مكتب التصميمات والإستشارات المندسية المهندس الإستشارى دكتور / محمود عبد المجيد عبد الغنى

كابة المزدسة — جامعة أسوان – قسم المزدسة المدنية

Technical Report On Implementation of Mechanical Boreholes, Soil Resarch, and Foundation Recommendations Network Rehabilitaon in El Zaydab Qebly and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 – Aswan Program Funder : Swiss Agency for Development and Cooperation SDC

Owner . Aswan Water and Sanitation Compny (AWSC)

February 2023



أسوان – شارع شرق البندر – برج الدرنكاوی – الدور الخامس Aswan - Shark El Bandar Street - El Dernkawi Tower ت: ٤٩٥٥٩٣٤ / ٢٣٠ ه موبايل : ١٢٩١٨٠٧ / ١٢٩٠ م ١٠٠٠ المالي المالي المالي المالي المالي المالي المالي المالي المالي The Engineering Designs and Consultations Office Consultant Eng. Dr / Mahmoud A. Mageed A.Ghaney Faculty of Eng. – Aswan University – Civil Eng. Eng. Dept.

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5- Identifications of soil classification, symboles used in Soil Sectors, and remarks.

(1)

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المهتدس الاستشارى قید استشاری ، ۱۹۹۲ ۲ سجن هندسی ، ۱۹۷۲/۶

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كانبكا تربة وأساسات)

ناری : : ۱/۵۹۹۲ سجل هندسی : ۲۵۳۷/غ

**Technical Report** 

On Implementation of Mechanical Boreholes, Soil Resarch, and Foundation Recommendations

Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3)

Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

**Programme Funder : Swiss Agency for Development and Cooperation SDC** 

### **Owner : Aswan Water and Sanitation Compny (AWSC)**

### First - Introduction and purpose of the report :-

The report was prepared at the request of the Swiss Agency for Development and Cooperation (SDC) to carry out mechanical boreholes and soil research , including the study of the natural , mechanical , and chemical properties of the soil , as well as to prepare foundation recommendations for the construction of water line networks ( pipes with diameters of 100 , 150 , 200 , and 355 mm ) in El Sail and El Zaydab Qeply (PA3) , as part of the Potable Water Management Programme in Upper

#### Second - Mechanical Boreholes works :-

The boreholes carried out in the paths of the water lines in the El Sail and El Zaydab Qebly areas were numbered (18), The boreholes were carried out at the required depth (7 m) were numbered only (3), the other boreholes were carried out at a depth of less than the required depth due to the presence of layers of high hardness granite rocks at the site of these boreholes. The numbers and the executed depths of all boreholes given in table in the figure No. (1) attached to the report.

All the boreholes were carried out from the ground level at the site of each borehole using the

(2)

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mechanical tube and its attachments to the equipment necessary for drilling. Soil samples were extracted, preserved, and transported to our laboratories. Equipment for conducting the standard penetration test (S.P.T.) was used, and ground water levels were monitored at the site of each borehole.

All the boreholes were identified at the site, and the depth was received by the supervisor of the entity requesting the report. Figure No. (1) shows a sketch of the general location, locations, and coordinates of the boreholes.

#### Third - field tests and their results :-

Standard penetration tests were carried out at the site (S.P.T.) at different depths of the sandy soil layers. The results of the tests are given in the tables attached to the boreholes sectors in figures from (2) to (19), respectively, which are the number of beats (N) for every 30 cm of penetration.

#### Fourth - Laboratory tests and their results :-

Laboratory tests were conducted on selected samples of soil extracted from the boreholes according to the Egyptian standard specifications and using standard devices . The tests and their results are as follows :-

- 1. Tests for determining the liquid limit (L.L.), the plastic limit (P.L.), and the plasticity index (Ip).
- 2. Tests to determine the percentage of free swelling (F.S. %).
- 3. Tests for determining the unconfined compression value (qun).
- 4. determine the Rock Quality Designation (R.Q.D.).

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The results of the above mentioned tests are given in the tables attached to the boreholes sectors in figures from No. (2) to No. (19), respectively.

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هندسة جيوتقىية؛ ميكانيكا تربة واساسات)

ت: ۲۳،۵۹۵٤ / ۹۷، & موبایل : ۱۲۹۱۸،۷ / ۱۲۹۱

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5. Gradual gradation tests : were performed on selected samples of sandy soil using standard sieves . The results of the tests are represented graphically by the gradation curves in Figures No. (20) and No. (21) .

6. Chemical tests for soil samples : Chemical tests were conducted to determine the sulphate content in the form of sulphur trioxide (SO3) and chloride content (CI), determine the hydrogen number (pH), and determine the electrical resistivity. The results of chemical tests of the soil samples are shown in the table. No. (1).

#### Fifth - the nature of the soil at the sites of the boreholes:-

Through the apparent examination of the soil samples extracted from the boreholes and by studying and analysing the results of the field and laboratory tests that were conducted on some of these samples , it was possible to classify and draw the verticality of the sequence of soil layers at the sites of the boreholes , as shown in figures from No. (2) to No. (19) , respectively . Through the study , it is clear that the soil layers at the sites of the investigations are dominated by coarse soil consisting of sand with different sizes , some of fine gravel , tafla and silt . It is noted that the appearance of layers of loamy soil ( tafla – expansive clay ) with varying degrees of cohesion strength and some of broken rocks of granite . It is noted that the appearance of layers of medium hardness sand stones in the site of the borehole No. (37) as shown in Fig (18) .

From studying the results of the chemical tests shown in Table No. (1), becomes clear soils vary between weak to mediumly aggressive soils, weakly aggressive soils, and non aggressive soils.

#### Sixth - Ground water levels (G.W.L):

It was not possible to monitor any level for the ground water at the locations of all the boreholes through the executed depth at the location of each borehole .

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(4)	دكتورا محمود عيد الجيد عبد العبى
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#### Seventh - Recommendations for incorporation :-

Through the apparent examination of soil samples and the study and analysis of the results of field and laboratory tests that were conducted on some of the soil samples extracted from the boreholes that were carried out along the path of the water line networks in El Sail and El Zaydab Qebly (PA3), within the work of the the Potable Water Management Programme in Upper Egypt – Phase 2 – Aswan, we recommend as follows :-

#### (a) Recommendations for construction Of water networks for all diameters of pipes :-

1. Excavation should be done until a depth is reached by the thickness of the soil replacement below the levels of the bottom tracer of the pipes, which are determined according to the hydraulic designs of the project.

2. The width of the excavation for the pipeline networks shall be determined according to the diameters of the pipes and in accordance with the instructions of the companies producing the pipes .

3. The thickness of the soil replacement below the pipe lines (pillow) is 75 cm in the case of a foundation on expansive clay (tafla) ; otherwise , the thickness of the soil replacement is 30 cm .

4. The soil replacement below the pipelines must consist of clean, coarse sand.

5. Excavation outputs shall not be used in backfilling works above and around the pipe networks . Backfilling must be done using clean sand with a thickness of not less than 50 cm above the levels of the upper plotter of the pipes or according to the catalogues of the company producing the pipes , whichever is greater , provided that the backfilling works are completed until reaching the surface of the earth using the Layers of valid excavation output , and the backfill must be well compacted in layers of 25 cm thickness .

#### (b) Recommendations for chambers:

1. Excavation should be done until a depth is reached by the thickness of the soil replacement below the plain concrete bottom levels of the chambers , which are determined according to the hydraulic

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designs of the project.

2. The excavation at the locations of the chambers must be done with a surface that allows for the soil replacement to flutter at least 30 cm from the plain concrete limits of the room foundations .

3. The thickness of the soil replacement from clean, coarse sand at the bottom of the chambers shall be in accordance with what is contained in paragraph (a) of the recommendations in items No. (3).

4. The permissible net stress of the soil at the surface level of the soil replacement should not be more than 0.60 kg / cm<sup>2</sup> (six tenths of a kilogramme per square centimeter).

5. The external surfaces of the chambers must be isolated against moisture in accordance with the technical specifications of the project .

6. Excavation outputs shall not be used in backfilling around the chambers ; instead , clean sand shall be used , which shall be well compacted in layers of 25 cm thickness .

#### (c) General recommendations :-

implementation works.

1. In the case of executing pipelines in narrow streets & in the case of excavations in collapsible soils, the sides of the excavations must be supported by suitable wooden wrenches, and the formwork must be strong enough to support the sides of the excavations and to maintain the integrity of the neighboring facilities , if any .

2. In the case of neighboring buildings adjacent to the paths of pipelines , the inspection must be carried out for these buildings and their structural condition monitored before excavation works are carried out , the necessary measures must be taken to maintain the structural integrity of the neighboring buildings . The conditions of the buildings must also be monitored during excavation and

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3. The natural soil at the bottom levels of the excavations, at the locations of the pipeline networks and chambers, must be compacted well and sprayed with water.

4. The stone layers must be examined if they appear at the foundation levels , and make sure that there are no dents , cracks , or breaks on the surface of these layers .

5. To clearly define the areas in which the loamy soil (tafla) will appear at the foundation levels of the pipeline networks and the champers, in which the replacement soil will be implemented with a thickness of 75 cm. Excavation works must be carried out in the entire lengths of the networks and refer back to us for inspection and identification of these areas on the sites.

6. Soil replacement (pillow) at the bottom of the pipes and at the bottom of the chambers , with a thickness of 30 cm , it is lowered in one layer , and with a thickness of 75 cm , it is lowered in three equal layers , and each layer must be thoroughly compacted by spraying with water until the field dry density reaches a rate of not less than 95 % of the maximum dry density according to Proctor laboratory experiment .

7. The average diameter of the grains of coarse sand used in replacement soil works ranges from 0.60 mm to 2.00 mm & the average diameter of the grains of graded gravel used in replacement soil works ranges from 6.00 mm to 20.00 mm .

8. The average diameter of the grains of sand used in backfilling works ranges from 0.60 mm to 2.00 mm .

9. To compact the replacement soil below the pipelines and at the bottom of the champers , likewise to compact the soil used in the backfilling works for all cases including implementation in narrow streets , a compactor weighing no less than 250 kg must be used .

10. The necessary field and laboratory tes	sts must be conduc	ted to verify the	effic	iency of compaction
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for each layer of the soil replacement and for each layer of the soil backfilling.

11. Sulfate resistant portland cement should be used with a content of not less than 250 kg per cubic meter for plain concrete works, and the fracture strength of standard cubes at the age of 28 days should not be less than 200 kg / cm<sup>2</sup>.

12. Sulfate resistant portland cement with a content of not less than 350 kilograms per cubic meter should be used for reinforced concrete works, and the fracture strength of standard cubes at the age of 28 days should not be less than about 250 kg/cm<sup>2</sup>.

13. The materials used in concrete works from sand, gravel, and cement must be free of impurities, salts, and organic matter, and conform to the Egyptian standard specifications.

14. The technical specifications must be followed in the operations of mixing, pouring, compacting and curing the concrete.

15. The technical specifications of the project must be followed .

16. All work must be carried out under the supervision of a specialised technician .

17. All the recommendations mentioned in paragraph " Seventh " above shall be followed in the implementation of home networks and connections .

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	Point	Easting	Northing	Z	Depth
	14	24.0584972	32.9264116	156	1.00
	15	24.0611849	32.9228518	121	1.00
	17	24.064223	32.9229391	115	5.00
40	19	24.0645025	32.9239736	111	3.00
A A A	21	24.0665824	32.9208874	114	4.00
(30,36) $(34)$	22	24.0696055	32.9254428	110	6.00
× 8 62	24	24.0717461	32.9251128	108	5.00
· (31)	25	24.07086	32.9274491	116	5.00
(29) (28)	28	24.0765731	32.9250175	108	7.00
	29	24.0777166	32.9229212	110	4.00
1. Vige	30	24.0860702	32.918819	113	7.00
64 55	31	24.0779344	32.9248979	114	7.00
	32	24.0783345	32.9217406	109	5.00
	34	24.0804535	32.9251479	112	4.00
	35	24.0812368	32.9217753	126	1.00
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Figure (1) : layout sketch , locations , coordinates (X,Y,Z), and depths of the boreholes

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		Gr		Water Le		L. (Initi	ial : None & Final : None )		
Free Swelling FS (%)	Plasticity Index Ip (%)	Plastic Limit PL (%)	Liquid Limit LL (%)	Unconfined Compression q un (کجم/سم )	Rock Quality Designation R.Q.D. (%)	Penetra- tion Number N	Soil layers Description		Depth (m)
							<b>Ground Surface Level</b>		
	14	11	25				Low cohesion light brown silt and		0.0
				<u>(End of</u>	<u>Borehole )</u>	<u>33</u>	coarse sand and broken rocks	-	1.(
									2.0
									4.
									6.
				الإستشارى	- see 57 of 1		- Souther Still was		8
			ل الگن و آساسات : ۲۰۳۷	الجباعا	محمود عا بحيوتقنية (م شارى : مومور	دکتور مندسة	والإستشارات		10
				X	A		Charles and a starting of the		12

# Figure (2) : Section of Borehole No (14) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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Depth (m)	Soil layers Description	Penetra- tion Number N	Rock Quality Designation R.Q.D. (%)	Unconfined Compression q un (کجم/سم )	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index Ip (%)	Free Swelling FS (%)
	Ground Surface Level							
0.0	Coarse sand , fine gravel , and	34						
1.0	some of yellow tafla and broken rocks		<u>Borehole )</u>	<u>( End of</u>				No. of Concession, Name
2.0								
4.0	معتقد التصعيدين والإستشارات المندسية معتقد المندسية							
8.0								
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12.0	Elviorio		-					

# Figure (3) : Section of Borehole No (15) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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Dept (m)	Soil layers Description	Penetra- tion Number N	Rock Quality Designation R.Q.D. (%)	Unconfined Compression (کجم/سم )	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index Ip (%)	Free Swelling FS (%)
	Ground Surface Level							
0.	Coarse sand , fine gravel , and Some of light brown silt	46						
- 5. 6.	( End of Borehole )	49						
8.	المتلسين الاستشارى	[						
10	المهندس الاستشارى دكتور/ مجمود علم الحمل علل العا مندسة جيوتقنية (ميكانبكا تربة وأساسا قيد استشارى المهمو السجر هندسى الم		$\square$		الهندسي التشاسات	and the second		
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Figure (4) : Section of Borehole No (17) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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	ial : None & Final : None )		vel G.W.					
Depti (m)	Soil layers Description	Penetra- tion Number N	Rock Quality Designation R.Q.D. (%)	Unconfined Compression q un (کجم/سم <sup>۲</sup> )	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index Ip (%)	Free Swelling FS (%)
	Ground Surface Level							
0.0	Medium to coarse sand	30						
2.	and some of brown clay							30
- 3.	( End of Borehole )							
4.								
6.				22	من من المنابع من الشقية	6		
8.	المهندس الاستشارى دكتور / محمود عبد الجبد عبد ال هندسة جيوتقنية (ميكانيكا تربة وأساس قيد استشارى ٢٥٦، سجر هندسى ٢٥٦				لاسيدة المان ·	2.00		
10.	هندسة جيوتقنية (ميكانيكا تربة وأساس قيد استشارى ١, ٥٩٩٤ ، سجر هندسى ، ٣٥٦	(I) (I)	1	(				
12.			6	M				

# Figure (5) : Section of Borehole No (19) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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	ial : None & Final : None )							
Dep (m	Soil layers Description	Penetra- tion Number N	Rock Quality Designation R.Q.D. (%)	Unconfined Compression q un (کجم/سم ')	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index Ip (%)	Free Swelling FS (%)
	Ground Surface Level							
0	Fill : silt , broken stones , and dust							
2	Fine sand and yellow tafla	18						40
4	( End of Borehole )							
6								
8			2	بب المتصمرين (ستشارات)	(			
1(	المهندس الاستشارى حقور / مجمود عبل الحيل عبل العلى							
12	یکور / میکو افسید میکانیکا تربة واساسات) مندسة جیوتقنیة میکانیکا تربة واساسات) قید استشاری : ۱۹۹۶ ، سجر مندسی : ۲۰۳۷/۶			t	/			

Figure (6) : Section of Borehole No (21) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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		Gr	ound	Water Lev	vel G.W.	L. (Initi	al : None & Final : None )		
Free Swelling FS (%)	Plasticity Index Ip (%)	Plastic Limit PL (%)	Liquid Limit LL (%)	Unconfined Compression q un (کجم/سم)	Rock Quality Designation R.Q.D. (%)	Penetra- tion Number N	Soil layers Description		Depth (m)
							Ground Surface Level		
45						18	Fine sand and light brown tafla	-	0.0 1.0
75	13	19	32	1.20			Low cohesion light brown tafla ,		2.0
									4.0
									5.0
<u>80</u>	<u>12</u>	<u>15</u>	27	<u>( End of</u>	<u>Borehole )</u>		Low cohesion brown tafla , broken rocks	-	6.0
				- Al mark			المهندس الاستشارى		8.0
		(	معیدان فاران		2		کتور ) مجمود عبد الجبد عبد الفتی ندسة جيوتقنية (ميكانية تربة واساست د استشارى ١٢٥٩٩٤ ، سجد هندسى ٢٢٥٩٤		10.(
		1	and a series	The second second	K				12.(

Figure (7) : Section of Borehole No (22) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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		Gr	ound '	Water Lev	vel G.W.I	L. (Initi	ial : None & Final : None )		
Free Swelling FS (%)	Plasticity Index Ip (%)	Plastic Limit PL (%)	Liquid Limit LL (%)	Unconfined Compression q un (کجم/سم	Rock Quality Designation R.Q.D. (%)	Penetra- tion Number N	Soil layers Description		Depth (m)
							<b>Ground Surface Level</b>		
70	13	18	31	1.00			Low cohesion light brown tafla,	-	0.0
							and little of fine sand		
								-	2.0
<u>75</u>	<u>12</u>	<u>17</u>	<u>29</u>	<u>0.90</u>			Low cohesion dark brown tafla, organic matter	-	3.0
85	19	27	46				Medium to low cohesion light brown tafla		4.0
							( End of Borehole )	-	5.0
									6.0
		C	مىيىن تشارات	11.1.2			المهندس الاستشارى كتور / مجمود عبد الحبد عبد الفني		8.0
		21 FE	Contraction of	113	7		كتور ا مجمود عبد الجبد عبد الفني ندسة جيوتقنية (ميكانيكا تربة واساسات) د استشارى ١/٥٩٩٤ سجل هندسي ٢٢٥٦		10.0
									12.(

Figure (8) : Section of Borehole No (24) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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	Final : None )	ial : None &	L. (Initi		Water Lev				
Dept (m)	ers Description		Penetra- tion Number N	Rock Quality Designation R.Q.D. (%)	Unconfined Compression q un (کجم/سم <sup>۲</sup> )	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index Ip (%)	Free Swelling FS (%)
	Surface Level	Grou							
0.	coarse sand , some of wn silt , and little		37						
	in sitt, and little	Ingitt bi							
	fine gravel								
4.			39						
- 5.	d of Borehole ) ———	——— ( E							
6									
8.	المهندس الا	تشاری			34	بالتصع بالتصع			
10	المهندس الا دکتور / محمود عیل مندسة جیوتقنیة (می قید استشاری : ۵۹۹٤	جيل عبل الف يكا تربة وأساس ير هندسي : ٥٦	(i) 5 (1)	2		التيند اللي التي الاليتار	ALL ALL ALL		
12		Real Provide		7.					

Figure (9) : Section of Borehole No (25) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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		al : None & Final : None )	L. (Initi	vel G.W.	Water Lev	Ground Water Level G.W.L. (Initial: None & Final: None)           Free         Plasticity         Plastic         Liquid         Unconfined         Rock Quality         Penetra-           Services         Liquid         Unconfined         Rock Quality         Penetra-										
Dept (m)		Soil layers Description	Penetra- tion Number N	Rock Quality Designation R.Q.D. (%)	Unconfined Compression q un (کجم/سم )	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index Ip (%)	Free Swelling FS (%)							
		<b>Ground Surface Level</b>														
0.		Low cohesion light brown tafla			1.10	33	19	14	65							
2.		and some of fine sand														
4.	-															
7.	-	<u>Medium to fine sand , some light brown tafla</u>	<u>29</u>						<u>30</u>							
8.					Ji Links	man	/									
10.		المهندس الاستشارى دكتور / مجمود عبل الجبل عبل العبي هندسة جيوتقنية (ميكانيكا تربة وأساسات) قيد استشارى :١/٥٩٩٤ سج هندسى : ٧٣٥٦		2	والإس الهذي الهذي	تشاران، لاسیة اسان	a.145									
12.			e			1										

Figure (10) : Section of Borehole No (28) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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	al : None & Final : None )	L. (Init				Gr		
Depth (m)	Soil layers Description	Penetra- tion Number N	Rock Quality Designation R.Q.D. (%)	Unconfined Compression q un (کجم/سم	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index Ip (%)	Free Swelling FS (%)
	Ground Surface Level							
0.0	Low cohesion light brown tafla			0.90	31	17	14	55
2.0	and some of fine sand							
4.0	( End of Borehole )							
6.0								
8.0								
10.0	المهندسی الاستشاری دکتور / محمول عبل الحبل عا مندسة جیوتقنیة (میکانیکا تربه قید استشاری ۲۰۹۹ (۲۰ سجل هندسی	ونشاست ونساست ٤/٧٣٥٦ :	N19	التصنيمات التصاديق بذرسية				
12.0			A. T.	S. A.	M			
					K			

Figure (11) : Section of Borehole No (29) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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Free Swelling FS (%)	Plasticity Index Ip (%)	Plastic Limit PL (%)	Liquid Limit LL (%)	Unconfined Compression <b>q</b> un (کجم/سم <sup>۲</sup> )	Rock Quality Designation R.Q.D. (%)	Penetra- tion Number N	Soil layers Description		Depth (m)
							<b>Ground Surface Level</b>		
							Fill : dust , gravel , broken stones		0.0 1.0
<u>30</u>	—					<u>34</u>	Medium to coarse sand and some of tafla <sup>*</sup>	-	2.0
<u>25</u>						<u>42</u>	<u>Coarse sand , fine gravel and some of tafla</u>	-	3.0
						<u>36</u>	Medium to coarse sand and		4.0
<u>30</u>							some of tafla light brown		
							( End of Borehole )	-	6.0 7.0 8.0
		اللماني متشارات تدسية	14 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	2		-	المهندس الاستشارى دكتور / مجمود عبل الجبل عبل الثنى مندسة جيوتقنية (ميكانيكا تربة وأساسات) نيد استشارى : ١٩٩٤ • سجر هندسى ٢٢٥٦		10.0
		N N	201	1					12.0

Figure (12) : Section of Borehole No (30) and Results of Field and Laboratory Tests

Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

مكتب التصميمات والإستشارات الهندسية

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Dept		F	Penetra-	<b>Rock Quality</b>	Water Lev Unconfined	Liquid	Plastic	Plasticity	Free
(m		Soil layers Description	tion Number N	Designation R.Q.D. (%)	Compression q un (کجم/سم )	Limit LL (%)	Limit PL	Index Ip (%)	Swelling FS (%)
		Ground Surface Level					(%)		
0.									
	•	Low cohesion light brown tafla			0.90	32	18	14	65
2.		and little of fine sand							
4									
6									
7		( End of Borehole )							
8									
						14:50	المعيد	1	
10		المهندس الاستشارى مرا مجمعة عدا الحدار عدل الحدر		7		(21/2)	بقندار ایتا ۱۰۰۰ ت		
	and and	ر · المراجع ( محافظ ، م				1	in the second	8	
12	اقيد اسا	سمة جيوتقندة (مىكانىكا تربة وأساسات) استشارى : ١٩٦٤ - سبر هندسى : ٤/٧٣٥٦			5	M	266		

Figure (13) : Section of Borehole No (31) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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Free Swelling FS (%)	Plasticity Index Ip (%)	Plastic Limit PL (%)	Liquid Limit LL (%)	Unconfined Compression q un (کجم/سم <sup>۲</sup> )	Rock Quality Designation R.Q.D. (%)	Penetra- tion Number N	Soil layers Description	(m)		
							<b>Ground Surface Level</b>			
70	25	32	57	2.7			High cohesion light brown tafla	2.0		
							( End of Borehole )	- 5. 6.		
		(	صعيدين شارات	101 - 102 - 101 - 10		5	المهندس الاستشارى دكتور / محمود عبد الجيد عبد الف	8.		
الفتى الفتى	الفتى الفتى	الفتى الفتى	الفتى	( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	ل في الم (ت السلس ٤/٧٣٥٣	110	المهندس الاستشارى دكتور / مجمود عبد الجبل عبل هندسة جير تقسة المكاترية وأ قيد استشارى عامر سعر هندسى .	8.		

Figure (14) : Section of Borehole No (32) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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		Gro	und V		el G.W.L	. (Initia	al = None & Final = - 2.70 )		
Free Swelling FS (%)	Plasticity Index Ip (%)	Plastic Limit PL (%)	Liquid Limit LL (%)	Unconfined Compression q un (کجم/سم )	Rock Quality Designation R.Q.D. (%)	Penetra- tion Number N	Soil layers Description		Depth (m)
							<b>Ground Surface Level</b>		
							Fill : fine tafla and broken stones		0.0
<u>40</u>	<u>17</u>	<u>21</u>	<u>38</u>				Medium cohesion tafla light brown	-	2.0
60	24	29	53	2.4			High cohesion tafla light brown		
							to brown		4.0
									6.
							( End of Borehole ) ——	-	7.0
		() ()	ب النصر لإستشار لمندس	8	7		المهندس الاستشارى		8.0
			1		-	(ä) \$/V	دکتور / ۲۹۹۹ کید ایکیا میکانه هندسة جیوتقنیة (میکانه تربة وأساس قید استشاری : ۲۵۹۸ سجر هندسی : ۳۵۲		12.

Figure (15) : Section of Borehole No (34) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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	ial : None & Final : None )	L. (Initi		Water Le	ound			
D (	Soil layers Description	Penetra- tion Number N	Rock Quality Designation R.Q.D. (%)	Unconfined Compression (کجم/سم')	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index Ip (%)	Free Swelling FS (%)
	Ground Surface Level							
	Coarse sand , fine gravel , broken	39						
-	rocks , and little light brown silt		<u>Borehole )</u>	<u>( End of</u>				
	المهندس الاستشارى دكتور / مجمود عبل الحبل عبل ا مندسة جيوتقنية (ميكانيكا تربة وأس قيد استشارى ، ١/٥٩٩٤ سجن هندسى ، ٢	<b>ریا</b> اسات) ٤/٧٣٥						
	جانب التصبيب والإستشارات							
1	الهندسية الم							
			7	M				

## Figure (16) : Section of Borehole No (35) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

مكتب التصميمات والإستشارات المندسية

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				Water Le		L. (Init	ial : None & Final : None )	
Free Swelling FS (%)	Plasticity Index Ip (%)	Plastic Limit PL (%)	Liquid Limit LL (%)	Unconfined Compression q un (کجم/سم )	Rock Quality Designation R.Q.D. (%)	Penetra- tion Number N	Soil layers Description	Dep (m
							<b>Ground Surface Level</b>	
						42	Coarse sand , fine gravel , broken	0
				(End of	<u>Borehole )</u>		rocks , and some light brown silt	- 1
								2
						C	المهندس الاستشارى دكتور / مجمود عبد الجبد عبد المار هندسة جيوتقنية (ميكانيكا قزية وأساسات قيد استشارى : ١/٥٩٩٤ سجل هندسى : ٧٣٥٦/	4
								6
							من التصعيد: من الإستشادات من الإستشادات	8
							Carles and a state of the state	10
								12

## Figure (17) : Section of Borehole No (36) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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Ground Water Level G.W.L. (Initial = None & Final = - 4.00)           Free         Plasticity         Plastic         Liquid         Unconfined         Rock Quality         Penetra-									
Free Swelling FS (%)	Plasticity Index Ip (%)	Plastic Limit PL (%)	Liquid Limit LL (%)	Unconfined Compression q un (کجم/سم <sup>۲</sup> )	Rock Quality Designation R.Q.D. (%)	Penetra- tion Number N	Soil layers Description		epth m)
							Ground Surface Level		
					52		Medium hardness sand stones		0.0
						44	Coarse sand , fine gravel , light	-	2.0
30							brown tafla , and broken rocks		4.(
							( End of Borehole )	-	5.0
						-	المهندس الاستشاري		6.
		June .	and a start			(1	دکتور / مجمود عبد الجبل عبد الغر هندسة جيوتقنية (ميكانيكا تربة وأساسات قيد استشارى ١٩٦٤ (سجر هندسى ٢٣٥٦		8.0
	( I I I I I I I I I I I I I I I I I I I	2015 C	1031 (10) 1001 (10) 1001 (10)	1.3	$\neg$			1	10.(
			19		1			1	12.

Figure (18) : Section of Borehole No (37) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

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el G.W.L	Vater Lev	ound V	Gr		
Rock Quality Designation R.Q.D. (%)	Unconfined Compression q un (کجم/سم <sup>۲</sup> )	Liquid Limit LL (%)	Plastic Limit PL	Plasticity Index Ip (%)	Free Swelling FS (%)
					35
	0.90	29	16	13	55
تور ا مجمع	art least	M.Lie.	۵۵۱ (22) (تاسات) ٤/٧٢		
1		Y			
y	Rock Quality Designation R.Q.D. (%)	Unconfined Compression q un (مجم/سم) Compression R.Q.D. (%) Compression R.Q.D. (%)	Liquid Limit LL (%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	Limit Limit Compression Designation PL (%) (***) (****) (****) (***) (***) (****) (****) (***) 16 29 0.90	Plasticity Index       Plastic Limit       Liquid Limit       Unconfined Compression       Rock Quality Designation         Ip       PL       (%)       q un (%)       R.Q.D. (%)       (%)         Imit       Imit       Q un (%)       (%)       (%)       (%)         Imit       Imit       Imit       Q un (%)       (%)       (%)         Imit       Imit       Imit       Imit       Imit       Imit         Imit       Imit       Imit       Imit       Imit       Imit       Imit         Imit       Imit       Imit       Imit       Imit       Imit       Imit       Imit     <

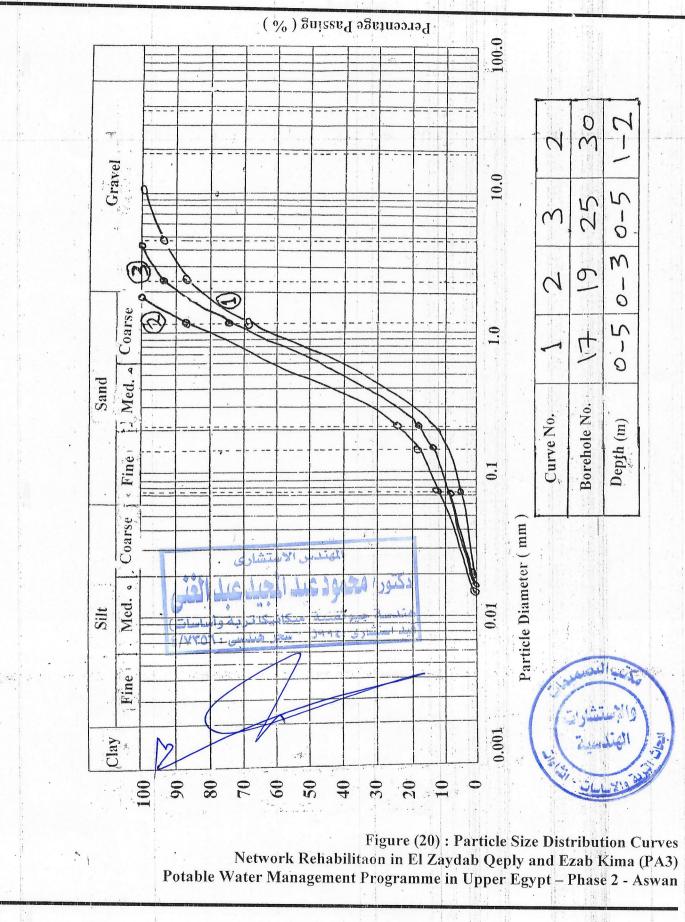
## Figure (19) : Section of Borehole No (40) and Results of Field and Laboratory Tests Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 - Aswan

### مكتب التصهيمات والإستشارات الهندسية

مكتب التصميمات والإستشارات المندسية

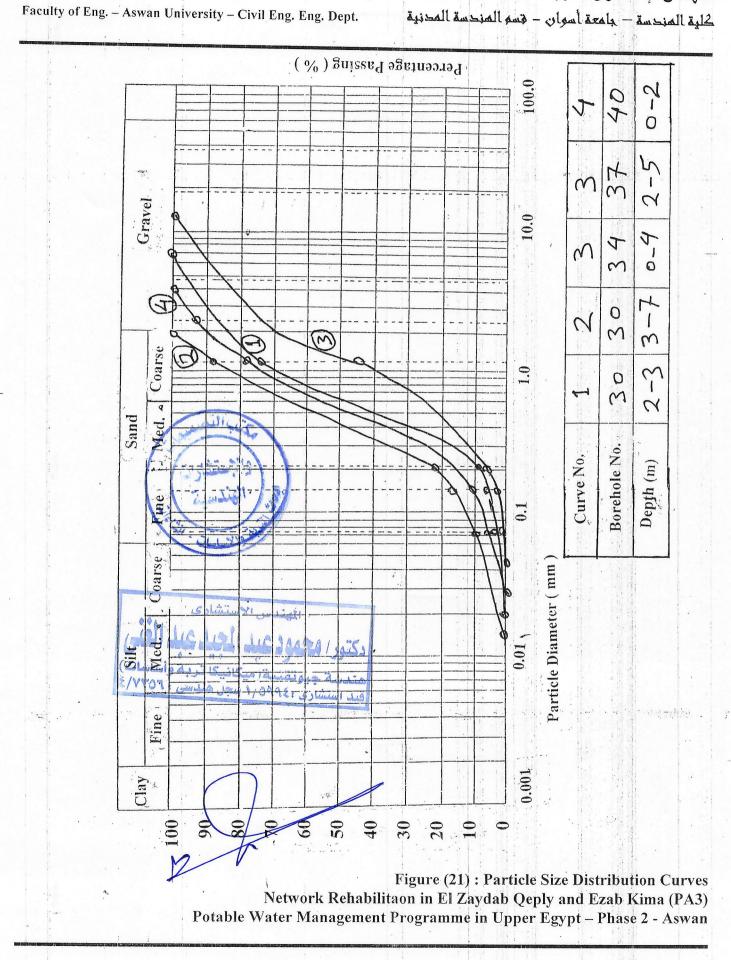
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أسوان - شارع شرق البندر - برج الدرنكاوى - الدور الخامس Aswan - Shark El Bandar Street - El Dernkawi Tower ت: ٤٥٩٥ . ٢٣ / ٩٩٠ & موبايل : ١٢٩١٨٠٧ / ١٢٩٠ . 1291807 / 1291807 / 2305954 & Mobile : 0100 The Engineering Designs and Consultations Office Consultant Eng. Dr / Mahmoud A. Mageed A.Ghaney

مكتب التصميمات والإستشارات المندسية المهندس الإستشارى دكتور / محمود عبد المجيد عبد الغنى كلية المندسة – جامعة أسوان – قسم المندسة المدنية



أسوان – شارع شرق البندر – برج الدرنكاوى – الدور الخامس Aswan - Shark El Bandar Street - El Dernkawi Tower ت: ٤٥٩٥ه. ٢٢ / ٩٩٠ & موبايل : ٢٩١٨٠٧ / ١٢٩٠ م ١٠٠٠ تو 1291807 / 1291807 & ٢٩٠٠٧ مكتب التصميمات والإستشارات المندسية

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## Table (1)

### **Results of Chemical Tests for Soil Samples**

## Network Rehabilitaon in El Zaydab Qeply and Ezab Kima (PA3) Potable Water Management Programme in Upper Egypt – Phase 2 – Aswan

Borehole	Depth	Sulphats Content	<b>Chlorides Content</b>	Hydrogen	Electrical
Number	( m )	(SO <sub>3</sub> )	( CI )	Number	Resistivity
		(% - by Weight)	(Part in Milion)	( pH )	(Ohm.cm)
14	0.0 - 1.0	0.08	240	7.90	3250
15	0.0 - 1.0	0.26	470	7.10	2400
17	0.0 - 5.0	0.09	260	7.80	3110
19	0.0 - 3.0	0.11	275	7.60	2950
21	1.0 - 4.0	0.43	780	6.30	1670
22	2.0 - 5.0	1.90	1200	5.30	1350
24	2.0 - 3.0	2.05	1460	5.20	1250
25	0.0 - 5.0	0.10	265	7.70	2960
28	0.0 - 6.0	1.75	910	6.40	1640
29	0.0 - 4.0	1.60	840	6.50	1530
30	2.0 - 3.0	0.12	290	7.50	3050
31	0.0 - 7.0	1.65	890	6.30	1720
32	0.0 - 5.0	1.95	1310	5.10	1140
34	0.0 - 4.0	0.10	270	7.80	3060
35	0.0 - 1.0	0.09	255	7.90	3260
36	0.0 - 1.0	0.12	285	7.60	3080
37	2.0 - 5.0	0.46	890	6.60	1480
40	2.0 - 5.0	1.35	710	6.10	1350

list وتقنية (ميكان قید استشاری : ۱/۵۹۹٤ سجل هندسی : ۳۵۶



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## **Identifications of Soil Classification**

## **1- Symboles Used in Soil Sections**

S.P.T. : Standard Penteration Test in field (for case of coarse soil)

N / 30 cm : Number of blows for peterate the device 30 cm in soil

LL % : Liquid Limit.

PL % : Liquid Limit .

I<sub>p</sub>% : Plasticity Index = LL - PL:

W<sub>n</sub> : Natural Moisture Content of Soil .

 $\gamma_b$ : Natural Bulk Density of Soil .

FS % : Percentage of Free Swelling of Soil .



<u>2- Relative Density ( D<sub>r</sub> ) of Coarse Soil According to Number of blows in</u> <u>Standard Penteration Test :-</u>

Relative	0.00 - 0.15	0.15 - 0.35	0.35 - 0.65	0.65 - 0.85	0.85 - 1.00
Density (D <sub>r</sub> )					
Number of	1 - 4	4 - 10	10 - 30	30 - 50	> 50
blows					
<b>Description</b>	Very Loose	Loose	Medium	Dense	Very Dense

## 3- Remarks :-

a – Description of soil layers and its properties given in the vertical sections in the report simulate the soil taken out from boreholes carried out in the field and given its locations in the figures attached in the report.
b – Ground water level in place of borehole record at the end of work in borehole (Initial Level) and record after 24 hours from the end of work in borehole (Final Level).

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