
	W =	52.60	%		W =	53.71	%		W =	54.93	%

PLASTIC LIMIT

1				2				3			
		No.	A-52			No.	T-38			No.	L-41
WW	56.120	DW	52.980	WW	57.050	DW	52.580	WW	54.840	DW	50.940
DW	52.980	TW	42.570	DW	52.580	TW	37.880	DW	50.940	TW	38.080
Ww	3.140	Ws	10.410	Ww	4.470	Ws	14.700	Ww	3.900	Ws	12.860
	W =	30.16	%		W =	30.41	%		W =	30.33	%



LIQUID LIMIT	=	52.15	%
PLASTIC LIMIT	=	30.30	%
PLASTICITY INDEX	=	21.85	%
FLOW INDEX	=	15.23	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	SILAE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 22	DEPTH (m)		22.50 - 23.00

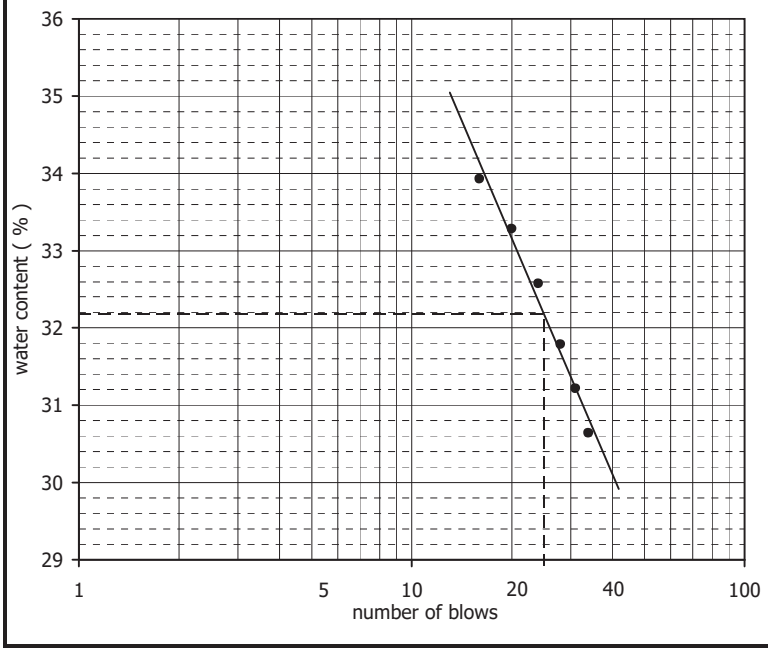
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	A-08			No.	A-105			No.	T-47
WW	54.160	DW	50.560	WW	49.650	DW	46.060	WW	53.020	DW	48.980
DW	50.560	TW	38.810	DW	46.060	TW	34.560	DW	48.980	TW	36.270
Ww	3.600	Ws	11.750	Ww	3.590	Ws	11.500	Ww	4.040	Ws	12.710
	W =	30.64	%		W =	31.22	%		W =	31.79	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	A-97			No.	L-29			No.	L-34
WW	51.180	DW	47.320	WW	55.330	DW	51.010	WW	54.490	DW	50.680
DW	47.320	TW	35.470	DW	51.010	TW	38.030	DW	50.680	TW	39.450
Ww	3.860	Ws	11.850	Ww	4.320	Ws	12.980	Ww	3.810	Ws	11.230
	W =	32.57	%		W =	33.28	%		W =	33.93	%

PLASTIC LIMIT

1				2				3			
		No.	A-97			No.	J-92			No.	T-93
WW	53.090	DW	49.390	WW	53.320	DW	50.080	WW	52.360	DW	49.030
DW	49.390	TW	35.470	DW	50.080	TW	37.970	DW	49.030	TW	36.500
Ww	3.700	Ws	13.920	Ww	3.240	Ws	12.110	Ww	3.330	Ws	12.530
	W =	26.58	%		W =	26.75	%		W =	26.58	%



LIQUID LIMIT	=	32.18	%
PLASTIC LIMIT	=	26.64	%
PLASTICITY INDEX	=	5.55	%
FLOW INDEX	=	10.06	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**TALISE - PALU**									
SAMPLE No			BAY - 23	BAY - 23	BAY - 23	BAY - 23	BAY - 23	BAY - 23	BAY - 23	BAY - 23	BAY - 23
DEPTH (m)			0.50 - 1.00	1.50 - 2.00	2.50 - 3.00	3.50 - 4.00	4.50 - 5.00	5.50 - 6.00	6.50 - 7.00	7.50 - 8.00	8.50 - 9.00
PROPERTIES	Natural Water Content	(%)	43.68	13.42	11.95	10.33	11.93	10.56	12.59	22.36	32.49
	Specific gravity of soil	*Gs*	2.652	2.657	2.658	2.648	2.647	2.637	2.646	2.653	2.692
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	0.00	15.89	12.33	8.01	14.16	12.87	17.34	16.74	0.00
	Proportion — Sand part	(%)	19.95	63.50	65.83	62.92	67.89	72.15	68.96	69.67	10.50
	Proportion — Silt part	(%)	63.54	12.01	13.56	21.07	11.84	11.64	10.56	10.55	65.98
	Proportion — Clay part	(%)	16.51	8.61	8.28	8.00	6.11	3.35	3.14	3.05	23.52
	Max. diameter	(mm)	2.00	9.52	9.52	19.10	9.52	19.10	9.52	9.52	2.00
	90 % diameter	(mm)	0.1579	6.5178	5.6525	4.0304	6.1519	7.0201	6.7689	6.6702	0.0768
	60 % diameter	(mm)	0.0468	0.7674	0.7042	0.5509	0.8181	0.7812	0.9982	1.1288	0.0283
	50 % diameter	(mm)	0.0338	0.5076	0.4490	0.3537	0.5556	0.5626	0.6523	0.6931	0.0224
	30 % diameter	(mm)	0.0151	0.1926	0.1796	0.0850	0.2305	0.2446	0.2747	0.2955	0.0088
	10 % diameter	(mm)	-	0.0076	0.0079	0.0074	0.0144	0.0264	0.0329	0.0392	-
	Uniformity Coefficient		-	100.96	88.94	74.24	56.81	29.61	30.38	28.78	-
	Passing # 200		80.05	20.61	21.84	29.07	17.95	14.99	13.70	13.59	89.50
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	NON PLASTIS	31.82
	Plastic limit	*PL* (%)									25.05
	Plasticity index	*PI* (%)									6.76
	Flow index										9.22
	Unified Classification										CL - ML

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**TALISE - PALU**									
SAMPLE No			BAY - 23	BAY - 23	BAY - 23	BAY - 23	BAY - 23				
DEPTH (m)			9.50 - 10.00	11.50 - 12.00	15.50 - 16.00	17.50 - 18.00	18.50 - 19.00				
PROPERTIES	Natural Water Content	(%)	24.09	55.76	39.24	9.27	36.84				
	Specific gravity of soil	*Gs*	2.708	2.617	2.653	2.645	2.675				
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	0.00	0.00	0.00	7.15	0.00				
	Proportion – Sand part	(%)	18.39	2.31	10.03	67.75	11.15				
	Proportion – Silt part	(%)	63.40	58.14	71.77	18.04	70.51				
	Proportion – Clay part	(%)	18.21	39.55	18.20	7.05	18.34				
	Max. diameter	(mm)	2.00	2.00	2.00	19.10	2.00				
	90 % diameter	(mm)	0.0998	0.0344	0.0742	3.8559	0.0808				
	60 % diameter	(mm)	0.0498	0.0099	0.0311	0.7363	0.0325				
	50 % diameter	(mm)	0.0386	0.0076	0.0228	0.5305	0.0248				
	30 % diameter	(mm)	0.0146	0.0029	0.0108	0.1396	0.0124				
	10 % diameter	(mm)	-	-	0.0015	0.0110	-				
	Uniformity Coefficient		-	-	20.98	67.21	-				
	Passing # 200		81.61	97.69	89.97	25.09	88.85				
CONSISTENCY	Liquid limit	*LL* (%)	30.99	66.61	46.83	NON PLASTIS	45.53				
	Plastic limit	*PL* (%)	24.97	45.94	35.34		33.87				
	Plasticity index	*PI* (%)	6.02	20.67	11.49		11.66				
	Flow index		9.10	18.87	13.74		13.70				
	Unified Classification		CL - ML	MH	ML		ML				

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	TALISE - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation						Date	Sample No.& Depth (m)	Average (%)	Calculation					
						No	T-05								No	L-47	
04/02	BAY - 23		WW	86.27	DW	71.51			04/02	BAY - 23		WW	123.35	DW	103.76		
2019	0.50 - 1.00	43.68	DW	71.51	TW	37.72			2019	8.50 - 9.00	32.49	DW	103.76	TW	43.47		
			Ww	14.76	Ws	33.79						Ww	19.59	Ws	60.29		
				WC	(%)	43.68							WC	(%)	32.49		
					No	A-09								No	J-53		
04/02	BAY - 23		WW	128.41	DW	118.00			04/02	BAY - 23		WW	107.86	DW	94.44		
2019	1.50 - 2.00	13.42	DW	118.00	TW	40.45			2019	9.50 - 10.00	24.09	DW	94.44	TW	38.74		
			Ww	10.41	Ws	77.55						Ww	13.42	Ws	55.70		
				WC	(%)	13.42							WC	(%)	24.09		
					No	T-31								No	A-22		
04/02	BAY - 23		WW	122.47	DW	113.45			04/02	BAY - 23		WW	91.69	DW	72.00		
2019	2.50 - 3.00	11.95	DW	113.45	TW	37.94			2019	11.50 - 12.00	55.76	DW	72.00	TW	36.69		
			Ww	9.02	Ws	75.51						Ww	19.69	Ws	35.31		
				WC	(%)	11.95							WC	(%)	55.76		
					No	A-42								No	J-84		
04/02	BAY - 23		WW	114.89	DW	107.83			04/02	BAY - 23		WW	103.60	DW	85.56		
2019	3.50 - 4.00	10.33	DW	107.83	TW	39.46			2019	15.50 - 16.00	39.24	DW	85.56	TW	39.59		
			Ww	7.06	Ws	68.37						Ww	18.04	Ws	45.97		
				WC	(%)	10.33							WC	(%)	39.24		
					No	T-91								No	J-77		
04/02	BAY - 23		WW	127.60	DW	117.90			04/02	BAY - 23		WW	133.21	DW	125.24		
2019	4.50 - 5.00	11.93	DW	117.90	TW	36.60			2019	17.50 - 18.00	9.27	DW	125.24	TW	39.23		
			Ww	9.70	Ws	81.30						Ww	7.97	Ws	86.01		
				WC	(%)	11.93							WC	(%)	9.27		
					No	L-07								No	J-52		
04/02	BAY - 23		WW	121.05	DW	113.13			04/02	BAY - 23		WW	127.09	DW	102.76		
2019	5.50 - 6.00	10.56	DW	113.13	TW	38.12			2019	18.50 - 19.00	36.84	DW	102.76	TW	36.71		
			Ww	7.92	Ws	75.01						Ww	24.33	Ws	66.05		
				WC	(%)	10.56							WC	(%)	36.84		
					No	T-53								No			
04/02	BAY - 23		WW	140.95	DW	129.24						WW		DW			
2019	6.50 - 7.00	12.59	DW	129.24	TW	36.26						DW		TW			
			Ww	11.71	Ws	92.98						Ww		Ws			
				WC	(%)	12.59							WC	(%)			
					No	L-43								No			
04/02	BAY - 23		WW	119.43	DW	104.56						WW		DW			
2019	7.50 - 8.00	22.36	DW	104.56	TW	38.07						DW		TW			
			Ww	14.87	Ws	66.49						Ww		Ws			
				WC	(%)	22.36							WC	(%)			

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	0.50 - 1.00

Determination No				1	2	3	4
No of Pycnometer				14	67	45	
Weight of Pycnometer		Wf	(gr)	69.710	36.820	37.860	
Weight of (Pycnometer + Water)		Wa	(gr)	170.370	137.620	139.180	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.900	150.160	151.730	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.820	37.880	37.840	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.040	20.100	20.060	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	170.3700	137.6200	139.1800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.510	7.560	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.668	2.659	2.671	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.655	2.645	2.657	
Average Specific Gravity at 20° C							**2.652**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	1.50 - 2.00

Determination No				1	2	3	4
No of Pycnometer				56	63	42	
Weight of Pycnometer		Wf	(gr)	52.690	45.527	39.190	
Weight of (Pycnometer + Water)		Wa	(gr)	152.160	149.488	142.220	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.810	162.220	154.820	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.010	38.150	37.890	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.230	20.370	20.110	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	152.1600	149.4884	142.2200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.580	7.638	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.669	2.667	2.678	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.655	2.653	2.664	
Average Specific Gravity at 20° C							**2.657**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	2.50 - 3.00

Determination No				1	2	3	4
No of Pycnometer				64	46	58	
Weight of Pycnometer		Wf	(gr)	37.070	39.280	35.070	
Weight of (Pycnometer + Water)		Wa	(gr)	148.310	140.310	145.730	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	160.880	153.030	158.340	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.860	38.140	37.910	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.080	20.360	20.130	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	148.3100	140.3100	145.7300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.510	7.640	7.520	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.674	2.665	2.677	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.660	2.651	2.663	
Average Specific Gravity at 20° C							**2.658**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	3.50 - 4.00

Determination No				1	2	3	4
No of Pycnometer				19	15	57	
Weight of Pycnometer		Wf	(gr)	66.300	77.130	50.930	
Weight of (Pycnometer + Water)		Wa	(gr)	167.700	173.150	151.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	180.650	185.700	163.810	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.510	37.910	38.010	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.730	20.130	20.230	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.7000	173.1500	151.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.780	7.580	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.665	2.656	2.665	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.651	2.642	2.652	
Average Specific Gravity at 20° C							**2.648**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	4.50 - 5.00

Determination No				1	2	3	4
No of Pycnometer				52	66	68	
Weight of Pycnometer		Wf	(gr)	52.420	36.290	34.650	
Weight of (Pycnometer + Water)		Wa	(gr)	153.990	136.280	134.460	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	166.600	148.880	147.050	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.030	37.930	37.940	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.250	20.150	20.160	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	153.9900	136.2800	134.4600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.640	7.550	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.651	2.669	2.663	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.637	2.655	2.649	
Average Specific Gravity at 20° C							**2.647**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	5.50 - 6.00

Determination No				1	2	3	4
No of Pycnometer				23	3	51	
Weight of Pycnometer		Wf	(gr)	43.180	63.340	53.870	
Weight of (Pycnometer + Water)		Wa	(gr)	146.380	166.670	154.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.240	179.340	167.010	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.420	38.140	38.220	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.640	20.360	20.440	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.3800	166.6700	154.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.780	7.690	7.710	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.653	2.648	2.651	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.639	2.634	2.637	
Average Specific Gravity at 20° C							**2.637**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**TALISE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	6.50 - 7.00

Determination No				1	2	3	4
No of Pycnometer				61	48	54	
Weight of Pycnometer		Wf	(gr)	37.700	37.760	51.250	
Weight of (Pycnometer + Water)		Wa	(gr)	146.520	139.170	151.310	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.230	151.830	164.040	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.150	38.050	38.190	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.370	20.270	20.410	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.5200	139.1700	151.3100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.660	7.610	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.659	2.664	2.658	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.646	2.650	2.644	
Average Specific Gravity at 20° C							**2.646**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**TALISE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	7.50 - 8.00

Determination No				1	2	3	4
No of Pycnometer				41	62	65	
Weight of Pycnometer		Wf	(gr)	35.950	41.480	34.080	
Weight of (Pycnometer + Water)		Wa	(gr)	137.160	152.370	134.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.790	165.130	146.990	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.990	38.190	38.140	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.210	20.410	20.360	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	137.1600	152.3700	134.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.580	7.650	7.640	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.666	2.668	2.665	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.653	2.654	2.651	
Average Specific Gravity at 20° C							**2.653**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**TALISE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	8.50 - 9.00

Determination No				1	2	3	4
No of Pycnometer				60	53	47	
Weight of Pycnometer		Wf	(gr)	43.180	52.280	40.660	
Weight of (Pycnometer + Water)		Wa	(gr)	146.610	153.170	142.080	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.380	165.890	154.940	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.030	37.980	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.250	20.200	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.6100	153.1700	142.0800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.480	7.480	7.520	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.707	2.701	2.710	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.693	2.687	2.696	
Average Specific Gravity at 20° C							**2.692**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	9.50 - 10.00

Determination No				1	2	3	4
No of Pycnometer				27	7	59	
Weight of Pycnometer		Wf	(gr)	39.750	68.750	33.640	
Weight of (Pycnometer + Water)		Wa	(gr)	140.000	169.400	144.580	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	153.360	182.340	157.480	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.890	38.250	38.160	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	21.110	20.470	20.380	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	140.0000	169.4000	144.5800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.750	7.530	7.480	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.724	2.718	2.725	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.710	2.704	2.711	
Average Specific Gravity at 20° C							**2.708**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	11.50 - 12.00

Determination No				1	2	3	4
No of Pycnometer				20	44	50	
Weight of Pycnometer		Wf	(gr)	68.510	38.880	52.650	
Weight of (Pycnometer + Water)		Wa	(gr)	168.600	139.990	154.080	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.220	152.650	166.750	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.130	38.190	38.250	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.350	20.410	20.470	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.6000	139.9900	154.0800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.730	7.750	7.800	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.633	2.634	2.624	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.619	2.620	2.611	
Average Specific Gravity at 20° C							**2.617**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	15.50 - 16.00

Determination No				1	2	3	4
No of Pycnometer				8	4	49	
Weight of Pycnometer		Wf	(gr)	67.390	65.900	39.190	
Weight of (Pycnometer + Water)		Wa	(gr)	168.560	167.100	141.110	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	181.390	179.810	153.860	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.320	38.100	38.180	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.540	20.320	20.400	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	168.5600	167.1000	141.1100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.710	7.610	7.650	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.664	2.670	2.667	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.650	2.656	2.653	
Average Specific Gravity at 20° C							**2.653**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 12, 2019
LOCATION	**TALISE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	17.50 - 18.00

Determination No				1	2	3	4
No of Pycnometer				35	25	55	
Weight of Pycnometer		Wf	(gr)	37.070	43.080	51.050	
Weight of (Pycnometer + Water)		Wa	(gr)	136.920	146.430	151.910	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.670	159.030	164.570	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.220	37.970	38.080	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.440	20.190	20.300	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9200	146.4300	151.9100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.690	7.590	7.640	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.658	2.660	2.657	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.644	2.646	2.643	
Average Specific Gravity at 20° C							**2.645**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 12, 2019
LOCATION	TALISE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	BAY - 23	DEPTH	18.50 - 19.00

Determination No				1	2	3	4
No of Pycnometer				17	10	43	
Weight of Pycnometer		Wf	(gr)	64.940	67.070	40.060	
Weight of (Pycnometer + Water)		Wa	(gr)	169.440	168.920	142.260	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.260	181.650	155.050	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.170	38.060	38.150	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.390	20.280	20.370	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.4400	168.9200	142.2600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.550	7.580	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.694	2.686	2.687	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.680	2.672	2.674	
Average Specific Gravity at 20° C							**2.675**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**0.50 - 1.00**

Wt. (Air dry soil + container) = 100.37 gr — Specific Gravity : **2.652**

Wt. of container M-68 = 40.11 gr — Plasticity Index : %

Wt. Of air dry soil W' = 60.26 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-23			NO	A-27			NO	A-41		
WW	51.10	DW	50.09	WW	57.70	DW	56.56	WW	54.47	DW	53.31	Mean value	
DW	50.09	TW	35.78	DW	56.56	TW	40.40	DW	53.31	TW	38.08	w	
Ww	1.01	Ws	14.31	Ww	1.14	Ws	16.16	Ww	1.16	Ws	15.23	7.24	%
w	7.06	%		w	7.05	%		w	7.62	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 56.190 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.0	22.0	29	10.045	10.045	3.1693	0.01231	0.0390	19.00	54.28	54.28
2	18.0	19.0	29	10.802	5.401	2.3240	0.01231	0.0286	16.00	45.71	45.71
5	14.0	15.0	29	11.811	2.362	1.5369	0.01231	0.0189	12.00	34.28	34.28
15	11.0	12.0	29	12.568	0.838	0.9153	0.01231	0.0113	9.00	25.71	25.71
30	9.0	10.0	29	13.072	0.436	0.6601	0.01231	0.0081	7.00	20.00	20.00
60	8.0	9.0	29	13.325	0.222	0.4712	0.01231	0.0058	6.00	17.14	17.14
240	7.0	8.0	28	13.577	0.057	0.2378	0.01245	0.0030	5.00	14.28	14.28
1140	6.0	7.0	29	13.829	0.012	0.1101	0.01231	0.0014	4.00	11.43	11.43

P = 100/W = 1.7797

$$Mx = \frac{G_s}{G_s - 1} = 1.6053$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.01	22.02	0.990		1.76	98.24	98.24
0.42	23.92		1.900		3.38	96.62	96.62
0.25	25.15		3.130		5.57	94.43	94.43
0.105	29.07		7.050		12.55	87.45	87.45
0.074	33.23		11.210		19.95	80.05	80.05

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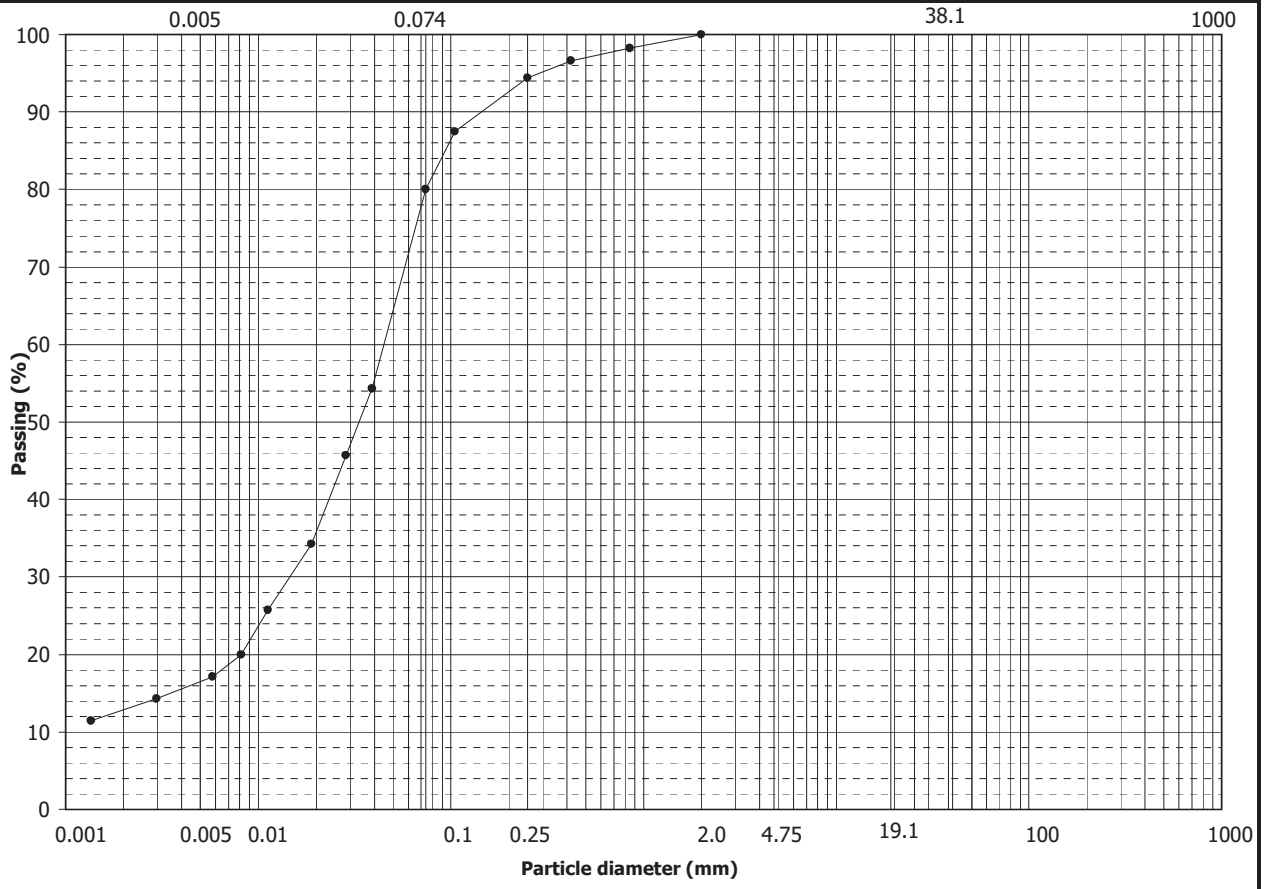
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**0.50 - 1.00**

SPECIFIC GRAVITY : **2.652**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	19.95	63.54	16.51	2.00	0.1579	0.0468	0.0338	0.0151	-	-	100.00	96.62	80.05



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 505.0 gr
Wt. container No ..... = 41.33 gr
Wt. Of air dry soil W' = 463.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **463.67** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	115.00	41.33	73.67		15.89	84.11
2.00	155.00		113.67		24.52	75.48

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**1.50 - 2.00**

Wt. (Air dry soil + container) = 151.24 gr — Specific Gravity : **2.657**

Wt. of container M-53 = 41.84 gr — Plasticity Index : %

Wt. Of air dry soil W' = 109.40 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 75.48 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-17			NO	A-69			NO	A-84		
WW	51.25	DW	50.95	WW	46.61	DW	46.35	WW	53.28	DW	52.89	Mean value	
DW	50.95	TW	36.39	DW	46.35	TW	33.11	DW	52.89	TW	37.78	w	
Ww	0.30	Ws	14.56	Ww	0.26	Ws	13.24	Ww	0.39	Ws	15.11	2.20	%
w	2.06	%		w	1.96	%		w	2.58	%			

$$W = \frac{100 \times W'}{100 + w} : 107.043 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.0	19.0	29	10.802	10.802	3.2866	0.01229	0.0404	16.00	23.97	18.09
2	16.5	17.5	29	11.180	5.590	2.3643	0.01229	0.0291	14.50	21.72	16.40
5	14.5	15.5	29	11.685	2.337	1.5287	0.01229	0.0188	12.50	18.72	14.13
15	12.5	13.5	29	12.189	0.813	0.9015	0.01229	0.0111	10.50	15.73	11.87
30	11.0	12.0	29	12.568	0.419	0.6472	0.01229	0.0080	9.00	13.48	10.18
60	10.0	11.0	29	12.820	0.214	0.4622	0.01229	0.0057	8.00	11.98	9.05
240	8.0	9.0	28	13.325	0.056	0.2356	0.01243	0.0029	6.00	8.99	6.78
1140	7.0	8.0	29	13.577	0.012	0.1091	0.01229	0.0013	5.00	7.49	5.65

P = 100/W = 0.9342

$$Mx = \frac{G_s}{G_s - 1} = 1.6035$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	39.47	22.02	17.450		16.30	83.70	63.18
0.42	62.94		40.920		38.23	61.77	46.63
0.25	80.19		58.170		54.34	45.66	34.46
0.105	96.18		74.160		69.28	30.72	23.19
0.074	99.83		77.810		72.69	27.31	20.61

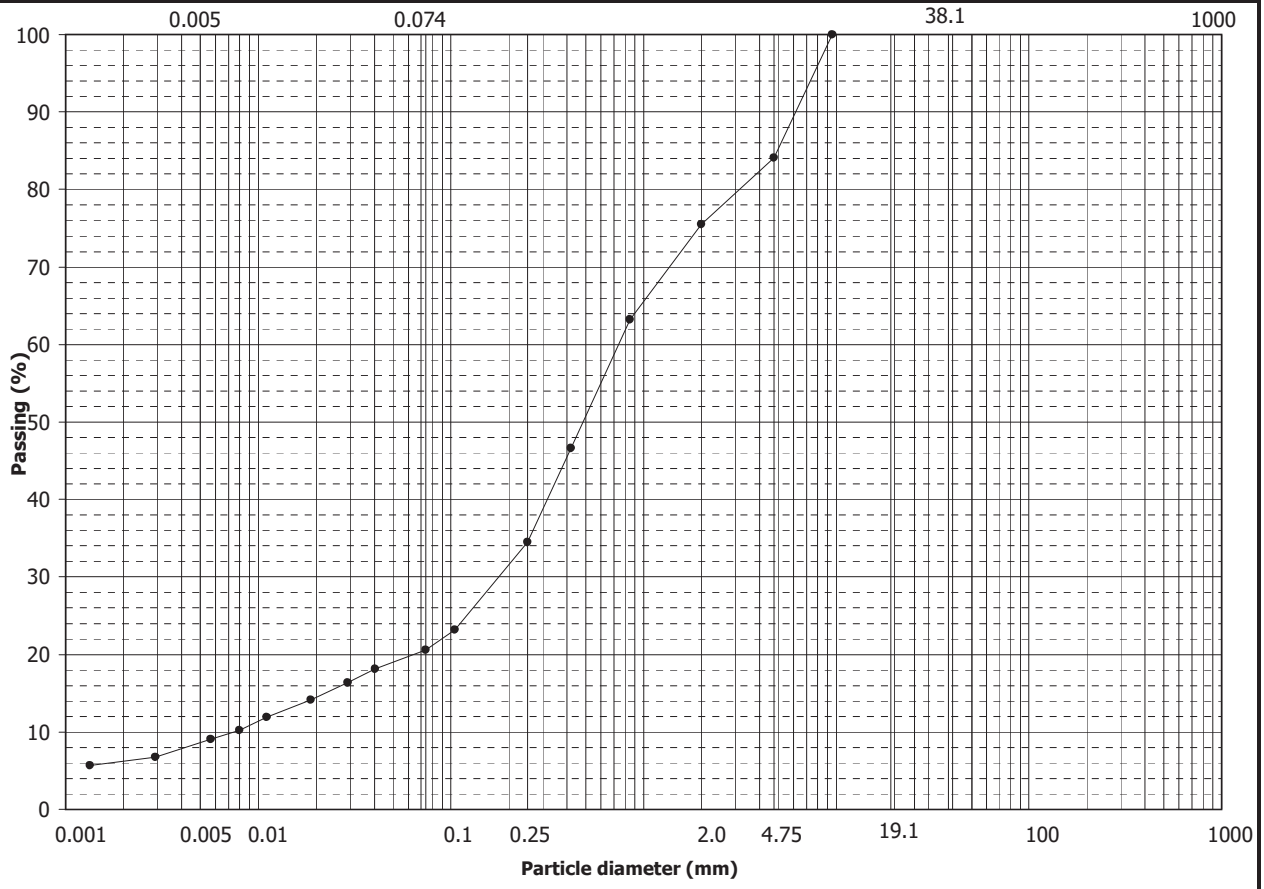
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**1.50 - 2.00**

SPECIFIC GRAVITY : **2.657**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
15.89	63.50	12.01	8.61	9.52	6.5178	0.7674	0.5076	0.1926	0.0076	100.96	75.48	46.63	20.61



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**2.50 - 3.00**

Wt. (Air dry soil + container) = 541.0 gr
Wt. container No ..... = 43.66 gr
Wt. Of air dry soil W' = 497.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **497.34** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	105.00	43.66	61.34		12.33	87.67
2.00	150.00		106.34		21.38	78.62

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 23	DEPTH	2.50 - 3.00

Wt. (Air dry soil + container) = 144.23 gr — Specific Gravity : 2.658
Wt. of container M-58 = 41.08 gr — Plasticity Index : %
Wt. Of air dry soil W' = 103.15 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 78.62 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-64			NO	A-75			NO	A-94		
WW	50.69	DW	50.29	WW	55.23	DW	54.80	WW	52.14	DW	51.65	Mean value	
DW	50.29	TW	35.92	DW	54.80	TW	39.14	DW	51.65	TW	36.89	w	
Ww	0.40	Ws	14.37	Ww	0.43	Ws	15.66	Ww	0.49	Ws	14.76	2.95	%
w	2.78	%		w	2.75	%		w	3.32	%			

$$W = \frac{100 \times W'}{100 + w} : 100.195 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	29	11.054	11.054	3.3247	0.01229	0.0409	15.00	24.00	18.87
2	16.0	17.0	29	11.306	5.653	2.3776	0.01229	0.0292	14.00	22.40	17.61
5	14.0	15.0	29	11.811	2.362	1.5369	0.01229	0.0189	12.00	19.20	15.09
15	11.5	12.5	29	12.442	0.829	0.9107	0.01229	0.0112	9.50	15.20	11.95
30	10.0	11.0	29	12.820	0.427	0.6537	0.01229	0.0080	8.00	12.80	10.06
60	9.0	10.0	29	13.072	0.218	0.4668	0.01229	0.0057	7.00	11.20	8.81
240	7.0	8.0	28	13.577	0.057	0.2378	0.01242	0.0030	5.00	8.00	6.29
1140	6.0	7.0	29	13.829	0.012	0.1101	0.01229	0.0014	4.00	6.40	5.03

P = 100/W = 0.9981

$$Mx = \frac{G_s}{G_s - 1} = 1.6031$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	38.47	22.02	16.450		16.42	83.58	65.71
0.42	59.94		37.920		37.85	62.15	48.86
0.25	77.19		55.170		55.06	44.94	35.33
0.105	91.18		69.160		69.03	30.97	24.35
0.074	94.38		72.360		72.22	27.78	21.84

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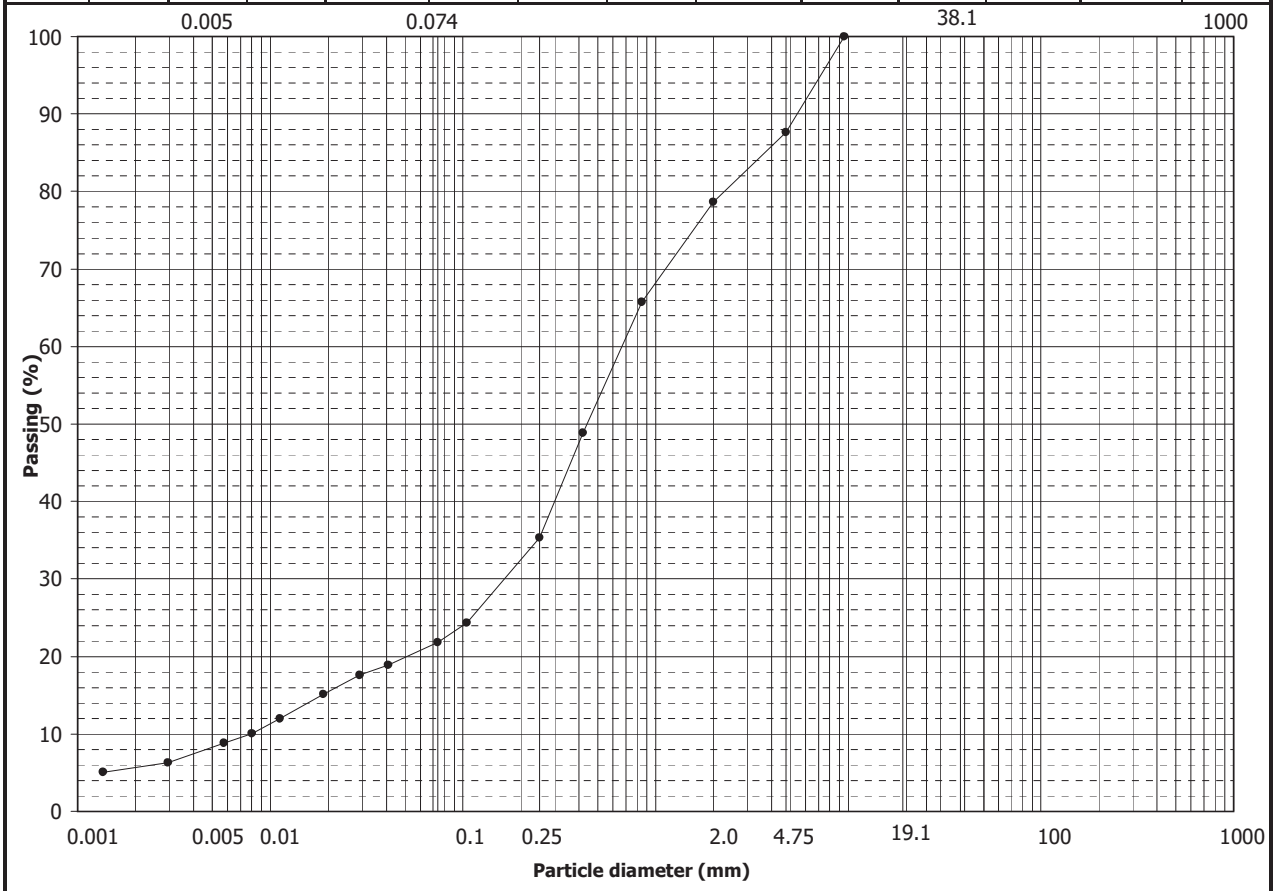
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Hadir untuk negeri

RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**2.50 - 3.00**

SPECIFIC GRAVITY : **2.658**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
12.33	65.83	13.56	8.28	9.52	5.6525	0.7042	0.4490	0.1796	0.0079	88.94	78.62	48.86	21.84



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**3.50 - 4.00**

Wt. (Air dry soil + container) = 515.0 gr
Wt. container No ..... = 43.66 gr
Wt. Of air dry soil W' = 471.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **471.34** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	73.60	43.66	29.94		6.35	93.65
4.75	81.40		37.74		8.01	91.99
2.00	117.30		73.64		15.62	84.38

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 23	DEPTH	3.50 - 4.00

Wt. (Air dry soil + container) = 145.41 gr — Specific Gravity : 2.648
Wt. of container M-49 = 39.87 gr — Plasticity Index : %
Wt. Of air dry soil W' = 105.54 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 84.38 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-55			NO	A-61			NO	A-71		
WW	59.13	DW	58.70	WW	52.21	DW	51.84	WW	55.74	DW	55.26	Mean value	
DW	58.70	TW	41.93	DW	51.84	TW	37.03	DW	55.26	TW	39.47	w	
Ww	0.43	Ws	16.77	Ww	0.37	Ws	14.81	Ww	0.48	Ws	15.79	2.70	%
w	2.56	%		w	2.50	%		w	3.04	%			

$$W = \frac{100 \times W'}{100 + w} : 102.765 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	19.0	20.0	29	10.549	10.549	3.2480	0.01233	0.0400	17.00	26.58	22.43
2	16.5	17.5	29	11.180	5.590	2.3643	0.01233	0.0291	14.50	22.67	19.13
5	14.0	15.0	29	11.811	2.362	1.5369	0.01233	0.0189	12.00	18.76	15.83
15	11.0	12.0	29	12.568	0.838	0.9153	0.01233	0.0113	9.00	14.07	11.87
30	10.0	11.0	29	12.820	0.427	0.6537	0.01233	0.0081	8.00	12.51	10.55
60	8.5	9.5	29	13.198	0.220	0.4690	0.01233	0.0058	6.50	10.16	8.58
240	6.5	7.5	28	13.703	0.057	0.2389	0.01246	0.0030	4.50	7.04	5.94
1140	5.0	6.0	29	14.081	0.012	0.1111	0.01233	0.0014	3.00	4.69	3.96

P = 100/W = 0.9731

$$Mx = \frac{G_s}{G_s - 1} = 1.6068$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	37.47	22.02	15.450		15.03	84.97	71.69
0.42	57.94		35.920		34.95	65.05	54.88
0.25	73.19		51.170		49.79	50.21	42.36
0.105	86.18		64.160		62.43	37.57	31.70
0.074	89.38		67.360		65.55	34.45	29.07

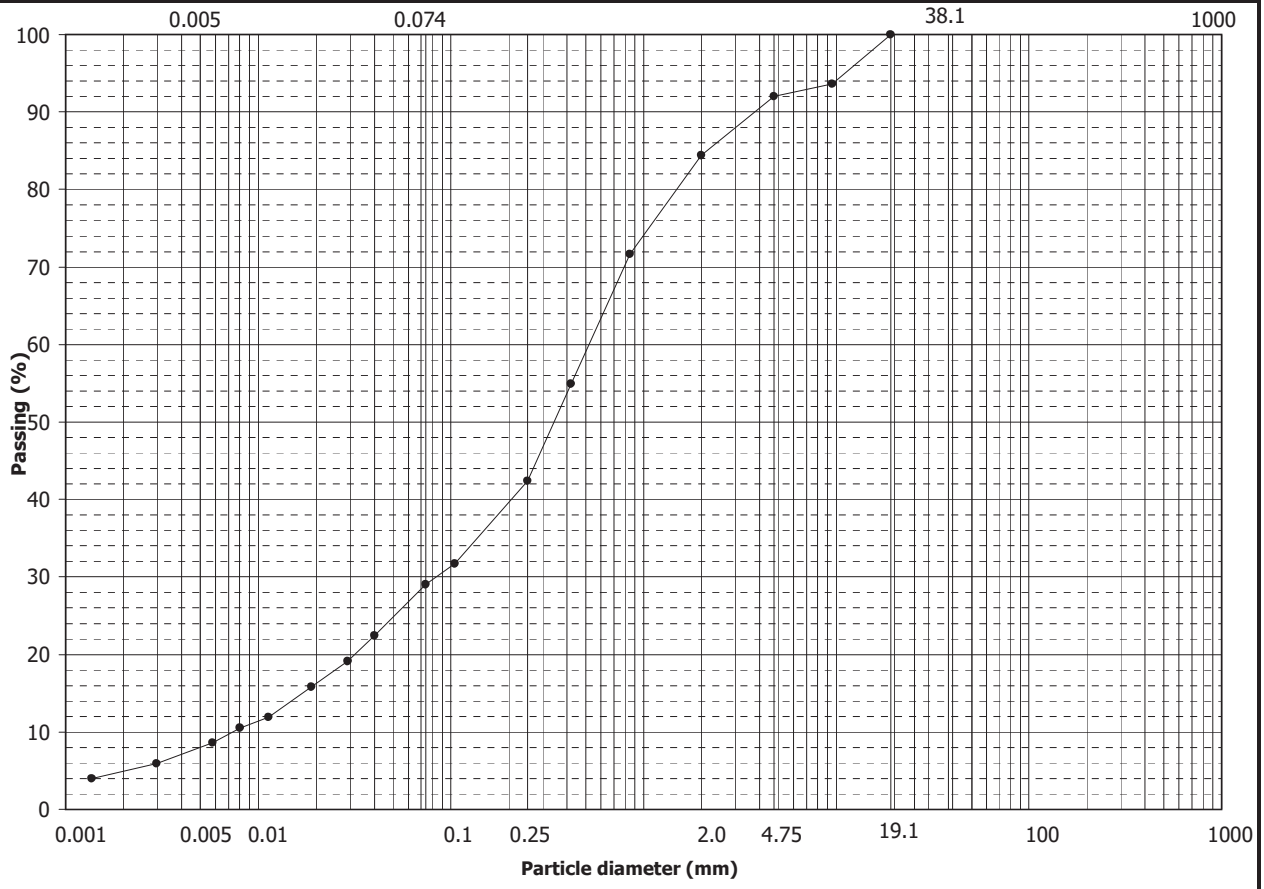
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**3.50 - 4.00**

SPECIFIC GRAVITY : **2.648**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
8.01	62.92	21.07	8.00	19.10	4.0304	0.5509	0.3537	0.0850	0.0074	74.24	84.38	54.88	29.07



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 507.0 gr
Wt. container No ..... = 44.50 gr
Wt. Of air dry soil W' = 462.5 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **462.50** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	110.00	44.50	65.50		14.16	85.84
2.00	160.00		115.50		24.97	75.03

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**4.50 - 5.00**

Wt. (Air dry soil + container) = 149.13 gr — Specific Gravity : **2.647**

Wt. of container M-21 = 44.43 gr — Plasticity Index : %

Wt. Of air dry soil W' = 104.70 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 75.03 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-15			NO	A-68			NO	A-92		
WW	55.60	DW	55.16	WW	52.22	DW	51.81	WW	54.10	DW	53.59	Mean value	
DW	55.16	TW	39.40	DW	51.81	TW	37.01	DW	53.59	TW	38.28	w	
Ww	0.44	Ws	15.76	Ww	0.41	Ws	14.80	Ww	0.51	Ws	15.31	2.96	%
w	2.79	%		w	2.77	%		w	3.33	%			

$$W = \frac{100 \times W'}{100 + w} : 101.686 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.0	16.0	29	11.558	11.558	3.3998	0.01233	0.0419	13.00	20.55	15.42
2	13.5	14.5	29	11.937	5.968	2.4430	0.01233	0.0301	11.50	18.18	13.64
5	12.0	13.0	29	12.315	2.463	1.5694	0.01233	0.0194	10.00	15.81	11.86
15	9.5	10.5	29	12.946	0.863	0.9290	0.01233	0.0115	7.50	11.85	8.89
30	8.5	9.5	29	13.198	0.440	0.6633	0.01233	0.0082	6.50	10.27	7.71
60	7.5	8.5	29	13.451	0.224	0.4735	0.01233	0.0058	5.50	8.69	6.52
240	6.0	7.0	28	13.829	0.058	0.2400	0.01247	0.0030	4.00	6.32	4.74
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01233	0.0014	2.00	3.16	2.37

P = 100/W = 0.9834

$$Mx = \frac{G_s}{G_s - 1} = 1.6072$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	40.74	22.02	18.720		18.41	81.59	61.21
0.42	62.94		40.920		40.24	59.76	44.83
0.25	81.00		58.980		58.00	42.00	31.51
0.105	96.18		74.160		72.93	27.07	20.31
0.074	99.38		77.360		76.08	23.92	17.95

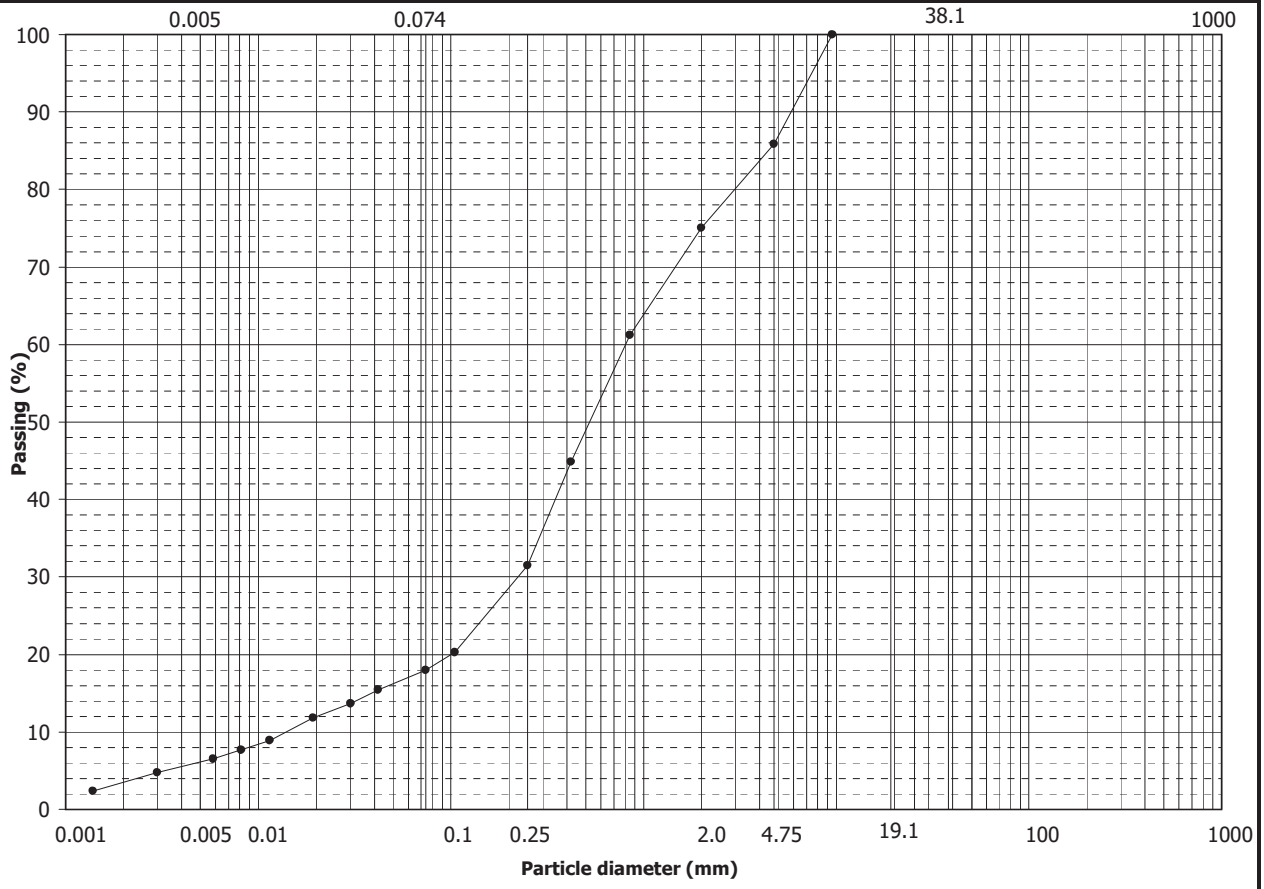
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**4.50 - 5.00**

SPECIFIC GRAVITY : **2.647**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
14.16	67.89	11.84	6.11	9.52	6.1519	0.8181	0.5556	0.2305	0.0144	56.81	75.03	44.83	17.95



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 550.0 gr
Wt. container No ..... = 43.65 gr
Wt. Of air dry soil W' = 506.4 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **506.35** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	78.30	43.65	34.65		6.84	93.16
4.75	108.80		65.15		12.87	87.13
2.00	152.90		109.25		21.58	78.42

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**5.50 - 6.00**

Wt. (Air dry soil + container) = 142.46 gr — Specific Gravity : **2.637**

Wt. of container B-107 = 36.56 gr — Plasticity Index : %

Wt. Of air dry soil W' = 105.90 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 78.42 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-06			NO	A-53			NO	A-99		
WW	56.41	DW	56.00	WW	50.24	DW	49.88	WW	53.71	DW	53.24	Mean value	
DW	56.00	TW	40.00	DW	49.88	TW	35.63	DW	53.24	TW	38.03	w	
Ww	0.41	Ws	16.00	Ww	0.36	Ws	14.25	Ww	0.47	Ws	15.21	2.73	%
w	2.56	%		w	2.53	%		w	3.09	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 103.089 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	29	12.315	12.315	3.5093	0.01237	0.0434	10.00	15.63	12.25
2	11.0	12.0	29	12.568	6.284	2.5068	0.01237	0.0310	9.00	14.06	11.03
5	9.0	10.0	29	13.072	2.614	1.6169	0.01237	0.0200	7.00	10.94	8.58
15	7.0	8.0	29	13.577	0.905	0.9514	0.01237	0.0118	5.00	7.81	6.13
30	6.0	7.0	29	13.829	0.461	0.6789	0.01237	0.0084	4.00	6.25	4.90
60	5.0	6.0	29	14.081	0.235	0.4844	0.01237	0.0060	3.00	4.69	3.68
240	4.0	5.0	28	14.334	0.060	0.2444	0.01250	0.0031	2.00	3.13	2.45
1140	3.0	4.0	29	14.586	0.013	0.1131	0.01237	0.0014	1.00	1.56	1.23

P = 100/W = 0.97

$$Mx = \frac{G_s}{G_s - 1} = 1.6109$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	42.10	22.02	20.080		19.48	80.52	63.15
0.42	67.96		45.940		44.56	55.44	43.48
0.25	85.05		63.030		61.14	38.86	30.47
0.105	101.90		79.880		77.49	22.51	17.66
0.074	105.41		83.390		80.89	19.11	14.99

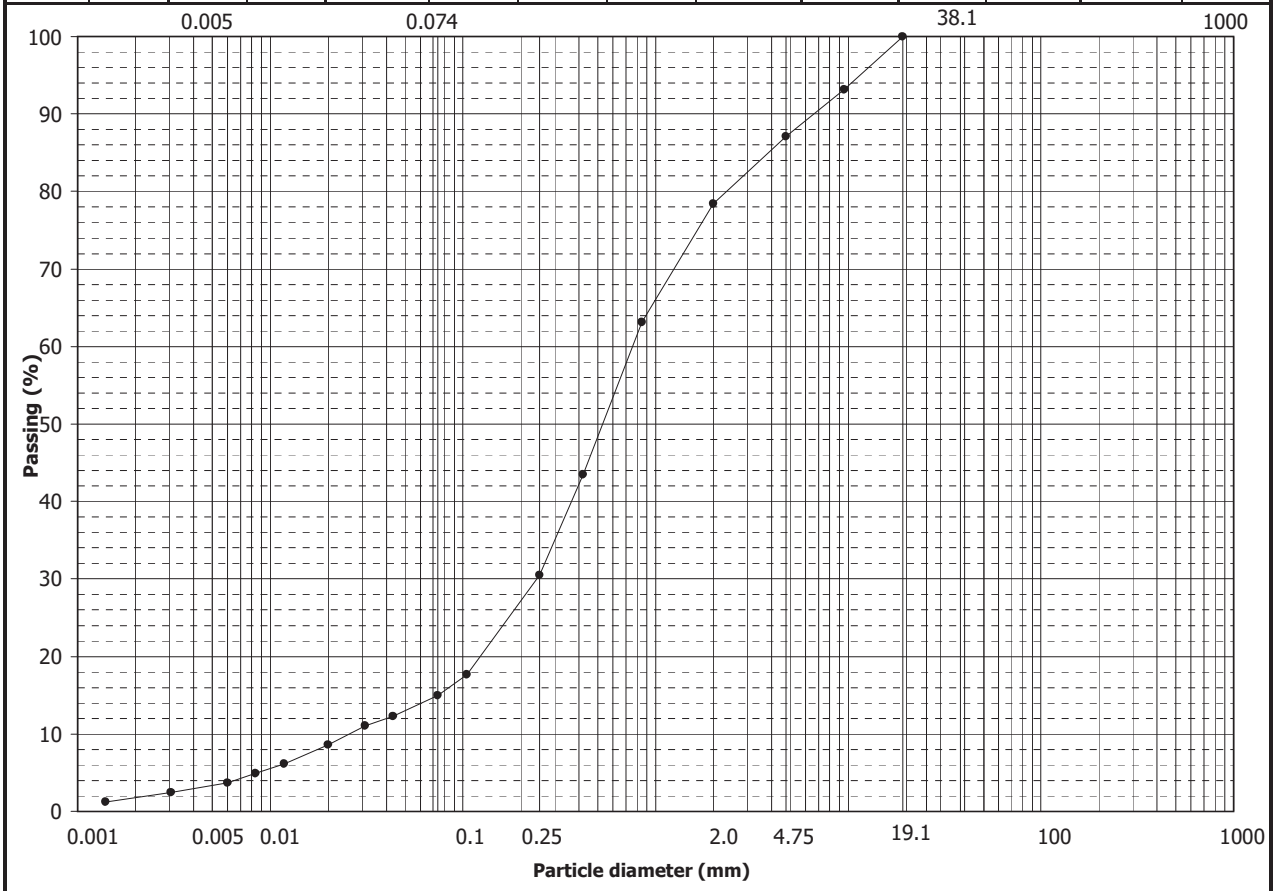
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**5.50 - 6.00**

SPECIFIC GRAVITY : **2.637**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
12.87	72.15	11.64	3.35	19.10	7.0201	0.7812	0.5626	0.2446	0.0264	29.61	78.42	43.48	14.99



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 443.0 gr
Wt. container No ..... = 46.20 gr
Wt. Of air dry soil W' = 396.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **396.80** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	115.00	46.20	68.80		17.34	82.66
2.00	155.40		109.20		27.52	72.48

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**6.50 - 7.00**

Wt. (Air dry soil + container) = 152.87 gr — Specific Gravity : **2.646**

Wt. of container M-04 = 48.16 gr — Plasticity Index : %

Wt. Of air dry soil W' = 104.71 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 72.48 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-108			NO	A-34			NO	A-50		
WW	48.32	DW	47.92	WW	51.58	DW	51.16	WW	52.91	DW	52.40	Mean value	
DW	47.92	TW	34.23	DW	51.16	TW	36.54	DW	52.40	TW	37.43	w	
Ww	0.40	Ws	13.69	Ww	0.42	Ws	14.62	Ww	0.51	Ws	14.97	3.07	%
w	2.92	%		w	2.87	%		w	3.41	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 101.594 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	12.0	13.0	29	12.315	12.315	3.5093	0.01233	0.0433	10.00	15.82	11.47
2	10.5	11.5	29	12.694	6.347	2.5193	0.01233	0.0311	8.50	13.45	9.75
5	8.5	9.5	29	13.198	2.640	1.6247	0.01233	0.0200	6.50	10.29	7.45
15	7.0	8.0	29	13.577	0.905	0.9514	0.01233	0.0117	5.00	7.91	5.73
30	6.0	7.0	29	13.829	0.461	0.6789	0.01233	0.0084	4.00	6.33	4.59
60	5.0	6.0	29	14.081	0.235	0.4844	0.01233	0.0060	3.00	4.75	3.44
240	4.0	5.0	28	14.334	0.060	0.2444	0.01247	0.0030	2.00	3.16	2.29
1140	3.0	4.0	29	14.586	0.013	0.1131	0.01233	0.0014	1.00	1.58	1.15

P = 100/W = 0.9843

$$Mx = \frac{G_s}{G_s - 1} = 1.6075$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	42.10	22.02	20.080		19.76	80.24	58.15
0.42	66.96		44.940		44.23	55.77	40.42
0.25	84.05		62.030		61.06	38.94	28.23
0.105	100.90		78.880		77.64	22.36	16.20
0.074	104.41		82.390		81.10	18.90	13.70

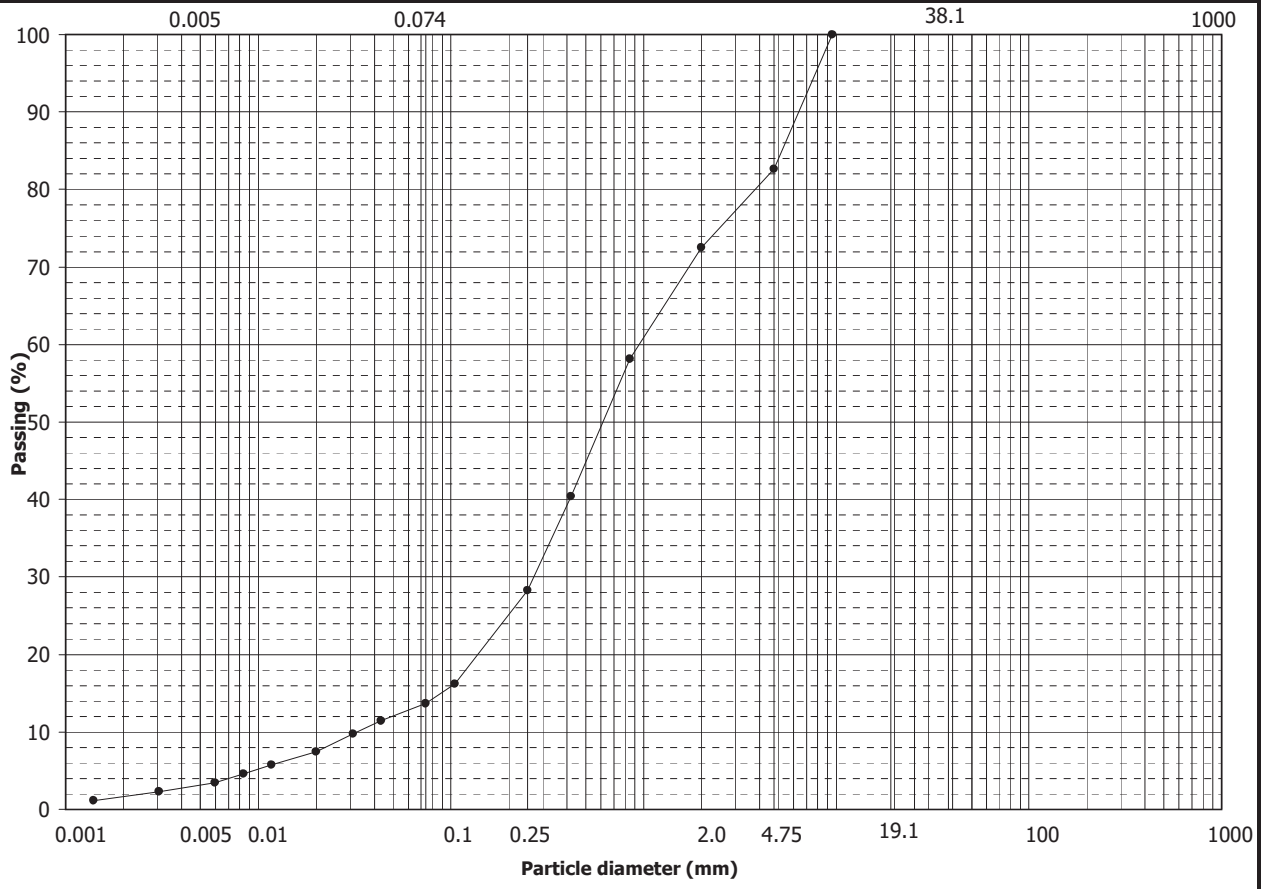
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**6.50 - 7.00**

SPECIFIC GRAVITY : **2.646**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
17.34	68.96	10.56	3.14	9.52	6.7689	0.9982	0.6523	0.2747	0.0329	30.38	72.48	40.42	13.70



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 449.0 gr
Wt. container No ..... = 40.41 gr
Wt. Of air dry soil W' = 408.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **408.59** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	108.80	40.41	68.39		16.74	83.26
2.00	162.90		122.49		29.98	70.02

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**7.50 - 8.00**

Wt. (Air dry soil + container) = 146.68 gr — Specific Gravity : **2.653**

Wt. of container M-46 = 41.96 gr — Plasticity Index : %

Wt. Of air dry soil W' = 104.72 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 70.02 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-01			NO	A-33			NO	A-87		
WW	54.30	DW	53.76	WW	53.58	DW	53.05	WW	56.83	DW	56.18	Mean value	
DW	53.76	TW	38.40	DW	53.05	TW	37.89	DW	56.18	TW	40.13	w	
Ww	0.54	Ws	15.36	Ww	0.53	Ws	15.16	Ww	0.65	Ws	16.05	3.69	%
w	3.52	%		w	3.50	%		w	4.05	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : \quad 100.996 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	11.5	12.5	29	12.442	12.442	3.5273	0.01231	0.0434	9.50	15.10	10.57
2	10.0	11.0	29	12.820	6.410	2.5318	0.01231	0.0312	8.00	12.71	8.90
5	8.5	9.5	29	13.198	2.640	1.6247	0.01231	0.0200	6.50	10.33	7.23
15	6.5	7.5	29	13.703	0.914	0.9558	0.01231	0.0118	4.50	7.15	5.01
30	6.0	7.0	29	13.829	0.461	0.6789	0.01231	0.0084	4.00	6.36	4.45
60	5.0	6.0	29	14.081	0.235	0.4844	0.01231	0.0060	3.00	4.77	3.34
240	4.0	5.0	28	14.334	0.060	0.2444	0.01244	0.0030	2.00	3.18	2.23
1140	3.0	4.0	29	14.586	0.013	0.1131	0.01231	0.0014	1.00	1.59	1.11

P = 100/W = 0.9901

$$Mx = \frac{G_s}{G_s - 1} = 1.6050$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	41.10	22.02	19.080		18.89	81.11	56.79
0.42	67.96		45.940		45.49	54.51	38.17
0.25	84.05		62.030		61.42	38.58	27.02
0.105	98.90		76.880		76.12	23.88	16.72
0.074	103.41		81.390		80.59	19.41	13.59

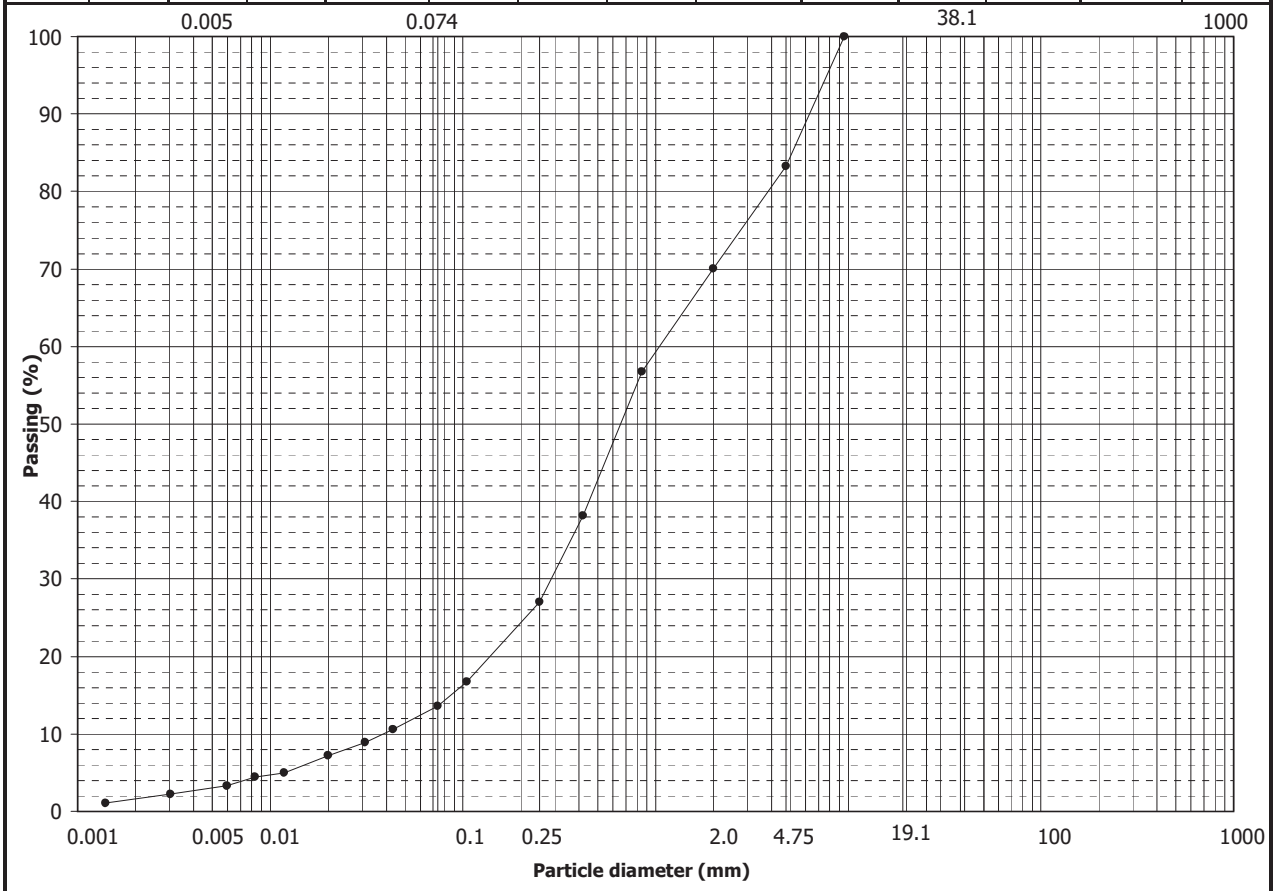
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**7.50 - 8.00**

SPECIFIC GRAVITY : **2.653**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
16.74	69.67	10.55	3.05	9.52	6.6702	1.1288	0.6931	0.2955	0.0392	28.78	70.02	38.17	13.59



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**8.50 - 9.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 23	DEPTH	8.50 - 9.00

Wt. (Air dry soil + container) = 153.42 gr — Specific Gravity : 2.692
Wt. of container H-53 = 90.99 gr — Plasticity Index : %
Wt. Of air dry soil W' = 62.43 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-32			NO	A-85			NO	A-88		
WW	51.21	DW	50.46	WW	51.21	DW	50.46	WW	52.45	DW	51.60	Mean value	
DW	50.46	TW	36.04	DW	50.46	TW	36.04	DW	51.60	TW	36.86	w	
Ww	0.75	Ws	14.42	Ww	0.75	Ws	14.42	Ww	0.85	Ws	14.74	5.39	%
w	5.20	%		w	5.20	%		w	5.77	%			

$$W = \frac{100 \times W'}{100 + w} : 59.237 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	27.5	28.5	29	8.405	8.405	2.8991	0.01217	0.0353	25.50	68.49	68.49
2	23.5	24.5	29	9.414	4.707	2.1696	0.01217	0.0264	21.50	57.75	57.75
5	17.5	18.5	29	10.928	2.186	1.4784	0.01217	0.0180	15.50	41.63	41.63
15	14.5	15.5	29	11.685	0.779	0.8826	0.01217	0.0107	12.50	33.57	33.57
30	12.5	13.5	29	12.189	0.406	0.6374	0.01217	0.0078	10.50	28.20	28.20
60	11.0	12.0	29	12.568	0.209	0.4577	0.01217	0.0056	9.00	24.17	24.17
240	9.5	10.5	28	12.946	0.054	0.2323	0.01230	0.0029	7.50	20.14	20.14
1140	8.0	9.0	29	13.325	0.012	0.1081	0.01217	0.0013	6.00	16.12	16.12

P = 100/W = 1.6881

$$Mx = \frac{Gs}{Gs - 1} = 1.5910$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.08	22.02	0.060		0.10	99.90	99.90
0.42	22.15		0.130		0.22	99.78	99.78
0.25	22.35		0.330		0.56	99.44	99.44
0.105	25.01		2.990		5.05	94.95	94.95
0.074	28.24		6.220		10.50	89.50	89.50

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BUMN
Hadir untuk negeri

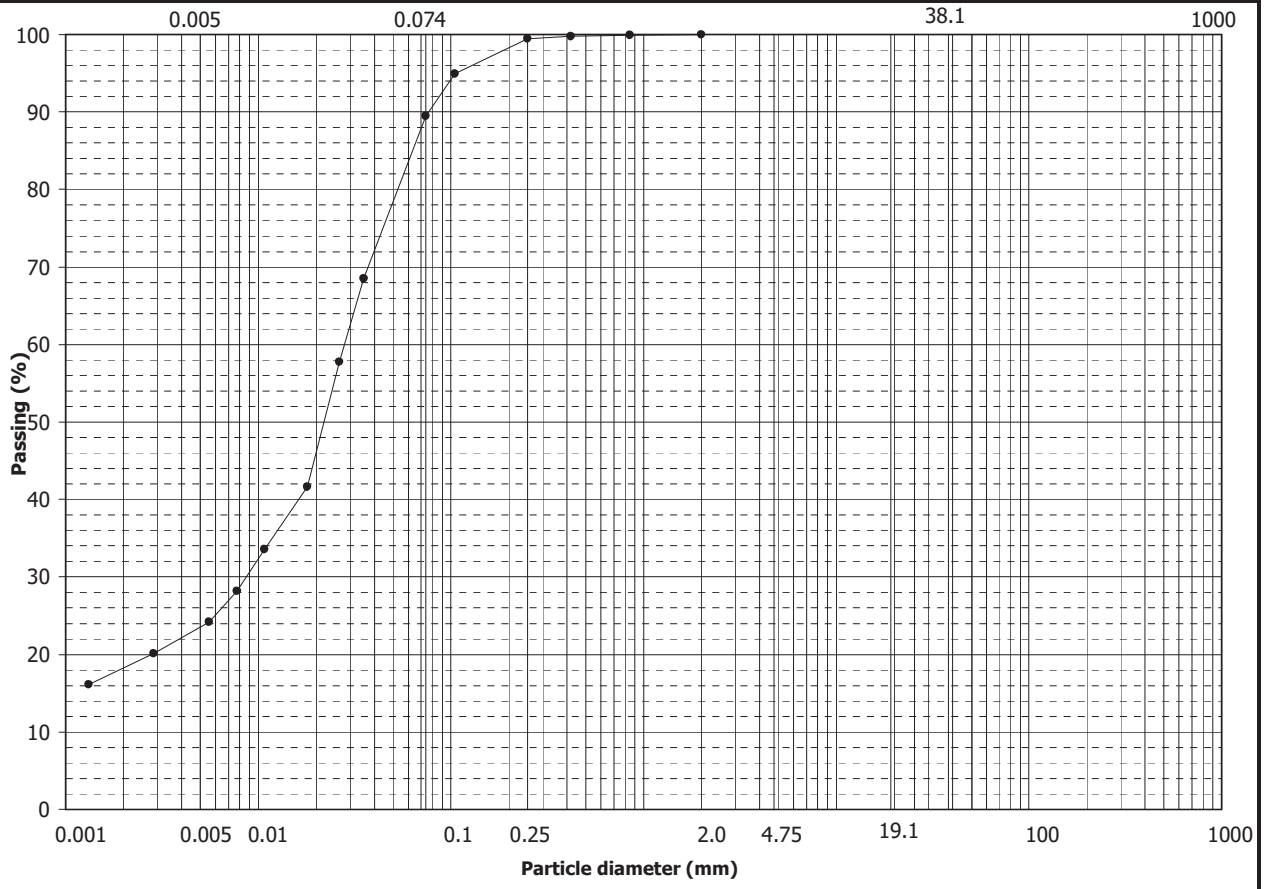
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**8.50 - 9.00**

SPECIFIC GRAVITY : **2.692**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	10.50	65.98	23.52	2.00	0.0768	0.0283	0.0224	0.0088	-	-	100.00	99.78	89.50



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**9.50 - 10.00**

Wt. (Air dry soil + container) = _____ gr
Wt. container No ..... = _____ gr
Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 23	DEPTH	9.50 - 10.00

Wt. (Air dry soil + container) = 121.52 gr — Specific Gravity : 2.708
Wt. of container M-89 = 46.77 gr — Plasticity Index : %
Wt. Of air dry soil W' = 74.75 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-07			NO	A-58			NO	A-81		
WW	59.58	DW	58.93	WW	53.43	DW	52.86	WW	49.10	DW	48.50	Mean value	
DW	58.93	TW	42.09	DW	52.86	TW	37.76	DW	48.50	TW	34.64	w	
Ww	0.65	Ws	16.84	Ww	0.57	Ws	15.10	Ww	0.60	Ws	13.86	3.99	%
w	3.86	%		w	3.77	%		w	4.33	%			

$$W = \frac{100 \times W'}{100 + w} : 71.883 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	24.0	25.0	29	9.288	9.288	3.0476	0.01211	0.0369	22.00	48.52	48.52
2	21.0	22.0	29	10.045	5.022	2.2411	0.01211	0.0271	19.00	41.91	41.91
5	17.0	18.0	29	11.054	2.211	1.4869	0.01211	0.0180	15.00	33.08	33.08
15	14.0	15.0	29	11.811	0.787	0.8873	0.01211	0.0107	12.00	26.47	26.47
30	12.0	13.0	29	12.315	0.411	0.6407	0.01211	0.0078	10.00	22.06	22.06
60	10.5	11.5	29	12.694	0.212	0.4600	0.01211	0.0056	8.50	18.75	18.75
240	9.0	10.0	28	13.072	0.054	0.2334	0.01224	0.0029	7.00	15.44	15.44
1140	7.5	8.5	29	13.451	0.012	0.1086	0.01211	0.0013	5.50	12.13	12.13

P = 100/W = 1.3911

$$Mx = \frac{Gs}{Gs - 1} = 1.5855$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.13	22.02	0.110		0.15	99.85	99.85
0.42	22.28		0.260		0.36	99.64	99.64
0.25	22.68		0.660		0.92	99.08	99.08
0.105	28.00		5.980		8.32	91.68	91.68
0.074	35.24		13.220		18.39	81.61	81.61

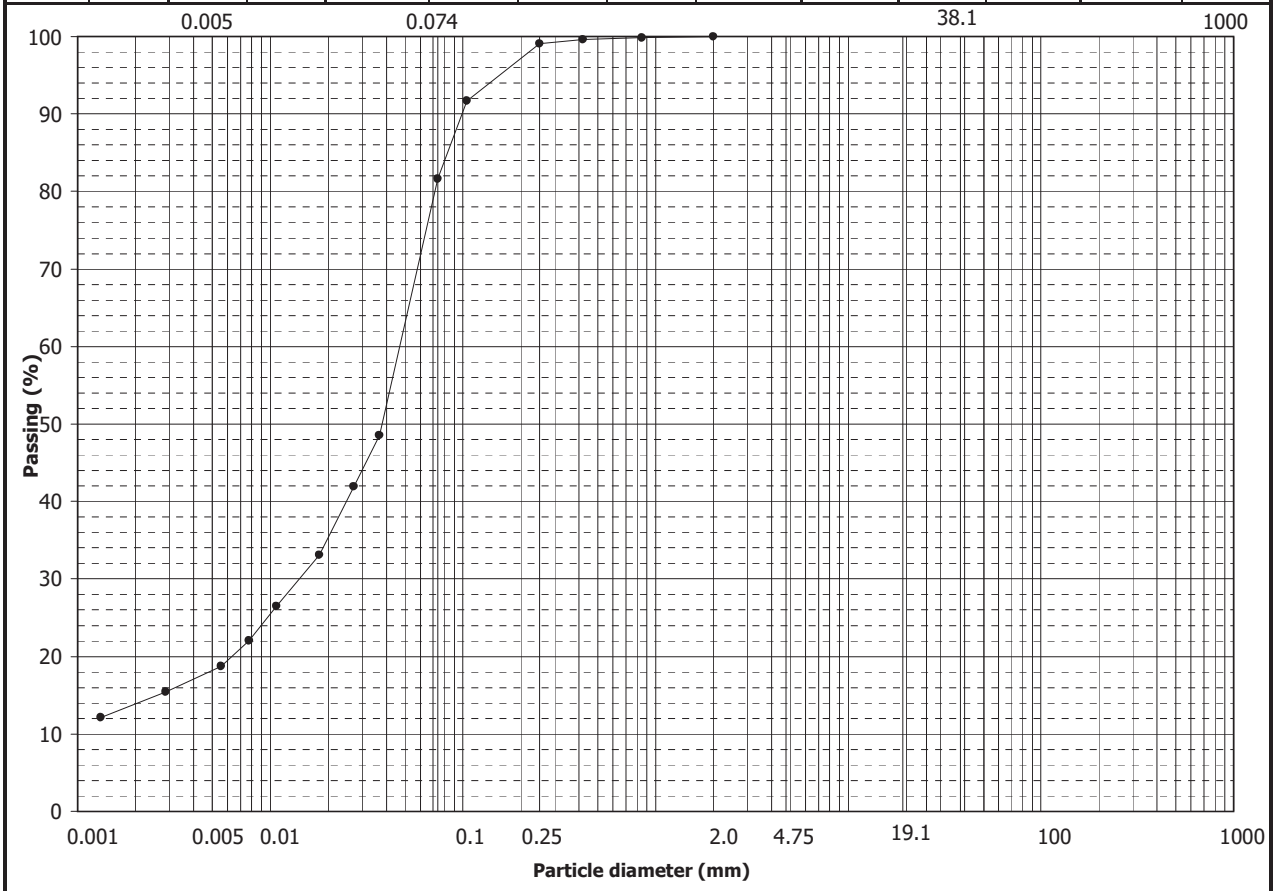
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**9.50 - 10.00**

SPECIFIC GRAVITY : **2.708**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	18.39	63.40	18.21	2.00	0.0998	0.0498	0.0386	0.0146	-	-	100.00	99.64	81.61



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**11.50 - 12.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 23	DEPTH	11.50 - 12.00

Wt. (Air dry soil + container) = 106.39 gr — Specific Gravity : 2.617
Wt. of container M-62 = 41.78 gr — Plasticity Index : %
Wt. Of air dry soil W' = 64.61 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-59			NO	A-82			NO	A-90		
WW	56.59	DW	55.31	WW	53.34	DW	52.14	WW	56.74	DW	55.38	Mean value	
DW	55.31	TW	39.51	DW	52.14	TW	37.24	DW	55.38	TW	39.56	w	
Ww	1.28	Ws	15.80	Ww	1.20	Ws	14.90	Ww	1.36	Ws	15.82	8.25	%
w	8.10	%		w	8.05	%		w	8.60	%			

$$W = \frac{100 \times W'}{100 + w} : 59.686 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	35.0	36.0	29	6.512	6.512	2.5520	0.01244	0.0318	33.00	89.48	89.48
2	33.0	34.0	29	7.017	3.509	1.8731	0.01244	0.0233	31.00	84.06	84.06
5	29.0	30.0	29	8.026	1.605	1.2670	0.01244	0.0158	27.00	73.21	73.21
15	24.0	25.0	29	9.288	0.619	0.7869	0.01244	0.0098	22.00	59.65	59.65
30	20.0	21.0	29	10.297	0.343	0.5859	0.01244	0.0073	18.00	48.81	48.81
60	17.0	18.0	29	11.054	0.184	0.4292	0.01244	0.0053	15.00	40.67	40.67
240	13.0	14.0	28	12.063	0.050	0.2242	0.01258	0.0028	11.00	29.83	29.83
1140	9.5	10.5	29	12.946	0.011	0.1066	0.01244	0.0013	7.50	20.34	20.34

P = 100/W = 1.6754

$$Mx = \frac{G_s}{G_s - 1} = 1.6184$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.25	22.02	0.230		0.39	99.61	99.61
0.42	22.34		0.320		0.54	99.46	99.46
0.25	22.55		0.530		0.89	99.11	99.11
0.105	22.73		0.710		1.19	98.81	98.81
0.074	23.40		1.380		2.31	97.69	97.69

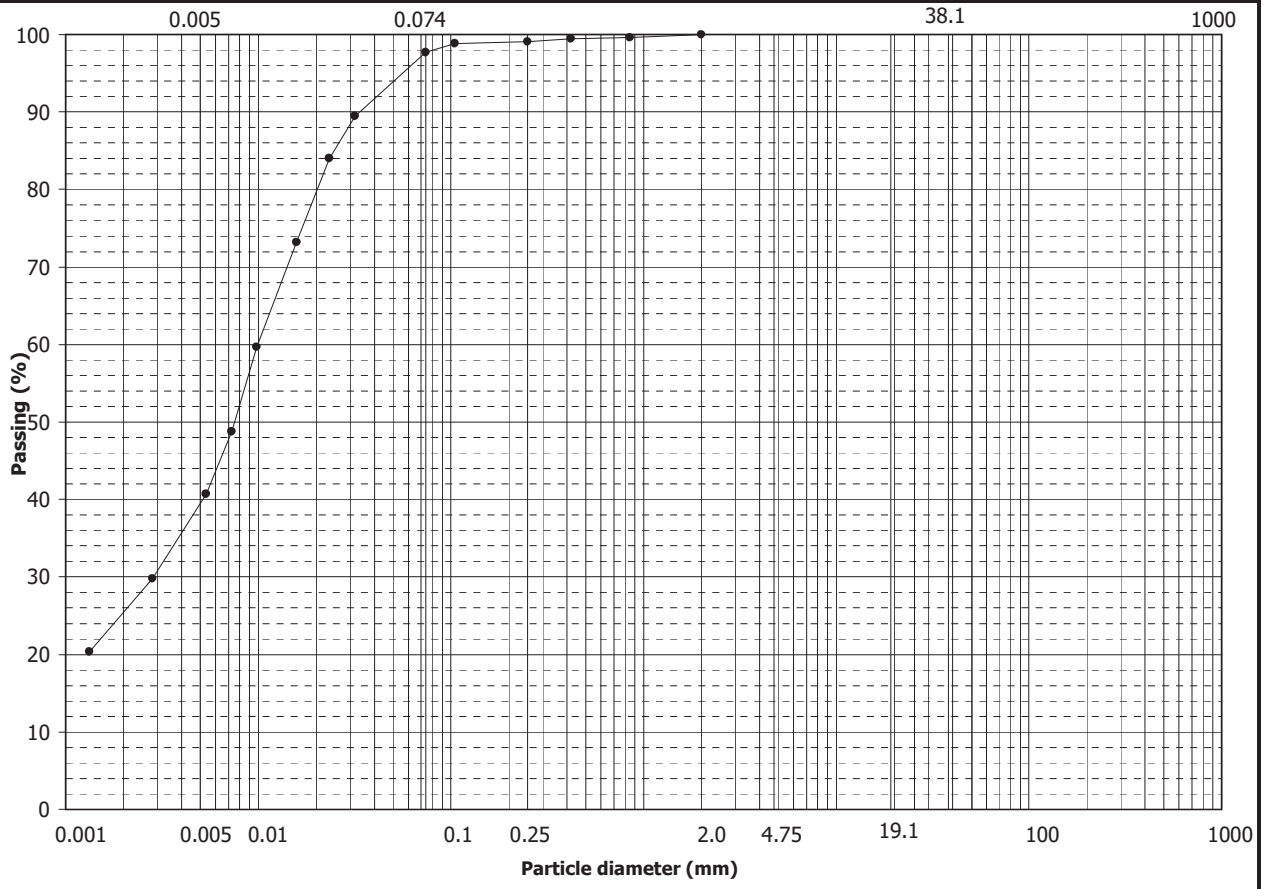
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**11.50 - 12.00**

SPECIFIC GRAVITY : **2.617**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
0.00	2.31	58.14	39.55	2.00	0.0344	0.0099	0.0076	0.0029	-	-	100.00	99.46	97.69



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**15.50 - 16.00**

Wt. (Air dry soil + container) = 163.80 gr — Specific Gravity : **2.653**

Wt. of container H-55 = 102.00 gr — Plasticity Index : %

Wt. Of air dry soil W' = 61.80 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-02			NO	A-43			NO	A-91		
WW	51.09	DW	50.18	WW	51.06	DW	50.16	WW	52.86	DW	51.84	Mean value	
DW	50.18	TW	35.84	DW	50.16	TW	35.83	DW	51.84	TW	37.03	w	
Ww	0.91	Ws	14.34	Ww	0.90	Ws	14.33	Ww	1.02	Ws	14.81	6.50	%
w	6.35	%		w	6.28	%		w	6.89	%			

$$W = \frac{100 \times W'}{100 + w} : 58.026 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	26.0	27.0	29	8.783	8.783	2.9636	0.01231	0.0365	24.00	66.38	66.38
2	22.0	23.0	29	9.792	4.896	2.2127	0.01231	0.0272	20.00	55.32	55.32
5	18.0	19.0	29	10.802	2.160	1.4698	0.01231	0.0181	16.00	44.26	44.26
15	13.0	14.0	29	12.063	0.804	0.8968	0.01231	0.0110	11.00	30.43	30.43
30	11.0	12.0	29	12.568	0.419	0.6472	0.01231	0.0080	9.00	24.89	24.89
60	9.0	10.0	29	13.072	0.218	0.4668	0.01231	0.0057	7.00	19.36	19.36
240	7.0	8.0	28	13.577	0.057	0.2378	0.01244	0.0030	5.00	13.83	13.83
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01231	0.0014	3.50	9.68	9.68

P = 100/W = 1.7234

$$Mx = \frac{Gs}{Gs - 1} = 1.6050$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.18	22.02	0.160		0.28	99.72	99.72
0.42	22.40		0.380		0.65	99.35	99.35
0.25	22.74		0.720		1.24	98.76	98.76
0.105	24.92		2.900		5.00	95.00	95.00
0.074	27.84		5.820		10.03	89.97	89.97

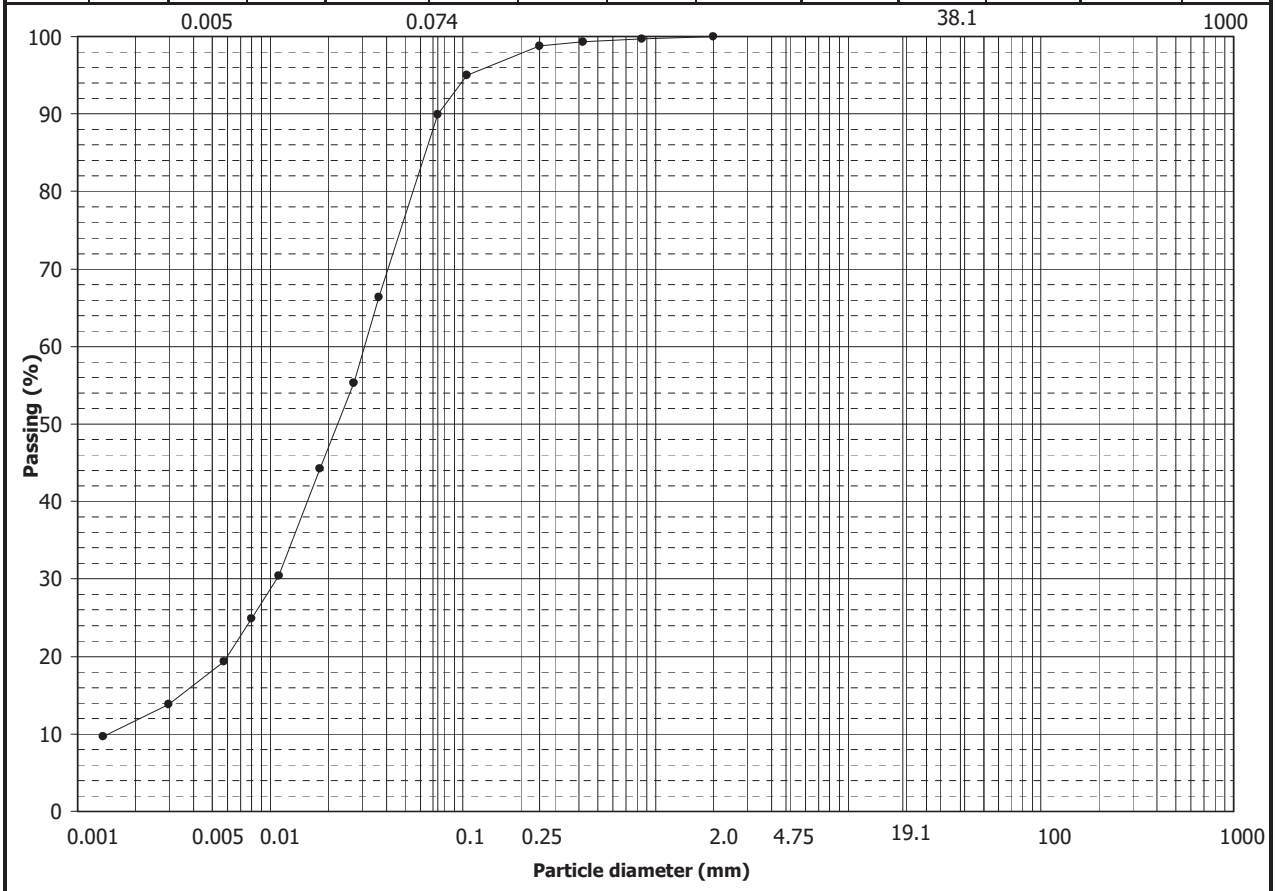
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**15.50 - 16.00**

SPECIFIC GRAVITY : **2.653**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	10.03	71.77	18.20	2.00	0.0742	0.0311	0.0228	0.0108	0.0015	20.98	100.00	99.35	89.97



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**17.50 - 18.00**

Wt. (Air dry soil + container) = 509.0 gr
Wt. container No ..... = 42.22 gr
Wt. Of air dry soil W' = 466.8 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **466.78** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						100.00
9.52	46.10	42.22	3.88		0.83	99.17
4.75	75.60		33.38		7.15	92.85
2.00	116.50		74.28		15.91	84.09

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**17.50 - 18.00**

Wt. (Air dry soil + container) = 149.69 gr — Specific Gravity : **2.645**

Wt. of container M-50 = 40.73 gr — Plasticity Index : %

Wt. Of air dry soil W' = 108.96 gr — Deflocculating agent 2.0

% finer then 2.00 mm : 84.09 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

			NO	A-55			NO	A-61			NO	A-71		
WW	59.10	DW	58.70		WW	52.18	DW	51.84	WW	55.71	DW	55.26	Mean value	
DW	58.70	TW	41.93		DW	51.84	TW	37.03	DW	55.26	TW	39.47	w	
Ww	0.40	Ws	16.77		Ww	0.34	Ws	14.81	Ww	0.45	Ws	15.79	2.51	%
w	2.39	%			w	2.30	%		w	2.85	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 106.292 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	29	11.054	11.054	3.3247	0.01234	0.0410	15.00	22.69	19.08
2	15.0	16.0	29	11.558	5.779	2.4040	0.01234	0.0297	13.00	19.67	16.54
5	12.5	13.5	29	12.189	2.438	1.5614	0.01234	0.0193	10.50	15.88	13.36
15	10.0	11.0	29	12.820	0.855	0.9245	0.01234	0.0114	8.00	12.10	10.18
30	9.0	10.0	29	13.072	0.436	0.6601	0.01234	0.0081	7.00	10.59	8.90
60	8.0	9.0	29	13.325	0.222	0.4712	0.01234	0.0058	6.00	9.08	7.63
240	6.0	7.0	28	13.829	0.058	0.2400	0.01247	0.0030	4.00	6.05	5.09
1140	4.5	5.5	29	14.208	0.012	0.1116	0.01234	0.0014	2.50	3.78	3.18

P = 100/W = 0.9408

$$Mx = \frac{G_s}{G_s - 1} = 1.6079$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	45.48	22.02	23.460		22.07	77.93	65.53
0.42	71.90		49.880		46.93	53.07	44.63
0.25	82.85		60.830		57.23	42.77	35.96
0.105	92.75		70.730		66.54	33.46	28.13
0.074	96.59		74.570		70.16	29.84	25.09

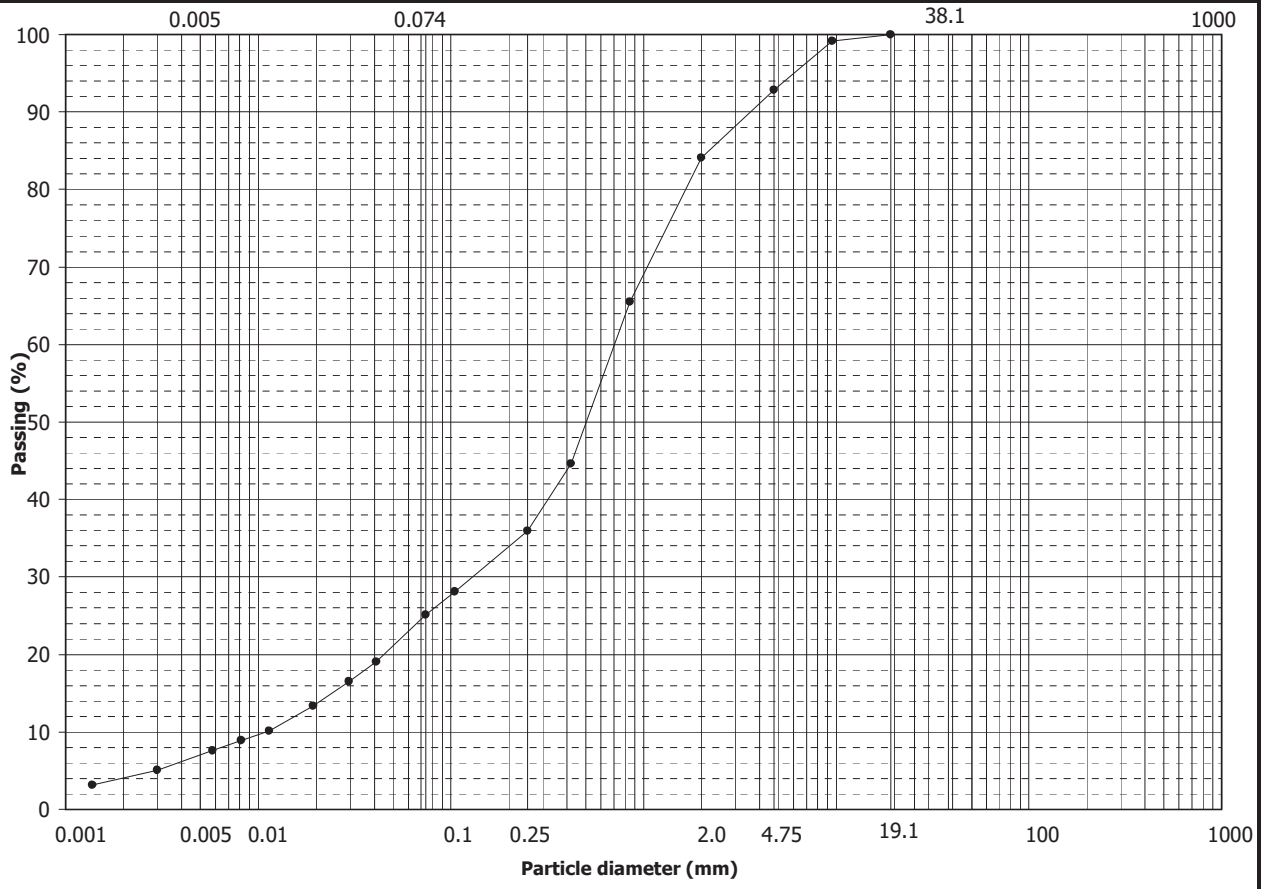
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**17.50 - 18.00**

SPECIFIC GRAVITY : **2.645**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
7.15	67.75	18.04	7.05	19.10	3.8559	0.7363	0.5305	0.1396	0.0110	67.21	84.09	44.63	25.09



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**18.50 - 19.00**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 16, 2019
LOCATION	TALISE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	BAY - 23	DEPTH	18.50 - 19.00

Wt. (Air dry soil + container) = 113.52 gr — Specific Gravity : 2.675
Wt. of container M-02 = 46.88 gr — Plasticity Index : %
Wt. Of air dry soil W' = 66.64 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-02			NO	A-43			NO	A-91		
WW	51.03	DW	50.18	WW	51.01	DW	50.16	WW	52.80	DW	51.84	Mean value	
DW	50.18	TW	35.84	DW	50.16	TW	35.83	DW	51.84	TW	37.03	w	
Ww	0.85	Ws	14.34	Ww	0.85	Ws	14.33	Ww	0.96	Ws	14.81	6.11	%
w	5.93	%		w	5.93	%		w	6.48	%			

$$W = \frac{100 \times W'}{100 + w} : 62.801 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	27.0	28.0	29	8.531	8.531	2.9208	0.01223	0.0357	25.00	63.57	63.57
2	23.0	24.0	29	9.540	4.770	2.1840	0.01223	0.0267	21.00	53.40	53.40
5	17.0	18.0	29	11.054	2.211	1.4869	0.01223	0.0182	15.00	38.14	38.14
15	13.0	14.0	29	12.063	0.804	0.8968	0.01223	0.0110	11.00	27.97	27.97
30	11.0	12.0	29	12.568	0.419	0.6472	0.01223	0.0079	9.00	22.89	22.89
60	9.5	10.5	29	12.946	0.216	0.4645	0.01223	0.0057	7.50	19.07	19.07
240	8.0	9.0	28	13.325	0.056	0.2356	0.01236	0.0029	6.00	15.26	15.26
1140	6.5	7.5	29	13.703	0.012	0.1096	0.01223	0.0013	4.50	11.44	11.44

P = 100/W = 1.5923

$$Mx = \frac{G_s}{G_s - 1} = 1.5970$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.21	22.02	0.190		0.30	99.70	99.70
0.42	22.79		0.770		1.23	98.77	98.77
0.25	23.23		1.210		1.93	98.07	98.07
0.105	25.73		3.710		5.91	94.09	94.09
0.074	29.02		7.000		11.15	88.85	88.85

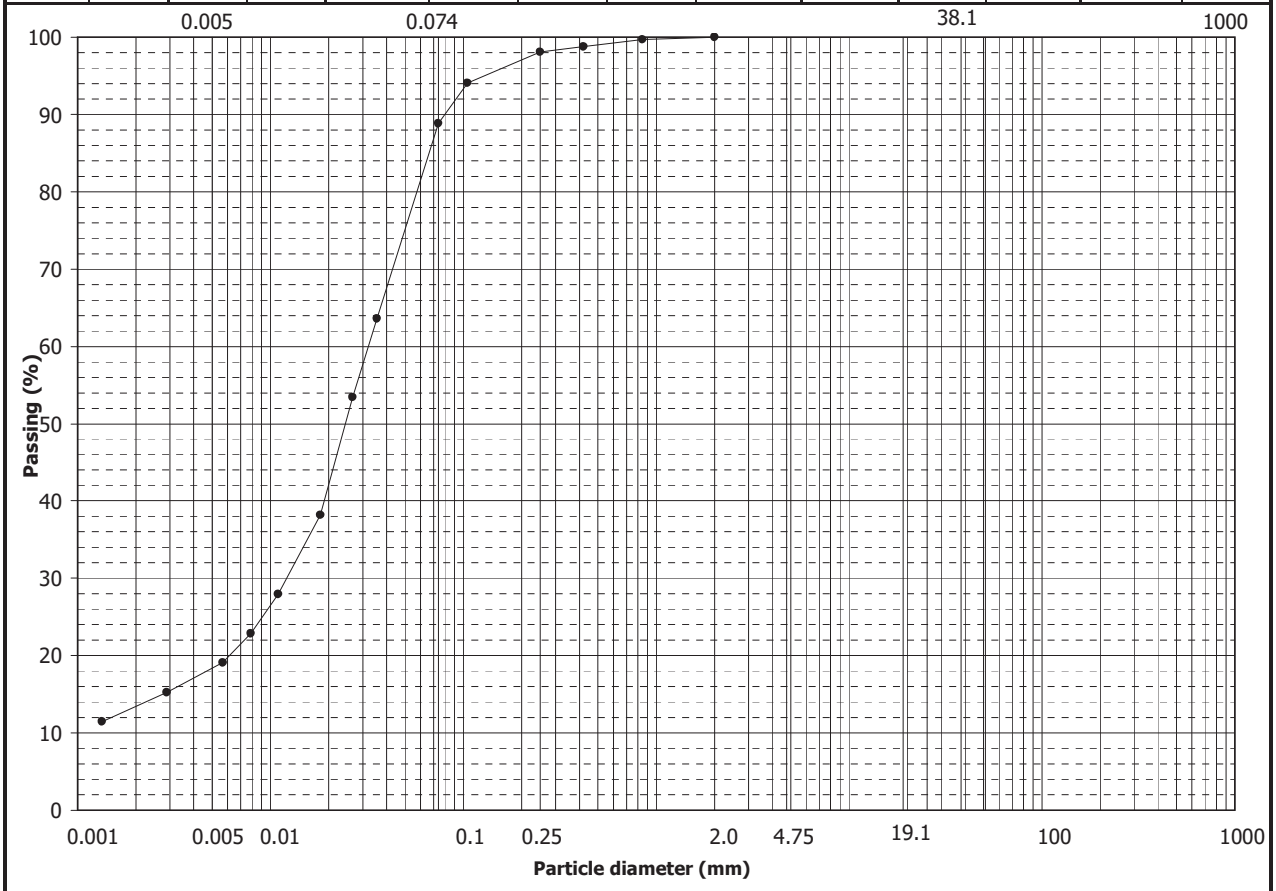
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 16, 2019
LOCATION	**TALISE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**BAY - 23**	DEPTH	**18.50 - 19.00**

SPECIFIC GRAVITY : **2.675**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	11.15	70.51	18.34	2.00	0.0808	0.0325	0.0248	0.0124	-	-	100.00	98.77	88.85



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		0.50 - 1.00

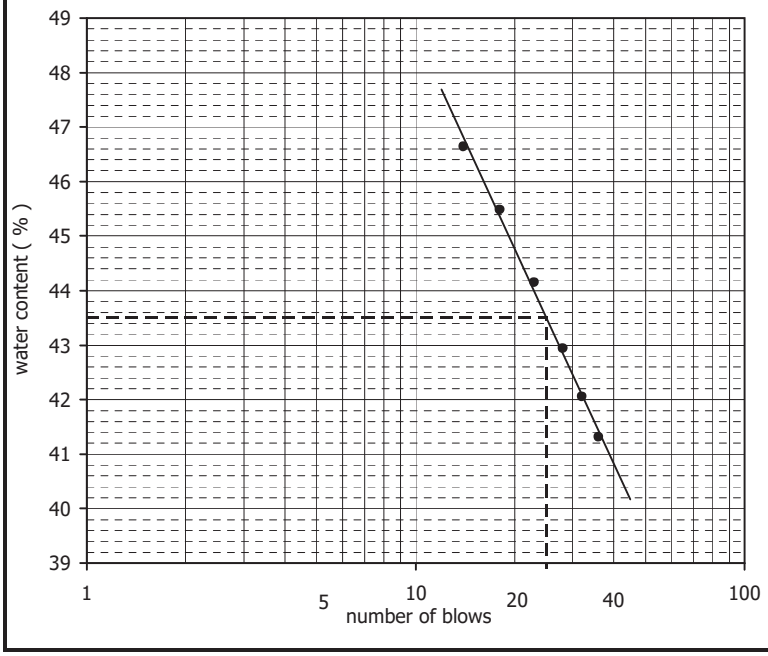
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	L-37			No.	T-36			No.	J-52
WW	57.630	DW	52.140	WW	55.610	DW	50.210	WW	51.890	DW	47.330
DW	52.140	TW	38.850	DW	50.210	TW	37.370	DW	47.330	TW	36.710
Ww	5.490	Ws	13.290	Ww	5.400	Ws	12.840	Ww	4.560	Ws	10.620
	W =		41.31 %		W =		42.06 %		W =		42.94 %

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			18 x	NO. OF BLOWS			14 x
		No.	T-65			No.	T-37			No.	T-12
WW	52.550	DW	46.850	WW	58.920	DW	53.070	WW	56.160	DW	50.810
DW	46.850	TW	33.940	DW	53.070	TW	40.210	DW	50.810	TW	39.340
Ww	5.700	Ws	12.910	Ww	5.850	Ws	12.860	Ww	5.350	Ws	11.470
	W =		44.15 %		W =		45.49 %		W =		46.64 %

PLASTIC LIMIT

1				2				3			
		No.	T-49			No.	L-36			No.	J-82
WW	52.070	DW	48.960	WW	54.200	DW	51.090	WW	54.860	DW	51.240
DW	48.960	TW	38.340	DW	51.090	TW	40.360	DW	51.240	TW	38.760
Ww	3.110	Ws	10.620	Ww	3.110	Ws	10.730	Ww	3.620	Ws	12.480
	W =		29.28 %		W =		28.98 %		W =		29.01 %



LIQUID LIMIT	=	43.51	%
PLASTIC LIMIT	=	29.09	%
PLASTICITY INDEX	=	14.42	%
FLOW INDEX	=	13.11	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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Cb. Sit : Jalan Jendi Barat 27 Malang Telp.: (0341) 362261, Fax.: (0341) 324402; E-mail : divisi.sit@indrakarya.co.id atau lab_geoteknik_ikm@yahoo.com

LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		1.50 - 2.00

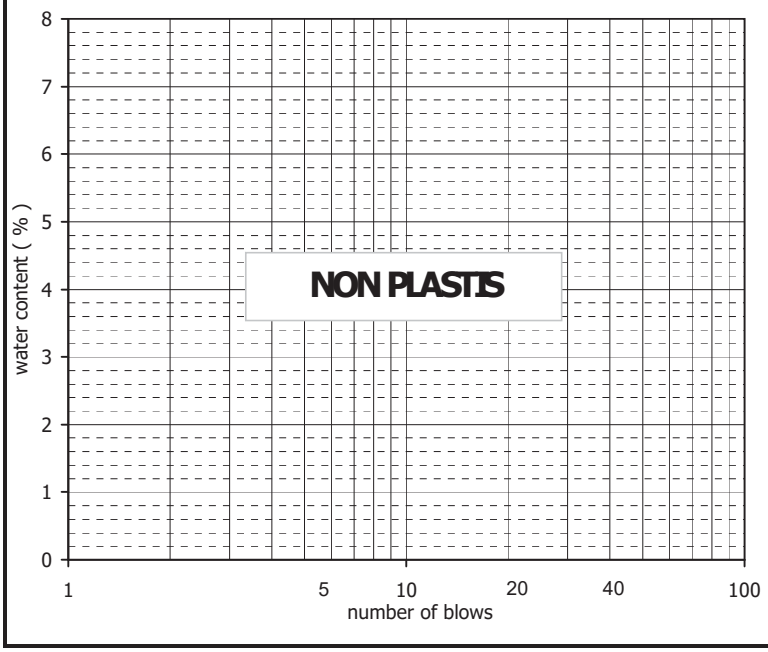
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		2.50 - 3.00

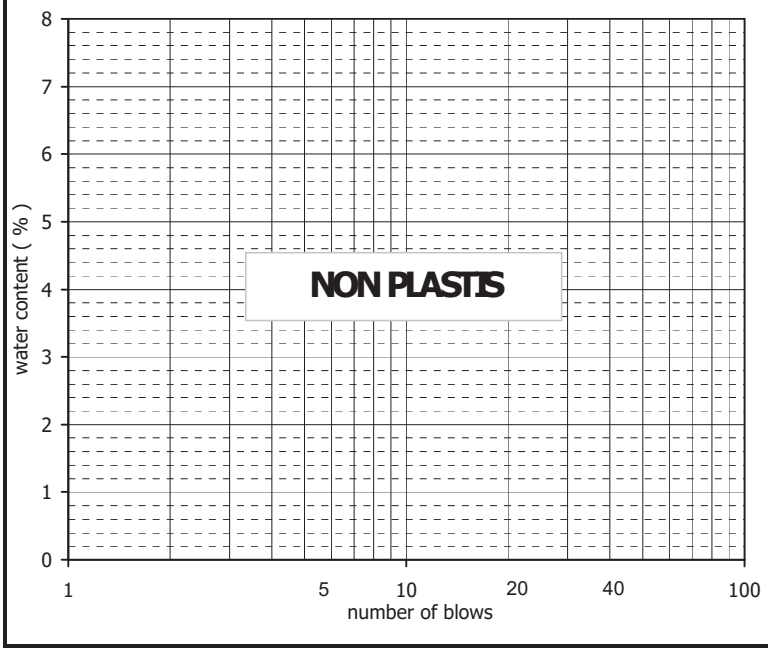
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		3.50 - 4.00

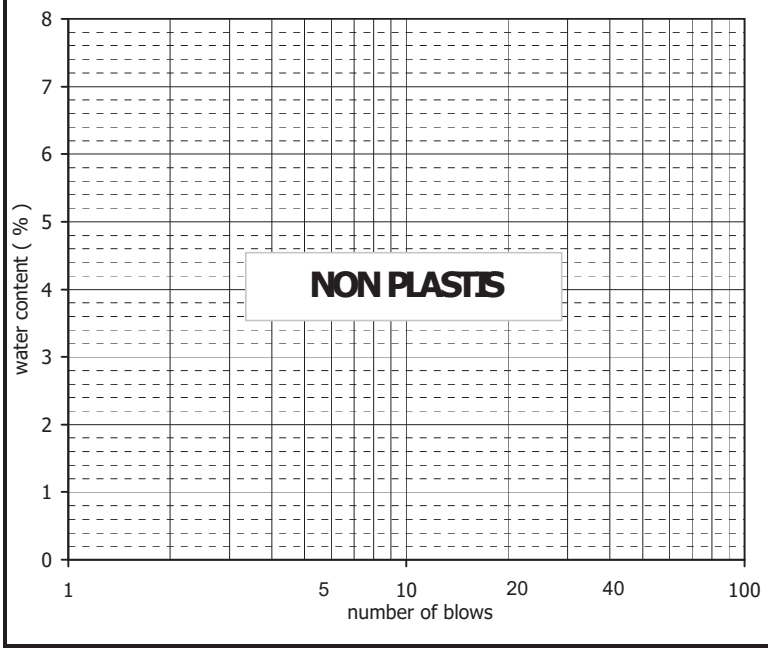
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		4.50 - 5.00

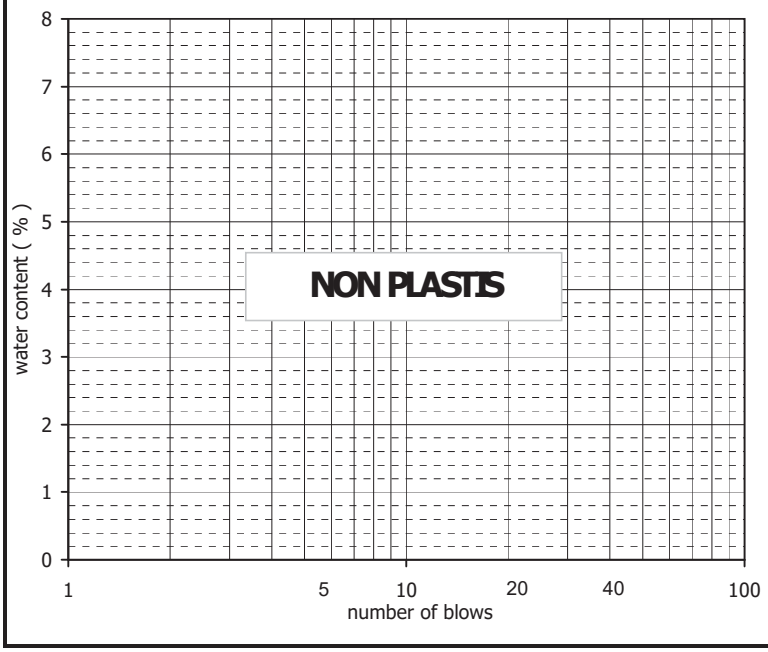
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		4.50 - 5.00

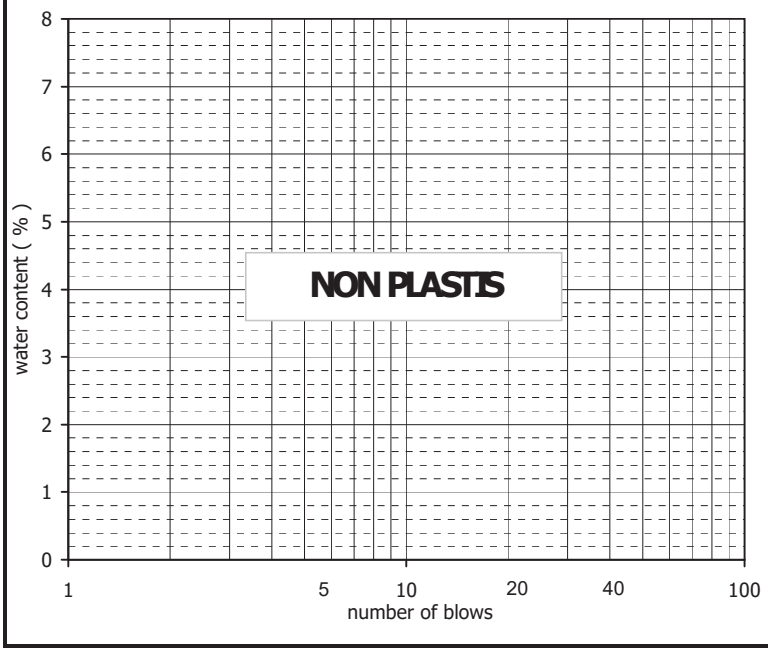
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =	%		W =	%		W =	%	



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		6.50 - 7.00

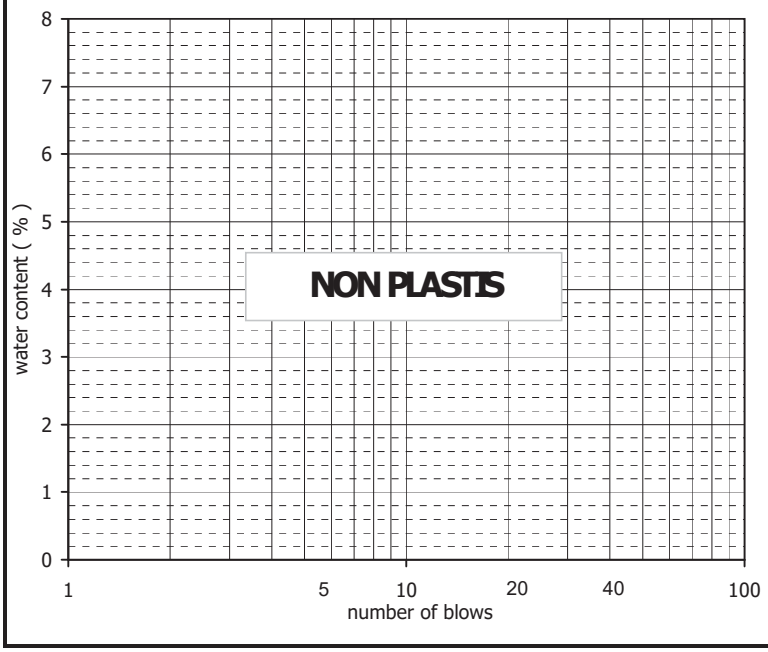
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
	No.		No.		No.
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		7.50 - 8.00

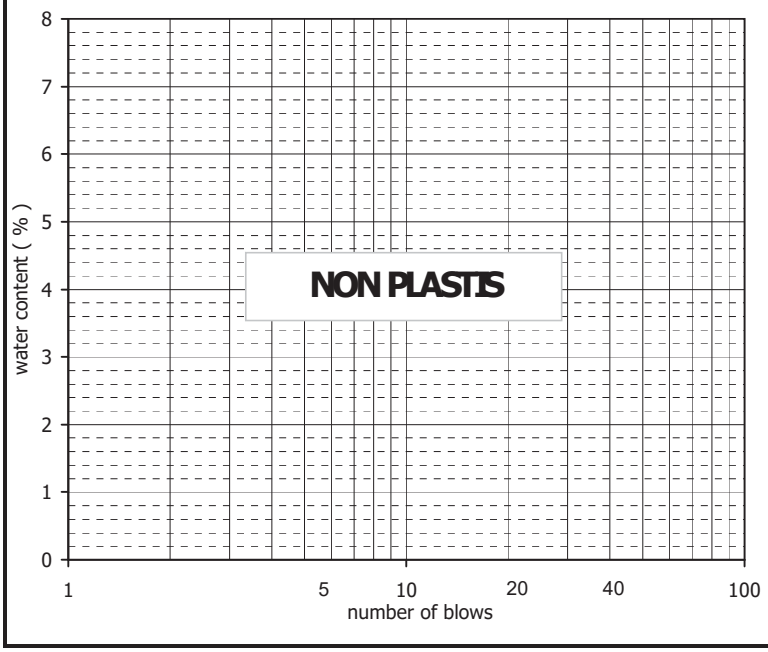
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
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TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		8.50 - 9.00

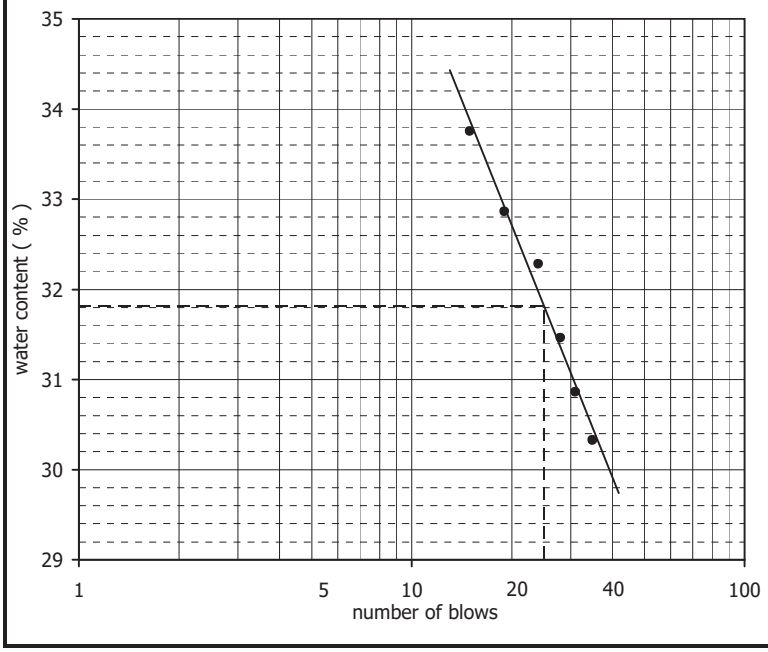
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	T-27			No.	T-44			No.	J-09
WW	55.040	DW	51.240	WW	55.050	DW	50.890	WW	56.500	DW	52.580
DW	51.240	TW	38.710	DW	50.890	TW	37.410	DW	52.580	TW	40.120
Ww	3.800	Ws	12.530	Ww	4.160	Ws	13.480	Ww	3.920	Ws	12.460
	W =		30.33 %		W =		30.86 %		W =		31.46 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	J-70			No.	J-83			No.	J-26
WW	57.940	DW	53.150	WW	54.180	DW	50.210	WW	55.570	DW	51.290
DW	53.150	TW	38.310	DW	50.210	TW	38.130	DW	51.290	TW	38.610
Ww	4.790	Ws	14.840	Ww	3.970	Ws	12.080	Ww	4.280	Ws	12.680
	W =		32.28 %		W =		32.86 %		W =		33.75 %

PLASTIC LIMIT

1				2				3			
		No.	J-89			No.	J-92			No.	T-45
WW	54.800	DW	51.280	WW	52.950	DW	49.940	WW	54.330	DW	51.210
DW	51.280	TW	37.250	DW	49.940	TW	37.970	DW	51.210	TW	38.690
Ww	3.520	Ws	14.030	Ww	3.010	Ws	11.970	Ww	3.120	Ws	12.520
	W =		25.09 %		W =		25.15 %		W =		24.92 %



LIQUID LIMIT	=	31.82	%
PLASTIC LIMIT	=	25.05	%
PLASTICITY INDEX	=	6.76	%
FLOW INDEX	=	9.22	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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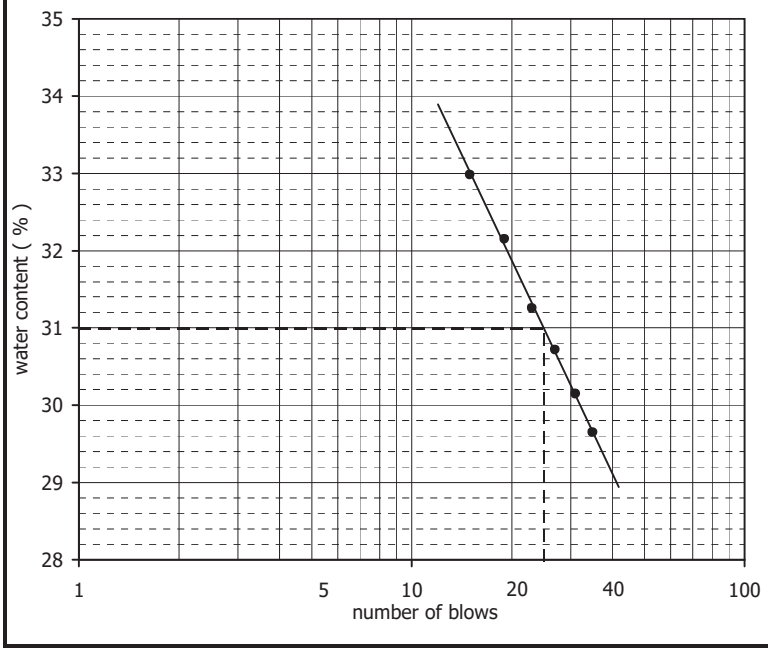
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		9.50 - 10.00

LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	L-59			No.	J-90			No.	L-43
WW	54.940	DW	51.050	WW	56.020	DW	52.110	WW	53.900	DW	50.180
DW	51.050	TW	37.930	DW	52.110	TW	39.140	DW	50.180	TW	38.070
Ww	3.890	Ws	13.120	Ww	3.910	Ws	12.970	Ww	3.720	Ws	12.110
	W =		29.65 %		W =		30.15 %		W =		30.72 %
4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	L-12			No.	A-58			No.	A-18
WW	53.640	DW	49.960	WW	54.120	DW	50.140	WW	57.240	DW	53.180
DW	49.960	TW	38.186	DW	50.140	TW	37.760	DW	53.180	TW	40.870
Ww	3.680	Ws	11.774	Ww	3.980	Ws	12.380	Ww	4.060	Ws	12.310
	W =		31.26 %		W =		32.15 %		W =		32.98 %

PLASTIC LIMIT

1				2				3			
		No.	A-17			No.	A-33			No.	A-36
WW	52.680	DW	49.440	WW	51.980	DW	49.150	WW	52.430	DW	49.220
DW	49.440	TW	36.390	DW	49.150	TW	37.890	DW	49.220	TW	36.350
Ww	3.240	Ws	13.050	Ww	2.830	Ws	11.260	Ww	3.210	Ws	12.870
	W =		24.83 %		W =		25.13 %		W =		24.94 %



LIQUID LIMIT	=	30.99	%
PLASTIC LIMIT	=	24.97	%
PLASTICITY INDEX	=	6.02	%
FLOW INDEX	=	9.10	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		11.50 - 12.00

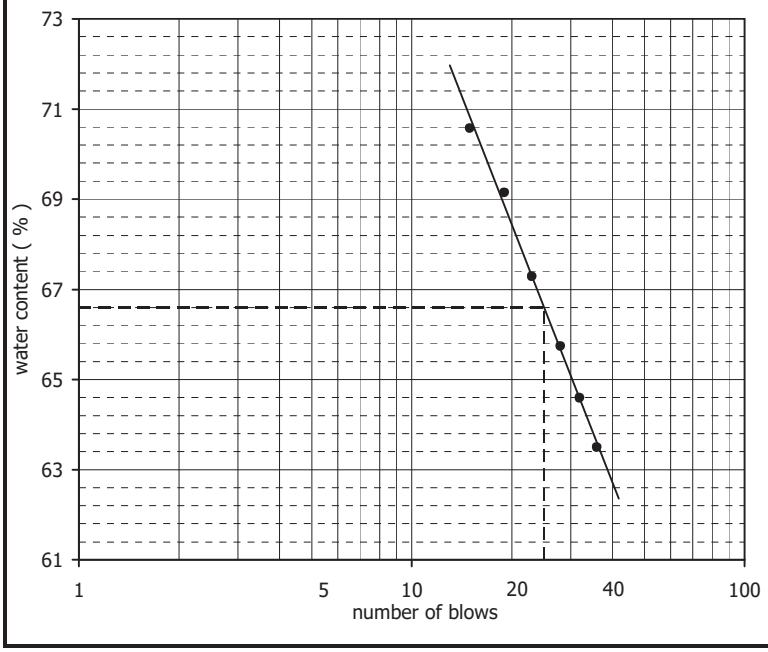
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			28 x
		No.	J-48			No.	T-81			No.	T-69
WW	55.340	DW	48.260	WW	58.780	DW	50.770	WW	56.480	DW	49.110
DW	48.260	TW	37.110	DW	50.770	TW	38.370	DW	49.110	TW	37.900
Ww	7.080	Ws	11.150	Ww	8.010	Ws	12.400	Ww	7.370	Ws	11.210
	W =	63.50	%		W =	64.60	%		W =	65.74	%

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	A-102			No.	J-03			No.	T-75
WW	56.160	DW	48.860	WW	58.610	DW	50.720	WW	61.220	DW	51.340
DW	48.860	TW	38.010	DW	50.720	TW	39.310	DW	51.340	TW	37.340
Ww	7.300	Ws	10.850	Ww	7.890	Ws	11.410	Ww	9.880	Ws	14.000
	W =	67.28	%		W =	69.15	%		W =	70.57	%

PLASTIC LIMIT

1				2				3			
		No.	T-19			No.	A-40			No.	T-61
WW	56.310	DW	50.890	WW	54.540	DW	49.710	WW	53.630	DW	48.730
DW	50.890	TW	39.080	DW	49.710	TW	39.240	DW	48.730	TW	38.030
Ww	5.420	Ws	11.810	Ww	4.830	Ws	10.470	Ww	4.900	Ws	10.700
	W =	45.89	%		W =	46.13	%		W =	45.79	%



LIQUID LIMIT	=	66.61	%
PLASTIC LIMIT	=	45.94	%
PLASTICITY INDEX	=	20.67	%
FLOW INDEX	=	18.87	

REMARKS :

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TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		15.50 - 16.00

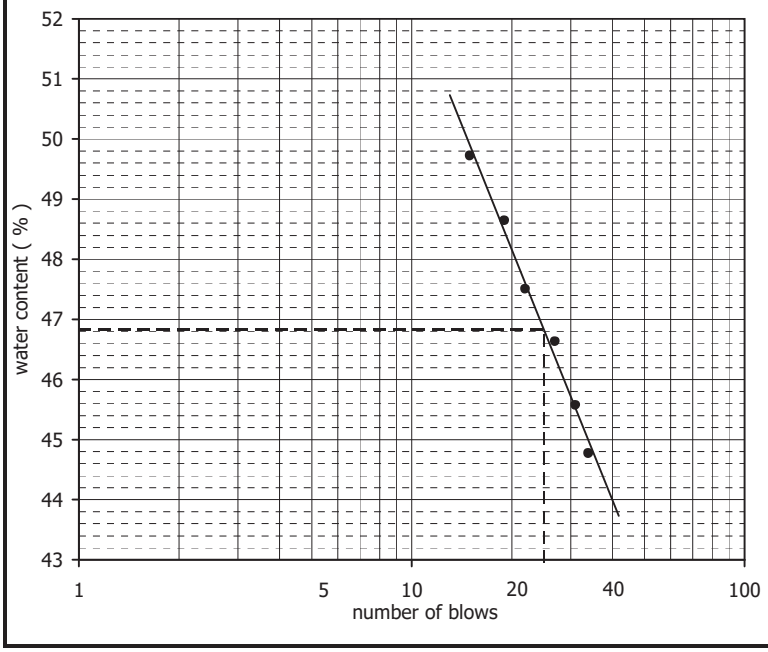
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-29			No.	T-58			No.	J-79
WW	55.100	DW	49.660	WW	54.270	DW	48.910	WW	54.800	DW	48.940
DW	49.660	TW	37.510	DW	48.910	TW	37.150	DW	48.940	TW	36.373
Ww	5.440	Ws	12.150	Ww	5.360	Ws	11.760	Ww	5.860	Ws	12.567
	W =	44.77	%		W =	45.58	%		W =	46.63	%

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	A-05			No.	J-87			No.	T-41
WW	59.350	DW	52.690	WW	57.400	DW	50.770	WW	57.860	DW	51.540
DW	52.690	TW	38.670	DW	50.770	TW	37.140	DW	51.540	TW	38.830
Ww	6.660	Ws	14.020	Ww	6.630	Ws	13.630	Ww	6.320	Ws	12.710
	W =	47.50	%		W =	48.64	%		W =	49.72	%

PLASTIC LIMIT

1				2				3			
		No.	A-70			No.	A-72			No.	T-42
WW	51.210	DW	47.720	WW	51.750	DW	47.770	WW	54.060	DW	50.330
DW	47.720	TW	37.830	DW	47.770	TW	36.570	DW	50.330	TW	39.730
Ww	3.490	Ws	9.890	Ww	3.980	Ws	11.200	Ww	3.730	Ws	10.600
	W =	35.29	%		W =	35.54	%		W =	35.19	%



LIQUID LIMIT	=	46.83	%
PLASTIC LIMIT	=	35.34	%
PLASTICITY INDEX	=	11.49	%
FLOW INDEX	=	13.74	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		17.50 - 18.00

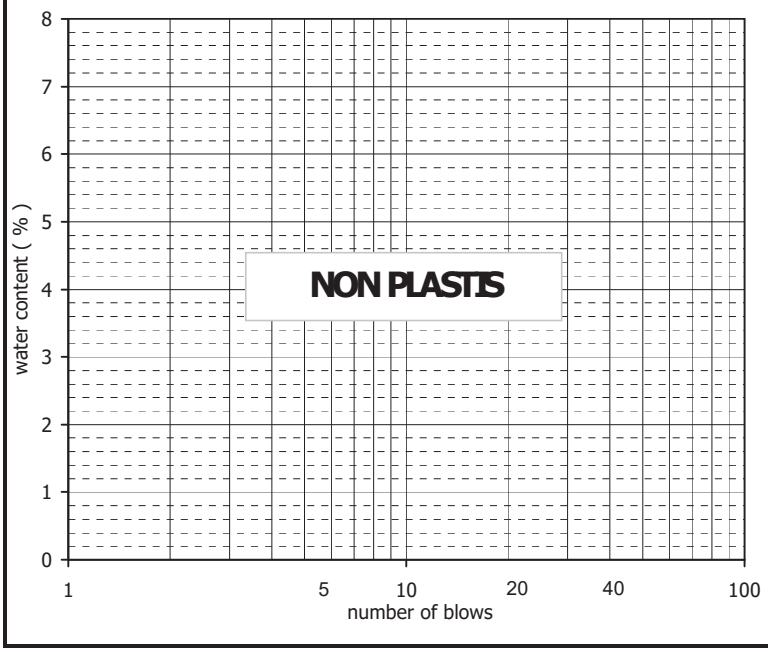
LIQUID LIMIT

1		2		3	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

4		5		6	
NO. OF BLOWS	x	NO. OF BLOWS	x	NO. OF BLOWS	x
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%

PLASTIC LIMIT

1		2		3	
No.		No.		No.	
WW	DW	WW	DW	WW	DW
DW	TW	DW	TW	DW	TW
Ww	Ws	Ww	Ws	Ww	Ws
W =	%	W =	%	W =	%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 7, 2019
LOCATION	:	TALISE PALU	TESTED BY		REDY ARIANTO
SAMPLE NO.	:	BAY - 23	DEPTH (m)		18.50 - 19.00

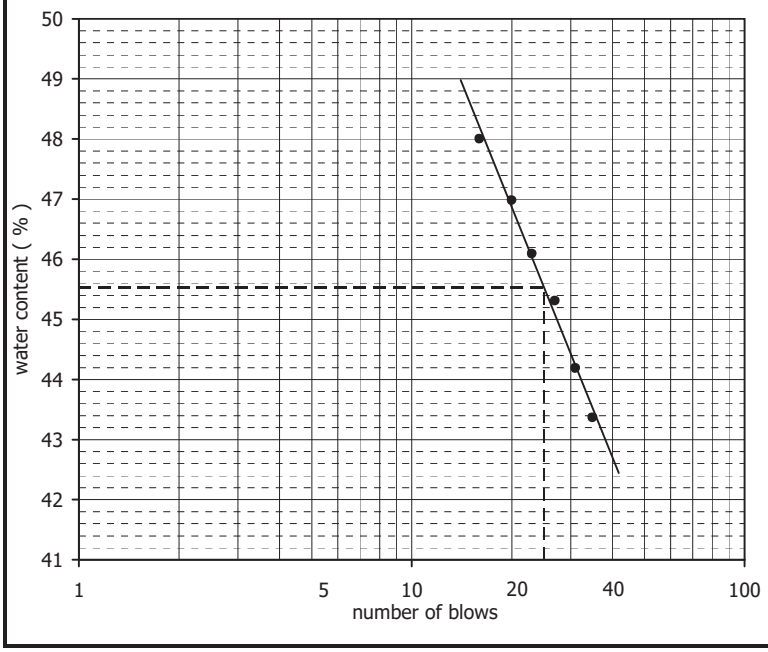
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	L-11			No.	J-44			No.	L-45
WW	59.890	DW	54.370	WW	57.070	DW	51.060	WW	58.780	DW	52.800
DW	54.370	TW	41.640	DW	51.060	TW	37.460	DW	52.800	TW	39.600
Ww	5.520	Ws	12.730	Ww	6.010	Ws	13.600	Ww	5.980	Ws	13.200
	W =	43.36	%		W =	44.19	%		W =	45.30	%

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			20 x	NO. OF BLOWS			16 x
		No.	J-32			No.	T-39			No.	J-35
WW	57.840	DW	52.180	WW	53.800	DW	47.890	WW	52.510	DW	46.630
DW	52.180	TW	39.900	DW	47.890	TW	35.310	DW	46.630	TW	34.380
Ww	5.660	Ws	12.280	Ww	5.910	Ws	12.580	Ww	5.880	Ws	12.250
	W =	46.09	%		W =	46.98	%		W =	48.00	%

PLASTIC LIMIT

1				2				3			
		No.	L-02			No.	T-22			No.	T-55
WW	54.700	DW	50.950	WW	52.400	DW	48.780	WW	51.070	DW	47.170
DW	50.950	TW	39.930	DW	48.780	TW	38.040	DW	47.170	TW	35.660
Ww	3.750	Ws	11.020	Ww	3.620	Ws	10.740	Ww	3.900	Ws	11.510
	W =	34.03	%		W =	33.71	%		W =	33.88	%



LIQUID LIMIT	=	45.53	%
PLASTIC LIMIT	=	33.87	%
PLASTICITY INDEX	=	11.66	%
FLOW INDEX	=	13.70	

REMARKS :

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DW : Wt. of container + dry soil in g.

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BUMN
Hadir untuk negeri

ISO 9001 CCMS - 3017883
ISO 14001 CCMS - 3019894
OHSAS 18001 CCMS - 3019827

SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**JONO OGE - PALU**									
SAMPLE No			TP - J8	TP - J8	TP - J8	TP - J8					
DEPTH (m)			SAMPLE - 1	SAMPLE - 2	SAMPLE - 3	SAMPLE - 4					
PROPERTIES	Natural Water Content	(%)	38.08	33.00	3.09	6.28					
	Specific gravity of soil	*Gs*	2.670	2.672	2.646	2.672					
GRAIN SIZE ANALYSIS	Proportion — Gravel part	(%)	0.00	0.00	15.54	0.45					
	Proportion — Sand part	(%)	16.51	23.97	77.36	57.21					
	Proportion — Silt part	(%)	35.10	60.73	5.70	25.12					
	Proportion — Clay part	(%)	48.39	15.30	1.39	17.21					
	Max. diameter	(mm)	4.75	2.00	25.40	9.52					
	90 % diameter	(mm)	0.1842	0.0987	8.1676	0.5084					
	60 % diameter	(mm)	0.0106	0.0552	0.9296	0.1527					
	50 % diameter	(mm)	0.0056	0.0435	0.6414	0.0975					
	30 % diameter	(mm)	0.0014	0.0208	0.3081	0.0290					
	10 % diameter	(mm)	-	0.0020	0.0984	-					
	Uniformity Coefficient		-	27.18	9.45	-					
	Passing # 200		83.49	76.03	7.10	42.34					
CONSISTENCY	Liquid limit *LL*	(%)	46.21	27.82	NON PLASTIS	25.94					
	Plastic limit *PL*	(%)	26.64	21.95		19.00					
	Plasticity index *PI*	(%)	19.57	5.87		6.94					
	Flow index		11.02	9.12		8.60					
	Unified Classification		CL	CL - ML		SC - SM					

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**JONO OGE - PALU**									
SAMPLE No			TP - J9	TP - J9	TP - J9	TP - J9	TP - J9				
DEPTH (m)			SAMPLE - 1	SAMPLE - 2	SAMPLE - 3	SAMPLE - 4	SAMPLE - 5				
PROPERTIES	Natural Water Content	(%)	29.31	38.00	14.30	2.93	33.07				
	Specific gravity of soil	*Gs*	2.670	2.646	2.659	2.653	2.634				
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	0.00	0.00	0.00	14.24	0.00				
	Proportion – Sand part	(%)	15.31	5.11	91.54	80.15	25.11				
	Proportion – Silt part	(%)	36.83	68.91	7.11	4.59	59.76				
	Proportion – Clay part	(%)	47.86	25.98	1.35	1.02	15.13				
	Max. diameter	(mm)	2.00	2.00	2.00	38.10	2.00				
	90 % diameter	(mm)	0.1601	0.0573	0.3719	9.7290	0.2696				
	60 % diameter	(mm)	0.0092	0.0154	0.2042	0.7650	0.0444				
	50 % diameter	(mm)	0.0056	0.0119	0.1790	0.5849	0.0305				
	30 % diameter	(mm)	0.0016	0.0062	0.1287	0.2952	0.0154				
	10 % diameter	(mm)	-	0.0014	0.0779	0.1126	0.0021				
	Uniformity Coefficient		-	10.77	2.62	6.80	21.28				
	Passing # 200		84.69	94.89	8.46	5.61	74.89				
CONSISTENCY	Liquid limit	*LL* (%)	46.38	42.21	NON PLASTIS	NON PLASTIS	31.61				
	Plastic limit	*PL* (%)	25.90	27.33			25.17				
	Plasticity index	*PI* (%)	20.48	14.89			6.44				
	Flow index		11.02	10.93			9.79				
	Unified Classification		CL	ML			CL - CM				

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	JONO OGE - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation				Date	Sample No.& Depth (m)	Average (%)	Calculation			
					No	T-03						No	
21/02	TP - J8		WW	115.11	DW	94.68				WW		DW	
2019	SAMPLE - 1	38.08	DW	94.68	TW	41.03				DW		TW	
			Ww	20.43	Ws	53.65				Ww		Ws	
					WC	(%) 38.08					WC	(%)	
					No	T-38						No	
21/02	TP - J8		WW	115.43	DW	96.19				WW		DW	
2019	SAMPLE - 2	33.00	DW	96.19	TW	37.88				DW		TW	
			Ww	19.24	Ws	58.31				Ww		Ws	
					WC	(%) 33.00					WC	(%)	
					No	J-48						No	
21/02	TP - J8		WW	109.18	DW	107.02				WW		DW	
2019	SAMPLE - 3	3.09	DW	107.02	TW	37.11				DW		TW	
			Ww	2.16	Ws	69.91				Ww		Ws	
					WC	(%) 3.09					WC	(%)	
					No	A-72						No	
21/02	TP - J8		WW	101.20	DW	97.38				WW		DW	
2019	SAMPLE - 4	6.28	DW	97.38	TW	36.57				DW		TW	
			Ww	3.82	Ws	60.81				Ww		Ws	
					WC	(%) 6.28					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	JONO OGE - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation				Date	Sample No.& Depth (m)	Average (%)	Calculation			
					No	A-70						No	
21/02	TP - J9		WW	121.40	DW	102.46				WW		DW	
2019	SAMPLE - 1	29.31	DW	102.46	TW	37.83				DW		TW	
			Ww	18.94	Ws	64.63				Ww		Ws	
					WC	(%) 29.31					WC	(%)	
					No	L-06						No	
21/02	TP - J9		WW	120.29	DW	97.17				WW		DW	
2019	SAMPLE - 2	38.00	DW	97.17	TW	36.32				DW		TW	
			Ww	23.12	Ws	60.85				Ww		Ws	
					WC	(%) 38.00					WC	(%)	
					No	J-09						No	
21/02	TP - J9		WW	110.86	DW	102.01				WW		DW	
2019	SAMPLE - 3	14.30	DW	102.01	TW	40.12				DW		TW	
			Ww	8.85	Ws	61.89				Ww		Ws	
					WC	(%) 14.30					WC	(%)	
					No	T-76						No	
21/02	TP - J9		WW	102.24	DW	100.39				WW		DW	
2019	SAMPLE - 4	2.93	DW	100.39	TW	37.34				DW		TW	
			Ww	1.85	Ws	63.05				Ww		Ws	
					WC	(%) 2.93					WC	(%)	
					No	T-04						No	
21/02	TP - J9		WW	122.33	DW	101.06				WW		DW	
2019	SAMPLE - 5	33.07	DW	101.06	TW	36.74				DW		TW	
			Ww	21.27	Ws	64.32				Ww		Ws	
					WC	(%) 33.07					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	JONO OGE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J8	DEPTH	SAMPLE - 1

Determination No				1	2	3	4
No of Pycnometer				29	33	71	
Weight of Pycnometer		Wf	(gr)	36.900	37.510	39.800	
Weight of (Pycnometer + Water)		Wa	(gr)	135.800	138.180	140.220	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.660	151.210	153.170	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.290	38.540	38.410	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.510	20.760	20.630	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8000	138.1800	140.2200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.730	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.681	2.686	2.686	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.667	2.672	2.672	
Average Specific Gravity at 20° C							**2.670**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	JONO OGE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J8	DEPTH	SAMPLE - 2

Determination No				1	2	3	4
No of Pycnometer				39	1	79	
Weight of Pycnometer		Wf	(gr)	36.940	62.150	37.880	
Weight of (Pycnometer + Water)		Wa	(gr)	136.930	165.770	137.560	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.040	178.820	150.640	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.660	38.580	38.620	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.880	20.800	20.840	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9300	165.7700	137.5600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.770	7.750	7.760	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.687	2.684	2.686	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.673	2.670	2.672	
Average Specific Gravity at 20° C							**2.672**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J8	DEPTH	SAMPLE - 3

Determination No				1	2	3	4
No of Pycnometer				34	24	57	
Weight of Pycnometer		Wf	(gr)	52.710	38.140	50.930	
Weight of (Pycnometer + Water)		Wa	(gr)	152.200	137.560	151.170	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.670	150.260	163.750	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.790	38.100	37.940	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.010	20.320	20.160	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	152.2000	137.5600	151.1700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.540	7.620	7.580	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.654	2.667	2.660	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.640	2.653	2.646	
Average Specific Gravity at 20° C							**2.646**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	JONO OGE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J8	DEPTH	SAMPLE - 4

Determination No				1	2	3	4
No of Pycnometer				37	22	80	
Weight of Pycnometer		Wf	(gr)	50.940	39.710	34.060	
Weight of (Pycnometer + Water)		Wa	(gr)	151.200	145.030	134.970	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.030	157.720	147.730	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.230	37.990	38.110	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.450	20.210	20.330	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.2000	145.0300	134.9700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.620	7.520	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.684	2.688	2.686	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.670	2.674	2.672	
Average Specific Gravity at 20° C							**2.672**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	JONO OGE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J9	DEPTH	SAMPLE - 1

Determination No				1	2	3	4
No of Pycnometer				26	10	51	
Weight of Pycnometer		Wf	(gr)	38.840	67.070	53.870	
Weight of (Pycnometer + Water)		Wa	(gr)	138.580	168.920	154.280	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	151.600	181.780	167.220	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.500	38.310	38.400	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.720	20.530	20.620	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.5800	168.9200	154.2800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.700	7.670	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.691	2.677	2.685	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.677	2.663	2.671	
Average Specific Gravity at 20° C							**2.670**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J9	DEPTH	SAMPLE - 2

Determination No				1	2	3	4
No of Pycnometer				36	21	64	
Weight of Pycnometer		Wf	(gr)	51.080	40.730	37.070	
Weight of (Pycnometer + Water)		Wa	(gr)	151.920	145.610	148.310	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.590	158.300	160.990	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.080	38.060	38.070	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.300	20.280	20.290	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.9200	145.6100	148.3100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.630	7.590	7.610	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.661	2.672	2.666	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.647	2.658	2.653	
Average Specific Gravity at 20° C							**2.653**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 24, 2019
LOCATION	JONO OGE - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J9	DEPTH	SAMPLE - 3

Determination No				1	2	3	4
No of Pycnometer				15	10	81	
Weight of Pycnometer		Wf	(gr)	77.130	67.070	36.910	
Weight of (Pycnometer + Water)		Wa	(gr)	173.150	168.920	135.890	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	185.830	181.550	148.550	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.110	38.010	38.070	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.330	20.230	20.290	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	173.1500	168.9200	135.8900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.600	7.630	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.658	2.662	2.659	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.644	2.648	2.646	
Average Specific Gravity at 20° C							**2.646**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J9	DEPTH	SAMPLE - 4

Determination No				1	2	3	4
No of Pycnometer				30	31	65	
Weight of Pycnometer		Wf	(gr)	38.460	34.630	34.080	
Weight of (Pycnometer + Water)		Wa	(gr)	138.140	134.510	134.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	150.860	147.230	146.990	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.100	38.110	38.100	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.320	20.330	20.320	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	138.1400	134.5100	134.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.600	7.610	7.600	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.674	2.671	2.674	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.660	2.658	2.660	
Average Specific Gravity at 20° C							**2.659**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 24, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - J9	DEPTH	SAMPLE - 5

Determination No				1	2	3	4
No of Pycnometer				17	23	60	
Weight of Pycnometer		Wf	(gr)	64.940	43.180	43.180	
Weight of (Pycnometer + Water)		Wa	(gr)	169.440	146.380	146.610	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	182.110	159.020	159.260	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.100	38.130	38.110	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.320	20.350	20.330	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	169.4400	146.3800	146.6100	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.650	7.710	7.680	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.656	2.639	2.647	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.643	2.626	2.634	
Average Specific Gravity at 20° C							**2.634**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J8**	DEPTH	**SAMPLE - 1**

Wt. (Air dry soil + container) = 502.9 gr
Wt. container No ..... = 44.34 gr
Wt. Of air dry soil W' = 458.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **458.56** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	49.93	44.34	5.59		1.22	98.78

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J8	DEPTH	SAMPLE - 1

Wt. (Air dry soil + container) = 101.55 gr — Specific Gravity : 2.670
Wt. of container B-84 = 35.70 gr — Plasticity Index : %
Wt. Of air dry soil W' = 65.85 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 98.78 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-81			NO	L-28			NO	J-28		
WW	51.93	DW	51.10	WW	54.20	DW	53.34	WW	49.56	DW	48.76	Mean value	
DW	51.10	TW	37.85	DW	53.34	TW	39.51	DW	48.76	TW	36.12	w	
Ww	0.83	Ws	13.25	Ww	0.86	Ws	13.83	Ww	0.80	Ws	12.64	6.27	%
w	6.26	%		w	6.22	%		w	6.33	%			

$$W = \frac{100 \times W'}{100 + w} : 61.965 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	31.5	32.5	29	7.396	7.396	2.7195	0.01225	0.0333	29.50	76.12	75.19
2	30.0	31.0	29	7.774	3.887	1.9715	0.01225	0.0241	28.00	72.25	71.36
5	28.0	29.0	29	8.279	1.656	1.2867	0.01225	0.0158	26.00	67.08	66.27
15	25.0	26.0	29	9.035	0.602	0.7761	0.01225	0.0095	23.00	59.34	58.62
30	23.0	24.0	29	9.540	0.318	0.5639	0.01225	0.0069	21.00	54.18	53.52
60	21.0	22.0	29	10.045	0.167	0.4092	0.01225	0.0050	19.00	49.02	48.43
240	17.0	18.0	28	11.054	0.046	0.2146	0.01238	0.0027	15.00	38.70	38.23
1140	13.5	14.5	29	11.937	0.010	0.1023	0.01225	0.0013	11.50	29.67	29.31

P = 100/W = 1.6138

$$Mx = \frac{G_s}{G_s - 1} = 1.5988$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.64	22.02	0.620		1.00	99.00	97.79
0.42	23.84		1.820		2.94	97.06	95.88
0.25	25.66		3.640		5.87	94.13	92.98
0.105	29.78		7.760		12.52	87.48	86.41
0.074	31.61		9.590		15.48	84.52	83.49

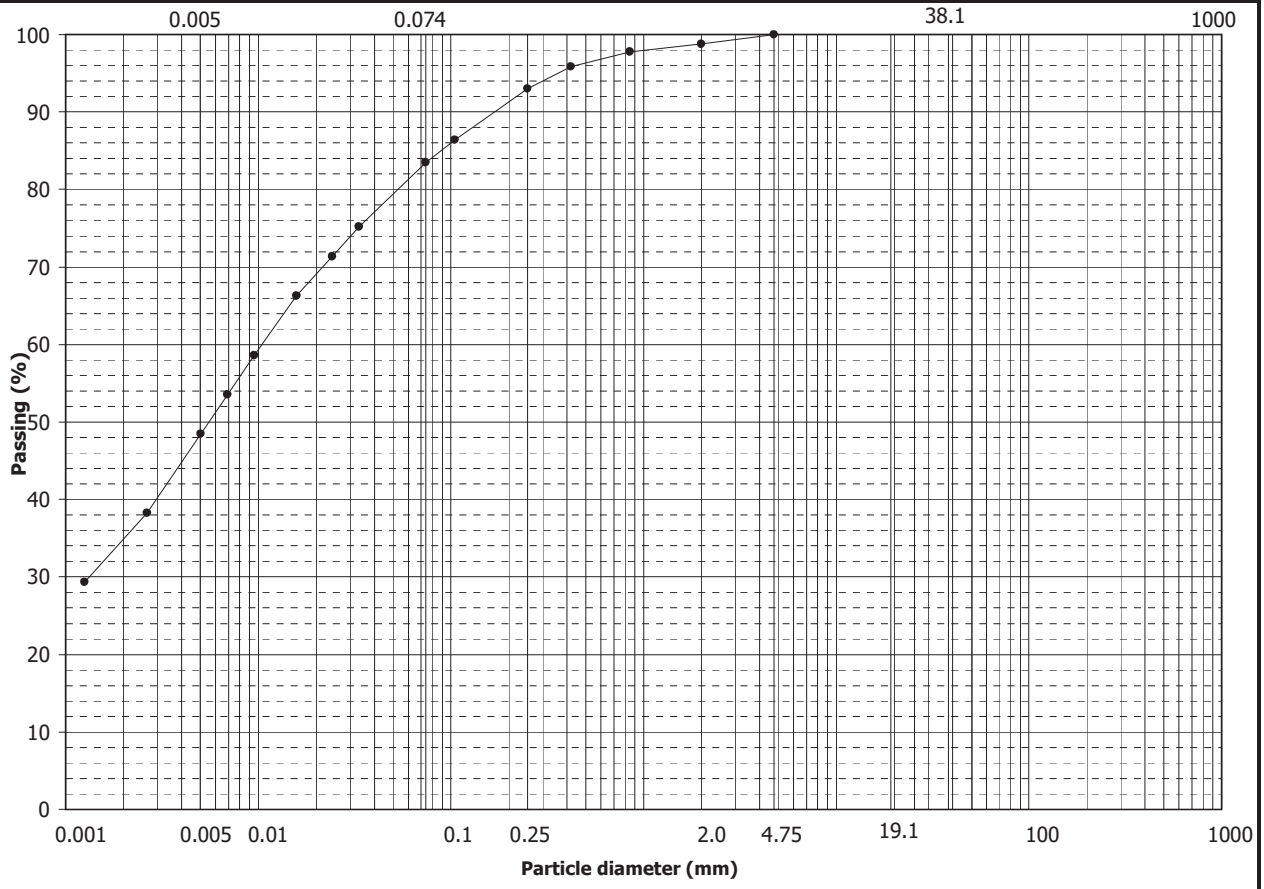
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J8**	DEPTH	**SAMPLE - 1**

SPECIFIC GRAVITY : **2.670**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	16.51	35.10	48.39	4.75	0.1842	0.0106	0.0056	0.0014	-	-	98.78	95.88	83.49



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J8**	DEPTH	**SAMPLE - 2**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J8	DEPTH	SAMPLE - 2

Wt. (Air dry soil + container) = 114.18 gr — Specific Gravity : 2.672
Wt. of container B-102 = 35.86 gr — Plasticity Index : %
Wt. Of air dry soil W' = 78.32 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-69			NO	J-25			NO	A-16		
WW	45.33	DW	44.70	WW	49.35	DW	48.67	WW	51.75	DW	51.02	Mean value	
DW	44.70	TW	33.11	DW	48.67	TW	36.05	DW	51.02	TW	37.79	w	
Ww	0.63	Ws	11.59	Ww	0.68	Ws	12.62	Ww	0.73	Ws	13.23	5.45	%
w	5.44	%		w	5.39	%		w	5.52	%			

$$W = \frac{100 \times W'}{100 + w} : 74.274 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	23.0	24.0	29	9.540	9.540	3.0887	0.01224	0.0378	21.00	45.18	45.18
2	19.0	20.0	29	10.549	5.275	2.2967	0.01224	0.0281	17.00	36.58	36.58
5	15.0	16.0	29	11.558	2.312	1.5204	0.01224	0.0186	13.00	27.97	27.97
15	12.0	13.0	29	12.315	0.821	0.9061	0.01224	0.0111	10.00	21.52	21.52
30	10.5	11.5	29	12.694	0.423	0.6505	0.01224	0.0080	8.50	18.29	18.29
60	9.5	10.5	29	12.946	0.216	0.4645	0.01224	0.0057	7.50	16.14	16.14
240	7.5	8.5	28	13.451	0.056	0.2367	0.01237	0.0029	5.50	11.83	11.83
1140	6.0	7.0	29	13.829	0.012	0.1101	0.01224	0.0013	4.00	8.61	8.61

P = 100/W = 1.3464

$$Mx = \frac{G_s}{G_s - 1} = 1.5981$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.06	22.02	0.040		0.05	99.95	99.95
0.42	22.14		0.120		0.16	99.84	99.84
0.25	22.63		0.610		0.82	99.18	99.18
0.105	26.81		4.790		6.45	93.55	93.55
0.074	39.82		17.800		23.97	76.03	76.03

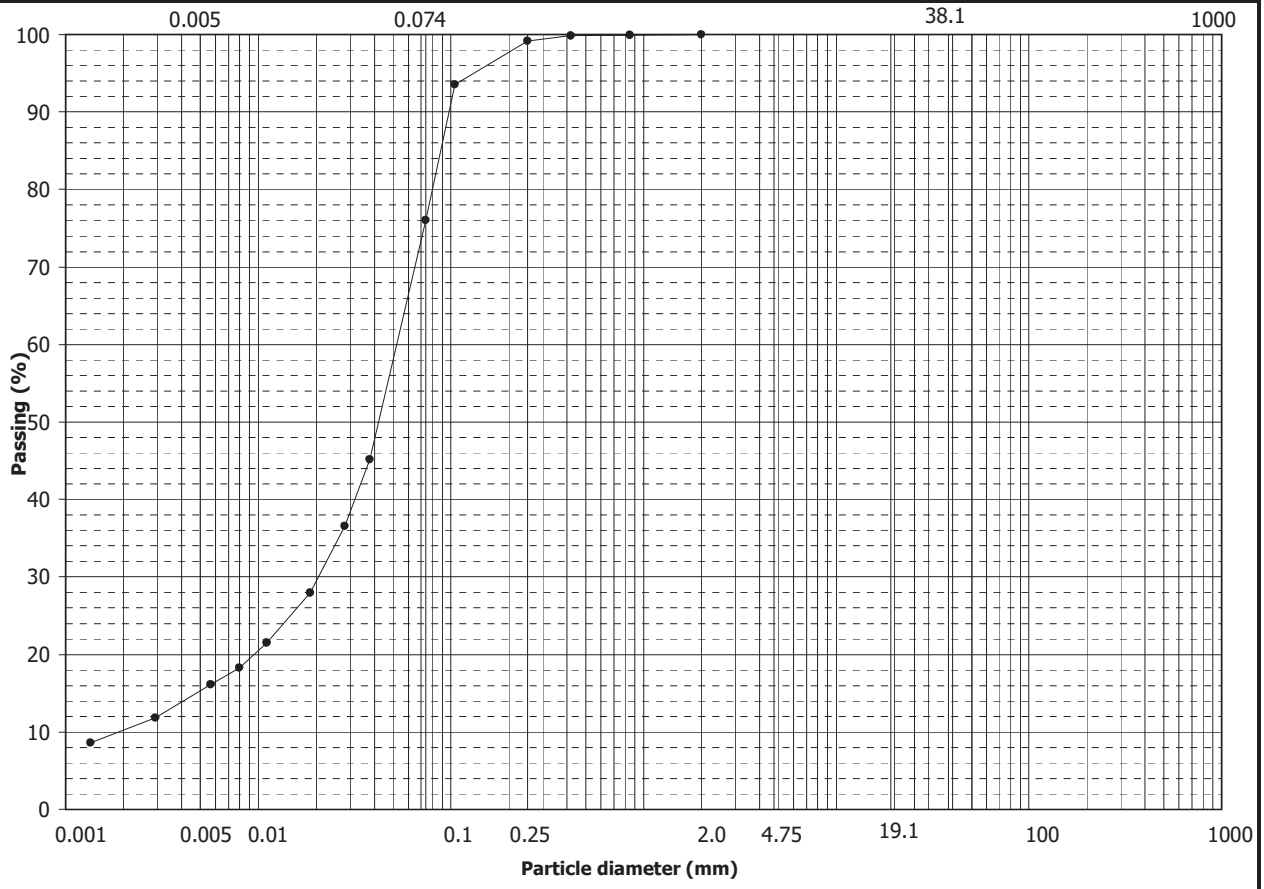
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J8**	DEPTH	**SAMPLE - 2**

SPECIFIC GRAVITY : **2.672**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	23.97	60.73	15.30	2.00	0.0987	0.0552	0.0435	0.0208	0.0020	27.18	100.00	99.84	76.03



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J8**	DEPTH	**SAMPLE - 3**

Wt. (Air dry soil + container) = 1394.0 gr
Wt. container No ..... = 41.92 gr
Wt. Of air dry soil W' = 1352.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **1352.08** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	55.60	41.92	13.68		1.01	98.99
9.52	147.50		105.58		7.81	92.19
4.75	252.00		210.08		15.54	84.46
2.00	399.90		357.98		26.48	73.52

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J8	DEPTH	SAMPLE - 3

Wt. (Air dry soil + container) = 152.02 gr — Specific Gravity : 2.646
Wt. of container B-70 = 33.31 gr — Plasticity Index : %
Wt. Of air dry soil W' = 118.71 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 73.52 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-61			NO	J-17			NO	A-107		
WW	50.38	DW	49.99	WW	51.15	DW	50.76	WW	49.10	DW	48.69	Mean value	
DW	49.99	TW	37.03	DW	50.76	TW	37.60	DW	48.69	TW	36.07	w	
Ww	0.39	Ws	12.96	Ww	0.39	Ws	13.16	Ww	0.41	Ws	12.62	3.07	%
w	3.01	%		w	2.96	%		w	3.25	%			

$$W = \frac{100 \times W'}{100 + w} : 115.170 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	6.0	7.0	29	13.829	13.829	3.7188	0.01233	0.0459	4.00	5.58	4.10
2	5.5	6.5	29	13.955	6.978	2.6415	0.01233	0.0326	3.50	4.89	3.59
5	5.0	6.0	29	14.081	2.816	1.6782	0.01233	0.0207	3.00	4.19	3.08
15	4.5	5.5	29	14.208	0.947	0.9732	0.01233	0.0120	2.50	3.49	2.57
30	4.0	5.0	29	14.334	0.478	0.6912	0.01233	0.0085	2.00	2.79	2.05
60	3.5	4.5	29	14.460	0.241	0.4909	0.01233	0.0061	1.50	2.09	1.54
240	3.0	4.0	28	14.586	0.061	0.2465	0.01247	0.0031	1.00	1.40	1.03
1140	2.5	3.5	29	14.712	0.013	0.1136	0.01233	0.0014	0.50	0.70	0.51

P = 100/W = 0.8683

$$Mx = \frac{Gs}{Gs - 1} = 1.6075$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	44.78	22.02	22.760		19.76	80.24	58.99
0.42	73.82		51.800		44.98	55.02	40.45
0.25	98.70		76.680		66.58	33.42	24.57
0.105	120.30		98.280		85.33	14.67	10.78
0.074	126.07		104.050		90.34	9.66	7.10

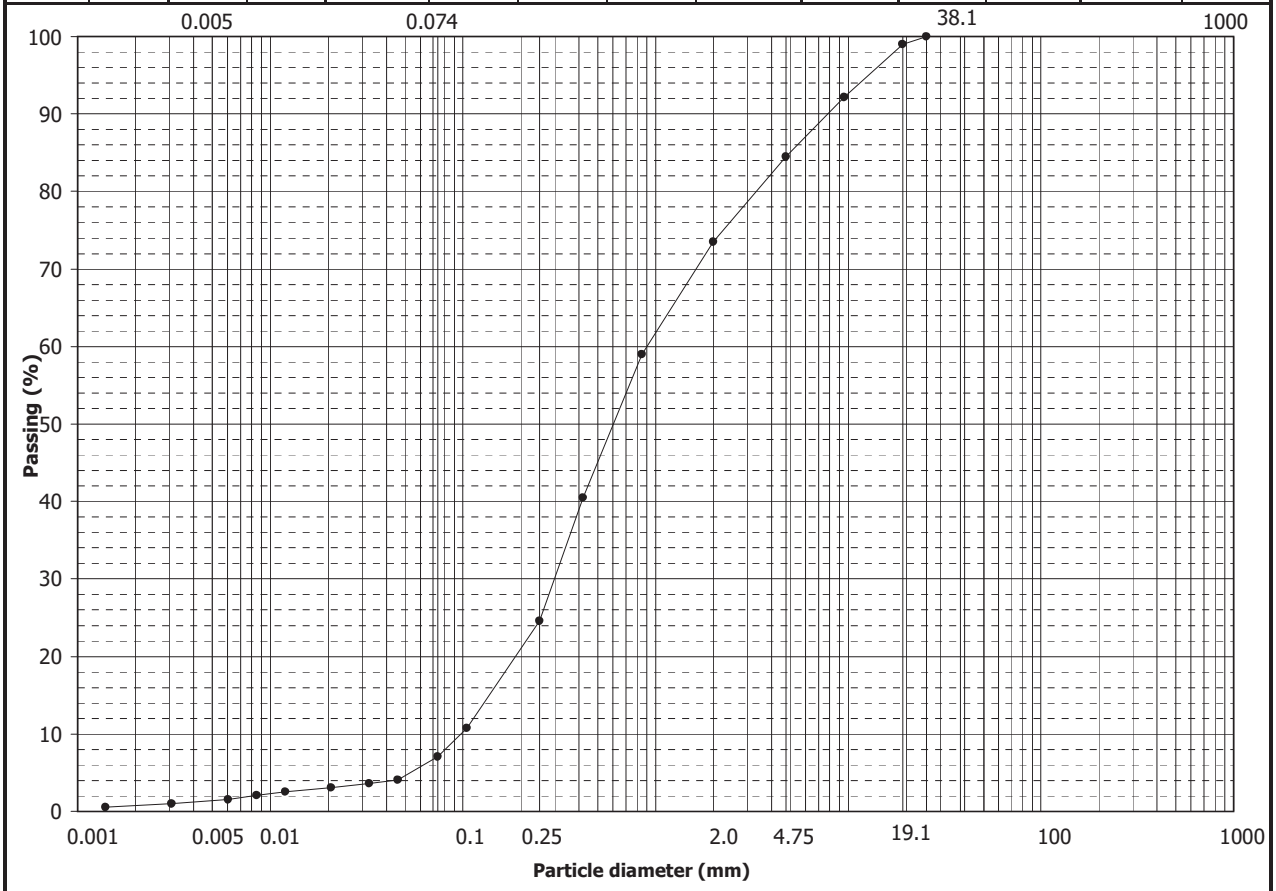
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J8	DEPTH	SAMPLE - 3

SPECIFIC GRAVITY : **2.646**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
15.54	77.36	5.70	1.39	25.40	8.168	0.930	0.6414	0.3081	0.0984	9.45	73.52	40.45	7.10



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J8**	DEPTH	**SAMPLE - 4**

Wt. (Air dry soil + container) = 718.5 gr
Wt. container No ..... = 39.77 gr
Wt. Of air dry soil W' = 678.7 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **678.73** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						100.00
4.75	42.80	39.77	3.03		0.45	99.55
2.00	50.30		10.53		1.55	98.45

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J8	DEPTH	SAMPLE - 4

Wt. (Air dry soil + container) = 101.57 gr — Specific Gravity : 2.672
Wt. of container B-72 = 35.53 gr — Plasticity Index : %
Wt. Of air dry soil W' = 66.04 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 98.45 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-23			NO	A-76			NO	J-32		
WW	49.08	DW	48.30	WW	48.23	DW	47.47	WW	54.75	DW	53.87	Mean value	
DW	48.30	TW	35.78	DW	47.47	TW	35.16	DW	53.87	TW	39.90	w	
Ww	0.78	Ws	12.52	Ww	0.76	Ws	12.31	Ww	0.88	Ws	13.97	6.23	%
w	6.23	%		w	6.17	%		w	6.30	%			

$$W = \frac{100 \times W'}{100 + w} : 62.164 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	15.5	16.5	29	11.432	11.432	3.3812	0.01224	0.0414	13.50	34.70	34.17
2	14.0	15.0	29	11.811	5.905	2.4301	0.01224	0.0297	12.00	30.85	30.37
5	12.0	13.0	29	12.315	2.463	1.5694	0.01224	0.0192	10.00	25.71	25.31
15	10.5	11.5	29	12.694	0.846	0.9199	0.01224	0.0113	8.50	21.85	21.51
30	10.0	11.0	29	12.820	0.427	0.6537	0.01224	0.0080	8.00	20.57	20.25
60	9.0	10.0	29	13.072	0.218	0.4668	0.01224	0.0057	7.00	18.00	17.72
240	8.0	9.0	28	13.325	0.056	0.2356	0.01237	0.0029	6.00	15.42	15.19
1140	7.0	8.0	29	13.577	0.012	0.1091	0.01224	0.0013	5.00	12.85	12.65

P = 100/W = 1.6086

$$Mx = \frac{G_s}{G_s - 1} = 1.5981$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.70	22.02	1.680		2.70	97.30	95.79
0.42	28.30		6.280		10.10	89.90	88.50
0.25	36.59		14.570		23.44	76.56	75.37
0.105	51.06		29.040		46.71	53.29	52.46
0.074	57.45		35.430		56.99	43.01	42.34

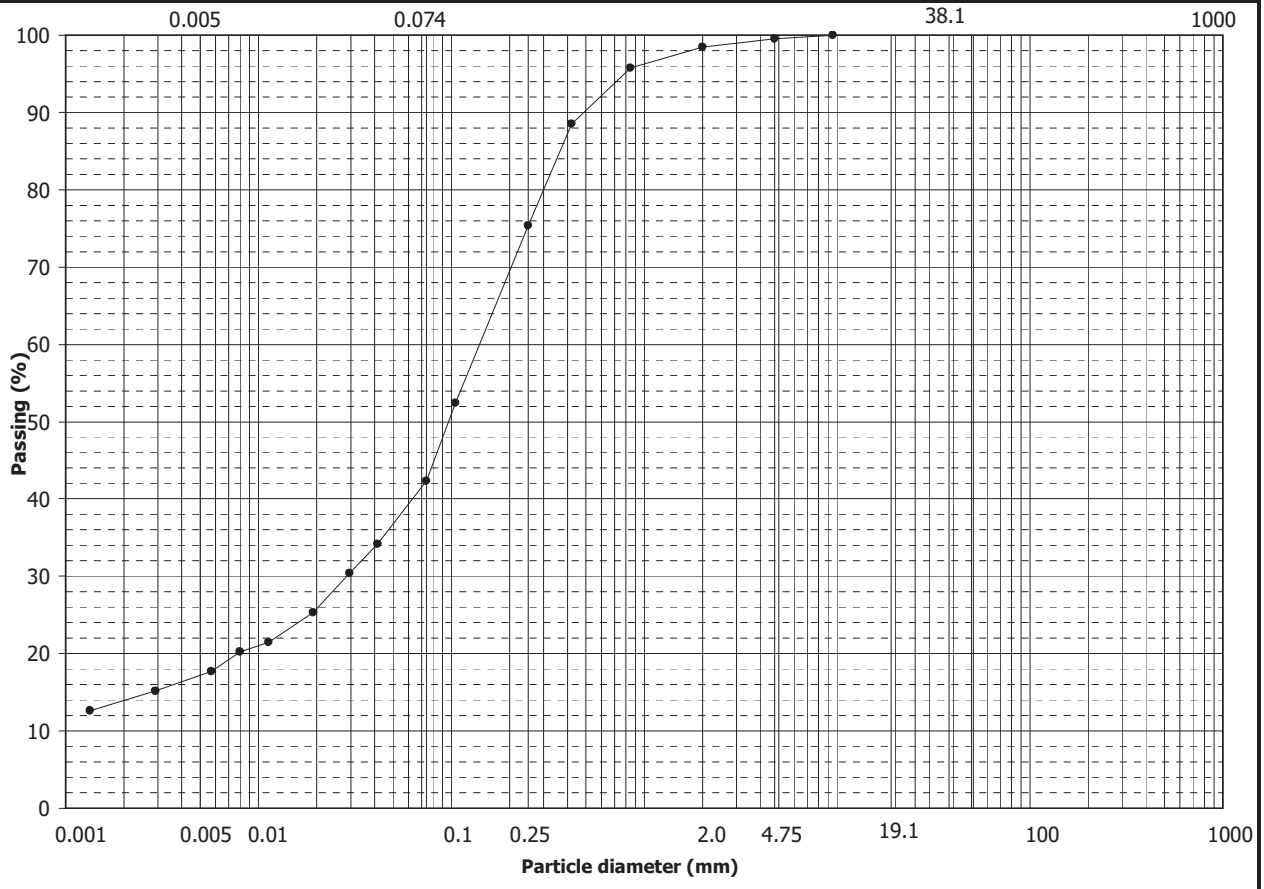
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J8**	DEPTH	**SAMPLE - 4**

SPECIFIC GRAVITY : **2.672**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.45	57.21	25.12	17.21	9.52	0.5084	0.1527	0.0975	0.0290	-	-	98.45	88.50	42.34



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 1**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J9	DEPTH	SAMPLE - 1

Wt. (Air dry soil + container) = 102.20 gr — Specific Gravity : 2.670
Wt. of container E-52 = 35.70 gr — Plasticity Index : %
Wt. Of air dry soil W' = 66.50 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-87			NO	J-43			NO	A-34		
WW	54.86	DW	54.18	WW	50.49	DW	49.87	WW	49.96	DW	49.33	Mean value	
DW	54.18	TW	40.13	DW	49.87	TW	36.94	DW	49.33	TW	36.54	w	
Ww	0.68	Ws	14.05	Ww	0.62	Ws	12.93	Ww	0.63	Ws	12.79	4.85	%
w	4.84	%		w	4.80	%		w	4.93	%			

$$W = \frac{100 \times W'}{100 + w} : 63.422 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	32.5	33.5	29	7.143	7.143	2.6727	0.01225	0.0327	30.50	76.89	76.89
2	31.0	32.0	29	7.522	3.761	1.9393	0.01225	0.0237	29.00	73.11	73.11
5	29.0	30.0	29	8.026	1.605	1.2670	0.01225	0.0155	27.00	68.06	68.06
15	26.0	27.0	29	8.783	0.586	0.7652	0.01225	0.0094	24.00	60.50	60.50
30	23.5	24.5	29	9.414	0.314	0.5602	0.01225	0.0069	21.50	54.20	54.20
60	21.0	22.0	29	10.045	0.167	0.4092	0.01225	0.0050	19.00	47.90	47.90
240	16.5	17.5	28	11.180	0.047	0.2158	0.01238	0.0027	14.50	36.55	36.55
1140	13.0	14.0	29	12.063	0.011	0.1029	0.01225	0.0013	11.00	27.73	27.73

P = 100/W = 1.5767

$$Mx = \frac{G_s}{G_s - 1} = 1.5988$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.39	22.02	0.370		0.58	99.42	99.42
0.42	23.85		1.830		2.89	97.11	97.11
0.25	25.97		3.950		6.23	93.77	93.77
0.105	29.83		7.810		12.31	87.69	87.69
0.074	31.73		9.710		15.31	84.69	84.69

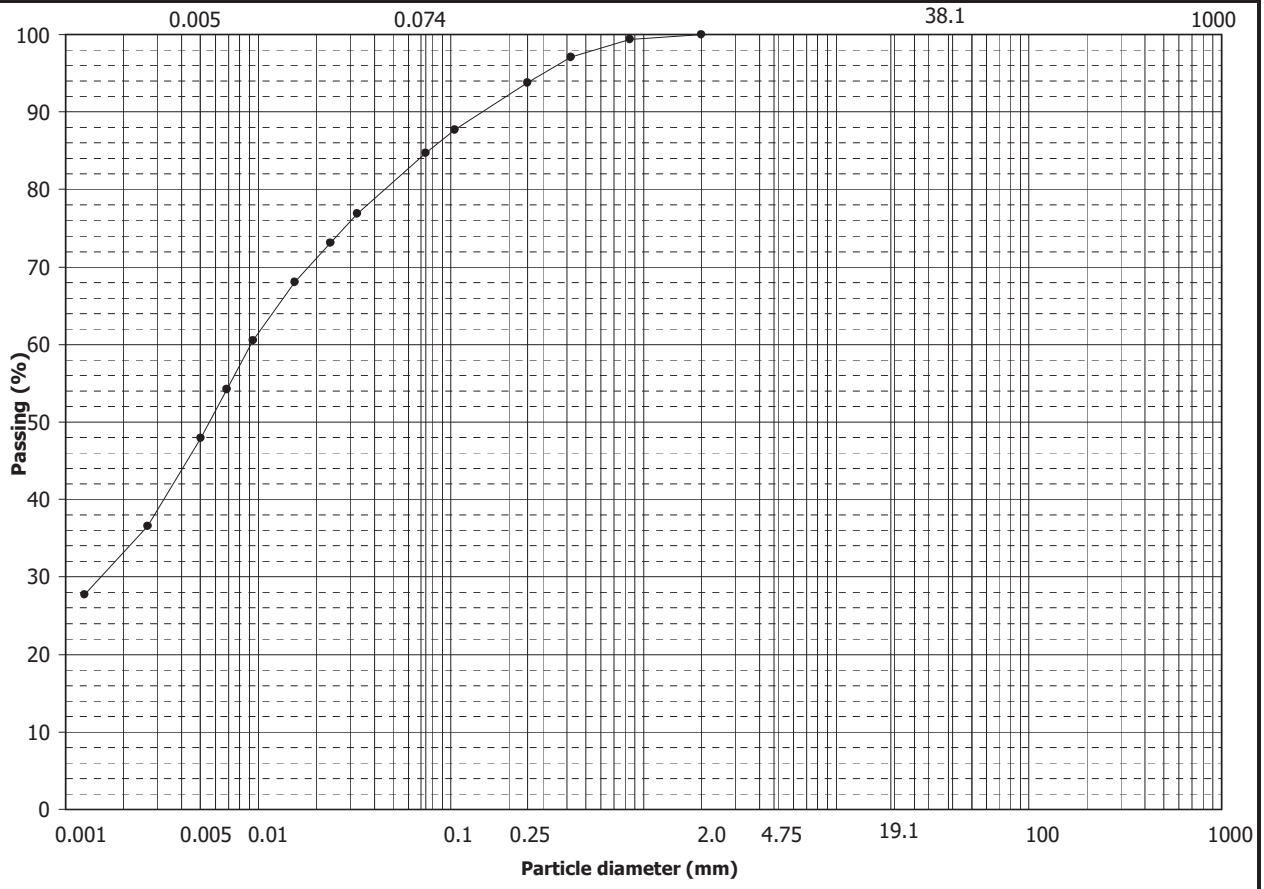
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 1**

SPECIFIC GRAVITY : **2.670**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	15.31	36.83	47.86	2.00	0.1601	0.0092	0.0056	0.0016	-	-	100.00	97.11	84.69



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 2**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J9	DEPTH	SAMPLE - 2

Wt. (Air dry soil + container) = 98.30 gr — Specific Gravity : 2.646
Wt. of container E-76 = 36.50 gr — Plasticity Index : %
Wt. Of air dry soil W' = 61.80 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-84			NO	J-40			NO	A-31		
WW	51.83	DW	51.00	WW	52.56	DW	51.73	WW	55.31	DW	54.42	Mean value	
DW	51.00	TW	37.78	DW	51.73	TW	38.32	DW	54.42	TW	40.31	w	
Ww	0.83	Ws	13.22	Ww	0.83	Ws	13.41	Ww	0.89	Ws	14.11	6.26	%
w	6.28	%		w	6.19	%		w	6.31	%			

$$W = \frac{100 \times W'}{100 + w} : 58.160 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	32.0	33.0	29	7.269	7.269	2.6962	0.01233	0.0333	30.00	82.92	82.92
2	29.5	30.5	29	7.900	3.950	1.9875	0.01233	0.0245	27.50	76.01	76.01
5	25.0	26.0	29	9.035	1.807	1.3443	0.01233	0.0166	23.00	63.57	63.57
15	18.5	19.5	29	10.675	0.712	0.8436	0.01233	0.0104	16.50	45.61	45.61
30	15.0	16.0	29	11.558	0.385	0.6207	0.01233	0.0077	13.00	35.93	35.93
60	12.0	13.0	29	12.315	0.205	0.4531	0.01233	0.0056	10.00	27.64	27.64
240	8.5	9.5	28	13.198	0.055	0.2345	0.01247	0.0029	6.50	17.97	17.97
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01233	0.0014	3.50	9.67	9.67

P = 100/W = 1.7194

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6075$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.10	22.02	0.080		0.14	99.86	99.86
0.42	22.42		0.400		0.69	99.31	99.31
0.25	22.88		0.860		1.48	98.52	98.52
0.105	23.64		1.620		2.79	97.21	97.21
0.074	24.99		2.970		5.11	94.89	94.89

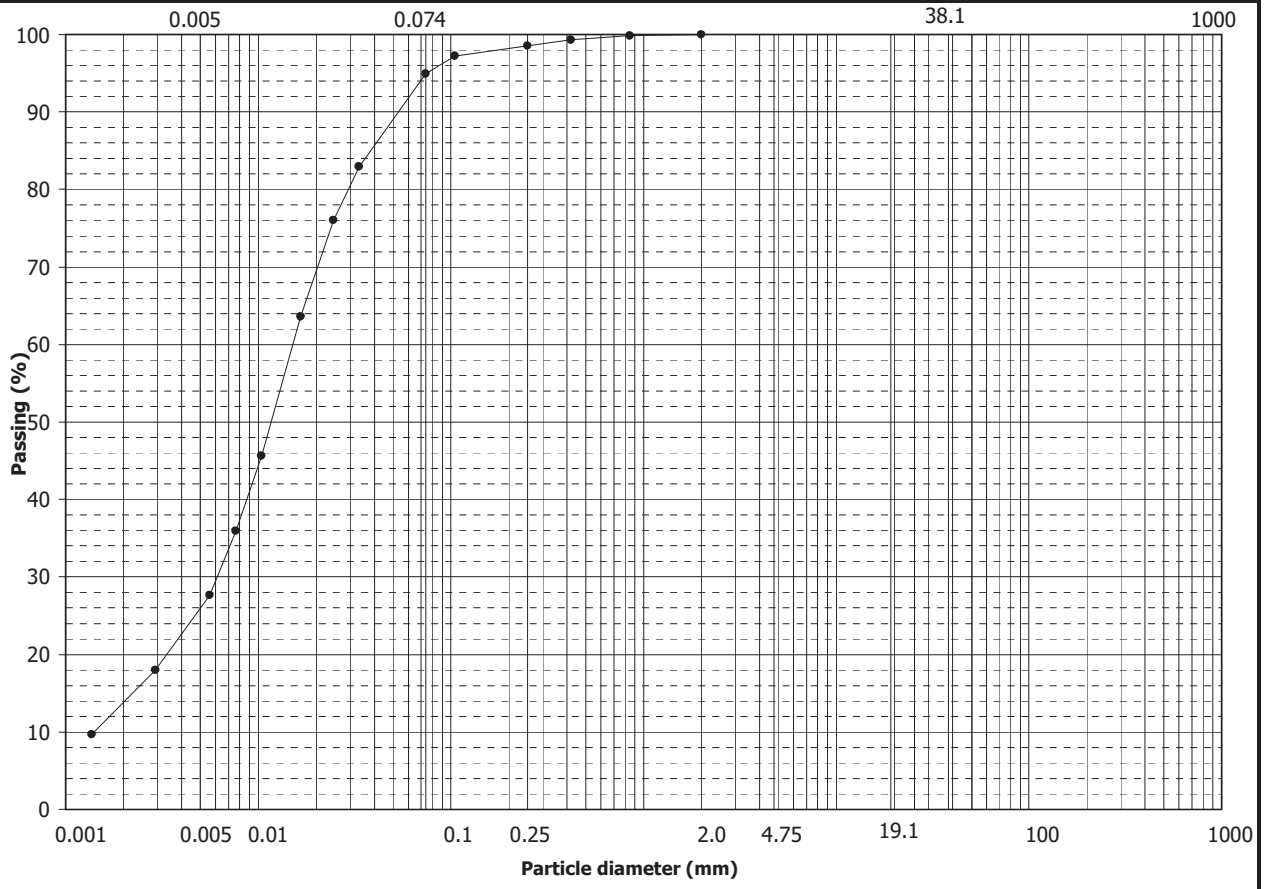
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J9	DEPTH	SAMPLE - 2

SPECIFIC GRAVITY : **2.646**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	5.11	68.91	25.98	2.00	0.0573	0.0154	0.0119	0.0062	0.0014	10.77	100.00	99.31	94.89



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 3**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J9	DEPTH	SAMPLE - 3

Wt. (Air dry soil + container) = 136.59 gr — Specific Gravity : 2.659
Wt. of container B-20 = 32.45 gr — Plasticity Index : %
Wt. Of air dry soil W' = 104.14 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-67			NO	J-23			NO	A-14		
WW	50.09	DW	49.79	WW	49.16	DW	48.87	WW	51.01	DW	50.68	Mean value	
DW	49.79	TW	36.88	DW	48.87	TW	36.20	DW	50.68	TW	37.54	w	
Ww	0.30	Ws	12.91	Ww	0.29	Ws	12.67	Ww	0.33	Ws	13.14	2.37	%
w	2.32	%		w	2.29	%		w	2.51	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 101.724 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	5.5	6.5	29	13.955	13.955	3.7357	0.01229	0.0459	3.50	5.51	5.51
2	5.0	6.0	29	14.081	7.041	2.6534	0.01229	0.0326	3.00	4.73	4.73
5	4.5	5.5	29	14.208	2.842	1.6857	0.01229	0.0207	2.50	3.94	3.94
15	4.0	5.0	29	14.334	0.956	0.9775	0.01229	0.0120	2.00	3.15	3.15
30	3.5	4.5	29	14.460	0.482	0.6943	0.01229	0.0085	1.50	2.36	2.36
60	3.0	4.0	29	14.586	0.243	0.4931	0.01229	0.0061	1.00	1.58	1.58
240	2.5	3.5	28	14.712	0.061	0.2476	0.01242	0.0031	0.50	0.79	0.79
1140	2.0	3.0	29	14.838	0.013	0.1141	0.01229	0.0014	0.00	0.00	0.00

P = 100/W = 0.9831

$$Mx = \frac{G_s}{G_s - 1} = 1.6028$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.43	22.02	0.410		0.40	99.60	99.60
0.42	27.45		5.430		5.34	94.66	94.66
0.25	44.20		22.180		21.80	78.20	78.20
0.105	102.80		80.780		79.41	20.59	20.59
0.074	115.14		93.120		91.54	8.46	8.46

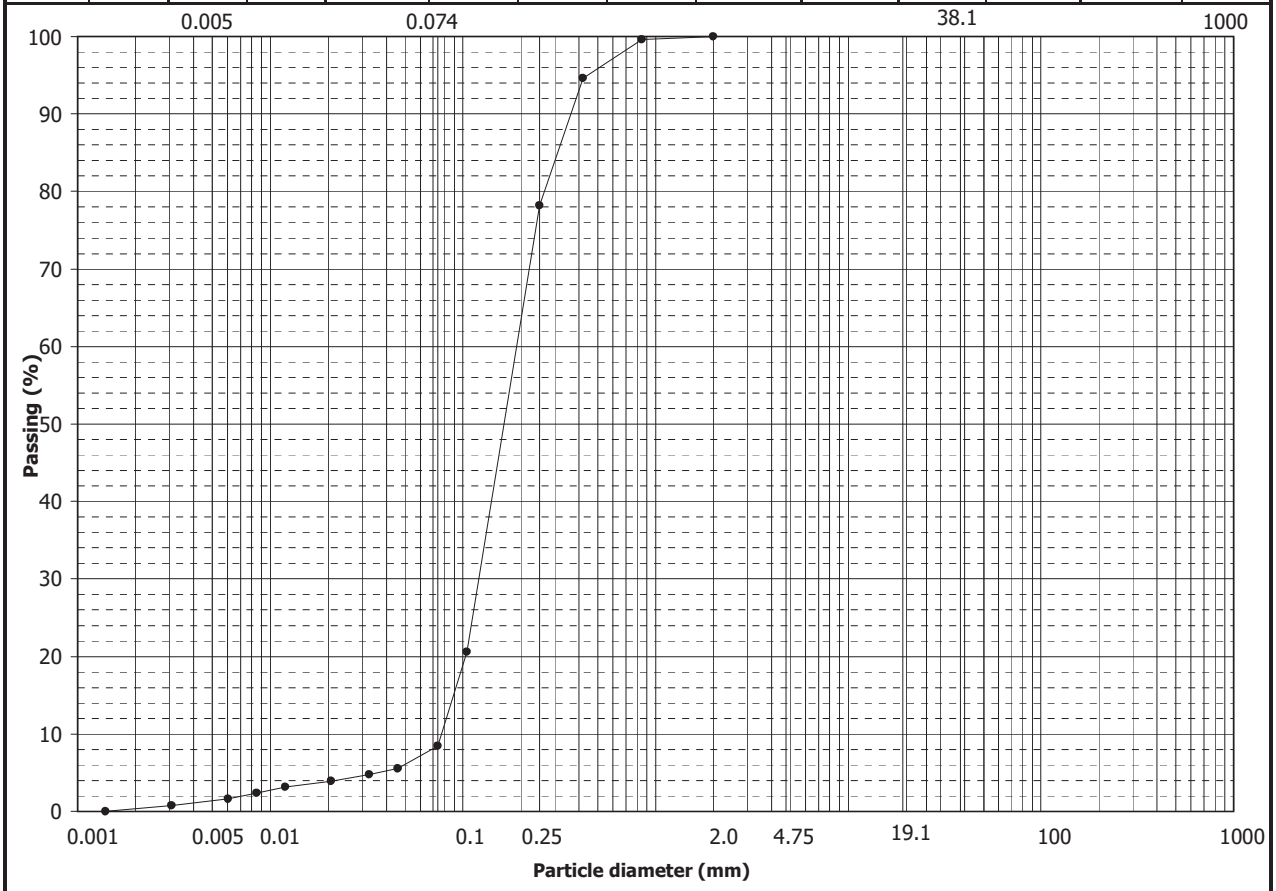
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 3**

SPECIFIC GRAVITY : **2.659**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	91.54	7.11	1.35	2.00	0.372	0.204	0.1790	0.1287	0.0779	2.62	100.00	94.66	8.46



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 4**

Wt. (Air dry soil + container) = 1318.0 gr
Wt. container No ..... = 44.43 gr
Wt. Of air dry soil W' = 1273.6 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **1273.57** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						100.00
25.40	108.20	44.4	63.77		5.01	94.99
19.10	144.30		99.87		7.84	92.16
9.52	172.40		127.97		10.05	89.95
4.75	225.80		181.37		14.24	85.76
2.00	309.30		264.87		20.80	79.20

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J9	DEPTH	SAMPLE - 4

Wt. (Air dry soil + container) = 146.67 gr — Specific Gravity : 2.653
Wt. of container B-15 = 36.39 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.28 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 79.20 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-34			NO	J-87			NO	A-78		
WW	54.80	DW	54.39	WW	50.51	DW	50.14	WW	52.19	DW	51.80	Mean value	
DW	54.39	TW	40.29	DW	50.14	TW	37.14	DW	51.80	TW	38.37	w	
Ww	0.41	Ws	14.10	Ww	0.37	Ws	13.00	Ww	0.39	Ws	13.43	2.89	%
w	2.91	%		w	2.85	%		w	2.90	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 107.187 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	5.5	6.5	29	13.955	13.955	3.7357	0.01231	0.0460	3.50	5.24	4.15
2	5.0	6.0	29	14.081	7.041	2.6534	0.01231	0.0327	3.00	4.49	3.56
5	4.5	5.5	29	14.208	2.842	1.6857	0.01231	0.0207	2.50	3.74	2.96
15	4.0	5.0	29	14.334	0.956	0.9775	0.01231	0.0120	2.00	2.99	2.37
30	3.5	4.5	29	14.460	0.482	0.6943	0.01231	0.0085	1.50	2.25	1.78
60	3.0	4.0	29	14.586	0.243	0.4931	0.01231	0.0061	1.00	1.50	1.19
240	2.5	3.5	28	14.712	0.061	0.2476	0.01244	0.0031	0.50	0.75	0.59
1140	2.0	3.0	29	14.838	0.013	0.1141	0.01231	0.0014	0.00	0.00	0.00

P = 100/W = 0.933

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6050$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	41.62	22.02	19.600		18.29	81.71	64.72
0.42	73.93		51.910		48.43	51.57	40.85
0.25	93.93		71.910		67.09	32.91	26.07
0.105	116.87		94.850		88.49	11.51	9.12
0.074	121.62		99.600		92.92	7.08	5.61

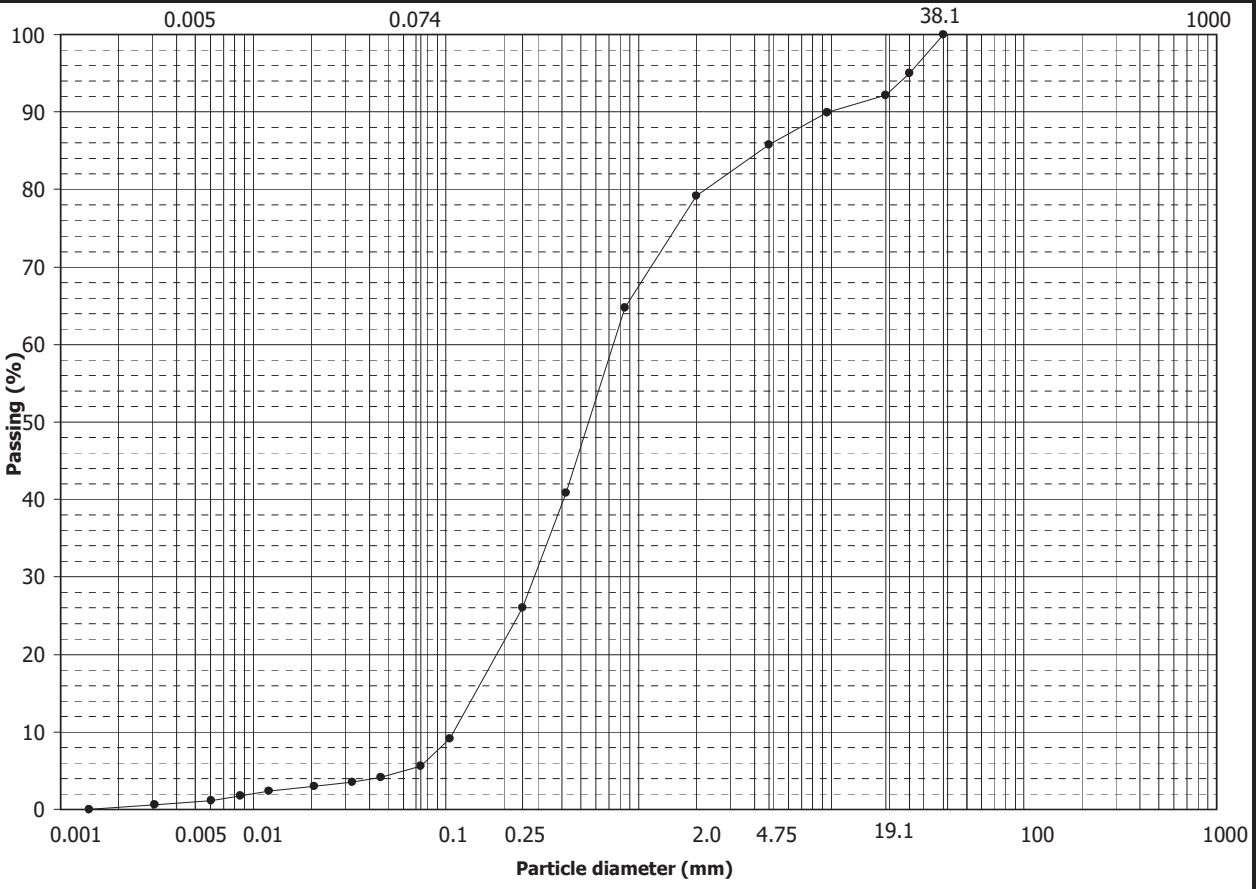
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 4**

SPECIFIC GRAVITY : **2.653**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
14.24	80.15	4.59	1.02	38.10	9.7290	0.7650	0.5849	0.2952	0.1126	6.80	79.20	40.85	5.61



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 5**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	JONO OGE - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - J9	DEPTH	SAMPLE - 5

Wt. (Air dry soil + container) = 115.52 gr — Specific Gravity : 2.634
Wt. of container E-40 = 36.00 gr — Plasticity Index : %
Wt. Of air dry soil W' = 79.52 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-18			NO	T-71			NO	L-18		
WW	50.17	DW	49.49	WW	53.55	DW	52.83	WW	52.44	DW	51.66	Mean value	
DW	49.49	TW	36.66	DW	52.83	TW	39.13	DW	51.66	TW	38.27	w	
Ww	0.68	Ws	12.83	Ww	0.72	Ws	13.70	Ww	0.78	Ws	13.39	5.46	%
w	5.30	%		w	5.26	%		w	5.83	%			

$$W = \frac{100 \times W'}{100 + w} : 75.403 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	28.0	29.0	29	8.279	8.279	2.8773	0.01238	0.0356	26.00	55.58	55.58
2	23.5	24.5	29	9.414	4.707	2.1696	0.01238	0.0269	21.50	45.96	45.96
5	18.0	19.0	29	10.802	2.160	1.4698	0.01238	0.0182	16.00	34.21	34.21
15	13.0	14.0	29	12.063	0.804	0.8968	0.01238	0.0111	11.00	23.52	23.52
30	11.0	12.0	29	12.568	0.419	0.6472	0.01238	0.0080	9.00	19.24	19.24
60	9.5	10.5	29	12.946	0.216	0.4645	0.01238	0.0058	7.50	16.03	16.03
240	7.5	8.5	28	13.451	0.056	0.2367	0.01251	0.0030	5.50	11.76	11.76
1140	6.0	7.0	29	13.829	0.012	0.1101	0.01238	0.0014	4.00	8.55	8.55

P = 100/W = 1.3262

$$Mx = \frac{G\,s}{G\,s - 1} = 1.6120$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	23.86	22.02	1.840		2.44	97.56	97.56
0.42	26.95		4.930		6.54	93.46	93.46
0.25	29.90		7.880		10.45	89.55	89.55
0.105	36.32		14.300		18.96	81.04	81.04
0.074	40.95		18.930		25.11	74.89	74.89

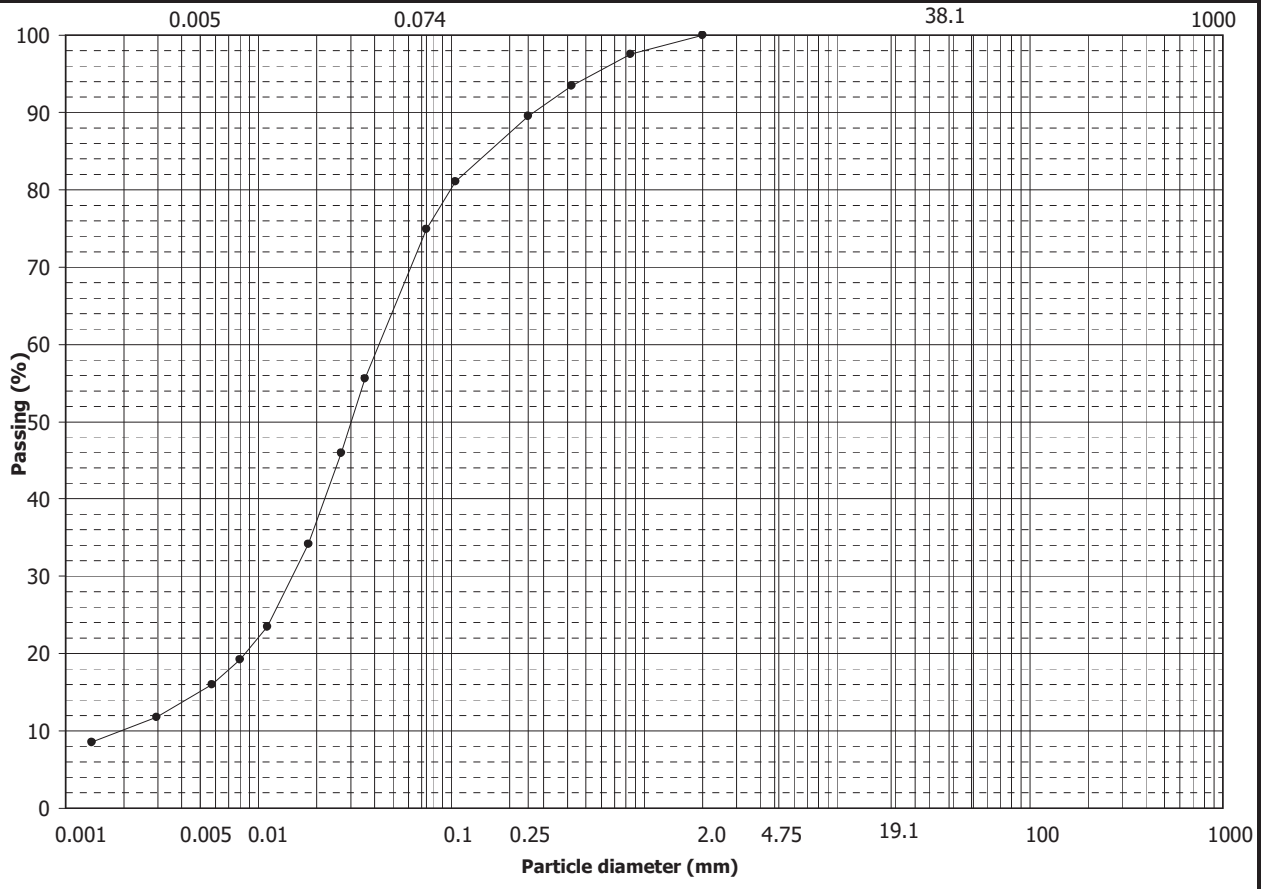
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**JONO OGE - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - J9**	DEPTH	**SAMPLE - 5**

SPECIFIC GRAVITY : **2.634**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	25.11	59.76	15.13	2.00	0.270	0.0444	0.0305	0.0154	0.0021	21.28	100.00	93.46	74.89



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY		REDY
SAMPLE NO.	:	TP - J8	DEPTH (m)		SAMPLE - 1

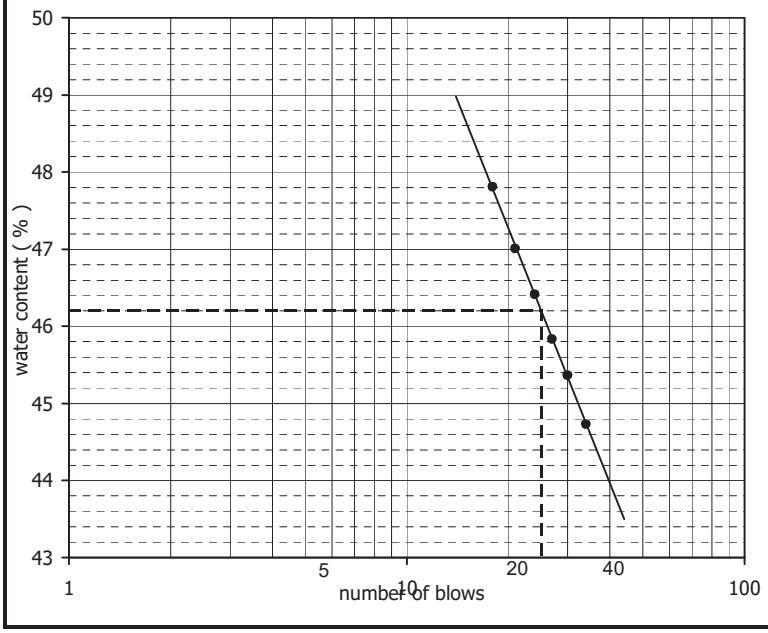
LIQUID LIMIT

1				2				2			
NO. OF BLOWS			34 x	NO. OF BLOWS			30 x	NO. OF BLOWS			27 x
		No.	A-19			No.	A-46			No.	A-99
WW	53.670	DW	49.260	WW	64.340	DW	55.630	WW	52.030	DW	47.630
DW	49.260	TW	39.400	DW	55.630	TW	36.430	DW	47.630	TW	38.030
Ww	4.410	Ws	9.860	Ww	8.710	Ws	19.200	Ww	4.400	Ws	9.600
	W =	44.73	%		W =	45.36	%		W =	45.83	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			21 x	NO. OF BLOWS			18 x
		No.	T-27			No.	A-02			No.	A-08
WW	54.420	DW	49.440	WW	55.950	DW	49.520	WW	56.990	DW	51.110
DW	49.440	TW	38.710	DW	49.520	TW	35.840	DW	51.110	TW	38.810
Ww	4.980	Ws	10.730	Ww	6.430	Ws	13.680	Ww	5.880	Ws	12.300
	W =	46.41	%		W =	47.00	%		W =	47.80	%

PLASTIC LIMIT

1				2				3			
		No.	J-83			No.	A-80			No.	T-53
WW	53.290	DW	50.060	WW	56.040	DW	52.420	WW	53.470	DW	49.830
DW	50.060	TW	38.130	DW	52.420	TW	38.510	DW	49.830	TW	36.260
Ww	3.230	Ws	11.930	Ww	3.620	Ws	13.910	Ww	3.640	Ws	13.570
	W =	27.07	%		W =	26.02	%		W =	26.82	%



LIQUID LIMIT	=	46.21	%
PLASTIC LIMIT	=	26.64	%
PLASTICITY INDEX	=	19.57	%
FLOW INDEX	=	11.02	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY		REDY
SAMPLE NO.	:	TP - J8	DEPTH (m)		SAMPLE - 2

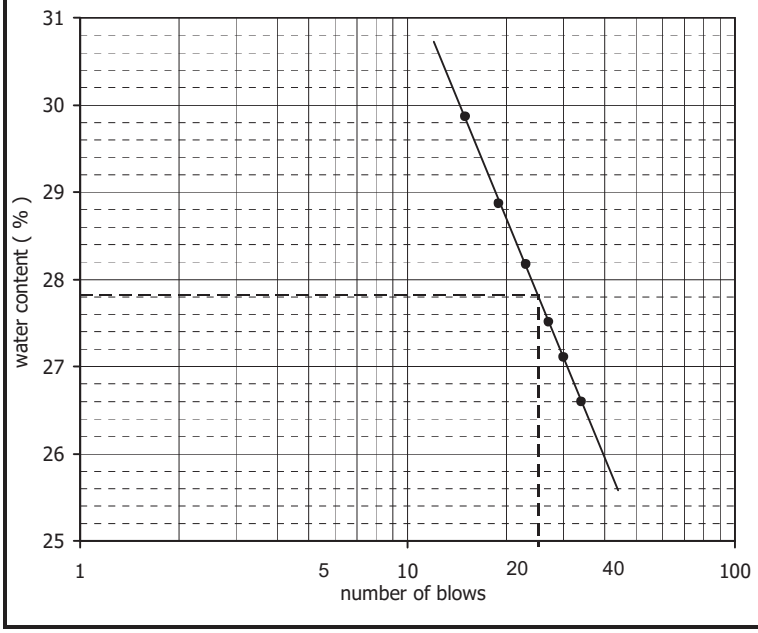
LIQUID LIMIT

1				2				2			
NO. OF BLOWS			34 x	NO. OF BLOWS			30 x	NO. OF BLOWS			27 x
		No.	T-59			No.	A-61			No.	J-17
WW	57.060	DW	52.940	WW	63.660	DW	57.980	WW	53.220	DW	49.850
DW	52.940	TW	37.450	DW	57.980	TW	37.030	DW	49.850	TW	37.600
Ww	4.120	Ws	15.490	Ww	5.680	Ws	20.950	Ww	3.370	Ws	12.250
	W =	26.60	%		W =	27.11	%		W =	27.51	%

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			19 x	NO. OF BLOWS			15 x
		No.	J-52			No.	A-107			No.	T-93
WW	57.500	DW	52.930	WW	58.970	DW	53.840	WW	60.330	DW	54.850
DW	52.930	TW	36.710	DW	53.840	TW	36.070	DW	54.850	TW	36.500
Ww	4.570	Ws	16.220	Ww	5.130	Ws	17.770	Ww	5.480	Ws	18.350
	W =	28.18	%		W =	28.87	%		W =	29.86	%

PLASTIC LIMIT

1				2				3			
		No.	A-97			No.	A-92			No.	L-02
WW	53.190	DW	50.010	WW	53.900	DW	51.060	WW	55.040	DW	52.340
DW	50.010	TW	35.470	DW	51.060	TW	38.280	DW	52.340	TW	39.930
Ww	3.180	Ws	14.540	Ww	2.840	Ws	12.780	Ww	2.700	Ws	12.410
	W =	21.87	%		W =	22.22	%		W =	21.76	%



LIQUID LIMIT	=	27.82	%
PLASTIC LIMIT	=	21.95	%
PLASTICITY INDEX	=	5.87	%
FLOW INDEX	=	9.12	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY	REDY
SAMPLE NO.	:	TP - J8	DEPTH (m)	SAMPLE - 3

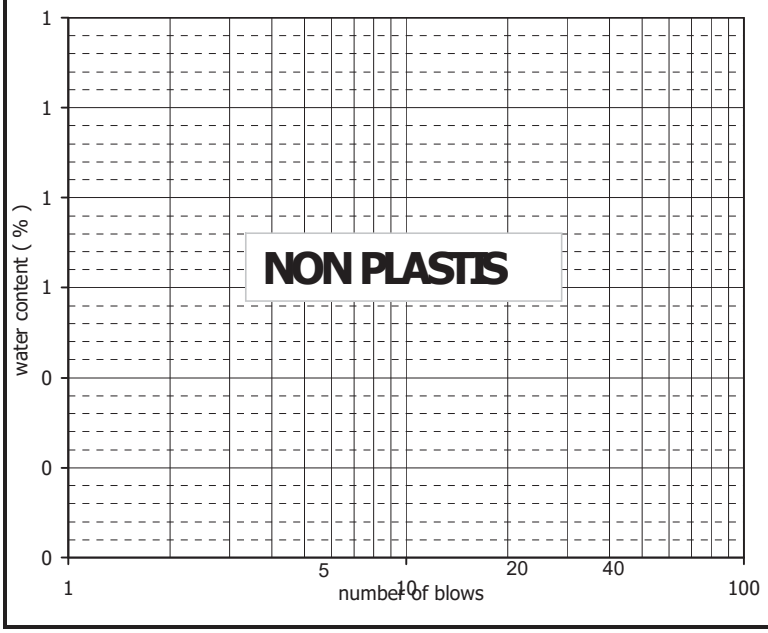
LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

4	5	6
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY		REDY
SAMPLE NO.	:	TP - J8	DEPTH (m)		SAMPLE - 4

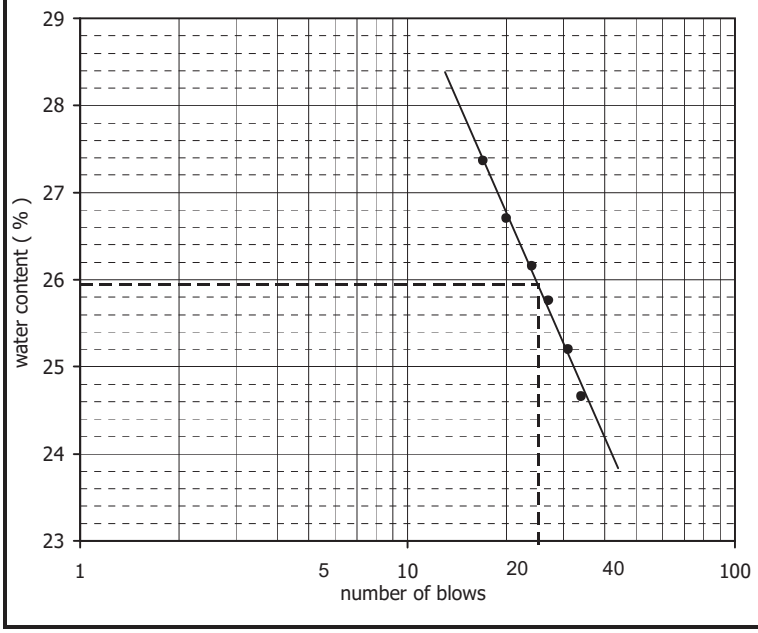
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			34 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-50			No.	A-55			No.	A-101
WW	57.450	DW	53.650	WW	51.220	DW	49.350	WW	63.970	DW	57.970
DW	53.650	TW	38.240	DW	49.350	TW	41.930	DW	57.970	TW	34.680
Ww	3.800	Ws	15.410	Ww	1.870	Ws	7.420	Ww	6.000	Ws	23.290
	W =		24.66 %		W =		25.20 %		W =		25.76 %

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	J-76			No.	L-11			No.	T-11
WW	56.040	DW	52.360	WW	62.090	DW	57.780	WW	56.060	DW	52.130
DW	52.360	TW	38.290	DW	57.780	TW	41.640	DW	52.130	TW	37.770
Ww	3.680	Ws	14.070	Ww	4.310	Ws	16.140	Ww	3.930	Ws	14.360
	W =		26.15 %		W =		26.70 %		W =		27.37 %

PLASTIC LIMIT

1				2				3			
		No.	T-36			No.	L-10			No.	T-77
WW	57.160	DW	54.040	WW	54.940	DW	52.650	WW	57.630	DW	54.770
DW	54.040	TW	37.370	DW	52.650	TW	40.810	DW	54.770	TW	39.670
Ww	3.120	Ws	16.670	Ww	2.290	Ws	11.840	Ww	2.860	Ws	15.100
	W =		18.72 %		W =		19.34 %		W =		18.94 %



LIQUID LIMIT	=	25.94	%
PLASTIC LIMIT	=	19.00	%
PLASTICITY INDEX	=	6.94	%
FLOW INDEX	=	8.60	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY		REDY
SAMPLE NO.	:	TP - J9	DEPTH (m)		SAMPLE - 1

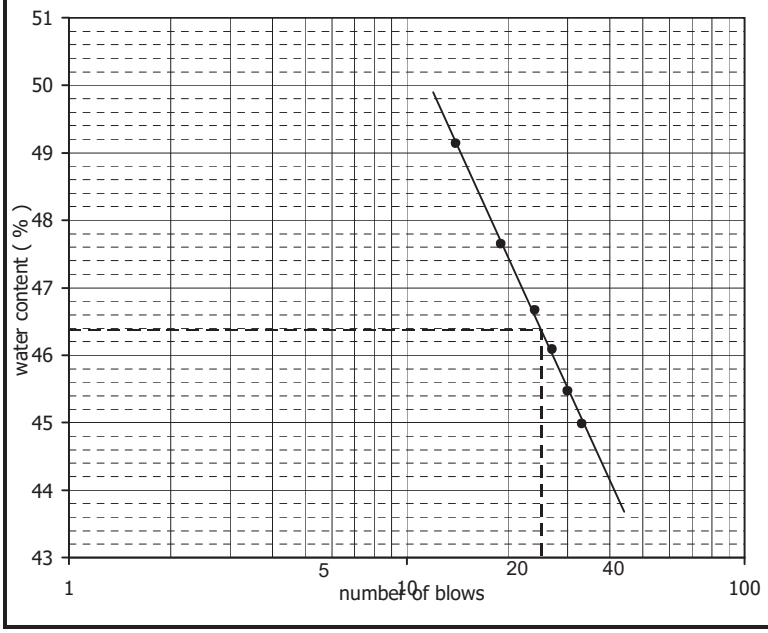
LIQUID LIMIT

1				2				2			
NO. OF BLOWS			33 x	NO. OF BLOWS			30 x	NO. OF BLOWS			27 x
		No.	J-31			No.	J-15			No.	J-68
WW	56.630	DW	48.960	WW	63.670	DW	55.630	WW	53.220	DW	47.610
DW	48.960	TW	31.910	DW	55.630	TW	37.949	DW	47.610	TW	35.437
Ww	7.670	Ws	17.050	Ww	8.040	Ws	17.681	Ww	5.610	Ws	12.173
	W =	44.99	%		W =	45.47	%		W =	46.08	%

4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			19 x	NO. OF BLOWS			14 x
		No.	T-72			No.	J-48			No.	A-59
WW	50.120	DW	44.720	WW	55.330	DW	49.450	WW	57.690	DW	51.700
DW	44.720	TW	33.150	DW	49.450	TW	37.110	DW	51.700	TW	39.510
Ww	5.400	Ws	11.570	Ww	5.880	Ws	12.340	Ww	5.990	Ws	12.190
	W =	46.67	%		W =	47.65	%		W =	49.14	%

PLASTIC LIMIT

1				2				3			
		No.	J-65			No.	T-91			No.	J-84
WW	50.740	DW	47.350	WW	51.640	DW	48.520	WW	52.910	DW	50.190
DW	47.350	TW	34.250	DW	48.520	TW	36.600	DW	50.190	TW	39.590
Ww	3.390	Ws	13.100	Ww	3.120	Ws	11.920	Ww	2.720	Ws	10.600
	W =	25.88	%		W =	26.17	%		W =	25.66	%



LIQUID LIMIT	=	46.38	%
PLASTIC LIMIT	=	25.90	%
PLASTICITY INDEX	=	20.48	%
FLOW INDEX	=	11.02	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY		REDY
SAMPLE NO.	:	TP - J9	DEPTH (m)		SAMPLE - 2

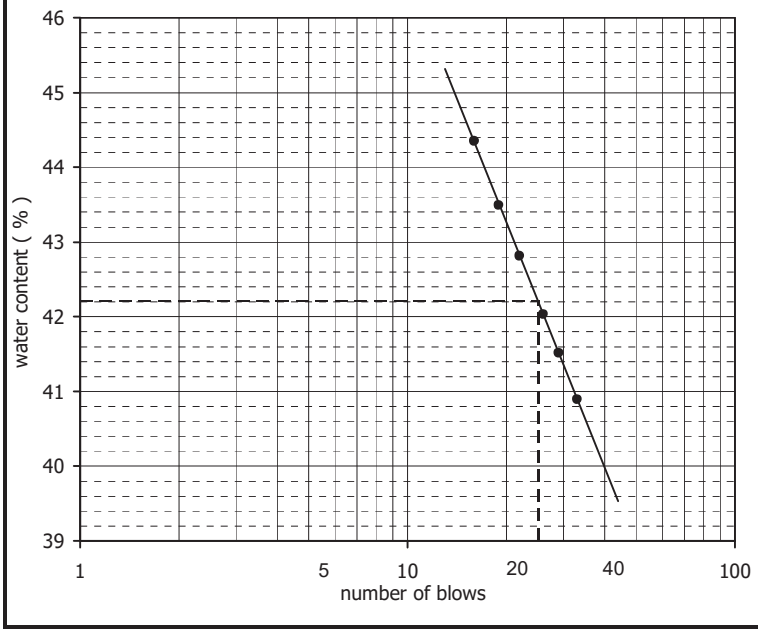
LIQUID LIMIT

1				2				2			
NO. OF BLOWS			33 x	NO. OF BLOWS			29 x	NO. OF BLOWS			26 x
		No.	J-41			No.	T-58			No.	T-37
WW	56.730	DW	50.980	WW	63.670	DW	55.890	WW	53.220	DW	49.370
DW	50.980	TW	36.920	DW	55.890	TW	37.150	DW	49.370	TW	40.210
Ww	5.750	Ws	14.060	Ww	7.780	Ws	18.740	Ww	3.850	Ws	9.160
W =	40.90	%		W =	41.52	%		W =	42.03	%	

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			19 x	NO. OF BLOWS			16 x
		No.	A-75			No.	T-20			No.	A-105
WW	64.290	DW	56.750	WW	58.950	DW	52.300	WW	56.920	DW	50.050
DW	56.750	TW	39.140	DW	52.300	TW	37.010	DW	50.050	TW	34.560
Ww	7.540	Ws	17.610	Ww	6.650	Ws	15.290	Ww	6.870	Ws	15.490
W =	42.82	%		W =	43.49	%		W =	44.35	%	

PLASTIC LIMIT

1				2				3			
		No.	J-58			No.	T-49			No.	L-14
WW	56.300	DW	52.710	WW	57.040	DW	53.040	WW	56.920	DW	53.220
DW	52.710	TW	39.570	DW	53.040	TW	38.340	DW	53.220	TW	39.740
Ww	3.590	Ws	13.140	Ww	4.000	Ws	14.700	Ww	3.700	Ws	13.480
W =	27.32	%		W =	27.21	%		W =	27.45	%	



LIQUID LIMIT	=	42.21	%
PLASTIC LIMIT	=	27.33	%
PLASTICITY INDEX	=	14.89	%
FLOW INDEX	=	10.93	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY	REDY
SAMPLE NO.	:	TP - J9	DEPTH (m)	SAMPLE - 3

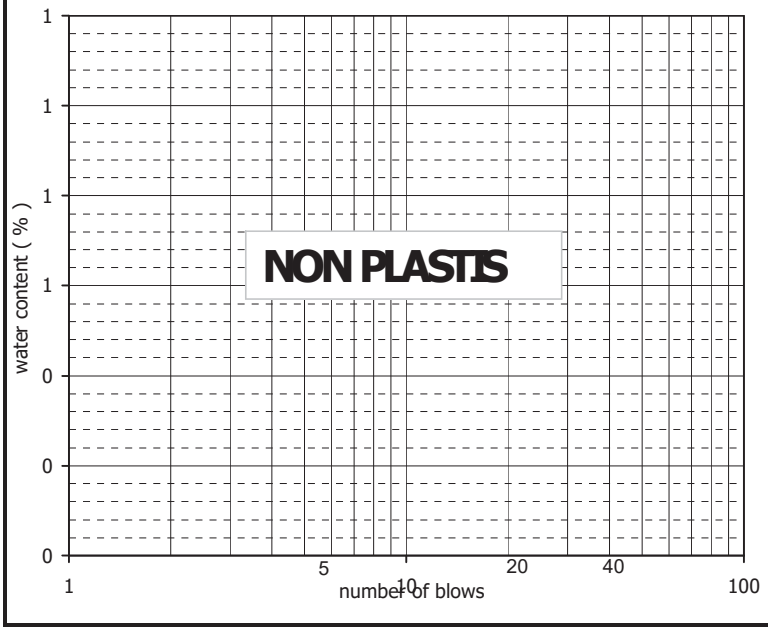
LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

4	5	6
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
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DW : Wt. of container + dry soil in g.
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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY	REDY
SAMPLE NO.	:	TP - J9	DEPTH (m)	SAMPLE - 4

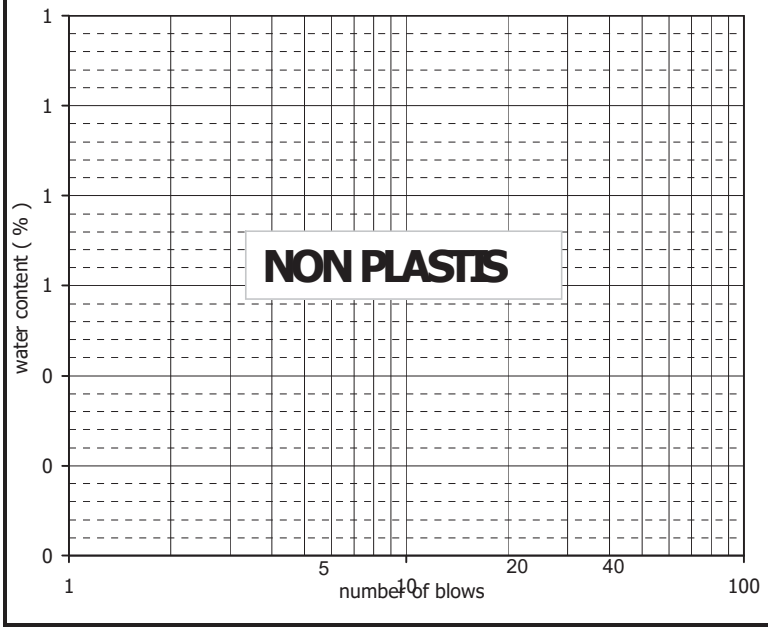
LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

4	5	6
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	JONO OGE - PALU	TESTED BY		REDY
SAMPLE NO.	:	TP - J9	DEPTH (m)		SAMPLE - 5

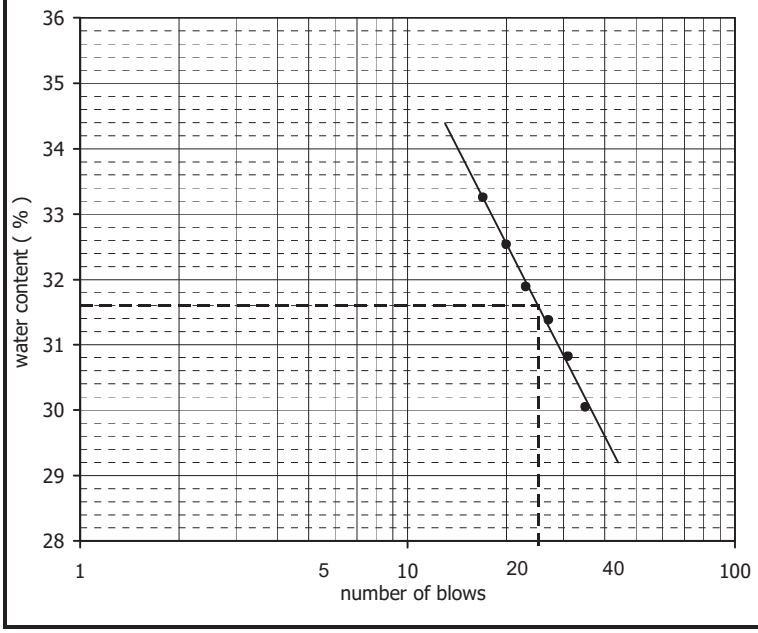
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			27 x
		No.	J-76			No.	J-78			No.	L-11
WW	58.500	DW	53.830	WW	53.180	DW	49.340	WW	63.080	DW	57.960
DW	53.830	TW	38.290	DW	49.340	TW	36.880	DW	57.960	TW	41.640
Ww	4.670	Ws	15.540	Ww	3.840	Ws	12.460	Ww	5.120	Ws	16.320
	W =	30.05	%		W =	30.82	%		W =	31.37	%

4				5				6			
NO. OF BLOWS			23 x	NO. OF BLOWS			20 x	NO. OF BLOWS			17 x
		No.	A-60			No.	J-11			No.	T-83
WW	64.880	DW	58.770	WW	63.750	DW	57.780	WW	57.780	DW	52.130
DW	58.770	TW	39.610	DW	57.780	TW	39.430	DW	52.130	TW	35.140
Ww	6.110	Ws	19.160	Ww	5.970	Ws	18.350	Ww	5.650	Ws	16.990
	W =	31.89	%		W =	32.53	%		W =	33.25	%

PLASTIC LIMIT

1				2				3			
		No.	J-40			No.	T-90			No.	J-24
WW	54.600	DW	51.310	WW	56.750	DW	52.980	WW	52.230	DW	48.420
DW	51.310	TW	38.320	DW	52.980	TW	37.920	DW	48.420	TW	33.272
Ww	3.290	Ws	12.990	Ww	3.770	Ws	15.060	Ww	3.810	Ws	15.148
	W =	25.33	%		W =	25.03	%		W =	25.15	%



LIQUID LIMIT	=	31.61	%
PLASTIC LIMIT	=	25.17	%
PLASTICITY INDEX	=	6.44	%
FLOW INDEX	=	9.79	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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SUMMARY OF SOIL TEST

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**										
LOCATION	**PETOBO - PALU**										
SAMPLE No			P - S	P - S							
DEPTH (m)			SAMPLE - 1	SAMPLE - 2							
PROPERTIES	Natural Water Content	(%)	3.33	31.46							
	Specific gravity of soil	*Gs*	2.675	2.709							
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	17.59	0.00							
	Proportion – Sand part	(%)	75.35	21.60							
	Proportion – Silt part	(%)	5.63	62.50							
	Proportion – Clay part	(%)	1.44	15.90							
	Max. diameter	(mm)	25.40	2.00							
	90 % diameter	(mm)	9.3518	0.1889							
	60 % diameter	(mm)	1.1102	0.0437							
	50 % diameter	(mm)	0.6915	0.0282							
	30 % diameter	(mm)	0.3304	0.0124							
	10 % diameter	(mm)	0.1023	0.0024							
	Uniformity Coefficient		-	17.93							
	Passing # 200		7.07	78.40							
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	34.41							
	Plastic limit	*PL* (%)		26.33							
	Plasticity index	*PI* (%)		8.08							
	Flow index			10.04							
	Unified Classification			ML							

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	PETOBO - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation				Date	Sample No.& Depth (m)	Average (%)	Calculation			
					No	A-26						No	
21/02	P - S		WW	112.00	DW	109.59				WW		DW	
2019	SAMPLE - 1	3.33	DW	109.59	TW	37.22				DW		TW	
			Ww	2.41	Ws	72.37				Ww		Ws	
					WC	(%) 3.33					WC	(%)	
					No	T-44						No	
21/02	P - S		WW	116.09	DW	97.26				WW		DW	
2019	SAMPLE - 2	31.46	DW	97.26	TW	37.41				DW		TW	
			Ww	18.83	Ws	59.85				Ww		Ws	
					WC	(%) 31.46					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	PETOBO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	P - S	DEPTH	SAMPLE - 1

Determination No				1	2	3	4
No of Pycnometer				29	26	47	
Weight of Pycnometer		Wf	(gr)	36.900	38.840	40.660	
Weight of (Pycnometer + Water)		Wa	(gr)	135.800	138.580	142.080	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.550	151.410	154.870	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.100	38.190	38.140	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.320	20.410	20.360	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.8000	138.5800	142.0800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.570	7.580	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.684	2.693	2.690	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.670	2.679	2.676	
Average Specific Gravity at 20° C							**2.675**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	PETOBO - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	P - S	DEPTH	SAMPLE - 2

Determination No				1	2	3	4
No of Pycnometer				39	38	72	
Weight of Pycnometer		Wf	(gr)	36.940	37.290	33.250	
Weight of (Pycnometer + Water)		Wa	(gr)	136.930	136.940	133.800	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	149.760	149.790	146.640	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.030	38.110	38.070	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.250	20.330	20.290	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	136.9300	136.9400	133.8000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.420	7.480	7.450	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.729	2.718	2.723	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.715	2.704	2.709	
Average Specific Gravity at 20° C							**2.709**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**PETOBO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**P - S**	DEPTH	**SAMPLE - 1**

Wt. (Air dry soil + container) = 655.0 gr
Wt. container No ..... = 40.67 gr
Wt. Of air dry soil W' = 614.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **614.33** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	59.60	40.67	18.93		3.08	96.92
9.52	100.40		59.73		9.72	90.28
4.75	148.70		108.03		17.59	82.41
2.00	218.70		178.03		28.98	71.02

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	PETOBO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	P - S	DEPTH	SAMPLE - 1

Wt. (Air dry soil + container) = 146.23 gr — Specific Gravity : 2.675
Wt. of container B-14 = 35.40 gr — Plasticity Index : %
Wt. Of air dry soil W' = 110.83 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 71.02 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-02			NO	A-46			NO	A-99		
WW	48.79	DW	48.38	WW	49.60	DW	49.18	WW	51.78	DW	51.34	Mean value	
DW	48.38	TW	35.84	DW	49.18	TW	36.43	DW	51.34	TW	38.03	w	
Ww	0.41	Ws	12.54	Ww	0.42	Ws	12.75	Ww	0.44	Ws	13.31	3.29	%
w	3.27	%		w	3.29	%		w	3.31	%			

$$W = \frac{100 \times W'}{100 + w} : 107.300 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	6.0	7.0	29	13.829	13.829	3.7188	0.01223	0.0455	4.00	5.95	4.23
2	5.5	6.5	29	13.955	6.978	2.6415	0.01223	0.0323	3.50	5.21	3.70
5	5.0	6.0	29	14.081	2.816	1.6782	0.01223	0.0205	3.00	4.47	3.17
15	4.5	5.5	29	14.208	0.947	0.9732	0.01223	0.0119	2.50	3.72	2.64
30	4.0	5.0	29	14.334	0.478	0.6912	0.01223	0.0085	2.00	2.98	2.11
60	3.5	4.5	29	14.460	0.241	0.4909	0.01223	0.0060	1.50	2.23	1.59
240	3.0	4.0	28	14.586	0.061	0.2465	0.01236	0.0030	1.00	1.49	1.06
1140	2.5	3.5	29	14.712	0.013	0.1136	0.01223	0.0014	0.50	0.74	0.53

P = 100/W = 0.932

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5970$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	43.54	22.02	21.520		20.06	79.94	56.78
0.42	71.32		49.300		45.95	54.05	38.39
0.25	95.37		73.350		68.36	31.64	22.47
0.105	113.79		91.770		85.53	14.47	10.28
0.074	118.64		96.620		90.05	9.95	7.07

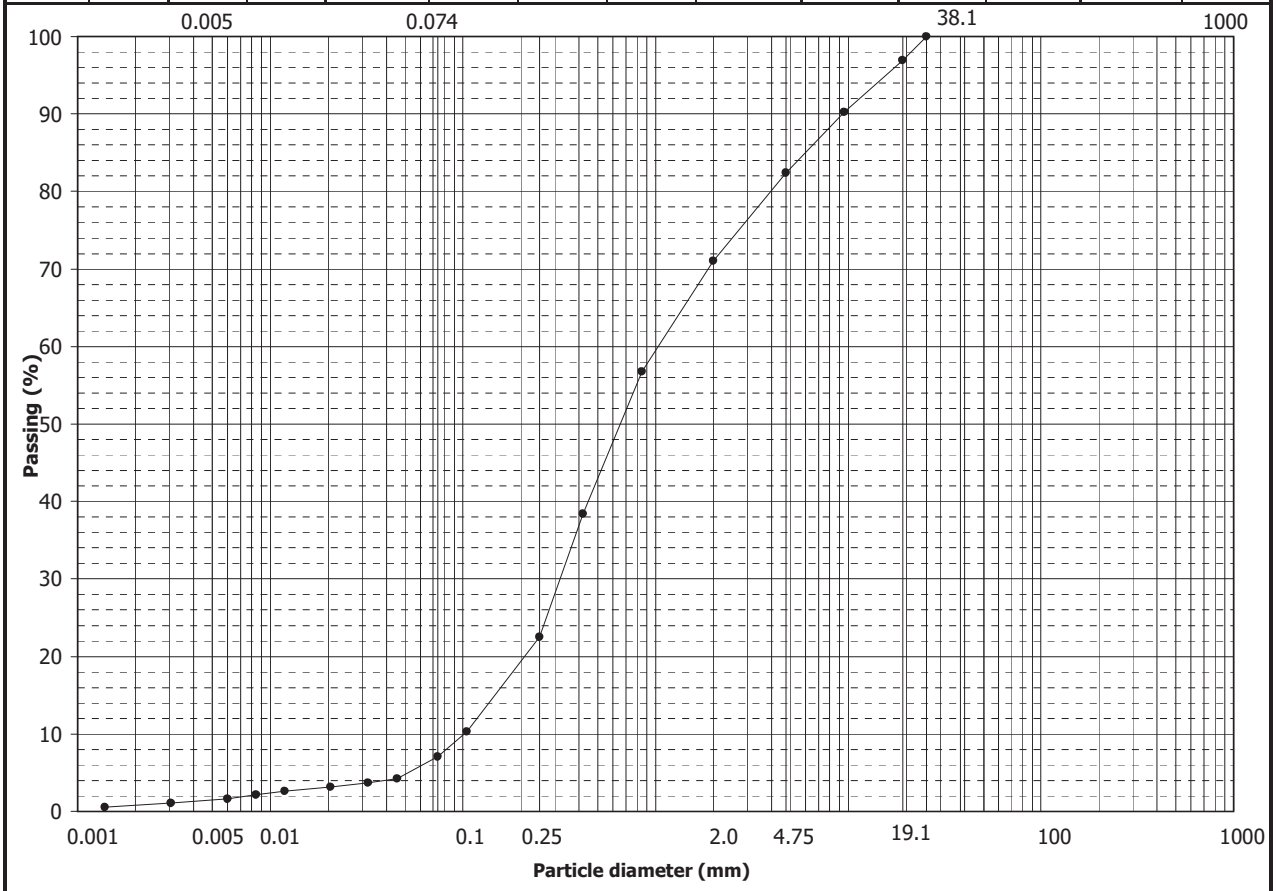
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**PETOBO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**P - S**	DEPTH	**SAMPLE - 1**

SPECIFIC GRAVITY : **2.675**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
17.59	75.35	5.63	1.44	25.40	9.3518	1.1102	0.6915	0.3304	0.1023	10.85	71.02	38.39	7.07



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**PETOBO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**P - S**	DEPTH	**SAMPLE - 2**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	PETOBO - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	P - S	DEPTH	SAMPLE - 2

Wt. (Air dry soil + container) = 113.22 gr — Specific Gravity : 2.709
Wt. of container B-82 = 33.81 gr — Plasticity Index : %
Wt. Of air dry soil W' = 79.41 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-06			NO	A-49			NO	J-05		
WW	54.72	DW	54.00	WW	53.98	DW	53.27	WW	49.98	DW	49.31	Mean value	
DW	54.00	TW	40.00	DW	53.27	TW	39.46	DW	49.31	TW	36.52	w	
Ww	0.72	Ws	14.00	Ww	0.71	Ws	13.81	Ww	0.67	Ws	12.79	5.17	%
w	5.14	%		w	5.14	%		w	5.24	%			

$$W = \frac{100 \times W'}{100 + w} : 75.503 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	28.0	29.0	29	8.279	8.279	2.8773	0.01210	0.0348	26.00	54.59	54.59
2	25.0	26.0	29	9.035	4.518	2.1255	0.01210	0.0257	23.00	48.29	48.29
5	20.0	21.0	29	10.297	2.059	1.4351	0.01210	0.0174	18.00	37.79	37.79
15	15.0	16.0	29	11.558	0.771	0.8778	0.01210	0.0106	13.00	27.29	27.29
30	12.0	13.0	29	12.315	0.411	0.6407	0.01210	0.0078	10.00	20.99	20.99
60	10.0	11.0	29	12.820	0.214	0.4622	0.01210	0.0056	8.00	16.80	16.80
240	7.5	8.5	28	13.451	0.056	0.2367	0.01224	0.0029	5.50	11.55	11.55
1140	5.0	6.0	29	14.081	0.012	0.1111	0.01210	0.0013	3.00	6.30	6.30

P = 100/W = 1.3244

$$Mx = \frac{Gs}{Gs - 1} = 1.5851$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.28	22.02	0.260		0.34	99.66	99.66
0.42	23.57		1.550		2.05	97.95	97.95
0.25	26.83		4.810		6.37	93.63	93.63
0.105	33.33		11.310		14.98	85.02	85.02
0.074	38.33		16.310		21.60	78.40	78.40

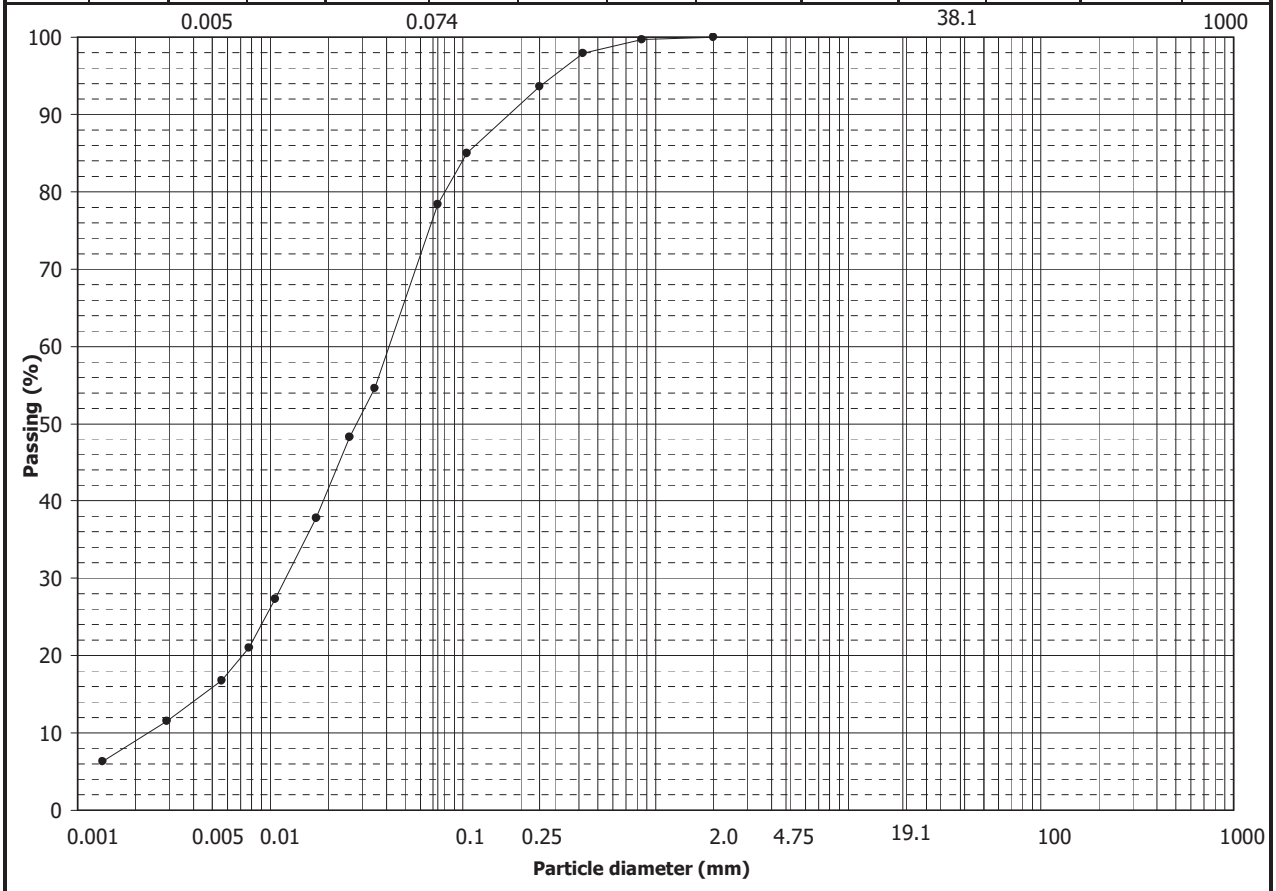
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 26, 2019
LOCATION	**PETOBO - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**P - S**	DEPTH	**SAMPLE - 2**

SPECIFIC GRAVITY : **2.709**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	21.60	62.50	15.90	2.00	0.1889	0.0437	0.0282	0.0124	0.0024	17.93	100.00	97.95	78.40



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	PETOBO - PALU	TESTED BY		REDY
SAMPLE NO.	:	P - S	DEPTH (m)		SAMPLE - 1

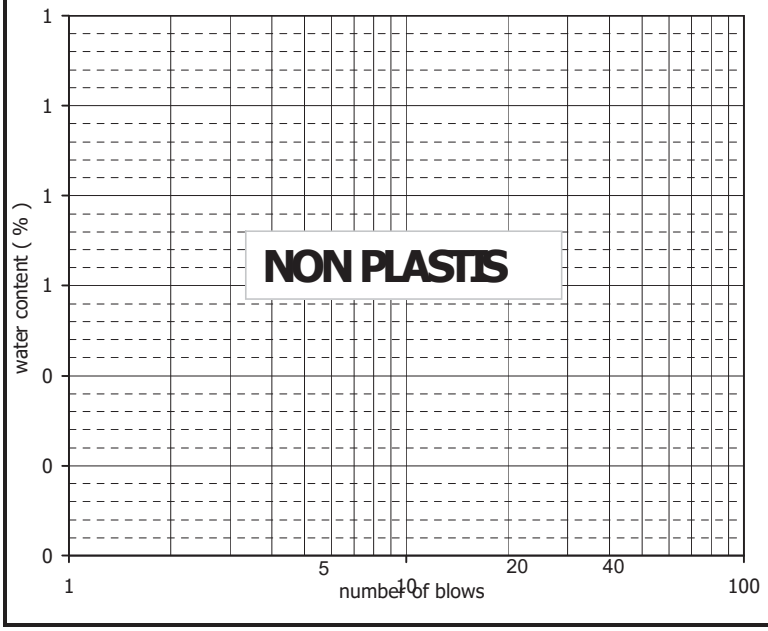
LIQUID LIMIT

1			2			3		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

4			5			6		
NO. OF BLOWS		x	NO. OF BLOWS		x	NO. OF BLOWS		x
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%

PLASTIC LIMIT

1			2			3		
	No.			No.			No.	
WW	DW		WW	DW		WW	DW	
DW	TW		DW	TW		DW	TW	
Ww	Ws		Ww	Ws		Ww	Ws	
W =		%	W =		%	W =		%



LIQUID LIMIT = %

PLASTIC LIMIT = %

PLASTICITY INDEX = %

FLOW INDEX =

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	PETOBO - PALU	TESTED BY	REDY
SAMPLE NO.	:	P - S	DEPTH (m)	SAMPLE - 2

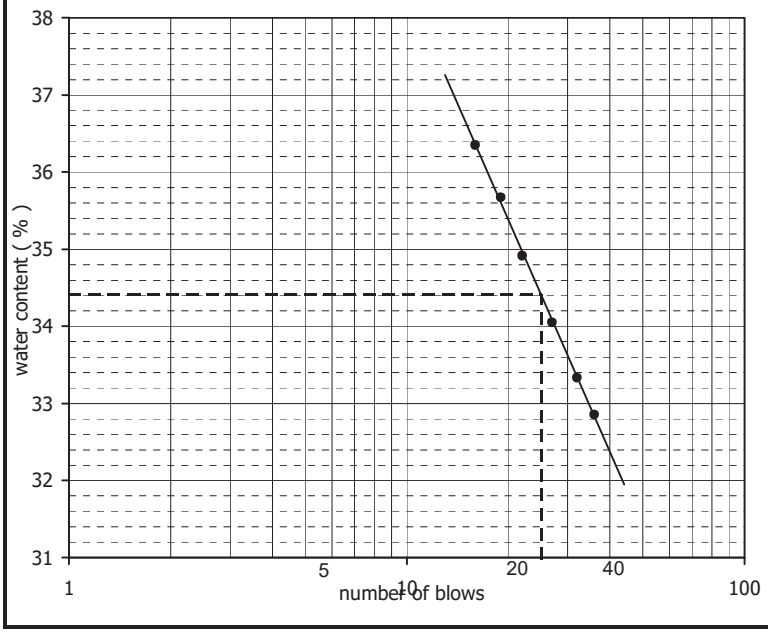
LIQUID LIMIT

1				2				2			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			27 x
		No.	A-14			No.	T-80			No.	A-67
WW	53.110	DW	49.260	WW	60.450	DW	55.130	WW	51.290	DW	47.630
DW	49.260	TW	37.540	DW	55.130	TW	39.170	DW	47.630	TW	36.880
Ww	3.850	Ws	11.720	Ww	5.320	Ws	15.960	Ww	3.660	Ws	10.750
	W =		32.85 %		W =		33.33 %		W =		34.05 %

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			19 x	NO. OF BLOWS			16 x
		No.	T-52			No.	J-23			No.	J-49
WW	53.750	DW	48.880	WW	54.270	DW	49.520	WW	59.190	DW	54.170
DW	48.880	TW	34.930	DW	49.520	TW	36.204	DW	54.170	TW	40.360
Ww	4.870	Ws	13.950	Ww	4.750	Ws	13.316	Ww	5.020	Ws	13.810
	W =		34.91 %		W =		35.67 %		W =		36.35 %

PLASTIC LIMIT

1				2				3			
		No.	T-08			No.	L-07			No.	A-57
WW	54.740	DW	51.770	WW	54.990	DW	51.430	WW	54.270	DW	51.330
DW	51.770	TW	40.510	DW	51.430	TW	38.120	DW	51.330	TW	39.960
Ww	2.970	Ws	11.260	Ww	3.560	Ws	13.310	Ww	2.940	Ws	11.370
	W =		26.38 %		W =		26.75 %		W =		25.86 %



LIQUID LIMIT	=	34.41	%
PLASTIC LIMIT	=	26.33	%
PLASTICITY INDEX	=	8.08	%
FLOW INDEX	=	10.04	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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SUMMARY OF SOIL TEST

PROJECT		**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**									
LOCATION		**SIBALAYA - PALU**									
SAMPLE No			TP - S	TP - S	TP - S	TP - S	TP - S	TP - S	TP - S		
DEPTH (m)			SAMPLE - 1	SAMPLE - 2	SAMPLE - 3	SAMPLE - 4	SAMPLE - 5.1	SAMPLE - 5.2	SAMPLE - 5.3		
PROPERTIES	Natural Water Content	(%)	9.60	40.16	20.09	37.96	11.18	11.95	11.09		
	Specific gravity of soil	*Gs*	2.658	2.644	2.685	2.714	2.668	2.685	2.682		
GRAIN SIZE ANALYSIS	Proportion – Gravel part	(%)	0.00	0.00	44.31	0.00	44.73	33.64	24.89		
	Proportion – Sand part	(%)	55.96	14.95	34.84	3.27	41.16	48.71	52.83		
	Proportion – Silt part	(%)	39.85	41.84	13.88	59.66	9.93	13.28	16.31		
	Proportion – Clay part	(%)	4.19	43.20	6.97	37.07	4.19	4.37	5.97		
	Max. diameter	(mm)	4.75	2.00	38.10	2.00	38.10	38.10	25.40		
	90 % diameter	(mm)	0.7921	0.1817	32.0306	0.0460	25.5005	22.6984	12.6695		
	60 % diameter	(mm)	0.1447	0.0114	7.3617	0.0106	6.5473	3.0045	1.5597		
	50 % diameter	(mm)	0.0916	0.0072	2.5792	0.0078	3.0304	1.4249	0.7489		
	30 % diameter	(mm)	0.0569	0.0024	0.3175	0.0037	0.4630	0.3340	0.1858		
	10 % diameter	(mm)	0.0184	-	0.0094	-	0.0296	0.0218	0.0148		
	Uniformity Coefficient		7.87	-	783.02	-	221.42	137.59	105.27		
	Passing # 200		44.04	85.05	20.85	96.73	14.11	17.65	22.28		
CONSISTENCY	Liquid limit	*LL* (%)	NON PLASTIS	62.65	NON PLASTIS	41.37	NON PLASTIS	NON PLASTIS	NON PLASTIS		
	Plastic limit	*PL* (%)		33.51		27.00					
	Plasticity index	*PI* (%)		29.14		14.37					
	Flow index			15.14		10.66					
	Unified Classification			MH		ML					

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NATURAL WATER CONTENT TEST (ASTM D.2216 - 90)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI
LOCATION	SIBALAYA - PALU

Date	Sample No.& Depth (m)	Average (%)	Calculation				Date	Sample No.& Depth (m)	Average (%)	Calculation			
					No	B-75						No	
21/02	TP - S		WW	78.76	DW	74.89				WW		DW	
2019	SAMPLE - 1	9.60	DW	74.89	TW	34.56				DW		TW	
			Ww	3.87	Ws	40.33				Ww		Ws	
					WC	(%) 9.60					WC	(%)	
					No	J-72						No	
21/02	TP - S		WW	92.87	DW	76.09				WW		DW	
2019	SAMPLE - 2	40.16	DW	76.09	TW	34.31				DW		TW	
			Ww	16.78	Ws	41.78				Ww		Ws	
					WC	(%) 40.16					WC	(%)	
					No	L-43						No	
21/02	TP - S		WW	110.71	DW	98.56				WW		DW	
2019	SAMPLE - 3	20.09	DW	98.56	TW	38.07				DW		TW	
			Ww	12.15	Ws	60.49				Ww		Ws	
					WC	(%) 20.09					WC	(%)	
					No	J-25						No	
21/02	TP - S		WW	99.62	DW	82.13				WW		DW	
2019	SAMPLE - 4	37.96	DW	82.13	TW	36.05				DW		TW	
			Ww	17.49	Ws	46.08				Ww		Ws	
					WC	(%) 37.96					WC	(%)	
					No	A-63						No	
21/02	TP - S		WW	113.02	DW	105.67				WW		DW	
2019	SAMPLE - 5.1	11.18	DW	105.67	TW	39.92				DW		TW	
			Ww	7.35	Ws	65.75				Ww		Ws	
					WC	(%) 11.18					WC	(%)	
					No	T-50						No	
21/02	TP - S		WW	111.49	DW	103.67				WW		DW	
2019	SAMPLE - 5.2	11.95	DW	103.67	TW	38.21				DW		TW	
			Ww	7.82	Ws	65.46				Ww		Ws	
					WC	(%) 11.95					WC	(%)	
					No	T-43						No	
21/02	TP - S		WW	109.75	DW	102.55				WW		DW	
2019	SAMPLE - 5.3	11.09	DW	102.55	TW	37.60				DW		TW	
			Ww	7.20	Ws	64.95				Ww		Ws	
					WC	(%) 11.09					WC	(%)	
					No							No	
			WW		DW					WW		DW	
			DW		TW					DW		TW	
			Ww		Ws					Ww		Ws	
					WC	(%)					WC	(%)	

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - S	DEPTH	SAMPLE - 1

Determination No				1	2	3	4
No of Pycnometer				80	86	83	
Weight of Pycnometer		Wf	(gr)	34.060	39.080	38.130	
Weight of (Pycnometer + Water)		Wa	(gr)	134.970	138.850	137.630	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	147.660	151.640	150.410	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.050	38.240	38.190	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.270	20.460	20.410	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	134.9700	138.8500	137.6300	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.580	7.670	7.630	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.674	2.668	2.675	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.660	2.654	2.661	
Average Specific Gravity at 20° C							**2.658**

Remarks

SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 23, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - S	DEPTH	SAMPLE - 2

Determination No				1	2	3	4
No of Pycnometer				27	2	41	
Weight of Pycnometer		Wf	(gr)	39.750	66.900	35.950	
Weight of (Pycnometer + Water)		Wa	(gr)	140.000	168.750	137.160	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	152.530	181.370	149.740	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.850	38.030	37.950	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.070	20.250	20.170	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	140.0000	168.7500	137.1600	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.540	7.630	7.590	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.662	2.654	2.657	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.648	2.640	2.644	
Average Specific Gravity at 20° C							**2.644**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - S	DEPTH	SAMPLE - 3

Determination No				1	2	3	4
No of Pycnometer				19	38	9	
Weight of Pycnometer		Wf	(gr)	66.300	37.290	65.320	
Weight of (Pycnometer + Water)		Wa	(gr)	167.700	136.940	167.290	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	180.370	149.860	180.080	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	37.920	38.290	38.100	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.140	20.510	20.320	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	167.7000	136.9400	167.2900	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.470	7.590	7.530	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.696	2.702	2.699	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.682	2.688	2.685	
Average Specific Gravity at 20° C							**2.685**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - S	DEPTH	SAMPLE - 4

Determination No				1	2	3	4
No of Pycnometer				28	40	67	
Weight of Pycnometer		Wf	(gr)	34.010	52.250	36.820	
Weight of (Pycnometer + Water)		Wa	(gr)	135.370	153.170	137.620	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	148.460	166.080	150.620	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.460	38.150	38.300	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.680	20.370	20.520	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	135.3700	153.1700	137.6200	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.590	7.460	7.520	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.725	2.731	2.729	
Coefficient for Temperature Correction	K			0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.711	2.717	2.715	
Average Specific Gravity at 20° C							**2.714**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - S	DEPTH	SAMPLE - 5.1

Determination No				1	2	3	4
No of Pycnometer				23	6	37	
Weight of Pycnometer		Wf	(gr)	43.180	65.150	50.940	
Weight of (Pycnometer + Water)		Wa	(gr)	146.380	167.850	151.200	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	159.480	180.400	164.010	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.670	37.780	38.220	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.890	20.000	20.440	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	146.3800	167.8500	151.2000	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.790	7.450	7.630	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.682	2.685	2.679	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.668	2.671	2.665	
Average Specific Gravity at 20° C							**2.668**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - S	DEPTH	SAMPLE - 5.2

Determination No				1	2	3	4
No of Pycnometer				14	9	50	
Weight of Pycnometer		Wf	(gr)	69.710	65.320	52.650	
Weight of (Pycnometer + Water)		Wa	(gr)	170.370	167.290	154.080	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	183.320	180.090	166.970	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.350	38.130	38.240	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.570	20.350	20.460	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	170.3700	167.2900	154.0800	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.620	7.550	7.570	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.699	2.695	2.703	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.686	2.682	2.689	
Average Specific Gravity at 20° C							**2.685**

Remarks

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SPECIFIC GRAVITY TEST OF SOIL (ASTM D. 854 - 58)

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 23, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	AHMAT ARIFIN
SAMPLE	TP - S	DEPTH	SAMPLE - 5.3

Determination No				1	2	3	4
No of Pycnometer				32	2	13	
Weight of Pycnometer		Wf	(gr)	51.260	66.900	66.070	
Weight of (Pycnometer + Water)		Wa	(gr)	151.350	168.750	167.270	
Temperature of Calibration (Corrsponding with Wa)		T'	°C	27	27	27	
Weight (Pycnometer + Soil + Water)		Wb	(gr)	164.070	181.520	180.030	
Temperature of Calibration (Corresponding to Wb)		T	°C	27	27	27	
Weight dry soil Wo	No of Container						
	Weight of (Container + Dry Soil)		(gr)	38.000	38.100	38.050	
	Weight of Container		(gr)	17.780	17.780	17.780	
	Wo		(gr)	20.220	20.320	20.270	
Unit of Water ratio (T °C / T' °C)				1.00000	1.00000	1.00000	
Weight of (Pycnometer + Water) Calculation for T° C			(gr)	151.3500	168.7500	167.2700	
Wo + (Wa - Wb)							
Deflocculant correction							
Wo + (Wa - Wb) corrected				7.500	7.550	7.510	
Specific Gravity Gs (T oC) $\frac{Wo}{Wo + (Wa - Wb)}$				2.696	2.691	2.699	
Coefficient for Temperature Correction		K		0.9949	0.9949	0.9949	
Specific Gravity at 20°C = K x Gs (T° C)				2.682	2.678	2.685	
Average Specific Gravity at 20° C							**2.682**

Remarks

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 1**

Wt. (Air dry soil + container) = 74.9 gr
Wt. container No ..... = 34.56 gr
Wt. Of air dry soil W' = 40.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **40.33** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						100.00
2.00	35.87	34.56	1.31		3.25	96.75

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - S	DEPTH	SAMPLE - 1

Wt. (Air dry soil + container) = 86.28 gr — Specific Gravity : 2.658
Wt. of container B-75 = 34.56 gr — Plasticity Index : %
Wt. Of air dry soil W' = 51.72 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 96.75 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-11			NO	A-63			NO	J-19		
WW	54.55	DW	54.19	WW	54.24	DW	53.89	WW	51.33	DW	50.99	Mean value	
DW	54.19	TW	40.14	DW	53.89	TW	39.92	DW	50.99	TW	37.77	w	
Ww	0.36	Ws	14.05	Ww	0.35	Ws	13.97	Ww	0.34	Ws	13.22	2.55	%
w	2.56	%		w	2.51	%		w	2.57	%			

$$W = \frac{100 \times W'}{100 + w} : 50.436 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	8.5	9.5	29	13.198	13.198	3.6330	0.01229	0.0446	6.50	20.66	19.99
2	6.5	7.5	29	13.703	6.852	2.6175	0.01229	0.0322	4.50	14.30	13.84
5	5.5	6.5	29	13.955	2.791	1.6706	0.01229	0.0205	3.50	11.12	10.76
15	4.5	5.5	29	14.208	0.947	0.9732	0.01229	0.0120	2.50	7.95	7.69
30	4.0	5.0	29	14.334	0.478	0.6912	0.01229	0.0085	2.00	6.36	6.15
60	3.5	4.5	29	14.460	0.241	0.4909	0.01229	0.0060	1.50	4.77	4.61
240	3.0	4.0	28	14.586	0.061	0.2465	0.01242	0.0031	1.00	3.18	3.08
1140	2.5	3.5	29	14.712	0.013	0.1136	0.01229	0.0014	0.50	1.59	1.54

P = 100/W = 1.9827

$$Mx = \frac{G_s}{G_s - 1} = 1.6030$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	25.00	22.02	2.980		5.91	94.09	91.04
0.42	29.01		6.990		13.86	86.14	83.34
0.25	33.68		11.660		23.12	76.88	74.38
0.105	44.01		21.990		43.60	56.40	54.57
0.074	49.50		27.480		54.49	45.51	44.04

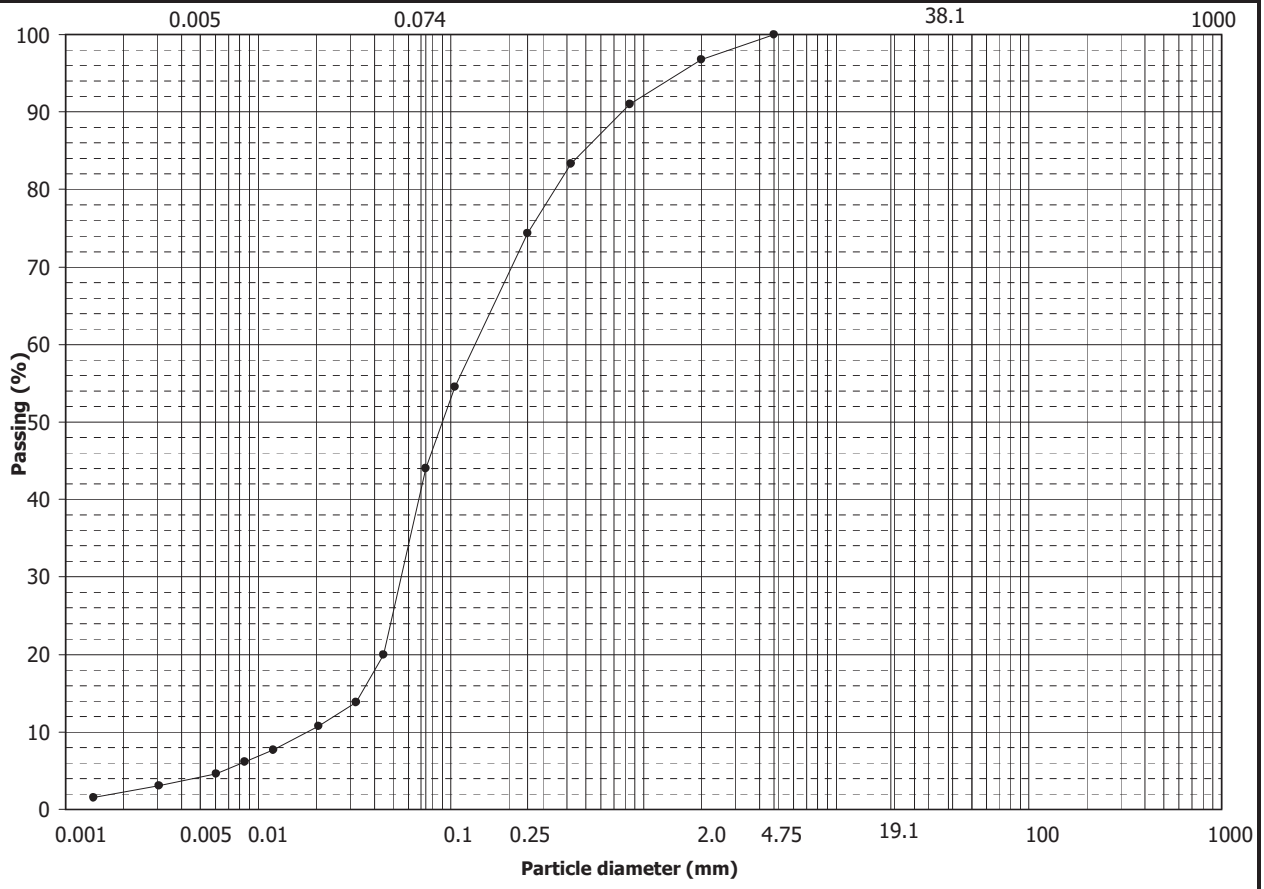
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 1**

SPECIFIC GRAVITY : **2.658**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	55.96	39.85	4.19	4.75	0.7921	0.1447	0.0916	0.0569	0.0184	7.87	96.75	83.34	44.04



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 2**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - S	DEPTH	SAMPLE - 2

Wt. (Air dry soil + container) = 92.80 gr — Specific Gravity : 2.644
Wt. of container E-48 = 36.80 gr — Plasticity Index : %
Wt. Of air dry soil W' = 56.00 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-64			NO	J-20			NO	A-12		
WW	49.33	DW	48.49	WW	53.64	DW	52.74	WW	52.90	DW	51.99	Mean value	
DW	48.49	TW	35.92	DW	52.74	TW	39.07	DW	51.99	TW	38.51	w	
Ww	0.84	Ws	12.57	Ww	0.90	Ws	13.67	Ww	0.91	Ws	13.48	6.67	%
w	6.68	%		w	6.58	%		w	6.75	%			

$$W = \frac{100 \times W'}{100 + w} : 52.497 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	27.5	28.5	29	8.405	8.405	2.8991	0.01234	0.0358	25.50	78.12	78.12
2	26.0	27.0	29	8.783	4.392	2.0956	0.01234	0.0259	24.00	73.52	73.52
5	24.0	25.0	29	9.288	1.858	1.3629	0.01234	0.0168	22.00	67.40	67.40
15	21.0	22.0	29	10.045	0.670	0.8183	0.01234	0.0101	19.00	58.21	58.21
30	18.5	19.5	29	10.675	0.356	0.5965	0.01234	0.0074	16.50	50.55	50.55
60	16.5	17.5	29	11.180	0.186	0.4317	0.01234	0.0053	14.50	44.42	44.42
240	12.5	13.5	28	12.189	0.051	0.2254	0.01248	0.0028	10.50	32.17	32.17
1140	10.0	11.0	29	12.820	0.011	0.1060	0.01234	0.0013	8.00	24.51	24.51

P = 100/W = 1.9049

$$Mx = \frac{G_s}{G_s - 1} = 1.6083$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.76	22.02	0.740		1.41	98.59	98.59
0.42	24.28		2.260		4.30	95.70	95.70
0.25	26.06		4.040		7.70	92.30	92.30
0.105	28.63		6.610		12.59	87.41	87.41
0.074	29.87		7.850		14.95	85.05	85.05

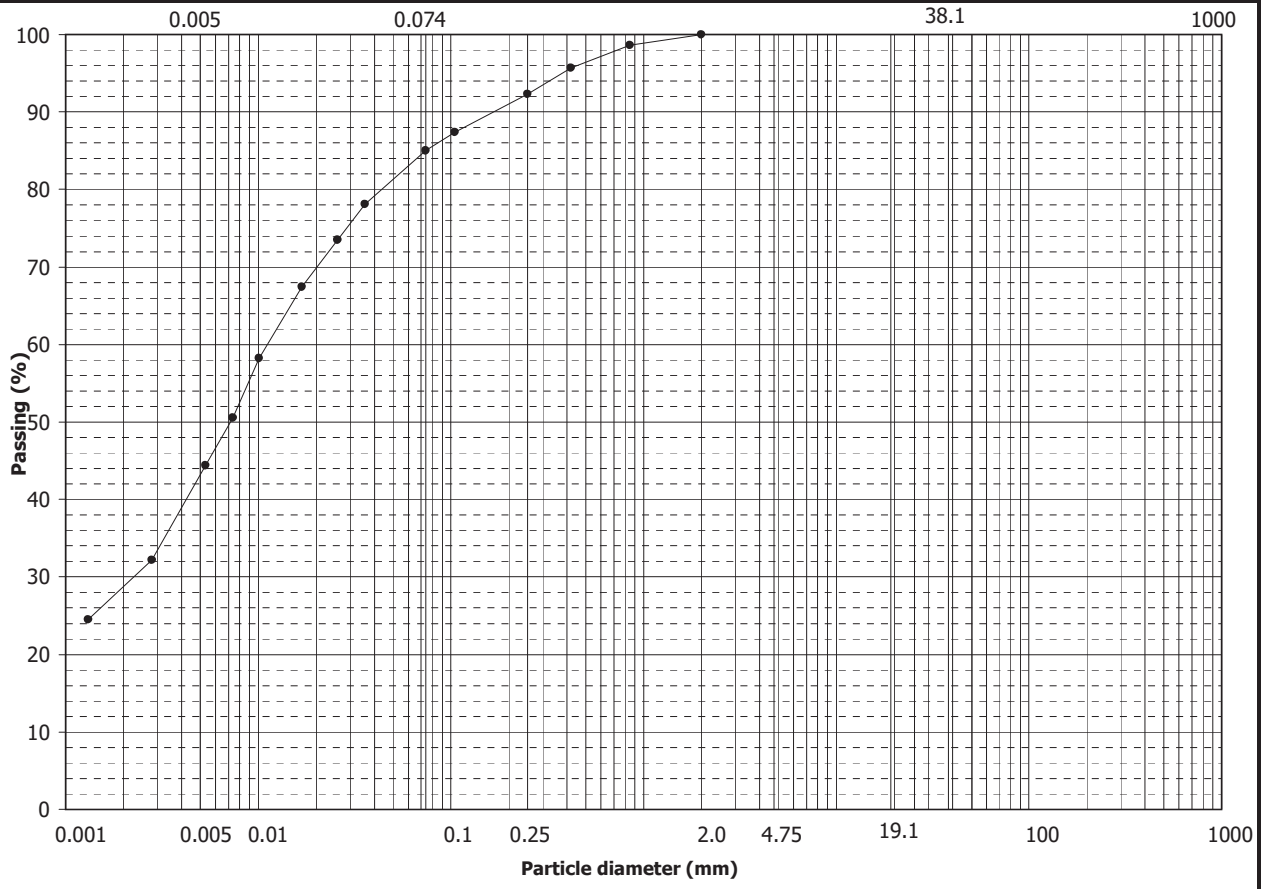
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 2**

SPECIFIC GRAVITY : **2.644**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm Passed Percentage	0.42 mm Passed Percentage	0.074 mm Passed Percentage
0.00	14.95	41.84	43.20	2.00	0.1817	0.0114	0.0072	0.0024	-	-	100.00	95.70	85.05



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 3**

Wt. (Air dry soil + container) = 570.0 gr
Wt. container No ..... = 60.74 gr
Wt. Of air dry soil W' = 509.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **509.26** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						100.00
25.40	167.30	60.7	106.56		20.92	79.08
19.10	206.30		145.56		28.58	71.42
9.52	246.30		185.56		36.44	63.56
4.75	286.40		225.66		44.31	55.69
2.00	323.10		262.36		51.52	48.48

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - S	DEPTH	SAMPLE - 3

Wt. (Air dry soil + container) = 115.84 gr — Specific Gravity : 2.685
Wt. of container M-03 = 50.68 gr — Plasticity Index : %
Wt. Of air dry soil W' = 65.16 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 48.48 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	J-79			NO	L-26			NO	J-26		
WW	49.51	DW	49.10	WW	51.35	DW	50.93	WW	52.60	DW	52.12	Mean value	
DW	49.10	TW	36.37	DW	50.93	TW	37.73	DW	52.12	TW	38.61	w	
Ww	0.41	Ws	12.73	Ww	0.42	Ws	13.20	Ww	0.48	Ws	13.51	3.32	%
w	3.22	%		w	3.18	%		w	3.55	%			

$$W = \frac{100 \times W'}{100 + w} : 63.067 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	16.0	17.0	29	11.306	11.306	3.3625	0.01219	0.0410	14.00	35.37	17.15
2	15.0	16.0	29	11.558	5.779	2.4040	0.01219	0.0293	13.00	32.85	15.92
5	13.0	14.0	29	12.063	2.413	1.5533	0.01219	0.0189	11.00	27.79	13.47
15	11.0	12.0	29	12.568	0.838	0.9153	0.01219	0.0112	9.00	22.74	11.02
30	9.5	10.5	29	12.946	0.432	0.6569	0.01219	0.0080	7.50	18.95	9.19
60	8.0	9.0	29	13.325	0.222	0.4712	0.01219	0.0057	6.00	15.16	7.35
240	6.5	7.5	28	13.703	0.057	0.2389	0.01232	0.0029	4.50	11.37	5.51
1140	4.5	5.5	29	14.208	0.012	0.1116	0.01219	0.0014	2.50	6.32	3.06

P = 100/W = 1.5856

$$Mx = \frac{G\,s}{G\,s - 1} = 1.5935$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	33.48	22.02	11.460		18.17	81.83	39.67
0.42	42.27		20.250		32.11	67.89	32.92
0.25	48.56		26.540		42.08	57.92	28.08
0.105	55.14		33.120		52.52	47.48	23.02
0.074	57.97		35.950		57.00	43.00	20.85

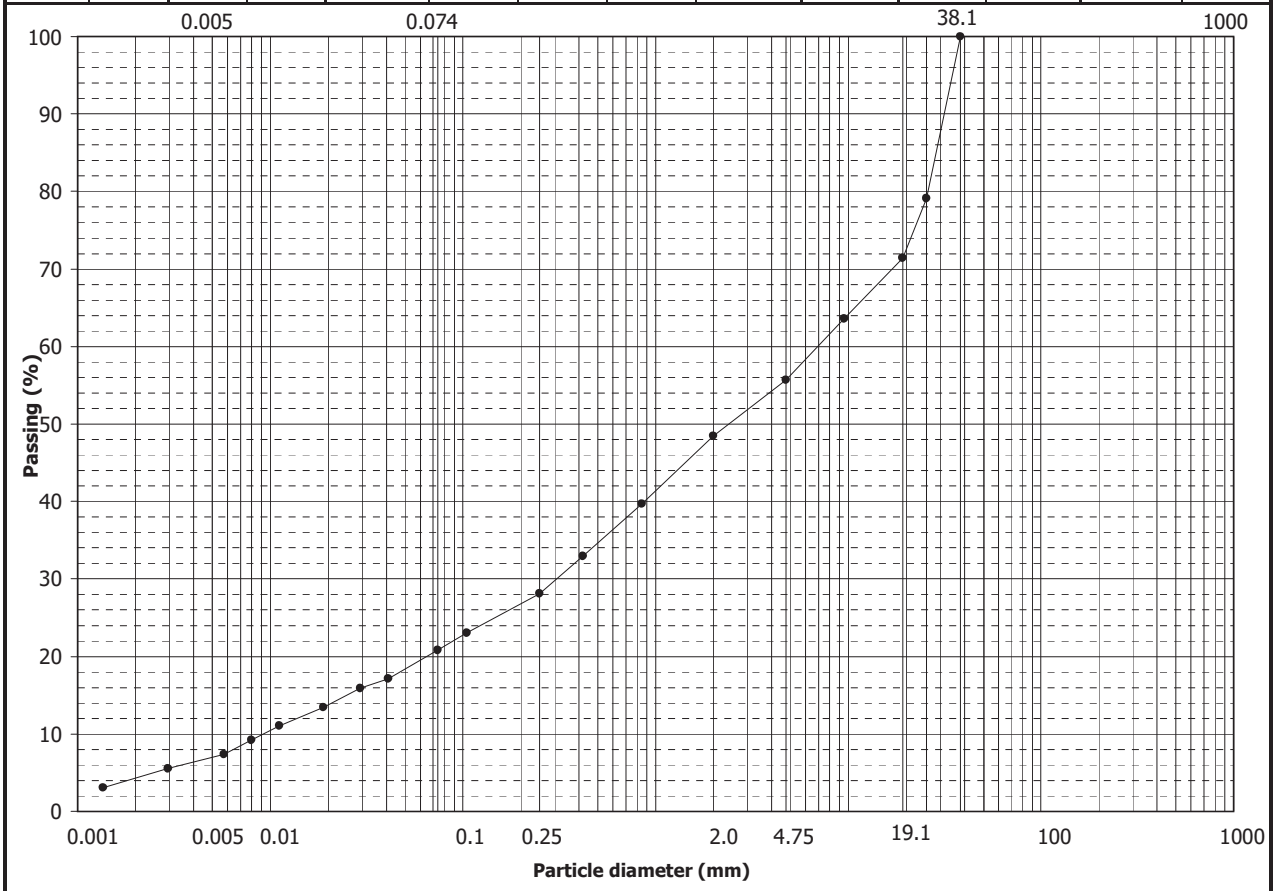
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 3**

SPECIFIC GRAVITY : **2.685**

Gravel %	Sand %	Silt %	Clay %	Max.Size mm	D90 mm	D60 mm	D50 mm	D30 mm	D10 mm	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
											Passed Percentage		
44.31	34.84	13.88	6.97	38.10	32.031	7.362	2.5792	0.3175	0.0094	783.02	48.48	32.92	20.85



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 4**

Wt. (Air dry soil + container) = _____ gr

Wt. container No ..... = _____ gr

Wt. Of air dry soil W' = _____ gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **0.00** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						
19.10						
9.52						
4.75						
2.00						100.00

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - S	DEPTH	SAMPLE - 4

Wt. (Air dry soil + container) = 100.68 gr — Specific Gravity : 2.714
Wt. of container B-36 = 36.39 gr — Plasticity Index : %
Wt. Of air dry soil W' = 64.29 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 100.00 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-65			NO	J-21			NO	A-126		
WW	53.08	DW	52.23	WW	50.14	DW	49.35	WW	43.82	DW	43.11	Mean value	
DW	52.23	TW	38.69	DW	49.35	TW	36.56	DW	43.11	TW	31.93	w	
Ww	0.85	Ws	13.54	Ww	0.79	Ws	12.79	Ww	0.71	Ws	11.18	6.27	%
w	6.28	%		w	6.18	%		w	6.35	%			

$$W = \frac{100 \times W'}{100 + w} : 60.498 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	35.0	36.0	29	6.512	6.512	2.5520	0.01209	0.0308	33.00	86.37	86.37
2	32.5	33.5	29	7.143	3.572	1.8899	0.01209	0.0228	30.50	79.83	79.83
5	29.0	30.0	29	8.026	1.605	1.2670	0.01209	0.0153	27.00	70.67	70.67
15	24.0	25.0	29	9.288	0.619	0.7869	0.01209	0.0095	22.00	57.58	57.58
30	20.0	21.0	29	10.297	0.343	0.5859	0.01209	0.0071	18.00	47.11	47.11
60	16.5	17.5	29	11.180	0.186	0.4317	0.01209	0.0052	14.50	37.95	37.95
240	11.5	12.5	28	12.442	0.052	0.2277	0.01222	0.0028	9.50	24.86	24.86
1140	7.5	8.5	29	13.451	0.012	0.1086	0.01209	0.0013	5.50	14.40	14.40

P = 100/W = 1.653

$$Mx = \frac{G_s}{G_s - 1} = 1.5834$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	22.15	22.02	0.130		0.21	99.79	99.79
0.42	22.28		0.260		0.43	99.57	99.57
0.25	22.38		0.360		0.60	99.40	99.40
0.105	23.11		1.090		1.80	98.20	98.20
0.074	24.00		1.980		3.27	96.73	96.73

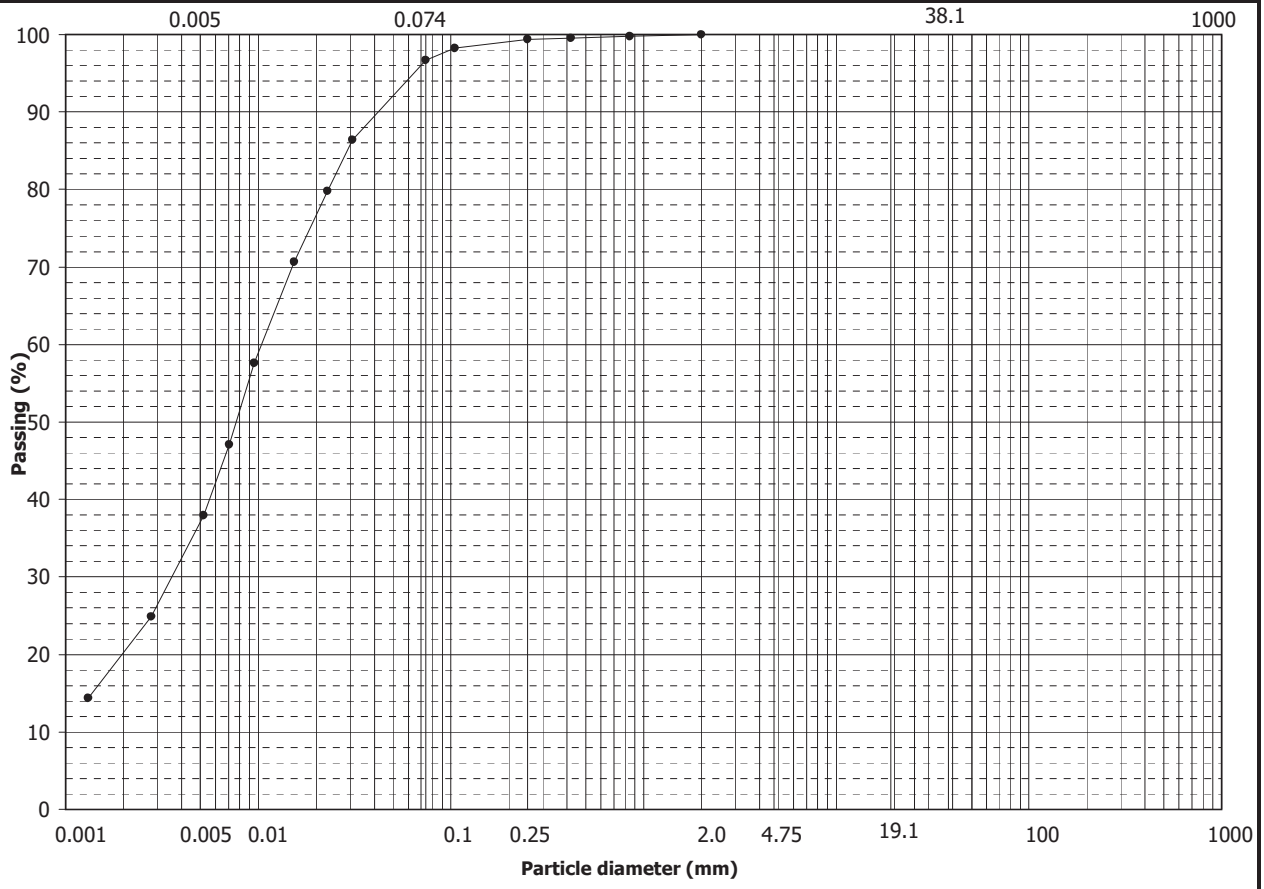
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 4**

SPECIFIC GRAVITY : **2.714**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
0.00	3.27	59.66	37.07	2.00	0.0460	0.0106	0.0078	0.0037	-	-	100.00	99.57	96.73



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 5.1**

Wt. (Air dry soil + container) = 598.0 gr
Wt. container No ..... = 42.73 gr
Wt. Of air dry soil W' = 555.3 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **555.27** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						100.00
25.40	98.70	42.7	55.97		10.08	89.92
19.10	139.90		97.17		17.50	82.50
9.52	221.40		178.67		32.18	67.82
4.75	291.10		248.37		44.73	55.27
2.00	337.90		295.17		53.16	46.84

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - S	DEPTH	SAMPLE - 5.1

Wt. (Air dry soil + container) = 134.97 gr — Specific Gravity : 2.668
Wt. of container B-71 = 34.62 gr — Plasticity Index : %
Wt. Of air dry soil W' = 100.35 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 46.84 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	L-33			NO	T-33			NO	J-86		
WW	53.65	DW	53.27	WW	51.87	DW	51.50	WW	50.61	DW	50.21	Mean value	
DW	53.27	TW	39.46	DW	51.50	TW	38.15	DW	50.21	TW	37.19	w	
Ww	0.38	Ws	13.81	Ww	0.37	Ws	13.35	Ww	0.40	Ws	13.02	2.87	%
w	2.75	%		w	2.77	%		w	3.07	%			

$$W = \frac{100 \times W'}{100 + w} : 97.555 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	17.0	18.0	29	11.054	11.054	3.3247	0.01225	0.0407	15.00	24.59	11.52
2	15.0	16.0	29	11.558	5.779	2.4040	0.01225	0.0295	13.00	21.31	9.98
5	12.5	13.5	29	12.189	2.438	1.5614	0.01225	0.0191	10.50	17.22	8.06
15	10.5	11.5	29	12.694	0.846	0.9199	0.01225	0.0113	8.50	13.94	6.53
30	9.0	10.0	29	13.072	0.436	0.6601	0.01225	0.0081	7.00	11.48	5.38
60	8.0	9.0	29	13.325	0.222	0.4712	0.01225	0.0058	6.00	9.84	4.61
240	5.5	6.5	28	13.955	0.058	0.2411	0.01239	0.0030	3.50	5.74	2.69
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01225	0.0014	2.00	3.28	1.54

P = 100/W = 1.0251

$$Mx = \frac{G_s}{G_s - 1} = 1.5995$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	39.79	22.02	17.770		18.22	81.78	38.31
0.42	59.02		37.000		37.93	62.07	29.08
0.25	71.04		49.020		50.25	49.75	23.30
0.105	83.55		61.530		63.07	36.93	17.30
0.074	90.18		68.160		69.87	30.13	14.11

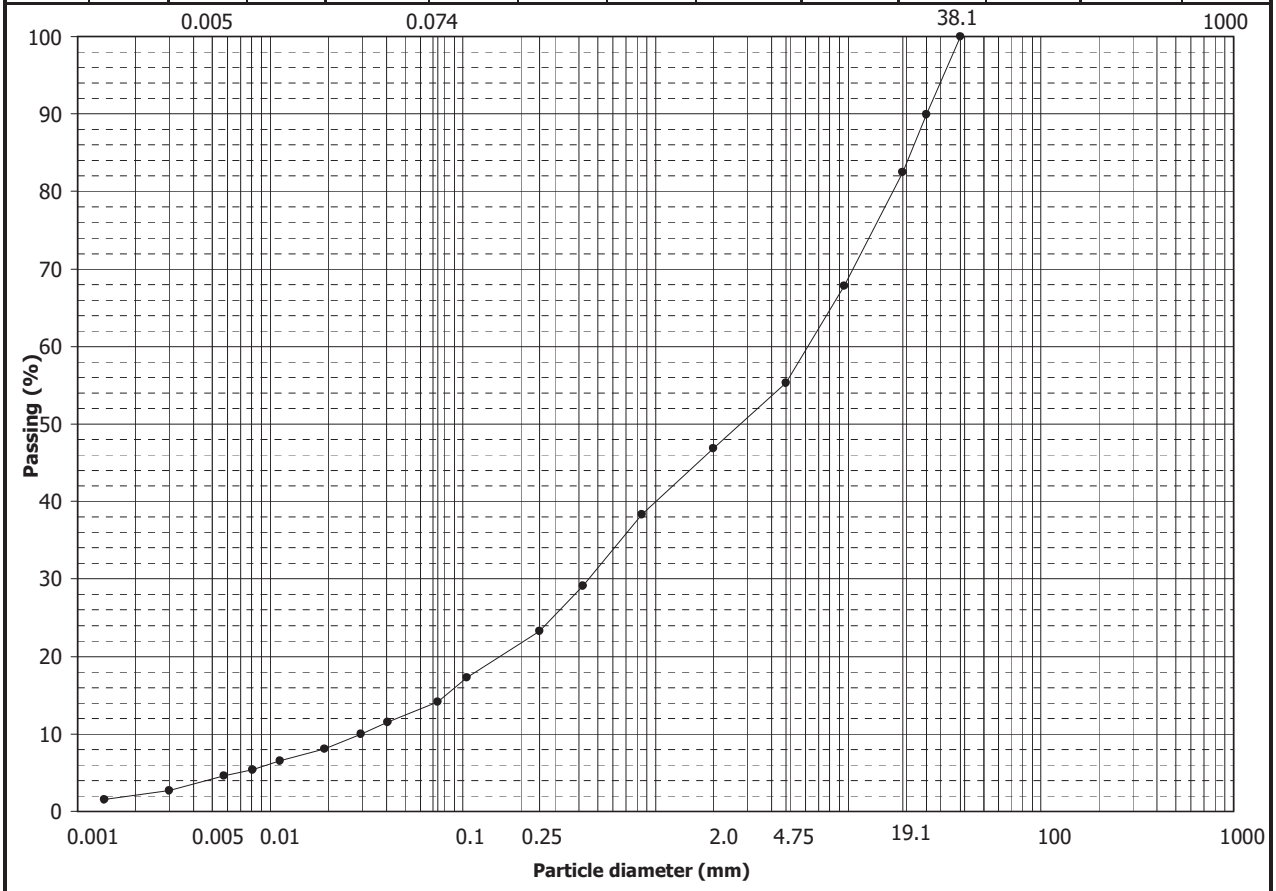
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 5.1**

SPECIFIC GRAVITY : **2.668**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
44.73	41.16	9.93	4.19	38.10	25.501	6.5473	3.0304	0.4630	0.0296	221.42	46.84	29.08	14.11



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 5.2**

Wt. (Air dry soil + container) = 617.0 gr

Wt. container No ..... = 44.95 gr

Wt. Of air dry soil W' = 572.1 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **572.05** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr

Wt. Of container No..... = _____ gr

Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						100.00
25.40	81.10	45.0	36.15		6.32	93.68
19.10	130.20		85.25		14.90	85.10
9.52	196.30		151.35		26.46	73.54
4.75	237.40		192.45		33.64	66.36
2.00	294.70		249.75		43.66	56.34

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - S	DEPTH	SAMPLE - 5.2

Wt. (Air dry soil + container) = 152.40 gr — Specific Gravity : 2.685
Wt. of container B-92 = 34.39 gr — Plasticity Index : %
Wt. Of air dry soil W' = 118.01 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 56.34 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	T-23			NO	T-76			NO	L-23		
WW	50.40	DW	50.03	WW	50.78	DW	50.41	WW	50.58	DW	50.17	Mean value	
DW	50.03	TW	37.06	DW	50.41	TW	37.34	DW	50.17	TW	37.16	w	
Ww	0.37	Ws	12.97	Ww	0.37	Ws	13.07	Ww	0.41	Ws	13.01	2.95	%
w	2.85	%		w	2.83	%		w	3.15	%			

$$W = \frac{100 \text{ x } W'}{100 + w} : 114.634 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	18.5	19.5	29	10.675	10.675	3.2673	0.01219	0.0398	16.50	22.94	12.92
2	16.5	17.5	29	11.180	5.590	2.3643	0.01219	0.0288	14.50	20.16	11.36
5	14.0	15.0	29	11.811	2.362	1.5369	0.01219	0.0187	12.00	16.68	9.40
15	11.0	12.0	29	12.568	0.838	0.9153	0.01219	0.0112	9.00	12.51	7.05
30	9.5	10.5	29	12.946	0.432	0.6569	0.01219	0.0080	7.50	10.43	5.87
60	8.0	9.0	29	13.325	0.222	0.4712	0.01219	0.0057	6.00	8.34	4.70
240	6.0	7.0	28	13.829	0.058	0.2400	0.01232	0.0030	4.00	5.56	3.13
1140	4.0	5.0	29	14.334	0.013	0.1121	0.01219	0.0014	2.00	2.78	1.57

P = 100/W = 0.8723

$$Mx = \frac{G_s}{G_s - 1} = 1.5935$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	47.82	22.02	25.800		22.51	77.49	43.66
0.42	68.62		46.600		40.65	59.35	33.44
0.25	82.44		60.420		52.71	47.29	26.65
0.105	96.51		74.490		64.98	35.02	19.73
0.074	100.75		78.730		68.68	31.32	17.65

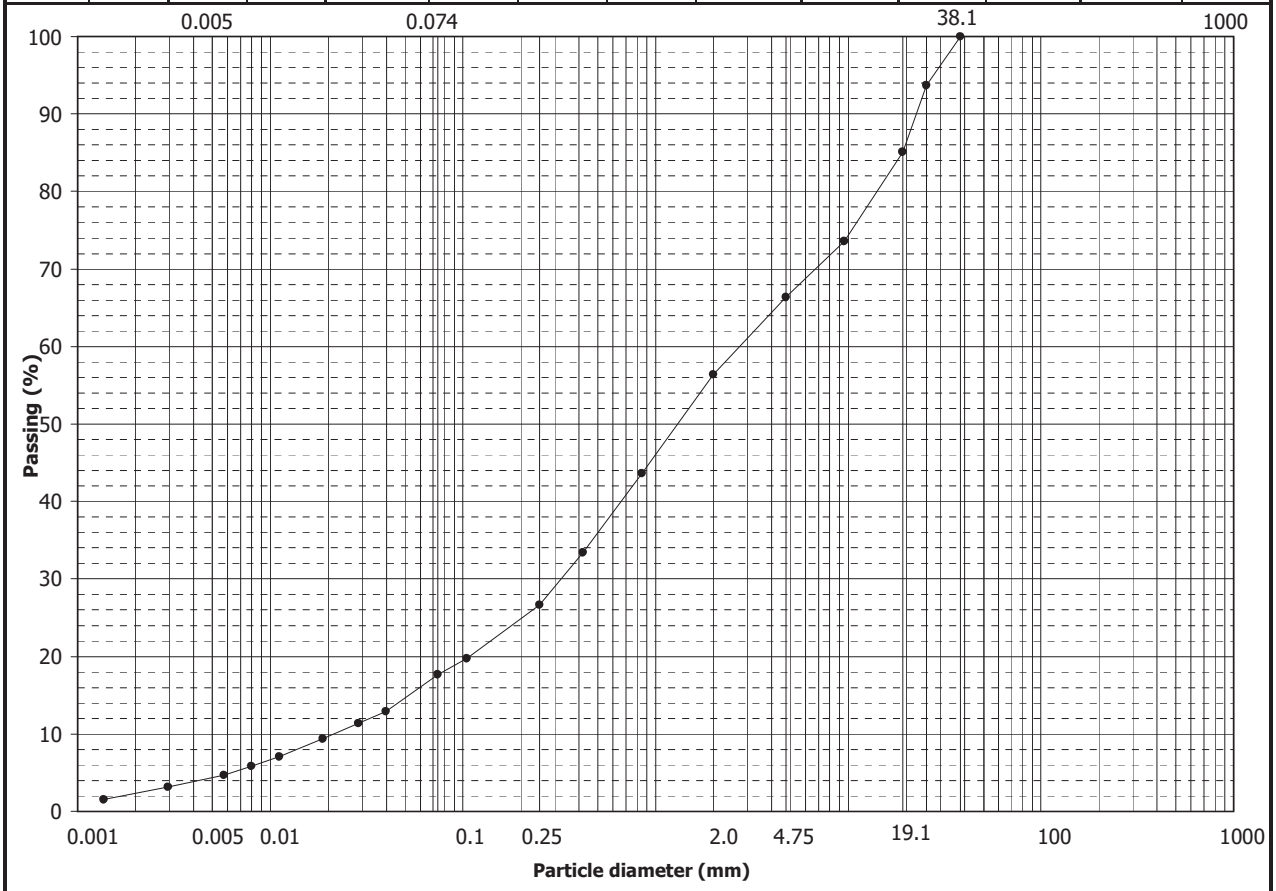
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 5.2**

SPECIFIC GRAVITY : **2.685**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
33.64	48.71	13.28	4.37	38.10	22.698	3.0045	1.4249	0.3340	0.0218	137.59	56.34	33.44	17.65



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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GRAIN SIZE ANALYSIS (COARSE PART) ASTM D 422 - 72

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 5.3**

Wt. (Air dry soil + container) = 681.0 gr
Wt. container No ..... = 44.99 gr
Wt. Of air dry soil W' = 636.0 gr

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

NO		NO		NO		
WW	DW	WW	DW	WW	DW	Mean value
DW	TW	DW	TW	DW	TW	w
Ww	Ws	Ww	Ws	Ww	Ws	%
w	%	w	%	w	%	

Wt. Oven dry soil $W = \frac{100\ W'}{100 + w}$: **636.01** gr

II. SIEVE ANALYSIS

Wash the retained soil on 2.00 mm sieve, dry it (Wt. of oven dry soil, Wo), and then make sive analysis

Wt. (Wo + container) = _____ gr
Wt. Of container No..... = _____ gr
Wo = _____ gr

Sieve opening mm	Wt (soil retained container) in gr	Wt. of container in gr	Wt of soil retained in gr	Percent retained %	Cumm.Percent retained %	Cumm. Percent finer %
101.6						
76.20						
63.50						
50.80						
38.10						
25.40						100.00
19.10	65.90	44.99	20.91		3.29	96.71
9.52	129.50		84.51		13.29	86.71
4.75	203.30		158.31		24.89	75.11
2.00	270.50		225.51		35.46	64.54

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GRAIN SIZE ANALYSIS (FINER PART) ASTM D 422 - 72

PROJECT	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 25, 2019
LOCATION	SIBALAYA - PALU	TESTED BY	Luqmanul Kh
SAMPLE NO.	TP - S	DEPTH	SAMPLE - 5.3

Wt. (Air dry soil + container) = 159.95 gr — Specific Gravity : 2.682
Wt. of container B-54 = 35.49 gr — Plasticity Index : %
Wt. Of air dry soil W' = 124.46 gr — Deflocculating agent 2.0
% finer then 2.00 mm : 64.54 %

I. WATER CONTENT OF AIR DRY SOIL SAMPLE

		NO	A-94			NO	J-50			NO	A-41		
WW	50.15	DW	49.80	WW	51.98	DW	51.62	WW	51.81	DW	51.41	Mean value	
DW	49.80	TW	36.89	DW	51.62	TW	38.24	DW	51.41	TW	38.08	w	
Ww	0.35	Ws	12.91	Ww	0.36	Ws	13.38	Ww	0.40	Ws	13.33	2.80	%
w	2.71	%		w	2.69	%		w	3.00	%			

$$W = \frac{100 \times W'}{100 + w} : 121.069 \text{ gr}$$

II. Hydrometer Analysis — Hydrometer No : 151 H

1	2	3	4	5	6	7	8	9	10	11	12
Elapsed time min	Hydrometer reading: Under decemal only	Hydrometer reading: r' 2+cm	Temperature	L	L/t	$\sqrt{\frac{L}{t}}$	$\sqrt{\frac{30\,\eta}{980\,(G_s - G_1)}}$	d	r' - G1	10xPxMx	Cummulative Finer P x P20
1	21.0	22.0	29	10.045	10.045	3.1693	0.01220	0.0387	19.00	25.02	16.15
2	18.5	19.5	29	10.675	5.338	2.3103	0.01220	0.0282	16.50	21.73	14.03
5	15.0	16.0	29	11.558	2.312	1.5204	0.01220	0.0186	13.00	17.12	11.05
15	12.5	13.5	29	12.189	0.813	0.9015	0.01220	0.0110	10.50	13.83	8.93
30	11.0	12.0	29	12.568	0.419	0.6472	0.01220	0.0079	9.00	11.85	7.65
60	9.5	10.5	29	12.946	0.216	0.4645	0.01220	0.0057	7.50	9.88	6.38
240	7.0	8.0	28	13.577	0.057	0.2378	0.01233	0.0029	5.00	6.59	4.25
1140	5.5	6.5	29	13.955	0.012	0.1106	0.01220	0.0013	3.50	4.61	2.98

P = 100/W = 0.826

$$Mx = \frac{G_s}{G_s - 1} = 1.5945$$

III. Sieve analysis — Cm = Miniscus Correction

Sieve Opening mm	Wt.(Soil Retained Container gram	Wt. of container gram	Wt of soil Retained gram	Percent Retained %	Percent Cumm. Retained %	Cumm. Percent Finer Part %	Corrected Percent finer P x P20
0.85	44.28	22.02	22.260		18.39	81.61	52.68
0.42	65.64		43.620		36.03	63.97	41.29
0.25	79.56		57.540		47.53	52.47	33.87
0.105	95.94		73.920		61.06	38.94	25.14
0.074	101.30		79.280		65.48	34.52	22.28

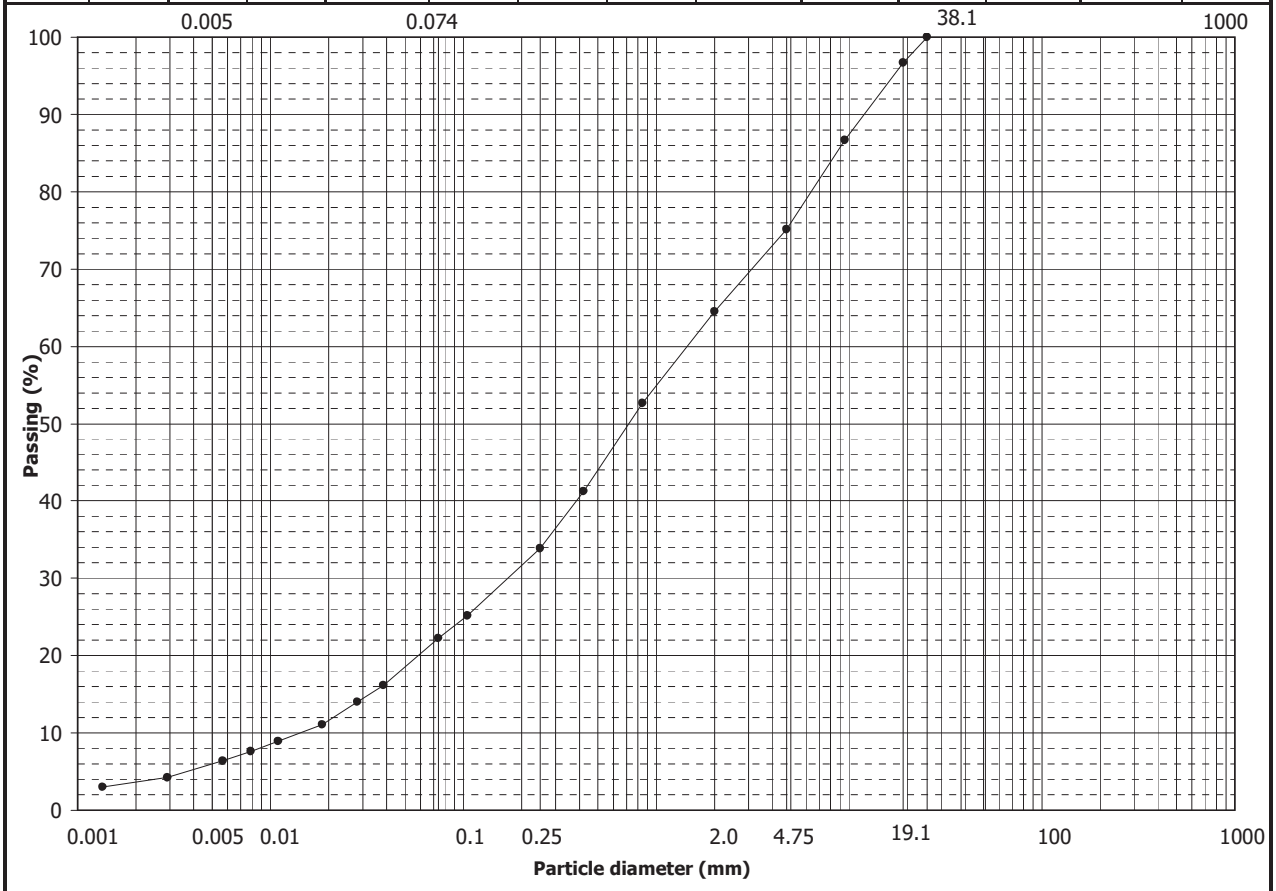
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RESULT OF GRAIN SIZE ANALYSIS

PROJECT	**BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI**	DATE	February 25, 2019
LOCATION	**SIBALAYA - PALU**	TESTED BY	Luqmanul Kh
SAMPLE NO.	**TP - S**	DEPTH	**SAMPLE - 5.3**

SPECIFIC GRAVITY : **2.682**

Gravel	Sand	Silt	Clay	Max.Size	D90	D60	D50	D30	D10	Uniformity Coeff.	2.00 mm	0.42 mm	0.074 mm
%	%	%	%	mm	mm	mm	mm	mm	mm		Passed Percentage		
24.89	52.83	16.31	5.97	25.40	12.670	1.5597	0.7489	0.1858	0.0148	105.27	64.54	41.29	22.28



Clay	Silt	Sand	Gravel		Cobble	Boulder
			Fine	Coarse		

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	SIBALAYA - PALU	TESTED BY	REDY
SAMPLE NO.	:	TP - S	DEPTH (m)	SAMPLE - 1

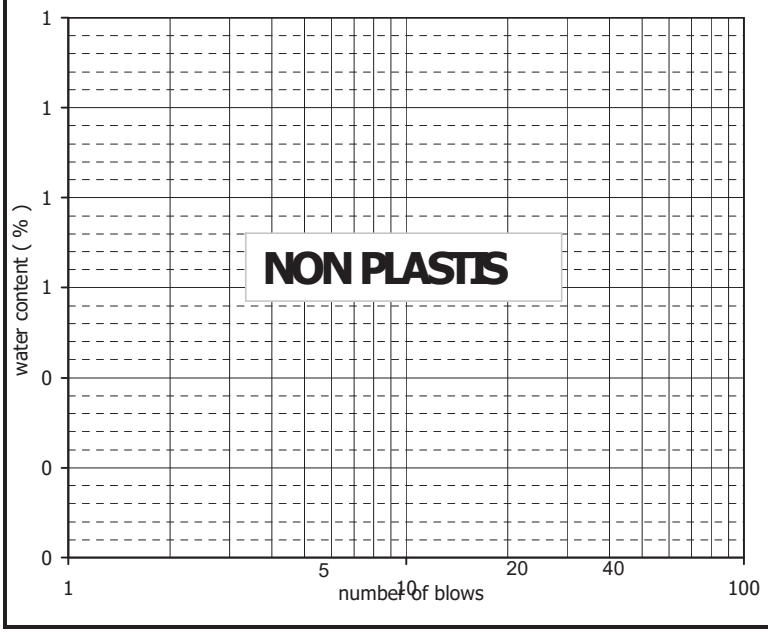
LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

4	5	6
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT = %
PLASTIC LIMIT = %
PLASTICITY INDEX = %
FLOW INDEX =

REMARKS :
WW : Wt. of container + wet soil in g.
DW : Wt. of container + dry soil in g.
TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

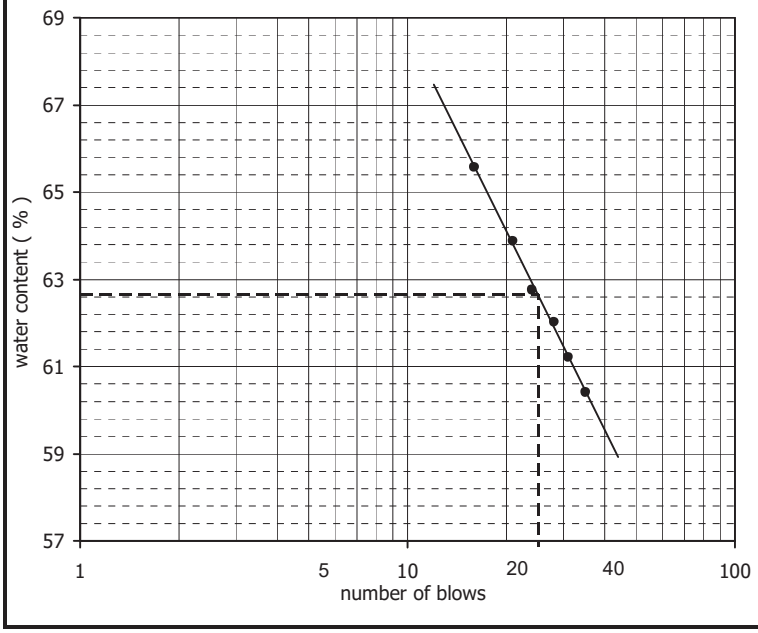
PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	SIBALAYA - PALU	TESTED BY		REDY
SAMPLE NO.	:	TP - S	DEPTH (m)		SAMPLE - 2

LIQUID LIMIT

1				2				2			
NO. OF BLOWS			35 x	NO. OF BLOWS			31 x	NO. OF BLOWS			28 x
		No.	T-05			No.	T-58			No.	T-37
WW	65.760	DW	55.200	WW	63.670	DW	53.600	WW	53.220	DW	48.240
DW	55.200	TW	37.720	DW	53.600	TW	37.150	DW	48.240	TW	40.210
Ww	10.560	Ws	17.480	Ww	10.070	Ws	16.450	Ww	4.980	Ws	8.030
	W =	60.41	%		W =	61.22	%		W =	62.02	%
4				5				6			
NO. OF BLOWS			24 x	NO. OF BLOWS			21 x	NO. OF BLOWS			16 x
		No.	L-05			No.	T-20			No.	T-07
WW	54.390	DW	48.400	WW	58.970	DW	50.410	WW	57.730	DW	49.980
DW	48.400	TW	38.857	DW	50.410	TW	37.010	DW	49.980	TW	38.160
Ww	5.990	Ws	9.544	Ww	8.560	Ws	13.400	Ww	7.750	Ws	11.820
	W =	62.77	%		W =	63.88	%		W =	65.57	%

PLASTIC LIMIT

1				2				3			
		No.	A-89			No.	J-82			No.	A-83
WW	56.910	DW	52.010	WW	56.580	DW	52.130	WW	57.710	DW	52.040
DW	52.010	TW	37.460	DW	52.130	TW	38.760	DW	52.040	TW	35.150
Ww	4.900	Ws	14.550	Ww	4.450	Ws	13.370	Ww	5.670	Ws	16.890
	W =	33.68	%		W =	33.28	%		W =	33.57	%



LIQUID LIMIT	=	62.65	%
PLASTIC LIMIT	=	33.51	%
PLASTICITY INDEX	=	29.14	%
FLOW INDEX	=	15.14	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	SIBALAYA - PALU	TESTED BY	REDY
SAMPLE NO.	:	TP - S	DEPTH (m)	SAMPLE - 3

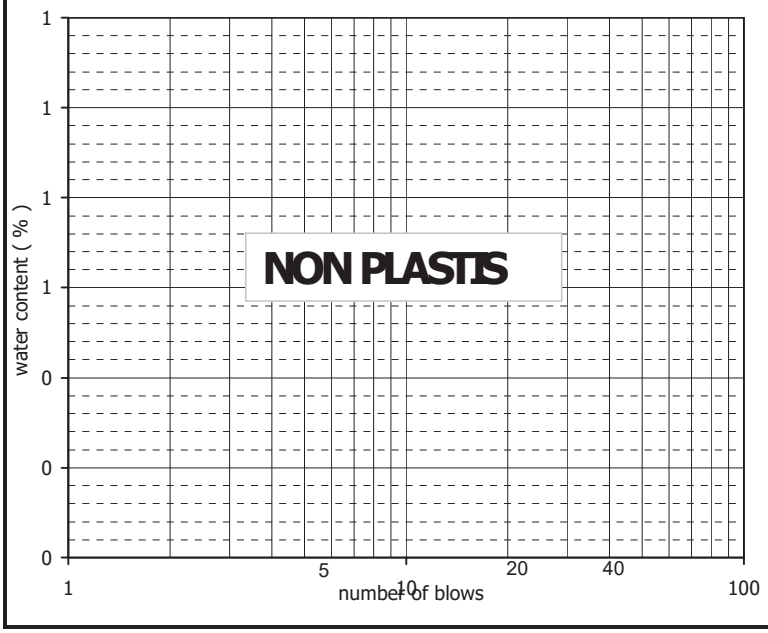
LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

4	5	6
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE		February 26, 2019
LOCATION	:	SIBALAYA - PALU	TESTED BY		REDY
SAMPLE NO.	:	TP - S	DEPTH (m)		SAMPLE - 4

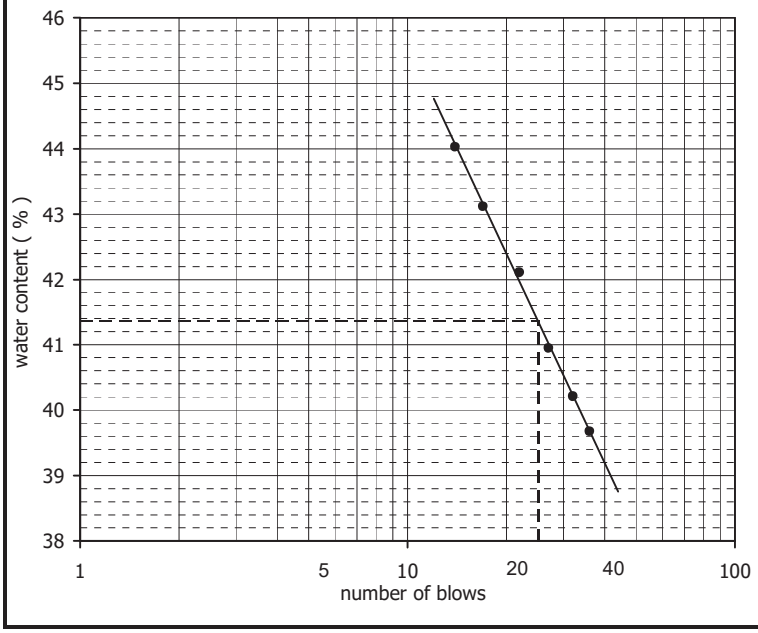
LIQUID LIMIT

1				2				3			
NO. OF BLOWS			36 x	NO. OF BLOWS			32 x	NO. OF BLOWS			27 x
		No.	J-66			No.	J-78			No.	L-13
WW	58.450	DW	52.560	WW	53.130	DW	48.470	WW	52.650	DW	48.620
DW	52.560	TW	37.715	DW	48.470	TW	36.880	DW	48.620	TW	38.779
Ww	5.890	Ws	14.846	Ww	4.660	Ws	11.590	Ww	4.030	Ws	9.841
	W =		39.68 %		W =		40.21 %		W =		40.95 %

4				5				6			
NO. OF BLOWS			22 x	NO. OF BLOWS			17 x	NO. OF BLOWS			14 x
		No.	A-20			No.	J-11			No.	T-13
WW	59.180	DW	53.260	WW	63.760	DW	56.430	WW	44.740	DW	42.420
DW	53.260	TW	39.200	DW	56.430	TW	39.430	DW	42.420	TW	37.150
Ww	5.920	Ws	14.060	Ww	7.330	Ws	17.000	Ww	2.320	Ws	5.270
	W =		42.11 %		W =		43.12 %		W =		44.02 %

PLASTIC LIMIT

1				2				3			
		No.	A-54			No.	A-42			No.	J-13
WW	57.050	DW	52.860	WW	57.840	DW	53.950	WW	50.490	DW	48.420
DW	52.860	TW	37.440	DW	53.950	TW	39.460	DW	48.420	TW	40.750
Ww	4.190	Ws	15.420	Ww	3.890	Ws	14.490	Ww	2.070	Ws	7.670
	W =		27.17 %		W =		26.85 %		W =		26.99 %



LIQUID LIMIT	=	41.37 %
PLASTIC LIMIT	=	27.00 %
PLASTICITY INDEX	=	14.37 %
FLOW INDEX	=	10.66

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

The Limits is determined on the portion of the soil passing 0.42 mm sieve

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	SIBALAYA - PALU	TESTED BY	REDY
SAMPLE NO.	:	TP - S	DEPTH (m)	SAMPLE - 5.1

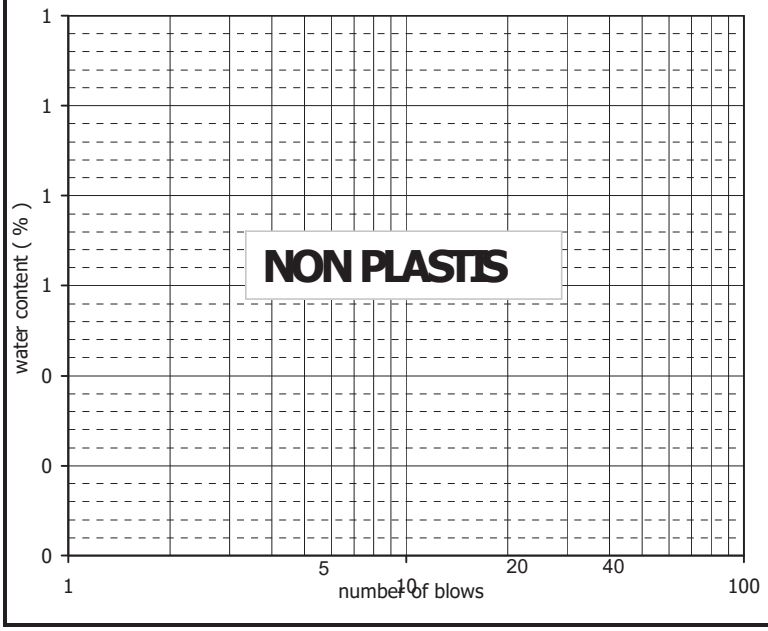
LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

4	5	6
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	SIBALAYA - PALU	TESTED BY	REDY
SAMPLE NO.	:	TP - S	DEPTH (m)	SAMPLE - 5.2

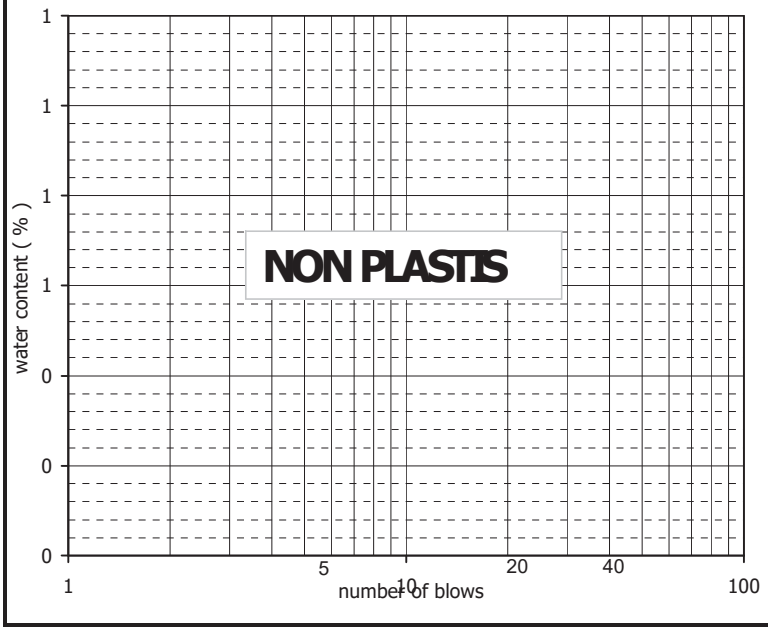
LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

4	5	6
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

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DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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LIQUID LIMIT & PLASTIC LIMIT (ASTM D. 4318 - 93)

PROJECT	:	BORING SURVEY OF COASTAL AREA FOR DEVELOPMENT OF REGIONAL DISASTER RISK RESILIENCE PLAN IN CENTRAL SULAWESI	DATE	February 26, 2019
LOCATION	:	SIBALAYA - PALU	TESTED BY	REDY
SAMPLE NO.	:	TP - S	DEPTH (m)	SAMPLE - 5.3

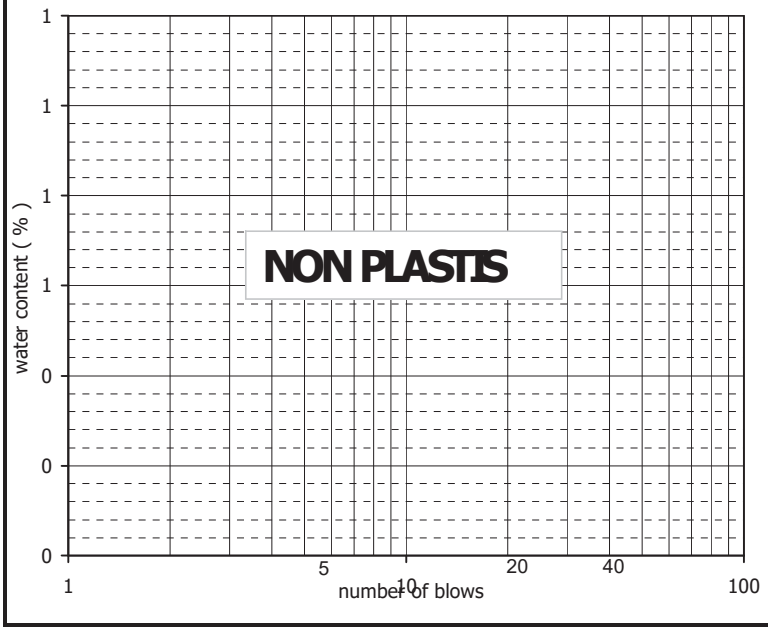
LIQUID LIMIT

1	2	3
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

4	5	6
NO. OF BLOWS x	NO. OF BLOWS x	NO. OF BLOWS x
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %

PLASTIC LIMIT

1	2	3
No.	No.	No.
WW DW	WW DW	WW DW
DW TW	DW TW	DW TW
Ww Ws	Ww Ws	Ww Ws
W = %	W = %	W = %



LIQUID LIMIT	=	%
PLASTIC LIMIT	=	%
PLASTICITY INDEX	=	%
FLOW INDEX	=	

REMARKS :

WW : Wt. of container + wet soil in g.

DW : Wt. of container + dry soil in g.

TW : Wt. of container in g.

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