

DMR 515

# MINISTRY OF TRANSPORT & PUBLIC INFRASTRUCTURE CENTRAL MATERIALS LABORATORY

# Reconstruction & Expansion of Selected Community Day Secondary Schools In Republic of Malawi REPORT ON

### **GEOTECHNICAL INVESTIGATIONS**

January, 2010

Secretary for Transport & Public Infrastructure

**Central Materials Laboratory** 

Private Bag 322

Private Bag 16

LILONGWE 3

LILONGWE

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#### SELECTED COMMUNITY DAY SECONDARY SCHOOLS

#### 1.0 INTRODUCTION

This report covers soil investigations for the Selected Community Day Secondary Schools. There are a total of six sites which cover the two out of three regions of Malawi. The two are the Central and the Southern Regions. In the Southern Region, three districts were proposed for the project which included Mulanje allocated Lot 1 at Chakhwaza, Balaka which was allocated Lot 2 at Dziwe and Lot 5 at Namalomba. Blantyre District was allocated Lot 3 at Nankumba which is in rural area and Lot 6 at Nanjiriri in urban area. In the Central region Lilongwe was allocated Lot 4 at Mseche which is in rural area. The project is under Education Development Management (EDMU) of Ministry of Education, Science The Japanese Government wants to assist the and Technology. Government of the Republic of Malawi to implement the project. In order to do this, the Government of Japan identified Matsuda Consultants International Company Limited to carry out the design and supervision works. Central Materials Laboratory in Ministry of Transport and Public Infrastructure was sub-contracted to carry out Soil Investigations on the proposed sites and subsequent testing in order to furnish the client with the information leading to proper designing of the structures. The sites Investigations commenced on 27th November, 2009 and were completed on 12<sup>th</sup> December, 2009 while laboratory testing was completed on 22<sup>nd</sup> December, 2009.

#### 2.0 FIELD WORKS

This involved the drilling of three boreholes to depth of 5.00 metres on each proposed site and carrying out percolation test at a depth of 1 metre. In each borehole, disturbed at soil change and undisturbed samples before Standard Penetration Test (SPT) were collected for classification and Shear strength testing respectively. Soil profiles were also recorded in each trial pit. The sampling was done in accordance to BS 5930. The Borehole logs are appended in appendix B and Percolation test results are appended in Appendix E.

#### 3.0 SITE LOCATIONS

### (a) MULANJE

Chikhwaza Community Day Secondary School site which is Lot 1, lies on the South West of Mulanje and is about twelve kilometres from Mulanje District Headquarters.

### (b) BALAKA

This district has two sites. Dziwe Community Day Secondary School which is Lot 2 is situated to the South East of Balaka. The site is about 30 Kilometres from Balaka Headquarters and about 10 Kilometres south of Liwonde Township along Shire River.

Namalomba Community Day Secondary School labelled Lot 5 is situated to the East of Balaka is about 40 Kilometres away. The site is close at Ulongwe Trading Centre on Lilonde – Mangochi Road.

#### (c) BLANTYRE

Blantyre District also has two sites. Nankumba Community Day Secondary School is in the rural area south of Blantyre District Headquarters. The site is about 20 Kilometres from the City on Blantyre – Chikwawa Road at Chadzunda in Mpemba.

Nanjiriri Community Day Secondary School is Lot 6 and is in the urban area. The school is situated to the north of the City of Blantyre and is about 7 Kilometres. The school is in Machinjiri Location.

### (d) LILONGWE

Mseche Community Day Secondary School site labelled Lot 4 lies to the east of Lilongwe City. The distance to the site is about 35 Kilometres and is on Lilongwe - Salima Road.

The site locations are appended in appendix A.

### 3.1 GEOLOGY OF THE SITES (AREAS)

#### (i) MULANJE

Chikhwaza CDSS site is geologically dominated by Greyish to Reddish brown sandy silt CLAY which is underlain by Semi-pelitic rocks: biotiteand hornblende-gneiss, commonly garnetiferous and locally graphic.

### (ii) BALAKA

Dziwe CDSS site has some clayey quartz GRAVEL and sandy silt CLAY while Namalomba CDSS site has also clayey SILT and clayey SAND. Both sites are underlain by Alluvium.

### (iii) BLANTYRE

Both sites Nankumba and Nanjiriri CDSS have sandy silt CLAY but Nankumba has also some clayey GRAVEL while Nanjiriri in addition has some weathered ROCK. The two sites are underlain by Charnockitic suite: banded pyroxene - granulites and gneisses, hypersthenes-granite.

### (iv) LILONGWE

Mseche CDSS site has a number of soils ranging from sandy silt CLAY, clayey silt SAND, quartz GRAVEL and weathered ROCK. Generally the site is geologically underlain by semi-pelitic rocks: - biotite and horn-blend gneisses commonly garnetiferous and locally graphitic.

#### 4.0 ENVIRONMENTAL CONDITIONS

Since environment conditions play an important role in the design assumptions, here are some meteorological data for the sites:-

#### (i) LOT 1 CHIKHWAZA CDSS IN MULANJE:

Mean rainfall = 1200mm Mean temperatures = 28 °C Mean relative humidity = 70%

### (ii) LOT 2 DZIWE CDSS IN BALAKA

Mean rainfall = 816mm Mean temperatures = 32 °C Mean relative humidity = 72%

#### (iii) LOT 3 NANKUMBA CDSS IN BLANTYRE RURAL

Mean rainfall = 1140mm Mean temperatures = 19.1 °C Mean relative humidity = 74%

### (iv) LOT 4 MSECHE CDSS IN LILONGWE RURAL

Mean rainfall = 848mm

Mean temperatures = 20 °C

Mean relative humidity = 70%

### (v) LOT 5 NAMALOMBA CDSS IN BALAKA

Mean rainfall = 816mm Mean temperatures = 32 °C Mean relative humidity = 72%

### (vi) LOT 6 NANJIRIRI CDSS IN BLANTYRE URBAN

Mean rainfall = 1140mm Mean temperatures = 19.0 °C Mean relative humidity = 74%

### 5.0 FIELD AND LABORATORY TEST RESULTS

In the field Standard Penetration Tests (SPT) were performed in the borehole at an average depth of 1.5 metres in accordance with BS 5930 of 1990. The N-Values derived from the SPT have been calculated to Estimated Ultimate Bearing Capacities. The Bearing Capacities are appended in appendix C.

In the Laboratory the following tests were performed in accordance with BS 1377 of 1990.

- (i) Atterberg Limits
- (ii) Sieve Analysis (Particle Size Distribution)
- (iii) Shear strength parameters on undisturbed samples.

The results are appended in appendix D.

#### 6.0 ANALYSIS OF THE RESULTS

Field description, Standard Penetration Tests (SPT) N-Values and laboratory test results confirm that:

- (i) Chikhwaza CDSS site is underlain by clayey soils with classifications of A-7-5 and A-7-6 with group indices ranging from 4to 19. Soils with A-7 are rated poor materials.
- (ii) Dziwe CDSS site has very poor material close to the surface with classification of A-7-5 at BH 1, A-6 at BH2 and A-7-6 at BH3. Below these soils, the site has clayey gravels with classification of A-2-7 having group indices ranging from o to 3. Samples with classification of A-2-7 group are rated fair materials.
- (iii) Nankumba CDSS site has clayey soils except in BH1 where soil with classification of A-2-4 was encountered from 0.00 to 0.40. In BH2, soil with classification of A-4 was encountered from 1.50 to 1.95. The material is silt. Both of them are non plastic while in BH3, all are clayey soils with classification of A-7-6 which are rated poor soils.
- (iv) Mseche CDSS site generally has clayey gravel with classification ranging from A-2-4 to A-2-7 which are rated good to fair soils except in BH2 where clayey material was encountered from 0.40 to 1.60 metres. In BH3, clayey soils were encountered from 0.00 to 1.80 metres.
- (v) Namalomba CDSS site generally has clayey soils as indicated in BH1 and BH3 with classification of A-6 with exceptional of A-4 in BH1 from 0.00 to 0.64 of a metre which is silt material. BH2 has a very different materials compared to BH1 and BH3. The soils classification in BH2 from 0.00 to 0.70m is A-2-4 which is rated good material, from 0.70 3.00m the material has a classification of A-2-6 and is rating as fair material while from 3.00 to 5.00 the soil has a classification of A-1-b which is excellent material.
- (vi) Nanjiriri CDSS site has different soils as encountered during boring. BH1 was drilled down to 5.00 metres with clayey soil from 0.00 to 0.45m. From 0.45 to 0.95 the material changes from clayey to silt gravel which is rated as good. From 0.90 to 1.60 metres, the material is fine sand which is also rated as good subgrade with a classification of A-3. From 1.60 to 5.00, the soil has been classified as A-2-6 which shows that the material is clayey gravel and is rated

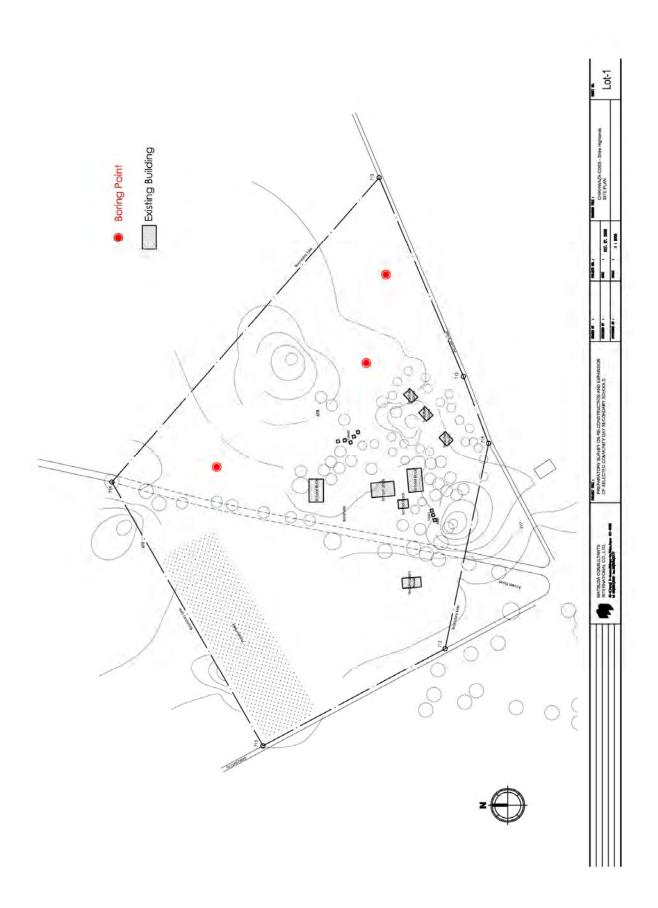
as fair subgrade. In BH2 there is clayey soil from 0.00 to 0.50m with a classification of A-6 but from 0.50 to 2.15, the materials are good to fair with classifications of A-2-4 and A-2-6. The two samples are silt and clayey gravels respectively. In BH3, from 0.00 to 0.22 the material is silt gravel with classification of A-2-4 while from 0.22 to 1.50 metres the soils have a classification of A-6 which is rated poor subgrade.

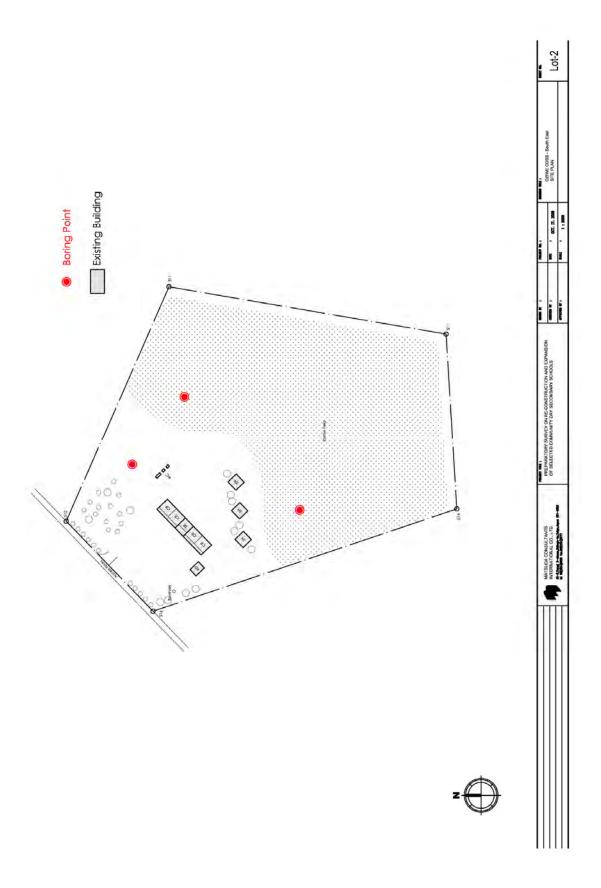
### (vii) Estimated Ultimate Bearing Capacities:

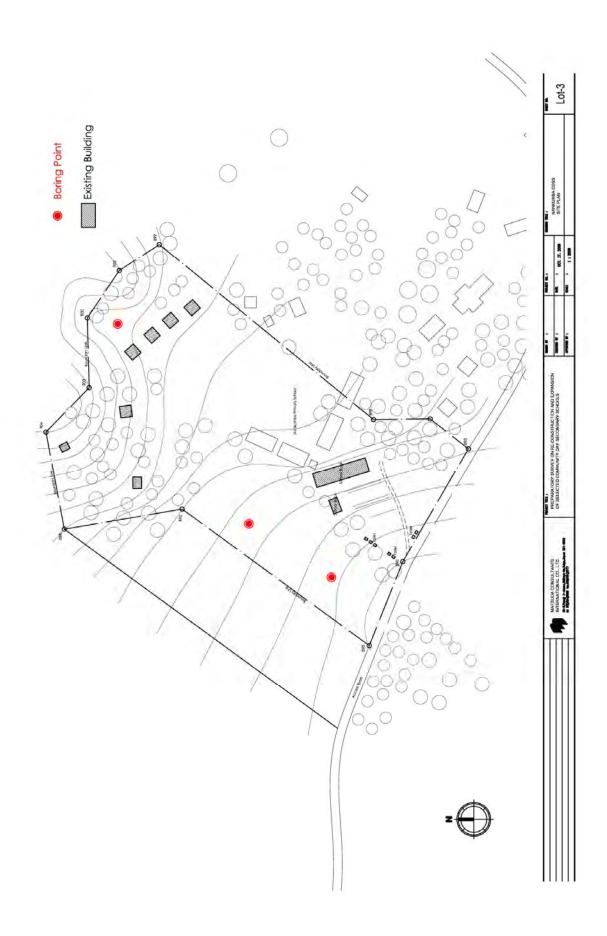
The bearing capacities have been calculated from Standard Penetration Test (SPT) N-Values for continuous and squarely foundations to assist the designer to make a sound judgement on design assumptions. It should also be noted that when calculating the Estimated Ultimate Bearing Capacities the ratio of water was one.

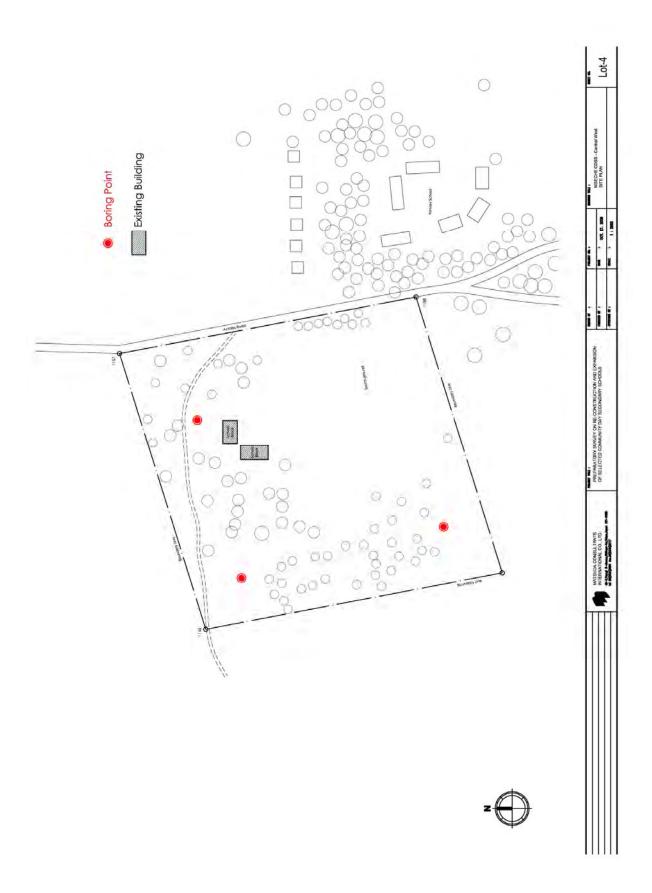
APPENDIX A

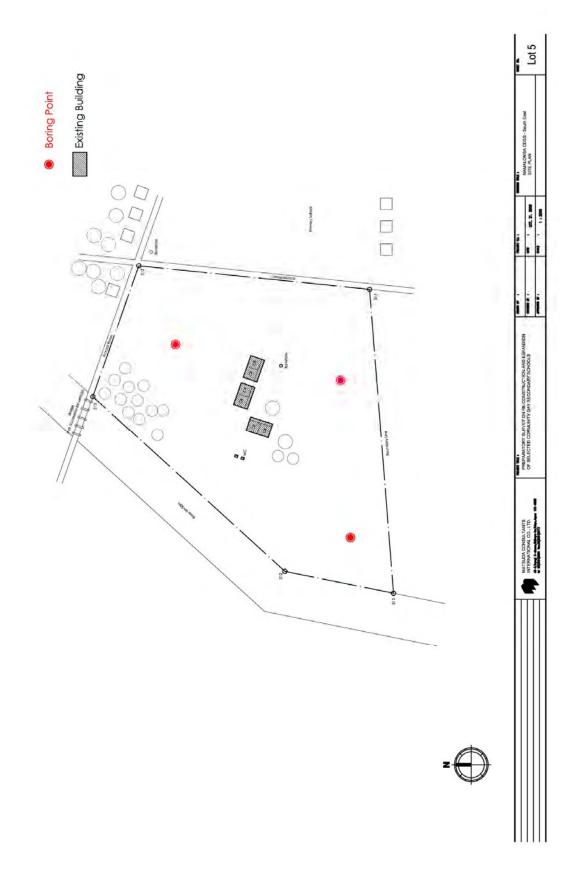
**Site Location** 

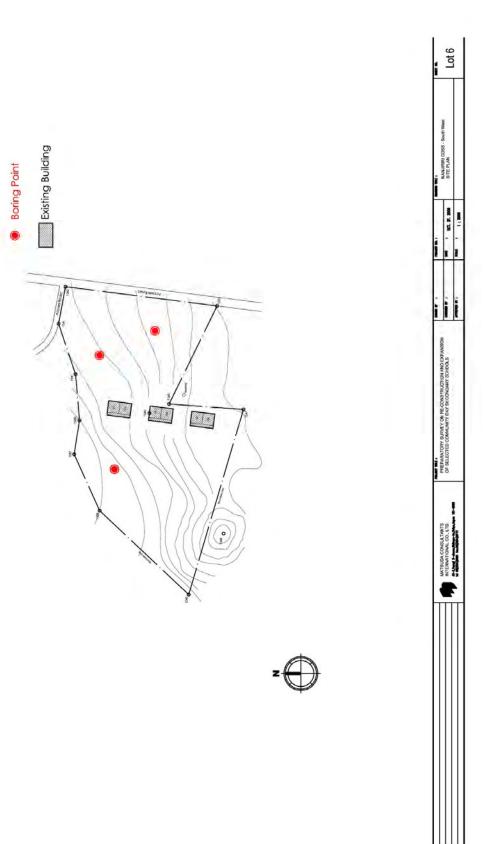












APPENDIX B

**Bore Hole Logs** 

PROJE	СТ	:	Selected	CDSS			AREA: Mulanje			
LOCAT		:	Chikhwa				GWL:	T-1		
-	ND ELEV	:	• • • • • • • • • • • • • • • • • • • •				RECORDED B	P.G. Goba		
$\overline{}$	DINATES	:					LOGGED BY:	E.G.S. Machila		
	HOLE NO.	:	1			-	DATE:	3/12/2009	-	
DEPTH		_	SAMPLE	NUMBE	P OF BI	OWS	SPT N	DESCRIPTION		
(m)	GRAPHIC	(m)	TYPE	IN	IN DE	IN	IN	OF	REMARKS	
(,	GICAFIIIC	(,		150mm	150mm		300mm	MATERIAL	KEMAKKS	
0.00	****			130111111	13011111	13011111	30011111	MATERIAL		
0.00	****			l	l			Very loose dark brown silty		
l	*::*::*::*::*	0.48		l	l			sandy CLAY		
l	****	0.40			<b>—</b>			Salidy CLAT		
1.00	****			l	l					
1.00	100000000000000000000000000000000000000			l	l					
l	*::*::*::*::*			l	l					
l	*::*::*::*::*			l			I	Vandana anddlab b		
l	*::*::*::*::*	4.05		l	l			Very loose reddish brown		
2 00	*::*::*::*::*	1.95	UD	l	l			silty sandy CLAY		
2.00	*::*::*::*::*			l	l					
l	*::*::*::*::*			9			898			
l	*::*::*::*::*	2.40	SPT	1	2	2	4			
l	*::*::*::*::*			l	l	l				
3.00	****	2.50	D							
3.00	1			l	l					
l	*::*::*::*::*			l	l					
l	*::*::*::*::*	3.45	UD	l	l					
l	*::*::*::*::*			١						
	*::*::*::*	3.90	SPT	4	6	6	12			
4.00	*::*::*::*::*			l .	l					
l	*::*::*::*			l	l	l		Medium to dense reddish		
l	*::*::*::*			l	l	l		brown silty sandy CLAY		
l	*::*::*::*			l	l	l				
-20020	*::*::*::*			l	l					
5.00	*::*::*::*			l			1			
	*::*::*::*		D							
	*::*::*::*::*	5.25	SPT	6	9	10	19		END OF B.H.	
				l .			1			
				l			I			
6.00			l			I				
0.00										
UD		urbed Sa	mple	*.**.** =			only i me or me			
N	= SPT N-Value				::::::: =			Fill Material		
D	= Disturbed Sample					-*0*0*-	=	Sand with Pebbles		
::-	= Clayey SILT					**:**:*	=	Clayey SAND		
*::*::*	=	andy CLA	Y		**-	=	Decomposed ROCK/Weathered ROCK			

PROJE	СТ		Selected	CDSS			AREA: Mulanje			
LOCAT	and the second	:		aza Lot 1		_	GWL:			
-	ND ELEV	:	OTHKITWE	ZCG LOC I	50		RECORDED B	A P. G. Goba		
-	DINATES	<del>:</del>					LOGGED BY:	E.G.S. Machila	-	
	HOLE NO.	:	2			_	DATE:	4/12/2009	-	
DEPTH			SAMPLE	NUMBE	D OF DI	OWE		SPT N DESCRIPTION		
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS	
(111)	GRAPHIC	(111)	TIPE	150mm	150mm	55.50	300mm	MATERIAL	REMARKS	
0.00	****	-	_	13011111	13011111	15011111	30011111	MATERIAL		
0.00	****			l	l				l .	
l		0.45		l	l			Loose dark brown sandy	l .	
l	****	0.45	<del></del>	-	$\vdash$	_	<b>-</b>	silty CLAY	ł	
1.00	****			l	l				l .	
1.00	100,000,000,000,000	l		l	l	l			l .	
l	*::*::*::*::*		l	l			1			
l	*::*::*::*::*		l	l			1			
l	*::*::*::*			l	l				l	
	*::*::*::*::*	1.95	UD	l	l				l .	
2.00	*::*::*::*	l		l	l	l			l	
l	*::*::*::*	12.00			12	_			l	
l	*::*::*::*::*	2.40	SPT	4	5	5	10	-	l	
l	****			l	l				l	
	*::*::*::*::*			l	l			Medium to dense reddish	l	
3.00	*::*::*::*::*			l	l			brown silty sandy CLAY	l	
l	*::*::*::*			l	l				l	
l	*::*::*::*	3.55	UD	l	l				l	
l	*::*::*::*			l	l				l	
0.0000	****	1000,000	storeo:	5194	- 65	687	1090		l	
4.00	*::*::*::*	4.00	SPT	8	9	9	18		l	
l	*::*::*::*			l	l				l	
l	*::*::*::*	l		l	l	l			l	
l	****			l					l	
	*::*::*::*::*		SPT	9	6	6	12		2000000 SCOORS	
5.00	*::*::*::*	5.00	D		$\perp$				END OF B.H.	
l			l	l			1			
l			l	l			I	1		
50000			l	l			I			
6.00				l						
					_		7.53		L	
UD			urbed Sa	mple		*_**_**	=	Silty Fine SAND		
N	=	SPT N-		20	l		=	Fill Material		
D	=	= Disturbed Sample						Sand with Pebbles		
;;-	= Clayey SILT				**:**:* = Clayey SAND			J. Paragonia		
*::*::*	= Silty Sandy CLAY					**-	=	Decomposed ROCK/Weathered ROCK		

PROJE	СТ	:	Selected	CDSS			AREA: Mulanje			
LOCAT		:	Chikhwa				GWL:	-		
	ND ELEV	:	• • • • • • • • • • • • • • • • • • • •				RECORDED B	P.G. Goba		
-	DINATES	:					LOGGED BY:	E.G.S. Machila		
	HOLE NO.	:	3			_	DATE:	4/12/2009		
DEPTH		_	SAMPLE	MIIMPE	D OF DI	OWE	SPT N	DESCRIPTION		
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS	
(111)	GRAPHIC	(111)	TIPE	150mm	150mm	55.50	300mm	MATERIAL	REWARKS	
0.00	****			15011111	15011111	15011111	300mm	MATERIAL		
0.00			_	l	l	l				
l	*::*::*::*::*		D	l	l			Very loose greyish brown		
l	*::*::*::*::*	0.90	-			-	-	sandy silty CLAY		
	*::*::*::*::*			l	l					
1.00	*::*::*::*			l	l	l		Loose reddish brown		
l	*::*::*::*	2000000		l	l	l		silty sandy CLAY		
	*::*::*::*::*	1.50	D		$\vdash$		<u> </u>			
l	****	1,452.02	No. and	l	l					
	*::*::*::*::*	1.95	UD	l	l	l				
2.00	*::*::*::*			l	l					
l	*::*::*::*::*	250,000,00		1000	es		67/3			
l	*::*::*::*::*	2.40	SPT	3	4	4	8			
l	*::*::*::*				l					
	*::*::*::*::*			l	l	l				
3.00	*::*::*::*::*			l	l					
l .	*::*::*::*::*			l	l	l				
l	*::*::*::*::*	3.45	UD	l	l	l				
l	*::*::*::*::*			l	l	l		Firm to stiff reddish brown		
	****	3.90	SPT	5	7	6	13	sandy silty CLAY		
4.00	*::*::*::*::*	4.00	SPT	8	9	9	18			
	*::*::*::*::*									
l	*::*::*::*::*			l	l	l				
	*::*::*::*::*			l			I			
	*::*::*::*			l			I			
5.00	*::*::*::*									
	*::*::*::*::*		D							
	*::*::*::*	5.40	SPT	6	8	11	19		END OF B.H.	
6.00										
UD		Undist	urbed Sa	mple	*.**.** =			Silty Fine SAND		
N	= SPT N-Value				=			Fill Material		
D	= Disturbed Sample				l	-*0*0*-		Sand with Pebbles		
-:-:-	= Clayey SILT					**.**.*	=	Clayey SAND		
*::*::*	=	andy CLA	Y			=	Decomposed ROCK/Weathered ROCK			
*::*::*	=	andy CLA	Y		**-	= Decomposed ROCK/Weathered ROCK				

PROJE	ECT	:	Selected	CDSS			AREA: Balaka			
LOCA	TION	;	Dziwe L	ot 2			GWL:			
GROU	ND ELEV	;					RECORDED B	P.G. Goba		
COOR	DINATES	:					LOGGED BY:	E.G.S. Machila		
BORE	HOLE NO.	:	1				DATE:	5/12/2009		
DEPTH		DEPTH	SAMPLE	NUMBE	R OF BL	ows	SPT N	DESCRIPTION		
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS	
` '		1 6		150mm	150mm	150mm	300mm	MATERIAL		
0.00	****									
	****			l	ı				l .	
l	****			l	l			Soft to firm dark brown		
l	****			l	ı			sandy silty CLAY	l .	
1.00	****			l	ı				l .	
	****	1.30		l	ı				l .	
l	*::*::*o*o*-							Stiff darkish grey sandy	1	
l	*::*::*o*o*- 1.90 D							silty CLAY with quartz	l l	
l	-*0*0*-*0*		SPT	21	22	10	32	7	1	
2.00	-*o*o*-*o*	1376	12724	17.7	1,000	17.00	5/8		l .	
1	-*0*0*-*0*			l	ı				l .	
l	-*0*0*-*0*			l	ı				l .	
l	-*o*o*-*o*	2.65	SPT	13	17	13	30			
l	-*0*0*-*0*							1		
3.00	-*0*0*-*0*			l	ı				l .	
	-*0*0*-*0*			l	ı				l .	
l	-*o*o*-*o*	3.45	SPT	27	23	51	74		l .	
l	-*o*o*-*o*							Very dense dark grey	l .	
l	-*o*o*-*o*			l	ı			quartz GRAVEL	l .	
4.00	-*0*0*-*0*			l	ı				l .	
	-*o*o*-*o*			l	ı				l .	
l	-*o*o*-*o*			l	ı				l .	
l	-*0*0*-*0*			l	l					
l	-*o*o*-*o*	4.95	SPT	30	41	55	96		l .	
5.00	-*o*o*-*o*	5.00	D						END OF B.H.	
l			l	l			l			
l				l	l		I			
				l						
6.00	1			l	l					
		Undisturbed Sample				L				
UD				mple	*-**-** =			Silty Fine SAND		
N	=	SPT N-			::::::: =			Fill Material		
D	=	Disturbed Sample				-*0*0*-	=	Sand with Pebbles		
::-	= Clayey SILT  = Silty Sandy CLAY					**:**:*	=	Clayey SAND		
*::*::*	=	andy CLA	Υ		**-	=	Decomposed ROCK/Weathered ROCK			

PROJE	СТ	:	Selected	CDSS			AREA: Balaka		
LOCAT			Dziwe L				GWL:		
	ID ELEV	;	D 2.111 O 2	-			RECORDED B	NP G. Goba	
-	DINATES	:					LOGGED BY:	100 100 100 100 100 100 100 100 100 100	-
	HOLE NO.	:	2				DATE:	5/12/2009	
DEPTH		_	SAMPLE	NUMBE	P OF BI	OWS	SPT N	DESCRIPTION	
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS
(,	GRAFIIC	,,	1172	150mm		150mm	300mm	MATERIAL	KEWIAKKS
0.00	****		D	15011111	13011111	13011111	30011111	Firm to stiff darkish grey	
0.00		0.30		l	l			15.005V	l .
l	*::*::*::* -*o*o*-*o*	0.30	_	_	$\vdash$	-		sandy silty CLAY	ł
l		l		l	l			Flore collection become	
	-*0*0*-*0*	l	_	l	l			Firm yellowish brown	
1.00	-*0*0*-*0*		D	l	l			clayey quartz GRAVEL	
l	-*0*0*-*0*	1.50			$\vdash$	_			-
l	*::*::*::*			l	l				
l	*::*::*::*	3,49202	2021		- 6	22	502		
	*::*::*::*	1.95	SPT	5	6	10	16	4	
2.00	*::*::*::*	l		l	l				
l	*::*::*::*			l	l				
l	*::*::*::*			l	l				
l	*::*::*::*			l	l			Dense to very dense	
encor	*::*::*::*			l	l			greyish brown sandy	
3.00	*::*::*::*::*	l		l	l			silty CLAY	
l	*::*::*::*	l	D	l	l				
l	*::*::*::*	3.22	SPT	40	55++			1	220 Pen.
	*::*::*::*				<u> </u>				END OF B.H.
0.0000				l	l				
4.00	1	l		l	l				
				l					
l				l	l				
l				l	l				
l				l	l				l .
5.00		l		l	l				l .
				l	l				
l				l	l				
I				l			l		
				l			l		
6.00				l	l				
				l					
UD		Undisturbed Sample				*_**_**	-	Silty Fine SAND	
N	=	SPT N-Value			l		=	Fill Material	
D	=	Disturbed Sample			-*o*o*- = Sand with Pebbles				
::-	= Clayey SILT			**:**:* = Clayey SAND					
*::*::*	= Clayey SIL1 = Silty Sandy CLAY					**.	=	Decomposed ROCK/Wea	thered ROCK
	_	Jilly 3	andy OLP	.,				Decomposed Roomwee	miereu NOOK

PROJE	СТ	:	Selected	CDSS			AREA: Balaka			
LOCAT		:	Dziwe L				GWL:			
_	ID ELEV	:	D2.110 E	-			RECORDED B	P.G. Goba		
-	INATES	:					LOGGED BY:	E.G.S. Machila	-	
	HOLE NO.	:	3			_	DATE:	5/12/2009		
DEPTH		_	SAMPLE	NUMBE	P OF BI	ows	SPT N	DESCRIPTION		
(m)	GRAPHIC	(m)	TYPE	IN	IN DE	IN	IN	OF	REMARKS	
(,	GICALLIC	(,		150mm	150mm		300mm	MATERIAL	KEWAKKS	
0.00	****		D	100111111	10011111	13011111	30011111	Medium to dense dark		
0.00	****	0.20		l .	l			brown sandy silty CLAY		
	*::*::*o*o*-	0.20	D		$\vdash$			Stiff greyish brown		
	*::*::*o*o*-	0.60	17.72	l	l			sandy CLAY with quartz		
1.00	*::*::*o*o*-	-0.00	D					Dense yellowish brown		
	*::*::*o*o*-	1.10			l	l		sandy CLAY with quartz		
	***							ound) our in man quantit	1	
l	**			l	l					
	**	1.95	SPT	12	13	12	25			
2.00	**_							1		
	**			l	l					
	**			l	l			Medium to dense		
	**			l	l			micaceous decomposed		
	**			l	l			ROCK		
3.00	**			l .	l					
	**		D	l .	l					
	**	3.45	SPT	7	16	14	30			
	**									
	**			l	l					
4.00	**			l	l					
	**			l .	l					
	**			l	l					
	**			l	l					
12001.500	**	0.0075	ens magazina	880	.81		55-81		TO THE PROPERTY OF THE PROPERT	
5.00	**	5.00	SPT	7	9	11	20		END OF B.H.	
							1			
							1			
							1			
20-2003							1			
6.00										
					_		l .			
UD			urbed Sa	mple		*_**_**	=	Silty Fine SAND		
N	=	SPT N-Value					Fill Material			
D	=	Disturbed Sample Clayey SILT				-*0*0*-		Sand with Pebbles		
;;-	=		v	**:**:* =			Clayey SAND Decomposed ROCK/Weathered ROCK			
*::*::*	=	Silty S	andy CLA	Y		******	=	Decomposed ROCK/Wea	tnered ROCK	

PROJE	СТ	:	Selected	CDSS			AREA: Blantyre Rural			
LOCAT		:	Nankum				GWL:			
-	ND ELEV	;	- Tollinoin				RECORDED B	P.G. Goba		
_	DINATES	:					LOGGED BY:	E.G.S. Machila		
	HOLE NO.		1			_	DATE:	27/11/2009		
DEPTH			SAMPLE	NUMBE	R OF BI	ows	SPT N	DESCRIPTION		
(m)	GRAPHIC	(m)	TYPE	IN	IN DE	IN	IN	OF	REMARKS	
(,	Oldar IIIO			150mm	3.3(4)	150mm	300mm	MATERIAL	KEMIAKKO	
0.00	-*o*o*-*o*		D					Loose dark brown		
-	-*0*0*-*0*	0.40		l	l			silty clayey GRAVEL		
l	****	0,40		-				Sity diayey Grotte		
l	****			l	l					
1.00	****			l	l					
	****			l	l					
	****			l			1			
l	****			l	l					
l	*::*::*::*::* 1.95 <b>SPT</b> 9					11	18			
2.00	****				7			i		
	****			l	l					
l .	****			l	l					
l	****			l	l					
l	****	l		l	l	l				
3.00	*::*::*::*::*			l	l					
	****			l	l					
l	*::*::*::*	3.45	SPT	7	8	10	18			
l	*::*::*::*::*							1		
l	****			l	l			Medium to dense		
4.00	*::*::*::*::*			l	l			reddish brown sandy		
1000	*::*::*::*::*			l	l			silty CLAY		
l	*::*::*::*::*			l	l					
l	*::*::*::*::*			l	l					
l	*::*::*::*::*		D	l	l					
5.00	*::*::*::*::*	5.05	SPT	5	6	9	15		END OF B.H.	
							1			
				l			1			
6.00				l			1			
0.00				l	l					
UD		Undist	urbed Sa	mple		*_**_**	= Silty Fine SAND			
N	=	Undisturbed Sample SPT N-Value			:::::::: =			Fill Material		
D	_	Disturbed Sample			-*o*o*- =			Sand with Pebbles		
	=	Clayey SILT				**:**:*	=	Clayey SAND		
*::*::*	_		andy CLA	Y	**. =			Clayey SAND Decomposed ROCK/Weathered ROCK		
		Jinty S	and OLF		Ь		/tent	2000mposed Room Wea	ROOK	

PROJE	СТ	:	Selected	CDSS			AREA: Blantyre Rural			
LOCAT		:	Nankum				GWL:			
-	ND ELEV	;					RECORDED B	P.G. Goba		
_	DINATES	:					LOGGED BY:	E.G.S. Machila		
	HOLE NO.	:	2			-	DATE:	28/11/2009		
DEPTH		_	SAMPLE	NUMBE	P OF BI	OWS	SPT N	DESCRIPTION		
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF .	REMARKS	
(,	GRAFIIC	,,	1172	150mm	3.3(4)	150mm	300mm	MATERIAL	KEWIAKKS	
0.00	****		D	15011111	13011111	15011111	30011111	Loose greyish brown		
0.00		0.49		l	l			Lancard Control of the Control of th		
l	*::*::*::*::*	0.49	_	_	$\vdash$	$\vdash$	l	sandy silty CLAY	1	
l	****			l	l					
				l	l					
1.00	*::*::*::*::*	l		l	l	l			l	
	*::*::*::*::*			l			l			
	*::*::*::*::*			l			l			
l	****	3,49202	UD	l	l					
	*::*::*::*::*	1.95	<b>—</b>		_	<u> </u>				
2.00	*::*::*::*	l		l	l	l				
l	*::*::*::*			l	l					
l	*.:*.:*.:*									
l	****	2.40	SPT	5	5	6	11			
encor	*::*::*::*							1		
3.00	*::*::*::*::*			l	l					
l	*::*::*::*::*	l		l	l	l				
l	*::*::*::*	3.45	SPT	5	9	12	21	1		
l	*::*::*::*::*	l		l	l	l				
- Co 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	*::*::*::*			l	l			Medium to dense		
4.00	*::*::*::*::*			l	l			reddish brown sandy		
	*::*::*::*			l	l			silty CLAY		
l	*::*::*::*	l		l	l	l			l	
l	*::*::*::*::*	l		l	l	l			l	
	*::*::*::*	4.95	SPT	7	16	14	30			
5.00	*::*::*::*::*	5.05	D				ĵ.		END OF B.H.	
l				l		l	I			
200000				l			l			
6.00										
UD		Undist	urbed Sa	mple	*.**.** =			Silty Fine SAND		
N	=	SPT N-Value			l		= Silty Fine SAND = Fill Material			
D	_	Disturbed Sample			-*o*o*- =			Sand with Pebbles		
Ľ	_	Clayey SILT				**:**:*	-	Sand with Pebbles Clayey SAND		
*::*::*	-	Clayey SILT Silty Sandy CLAY				**_	=	Clayey SAND Decomposed ROCK/Weathered ROCK		
	: : <del>-</del> :	JIIII S	andy CLA					Decomposed ROCK/Wea	mered ROCK	

PROJE	СТ	:	Selected	CDSS			AREA: Blantyre Rural			
LOCAT		:	Nankum				GWL:			
$\overline{}$	ND ELEV	;	- Tellinean				RECORDED B	P.G. Goba		
-	DINATES	:					LOGGED BY:	E.G.S. Machila		
	HOLE NO.	:	3			-	DATE:	29/11/2009	-	
DEPTH		_	SAMPLE	NUMBE	P OF BI	OWS	SPT N	DESCRIPTION	T	
(m)	GRAPHIC	(m)	TYPE	IN	IN DE	IN	IN	OF	REMARKS	
····,	GICAFIIIC	, <i>,</i>		150mm	150mm	55.50	300mm	MATERIAL	KEMAKKS	
0.00	****			13011111	13011111	13011111	30011111	Loose dark brown		
0.00	****			l	l			silty sandy CLAY		
l	****	0.65	_	l	l			Silty Sandy CLAT		
l	****	0.03	D .		<b>—</b>					
1.00	****			l	l					
1.00	****			l	l					
l	****		l	l			I			
l	****		UD	l						
l	****	1.95	OD	l	l					
2.00	11 11 11	1.95	$\vdash$	$\vdash$	$\vdash$	$\vdash$		1		
2.00	****	*::*::*::*::*								
l	****			l	l					
l	****	2.40	SPT	3	5	6	11			
l	****	2.40	3P1	3	5	0	11	1		
3.00	****			l	l					
3.00				l	l					
l	****	2 15	SPT	5	6	8	14			
l	*::*::*::*::*	3,43	351	Ť	Ů	•	14	1		
l	****			l	l			Medium to dense		
4.00	****	l		l	l	l		reddish brown sandy	l	
4.00	****			l	l			silty CLAY		
l	****			l	l			Silly CEAT		
	****		l	l			l			
l	****		l	l						
5.00	****		D	l						
0.00	****	5 15	SPT	6	8	9	17		END OF B.H.	
		0.10	<u>, , , , , , , , , , , , , , , , , , , </u>	Ť	Ť	Ť		7	D O! D.III.	
			l	l			l			
			l	l			l			
6.00			l	l			l			
0.00				l	l					
UD		Undist	urbed Sa	mple		*_**_**	=	Silty Fine SAND		
N	=	SPT N-Value					=	Fill Material		
D	_	Disturbed Sample				-*0*0*-		Sand with Pebbles		
	= Clayey SILT				**:**:* =			Clayey SAND		
*::*::*	[10] - 10 Test					** = Decomposed ROCK/Weathered			thered ROCK	
	·	Only S	unuy OLA				<del>/</del> /-	Decomposed ROOK/Wea	MICIEU NOCK	

PROJE	СТ	:	Selected	CDSS			AREA: Lilongwe Rural			
LOCAT	ION	:	Mseche	Lot 4			GWL:			
GROUN	ND ELEV	:					RECORDED B	۱P.G. Goba		
COOR	DINATES	:					LOGGED BY:	E.G.S. Machila		
BORE	HOLE NO.	:	1				DATE:	9/12/2009		
DEPTH		DEPTH	SAMPLE	NUMBE	R OF BL	ows	SPT N	DESCRIPTION	1	
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS	
,,	0.0.0.1.10	,,		150mm	1.0,000		300mm	MATERIAL	TLE.III.A.T.T.T.	
0.00	**.**.**									
0.00	**.**.**			l	ı					
	**.**.**			l	ı			Medium to dense	l .	
	**.**.**			l	ı			reddish brown clayey	l .	
1.00	**.**.**			l	ı			silty SAND	l .	
1.00	**.**.**		D	l	ı			Sity SAIVE		
	**.**.**	1.70	0,000	l	ı					
	-*o*o*o*-	1.70	$\vdash$	<del>                                     </del>	$\vdash$	$\vdash$	l		1	
	-*0*0*0*-	1.05	SPT	4	6	11	17		l .	
2.00	-*0*0*0*-	1.50	371	-	۱ů			1	l .	
2.00	-*0*0*0*-			l	ı				l .	
	-*0*0*0*-			l	ı			Medium to dense	l .	
	-*0*0*0*-			l	ı			reddish brown quartz	l .	
	-*0*0*0*-			l	ı			GRAVEL	l .	
3.00	-*0*0*0*-			l	ı			GRAVEL		
3.00	-*0*0*0*-		D	l	ı				l .	
	-*o*o*o*-	3.30	ľ	l	ı				l .	
	-:-:-:-		SPT	6	8	9	17		i	
	-:-:-:-	3.43	SF 1	_	<del>Ľ</del>		37.	1	l .	
4.00	-:-:-:-:-			l	ı					
4.00	-:-:-:-			l	ı				l .	
	-:-:-:-			l	ı			Medium to dense	l .	
	-:-:-:-	4 90	SPT	7	11	7	18	greyish brown sandy	l .	
	-:-:-:-	4.00	0. 1	<u> </u>			10	clayey SILT	l .	
5.00	-:-:-:-	5.00	D	l	ı			olayoy olar	END OF B.H.	
		0.00	_	$\vdash$	-	$\vdash$				
	l			l	l					
				l	l		I			
					l					
6.00	l			l	ı					
0.00	l			l	l					
UD		Undist	urbed Sa	mple		*_**_**	=	Silty Fine SAND	•	
N	=	SPT N-					=	Fill Material		
D	=	Disturbed Sample			-*o*o*- =			Sand with Pebbles		
::-	=	Clayey SILT				**:**:*	=	Clayey SAND		
***	=		andy CLA	Y	l	**-	=	Decomposed ROCK/Weathered ROCK		

DOCATION	PROJE	СТ	:	Selected	CDSS			AREA: Lilongwe Rural			
RECORDED BY P. G. Goba			-						117.130(30)		
CORDINATES   2			-	111000110					NP G. Goba		
Depth   Graphic   Depth   Graphic   Depth   Graphic   Depth   Graphic   Depth   Graphic   Depth   Type   Isomm   Isomm   Isomm   Isomm   Isomm   Isomm   Isomm   Isomm   Ample   Depth   Isomm   Isomm   Isomm   Isomm   Isomm   Ample   Depth   Isomm   Isomm   Isomm   Isomm   Ample   Depth   Isomm   Isomm   Isomm   Ample   Depth   Isomm   Isomm   Isomm   Ample   Isomm   Iso	-								10.1.2.3.4.4.1.1.2.200.0.0.00		
DEPTH				2			-				
(m)   GRAPHIC   (m)   TYPE   N   150mm   150mm   150mm   300mm   MATERIAL   Loose greyish brown clayey SAND					MIIMPE	D OF DI	OWE		_		
150mm   150mm   300mm   MATERIAL   Loose greyish brown   clayey SAND		I	20000000							DEMARKS	
1.00   1.00	(111)	GRAPHIC	(111)	TIPE		3.3,3,7	55.50			REMARKS	
1.00   Clayey SAND   Clayey SAND   Clayey SAND   Clayey SAND   Clayey SAND	0.00	**.**.**			15011111	15011111	15011111	30011111			
1.00  1.00	0.00			_	l .	l				l	
1.00 ************	1			ь	l .	l			clayey SAND	l	
1.00 *********		400,000,000	0.40	-			-			<b>l</b>	
1.60   D			l		l	l	l			l	
#::::::::: 1.60 D	1.00	100000000000000000000000000000000000000	l		l	l	l			l	
2.00			1007.0000		l	l	l			l	
2.00		$\overline{}$	1.60	D					silty CLAY		
2.00			1,462.02	No. and	l .	l				l	
3.00			1.95	UD					4	l	
3.00	2.00				l .	l				l	
3.00	ı		l		l	l	l			l	
3.00			l		l	l	l			l	
3.00			2.40	SPT	10	7	6	13	4	l	
										l	
1	3.00	***			l	l				l	
## 13		***			l	l			Very hard yellowish	l	
4.00		***			l	l			brown completely	l	
4.00**************	ı	***	3.45	SPT	13	14	16	30	weathered micaceous	l	
1		***							ROCK	l	
1.	4.00	***	l		l	l	l			l	
*** 5.00** 5.00 D  Undisturbed Sample N = SPT N-Value D = Disturbed Sample Disturbed Sampleo-o = Sand with Pebbles		***	l		l	l	l			l	
5.00		***	l		l	l	l			l	
5.00** 5.00 D END OF B.H  6.00  UD Undisturbed Sample *-**-* = Silty Fine SAND  N = SPT N-Value ::::::: = Fill Material  D = Disturbed Sample -*o*o*- = Sand with Pebbles		***	4.95	SPT	17	26	41	67		l	
6.00  UD Undisturbed Sample *-**-** = Silty Fine SAND  N = SPT N-Value ::::::: = Fill Material  D = Disturbed Sample -*o*o*- = Sand with Pebbles	l .	***							1	l	
UD Undisturbed Sample *-**-** = Silty Fine SAND  N = SPT N-Value :::::::: = Fill Material  D = Disturbed Sample -*o*o*- = Sand with Pebbles	5.00	***	5.00	D						END OF B.H.	
UD Undisturbed Sample *-**-** = Silty Fine SAND  N = SPT N-Value :::::::: = Fill Material  D = Disturbed Sample -*o*o*- = Sand with Pebbles											
UD Undisturbed Sample *-**-** = Silty Fine SAND  N = SPT N-Value :::::::: = Fill Material  D = Disturbed Sample -*o*o*- = Sand with Pebbles	I							l			
UD Undisturbed Sample *-**-** = Silty Fine SAND  N = SPT N-Value :::::::: = Fill Material  D = Disturbed Sample -*o*o*- = Sand with Pebbles	I						l	l			
UD Undisturbed Sample *-**-** = Silty Fine SAND  N = SPT N-Value :::::::: = Fill Material  D = Disturbed Sample -*o*o*- = Sand with Pebbles					l			I			
N = SPT N-Value ::::::: = Fill Material D = Disturbed Sample -*o*o*- = Sand with Pebbles	6.00		l		l	l	l			l	
N = SPT N-Value ::::::: = Fill Material D = Disturbed Sample -*o*o*- = Sand with Pebbles											
D = Disturbed Sample -*o*o*- = Sand with Pebbles	UD		Undist	urbed Sa	mple	*.**.** =			Silty Fine SAND		
I	N	=	SPT N-	Value		:::::::: =			1200 • 1.111 1.000 A.C. (1.000 )		
I	D	=	17.H 19.00 19.00 19.10 19.00				-*0*0*-	=			
I Clayey SILI I = Clayey SAND	::-	=	Clayey SILT				**:**:*	=	Clayey SAND		
*::*::* = Silty Sandy CLAY** = Decomposed ROCK/Weathered ROCK	***	=			Y					thered ROCK	

PROJE	СТ	:	Selected	CDSS			AREA: Lilongwe Rural			
LOCAT		:	Mseche				GWL:			
GROUN	ND ELEV	:					RECORDED B	YP.G. Goba		
$\overline{}$	DINATES	:					LOGGED BY:	E.G.S. Machila		
	HOLE NO.		3			_	DATE:	11/12/2009		
DEPTH		_	SAMPLE	NUMBE	R OF BL	ows	SPT N	DESCRIPTION		
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS	
, <i>j</i>		1,		150mm	150mm		300mm	MATERIAL		
0.00	****							Loose greyish brown		
	****		D	l .	l			sandy silty CLAY	l .	
	****	0.50			l			Sundy Siny ODA		
	****	0.00							i	
1.00	****			l .	l			Loose reddish brown	l .	
	****			l .	l			sandy silty CLAY	l .	
	*::*::*::* 1.80 D									
l	-*o*o*o*-					$\vdash$			1	
l	-*0*0*0*-	1.95	SPT	11	6	3	9		l .	
2.00	-*o*o*o*-							1		
	-*o*o*-							Medium to dense	l .	
l	-*o*o*o*-			l .	l			reddish brown clayey	l .	
l	-*o*o*o*-			l .	l			quartz GRAVEL	l .	
l	-*0*0*0*-			l	l				l .	
3.00	-*o*o*o*-	3.00	D		l .				l	
	***								1	
l	***			l	l				l .	
l	***	3.55	SPT	6	7	8	15		l .	
l	***								l .	
4.00	***			l	l				l .	
	***			l	l				l .	
l	***			l	l			Medium to dense	l .	
l	***	4.95	UD	l	l			greyish brown	l .	
	***						l	completely weathered		
5.00	***							ROCK		
	***	20000	D	- 20	- 25	2022	patro		nearth agreement	
	***	5.40	SPT	6	9	12	21		END OF B.H.	
20-2703										
6.00				l	l		l			
					_			<u> </u>	L	
UD		Undisturbed Sample SPT N-Value				*_**_**	= Silty Fine SAND			
N	=						=	Fill Material		
D	=	Disturbed Sample				-*0*0*-		Sand with Pebbles		
;:-	= Clayey SILT = Silty Sandy CLAY					**:**:*	=	Clayey SAND		
*::*::*	=	andy CLA	Υ		**-	=	Decomposed ROCK/Weathered ROCK			

PROJE	СТ	,	Selected	CDSS			AREA: Balaka				
LOCAT		:	Namalo		5		GWL:				
-	ID ELEV	:					RECORDED B\P.G. Goba				
-	INATES	:					LOGGED BY: E.G.S. Machila				
	HOLE NO.		1			_	DATE:				
DEPTH		DEPTH	SAMPLE	NUMBE	R OF BL	ows	SPT N	DESCRIPTION	I		
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS		
V		, ,		150mm	150mm		300mm	MATERIAL			
0.00	:::							Very loose yellowish			
-	:::		D	l	l			brown clayey SILT	l .		
	:::	0.64			l .				l .		
	****						i		i		
1.00	****			l	l				l .		
	****						l				
	****						l				
	****						l				
	****	1.95	UD	l	l				l		
2.00	*::*::*::*	1995		l	l			Medium to dense			
	****			l	l			dark grey silty	l		
	****	2.40	SPT	5	6	6	12	sandy CLAY	l		
	*.:*::*::*							870	l		
	*::*::*::*::*			l	l						
3.00	*::*::*::*::*			l	l						
	*::*::*::*	3.10	D								
	****								1		
	*::*::*::*::*	3.45	UD	l	l				l		
	*::*::*::*	3.90	SPT	6	9	12	21		l		
4.00	*::*::*::*::*										
	*::*::*::*::*			l	l				l		
	*::*::*::*::*			l	l			Medium to dense			
	*::*::*::*	4.95	UD					greyish brown			
	*::*::*::*							sandy silty CLAY			
5.00	*::*::*::*::*										
	*::*::*::*	71CUM	D	- 20	0.20		1,000		resista esperatura		
	*::*::*::*::*	5.40	SPT	6	10	14	24		END OF B.H.		
20.00											
6.00											
		L		L				William State Control of the Control			
UD			urbed Sa	mple		*_**_**	=	- Only I me Onlib			
N	=	SPT N-Value			::::::: =			Fill Material			
D	=		ed Samp	ole	-*o*o*- =			Sand with Pebbles			
::-	=	Clayey		200		**.**.*	=	Clayey SAND			
*::*::*	=	Silty S	andy CLA	Υ		**-	=	Decomposed ROCK/Weathered ROCK			

PROJE	СТ	:	Selected	CDSS			AREA: Balaka				
LOCAT	ION	:	Namalo	mba Lot	5	GWL:					
GROUN	ND ELEV	;					RECORDED B\P.G. Goba				
$\overline{}$	DINATES	:				LOGGED BY: E.G.S. Machila					
	HOLE NO.		2			DATE:	9/12/2009				
DEPTH		_	SAMPLE	NUMBE	P OF BI	ows	SPT N	DESCRIPTION			
(m)	GRAPHIC	(m)	TYPE	IN	IN DE	IN	IN	OF	REMARKS		
\ <i>,</i>	Oldar IIIO	,,		150mm	150mm	55.50	300mm	MATERIAL	REMIARITO		
0.00	:::			13011111	10011111	13011111	300111111	Medium to dense			
0.00	-:-:-:-		D	l	l			yellowish brown clayey	l .		
l	-:-:-:-:-	0.70	ľ	l	l			SAND	l .		
l	-*0*0*0*-	0.70		<del>                                     </del>				SAND	ł		
1.00	-*0*0*0*-			l	l				l .		
1.00	-*0*0*0*-	l		l	l	l			l .		
l	-*0*0*0*-		l	l			I				
	-*0*0*0*-		l	l			l				
l	-*0*0*0*-	1.95	un	l	l	l		Medium to dense	l		
2.00	-*0*0*0*-	1.95	100	l			I	clayey quartz			
2.00	-*0*0*0*-			l	l			GRAVEL	l		
l	-*0*0*0*-	2.40	SPT	8	11	8	19	GRAVEL	l .		
l	-*0*0*0*-	2.40	3P1	۰	111	0	19	1	l		
l	-*0*0*0*-	l		l	l	l			l		
3.00	-*0*0*0*-	3.00	n	l	l				l		
3.00	-:-:-:-	3.00		<del>                                     </del>	$\vdash$	_			ł		
l	-:-:-:-:-			l	l				l		
l	-:-:-:-:-	3.45	lun.	l	l	l			l		
l			SPT	8	10	9	19		l		
4.00	(()(	3.90	371	8	10	9	19	1	l		
4.00				l	l	l		Medium to dense	l		
l	:::			l	l	l		yellowish brown	l		
l	-:-:-:-:-	4.05	SPT	9	13	15	28	clayey SAND	l .		
l	-:-:-:-:-	4.95	5P1	9	13	15	20	Clayey SAND	l		
5.00	-:-:-:-:-	5.00	<u>_</u>	l	l				END OF B.H.		
5.00	,,,	5.00	-	-	-	$\vdash$		ł — — — — — — — — — — — — — — — — — — —	END OF B.H.		
			l	l			l				
			l	l			l				
			l	l		l	l				
6.00			l	l							
6.00				l	l						
UD		Undiet	urbed Sa	mnle		*_**_**	=	Cille: Fine CAND			
N	=	Undisturbed Sample			1015639 18.80			Silty Fine SAND			
D	_	SPT N-Value Disturbed Sample			******* =			Fill Material			
ľ	=			ne	-*o*o*- = **:**:* =			Sand with Pebbles			
*::*::*	=	Clayey		~				Clayey SAND			
	·	Silty S	andy CLA	11			-	Decomposed ROCK/Weathered ROCK			

PROJE	СТ	:	Selected	CDSS			AREA: Balaka				
LOCAT		:	Namalo		5	GWL:					
GROUN	ND ELEV	:					RECORDED B\P.G. Goba				
$\overline{}$	DINATES	:					LOGGED BY: E.G.S. Machila				
	HOLE NO.	:	3			DATE: 7/12/2009					
DEPTH		_	SAMPLE	NUMBE	R OF BL	ows	SPT N	DESCRIPTION			
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS		
```'	0.0.0.1.10	,,		150mm	150mm	55.50	300mm	MATERIAL	112		
0.00	****							Loose yellowish			
-	****		D	l	l	l		brown sandy silty	l		
l	****	0.40	_	l	l			CLAY	l		
l	****	0.10							1		
1.00	****			l	l	l			l		
-	****			l	l	l			l		
	****			l			l				
l	****			l	l			Medium to dense	l		
l	****	1.95	SPT	6	6	7	13	gevish brown silty	l		
2.00	****			<u> </u>	-			sandy CLAY	l		
	****			l	l	l		,	l		
l	****	2.70	D	l	l				l		
l	****								1		
l	****			l	l				l		
3.00	*::*::*::*::*			l	l				l		
	*::*::*::*::*			l	l	l			l		
l	*::*::*::*::*			l	l				l		
l	*::*::*::*::*	3.45	SPT	5	8	9	17		l		
	****							Medium to dense	l		
4.00	*::*::*::*::*			l	l			dark brown	l		
	*::*::*::*::*			l	l			sandy silty CLAY	l		
	*::*::*::*::*			l	l	l			l		
l	*::*::*::*::*	4.95	SPT	4	7	10	17	_	l		
	*::*::*::*										
5.00	*::*::*::*	5.00	D						END OF B.H.		
l				l							
l				l			I				
20-2004											
6.00				l							
<u> </u>				L	_	*_**_**		<u> </u>			
UD	_	Undisturbed Sample					=	Silty Fine SAND			
N	=	SPT N-Value Disturbed Sample			::::::: =			Fill Material			
D	=			oie		-*0*0*-		Sand with Pebbles			
***	=	Clayey		v	**:**:* =			Clayey SAND Decomposed ROCK/Weathered ROCK			
*::*::*	-	Silty S	andy CLA	11		''-	=	Decomposed ROCK/Wea	itnered ROCK		

PROJE	CT		Selected	CDSS			AREA: Blantyre Urban				
LOCAT	and the second	:	Nanjiriri			GWL:	ic orban				
_	ND ELEV	:	Ivarijiiii	LOLO		RECORDED B\P.G. Goba					
-		1.5						100 23 CO 10 10 10 10 10 10 10 10 10 10 10 10 10			
COORDINATES : BORE HOLE NO. : 1							LOGGED BY: E.G.S. Machila				
		:			5 05 51	014/0	DATE:	1/12/2009			
DEPTH			SAMPLE				SPT N	DESCRIPTION			
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS		
		-	_	150mm	150mm	150mm	300mm	MATERIAL			
0.00	*::*::*::*	120000	D	l	ı			Loose yellowish	l .		
l	****	0.45	D	<b>—</b>	<b>—</b>	$\vdash$		brown sandy silty CLAY	1		
l		220.272	100	l	ı			Medium dense yellowish	l .		
	***	0.90	D					brown weathered ROCK	Į .		
1.00	***	ı		l	ı			Medium dense greyish	l .		
	***	V222000		l	ı	ı		brown weathered ROCK			
l	***	1.60	D		<u> </u>	<u> </u>					
l	***		100000000		1000	.010	0.00		l		
	***	1.95	SPT	8	12	16	28		l		
2.00	***	ı		l	ı				l		
ľ	***	ı		l	ı				l .		
l	***	ı		l	ı				l		
l	***	ı		l	ı				l		
	***	ı		l	ı				l		
3.00	***	ı		l	ı				l		
	***	ı		l	ı			Dense to very dense	l		
l	***	ı		l	ı			yellowish brown	l		
l	***	3.45	SPT	8	11	14	25	completely weathered	l		
	***							ROCK	l		
4.00	***	ı		l	ı				l		
	***	ı		l	ı				l .		
l	***		l	l							
l	***	4.95	SPT	20	21	39	60	]			
	***										
5.00	***	5.00	D						END OF B.H.		
6.00											
UD		Undisturbed Sample			$\vdash$	*.**.**	=	Silty Fine SAND			
N	=	SPT N-Value					=	Fill Material			
D	_	Disturbed Sample				-*o*o*-	-	Sand with Pebbles			
::-	=	Clayey				**:**:*	-				
*::*::*	=		andy CLA	· ·				Clayey SAND Decomposed ROCK/Weathered ROCK			
	-	Silty S	aridy CLA	NT.			-	Decomposed ROCK/Weathered ROCK			

PROJE	СТ	:	Selected	CDSS			AREA: Blantyre Urban			
LOCAT	TION	;	Nanjiriri	Lot 6		GWL:				
GROU	ND ELEV	;					RECORDED B\P.G. Goba			
COOR	DINATES	:					LOGGED BY: E.G.S. Machila			
BORE	HOLE NO.	:	2			DATE:	2/12/2009			
DEPTH		DEPTH	_	NUMBE	R OF BL	ows	SPT N	DESCRIPTION	1	
(m)	GRAPHIC	(m)	TYPE	IN	IN	IN	IN	OF	REMARKS	
\····/	10.0.0.1.1.0	,,		150mm	1.0,000		300mm	MATERIAL	The state of	
0.00	****							Very loose yellowish		
-	****	0.50	n	l	ı			brown sandy silty CLAY	l .	
	_*_*_*	0.00		_	-	$\vdash$		brown sandy sitty OEAT	1	
	***			l	ı			Loose greyish brown		
1.00	***			l	ı			completely weathered		
1.00		l		l	ı			ROCK		
		1.50	n	l			l	The state of the s		
	***	1.50	_	$\vdash$	$\vdash$	$\vdash$			1	
	_*_*_*	1.95	un	l	ı			Dense greyish brown	l .	
2.00	_*_*_*	1.55	100	l	ı			completely weathered		
2.00		2.15	n	l	ı			ROCK	l .	
		2.10	U				i i	ROCK	ł	
		2.40	SPT	9	15	17	32		l .	
		2.40	351	-	15	-''	32	1	l .	
3.00	***	l		l	ı					
5.00				l	ı			Very hard weathered		
		3 23	SPT	18	41	55	96	ROCK	l .	
		3,23	351	10	41	- 55	90	ROCK	l .	
		3.50	SPT	55++	l				END OF B.H.	
4.00		0.00	011	5511	$\vdash$	$\vdash$			END OF B.II.	
4.00				l	ı				l .	
				l	ı				l .	
				l	ı				l .	
				l	ı				l .	
5.00				l	ı				l .	
5.00	1			l	ı				l .	
				l	ı				l .	
				l	ı				l .	
l			l	l	l		I			
212.22				l	ı				l .	
6.00		l		l	ı					
				<u> </u>				<u> </u>		
UD		Undisturbed Sample			*-**-** =			Silty Fine SAND		
N	-	SPT N-Value			::::::: =			Fill Material		
D	-	Disturbed Sample			-*o*o*- =			Sand with Pebbles		
;;-	=	Clayey		100	**:**:* =			Clayey SAND		
*::*::*	=	Silty S	andy CLA	Υ		**-	=	Decomposed ROCK/Wea	thered ROCK	

PROJE	СТ	:	Selected	CDSS			AREA: Blantyre Urban			
LOCAT		:	Nanjiriri			GWL:				
-	ND ELEV	:				RECORDED B\P.G. Goba				
	DINATES	:				LOGGED BY: E.G.S. Machila				
	BORE HOLE NO. : 3							DATE: 3/12/2009		
DEPTH			SAMPLE	NUMBE	R OF BI	SPT N	DESCRIPTION			
(m)	GRAPHIC	(m)	TYPE	IN	IN DE	IN	IN	OF	REMARKS	
(,	Oldar IIIO			150mm		150mm	300mm	MATERIAL	KEMAKKO	
0.00	**.**.**			100111111	10011111	10011111		Greyish brown silty	_	
0.00	**.**.**	0.22	n	l	l			clayey SAND		
	****	0.22		_				Yellowish brown sandy	1	
	****	0.70	D	l	l			silty CLAY		
1.00	***							Very dense greyish	1	
			D	l	l			brown weathered		
	***	1.32	SPT	55++	l			ROCK	END OF B.H.	
-										
l				l	l					
2.00		l		l	l					
	1	l		l	l					
l				l	l					
l				l	l					
l				l	l					
3.00				l	l					
0.00	1			l	l	l			l	
l				l	l	l			l	
l				l	l	l			l	
l				l	l	l			l	
4.00	1			l	l	l			l	
4.00				l	l	l			l	
l		l		l	l	l			l	
l		l		l	l	l			l	
l		l		l	l	l			l	
5.00				l	l	l			l	
5.00	1			l	l	l			l	
l				l	l	l			l	
				l		l	l			
				l		l	l			
				l		l	l			
6.00		l		l	l					
		11 11 11 11 11			$\vdash$	*_**_**	<u> </u>	Silter Fire SAND		
UD		Undisturbed Sample					= Silty Fine SAND			
N	=	SPT N-Value			l	******	= Fill Material			
D .	=	Disturbed Sample				-*0*0*-				
-:-:-	=	Clayey				**:**:*	=	Clayey SAND		
*::*::*	=	Silty Sandy CLAY					=	Decomposed ROCK/Wea	tnered ROCK	