SLAKING TENDENCY

ESCUELA POLITECNICA NACIONAL
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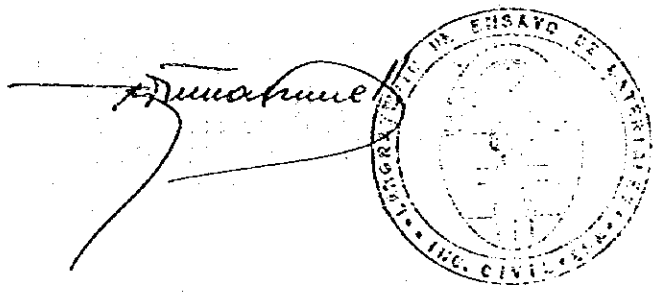
LABORATORIO DE MECANICA DE SUELOS



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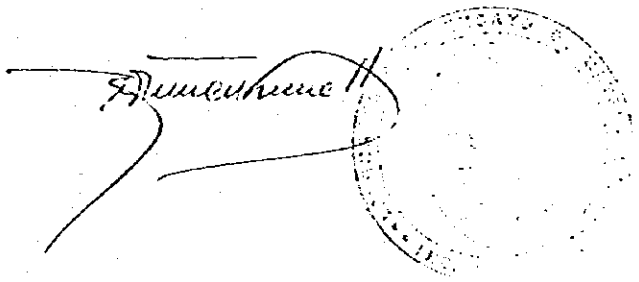

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ESCUELA POLITECNICA NACIONAL
FACULTAD DE INGENIERIA CIVIL
LABORATORIO DE MECANICA DE ROCAS

PROYECTO "TRASVASES MANABI"

FECHA: ENERO 1994
ENVIO : 3
NORMA UTILIZADA: ISRM

ENSAYO DE DURABILIDAD SLAKE

SONDEO	SR-93-3
MUESTRA Nº	1
PROFUNDIDAD (m)	20.36-20.72
DESCRIPCION	ARENISCA GRANO FINO
PESO INICIAL SECO, A (gr)	521.0
PESO FINAL SECO DEL PRIMER CICLO, B (gr)	412.0
PESO FINAL SECO DEL SEGUNDO CICLO, C (gr)	280.6
INDICE DE DURABILIDAD SLAKE, Id2 (%)	79.1
FLUIDO EMPLEADO	AGUA POTABLE A 15 °C
APARIENCIA DEL MATERIAL QUE PASA LA MALLA	LIMOS Y ARCILLAS CON ARENA FINA
APARIENCIA DEL MATERIAL RETENIDO EN LA MALLA	REDONDEADAS/ONDULADAS

Ing. Germán Luna H.
JEFE DE LABORATORIO

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ESCUELA POLITECNICA NACIONAL
FACULTAD DE INGENIERIA CIVIL
LABORATORIO DE MECANICA DE ROCAS

PROYECTO "TRASVASES MANABI"

FECHA: ENERO 1994
ENVIO : 3
NORMA UTILIZADA: ISRM

ENSAYO DE DURABILIDAD SLAKE

SONDEO	SR-93-5
MUESTRA Nº	1
PROFUNDIDAD (m)	8.79-9.00
DESCRIPCION	ARENISCA GRANO FINO
PESO INICIAL SECO, A (gr)	485.8
PESO FINAL SECO DEL PRIMER CICLO, B (gr)	443.7
PESO FINAL SECO DEL SEGUNDO CICLO, C (gr)	407.7
INDICE DE DURABILIDAD SLAKE, Id2 (%)	83.9
FLUIDO EMPLEADO	AGUA POTABLE A 15 °C
APARIENCIA DEL MATERIAL QUE PASA LA MALLA	ARENAS MEDIAS Y GRUESAS LIMOS
APARIENCIA DEL MATERIAL RETENIDO EN LA MALLA	REDONDEADOS CON FRAGMENTO PEQUENO RDONDEADO

Ing. Germán Luna H.
JEFE DE LABORATORIO

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ESCUELA POLITECNICA NACIONAL
FACULTAD DE INGENIERIA CIVIL
LABORATORIO DE MECANICA DE ROCAS

PROYECTO "TRASVASES MANABI"

FECHA: ENERO 1994
ENVIO : 3
NORMA UTILIZADA: ISRM

ENSAYO DE DURABILIDAD SLAKE

SONDEO	MG-93-2
MUESTRA Nº	1
PROFUNDIDAD (m)	36.52-37.00
DESCRIPCION	ARENISCA GRANO FINO
PESO INICIAL SECO, A (gr)	446.5
PESO FINAL SECO DEL PRIMER CICLO, B (gr)	293.0
PESO FINAL SECO DEL SEGUNDO CICLO, C (gr)	56.1
INDICE DE DURABILIDAD SLAKE, Id2 (%)	12.6
FLUIDO EMPLEADO	AGUA POTABLE A 15 °C
APARIENCIA DEL MATERIAL QUE PASA LA MALLA	LIMOS Y ARENAS FINAS
APARIENCIA DEL MATERIAL RETENIDO EN LA MALLA	FRAGMENTOS REDONDEADOS TAMANO VARIABLE

Ing. Germán Luna H.
JEFE DE LABORATORIO

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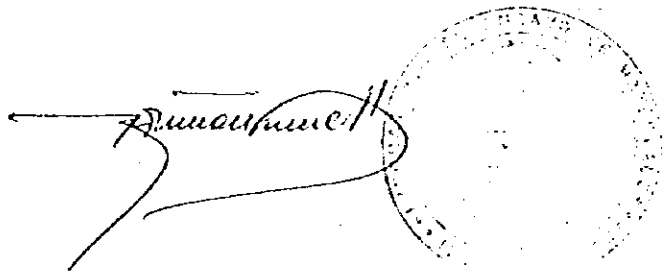

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JAPAN INTERNATIONAL COOPERATION AGENCY
J I C A

THE DETAILED DESIGN STUDY ON THE WATER TRANSBASIN SCHEMES FOR CHONE-PORTOVIEJO RIVER BASINS

GEOLOGICAL - GEOTECHNICAL INVESTIGATIONS REPORT

VOLUME II

FEBRUARY 1994

JAPAN INTERNATIONAL COOPERATION AGENCY
J I C A

DETAILED DESIGN STUDY ON THE TRANSBASIN WATER PROJECT FOR THE CHONE-PORTOVIEJO RIVER BASINS

REPORT ON GEOLOGICAL - GEOTECHNICAL RESEARCH

VOLUME II

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JAPAN INTERNATIONAL COOPERATION AGENCY
J I C A

DETAILED DESIGN STUDY ON THE TRANSBASIN WATER PROJECT FOR THE CHONE-PORTOVIEJO RIVER BASINS

REPORT ON GEOLOGICAL - GEOTECHNICAL RESEARCH

5. TEST PITTING AND MANUAL SOUNDING

5.1 PURPOSE AND SCOPE OF THE INVESTIGATIONS

The Geotechnical Investigation Campaign using test pitting and manual sounding with standard penetration tests, "SPT," is in order to investigate the geomechanical characteristics of the highly weathered soils and rock.

For this purpose, geotechnical logging was performed both for the test pitting as well as the sounding, and samples were taken for study, depending on the focus to be given the study whether based on the foundation work or the use of the material excavated for construction material. Thus, three main activities may be defined:

- Test Pits along the Open Channel

  They were excavated for the purpose of learning the characteristics of the colluvial soil or weathered rock in order to use said soils as construction materials in the earth fill of the channel. Therefore the sampling used disturbed samples on two levels.

- Test Pits along the Transmission Line

  Excavated for the purpose of learning the geomechanical characteristics of the soils or weathered rock for the foundations of towers or other types of structures. For this purpose, undisturbed samples were obtained of the soils wherever possible.

- Manual Sounding with standard penetration tests

  Performed for the purpose of evaluating the soil and weathered rock resistance characteristics and on three different fronts:

- Along the Open Channel, especially on the intersections of the channel line and streams.

- Along the Transmission Line, basically at the sites for the foundations of the towers.

- At the entrance to the Poza Honda-Mancha Grande-Estero Guajabito Tunnel and the exit of the La Esperanza-Poza Honda Tunnel at the Pata de Pajaro River for the purpose of studying the building of a Retaining Wall for these sites for the construction of the underwater portals.

5.2 WORKS PERFORMED AND METHODS USED

5.2.1 Test Pits

Fifteen test pits were excavated, ten of which were along the section of the channel and five along the transmission line. The location of same is shown in Appendix No. 7.4

The depth and the samples taken are shown in the following table:

WORK: OPEN CHANNEL

TEST PIT №	COORDINATE		DEPTH m	TYPE OF SAMPLE		ROCK LINE m
	N	E		DISTURBED	INDISTURBED	
C - 10	9892630	607645	3,00	0,50-1,40 2,00-3,00	-	1,40 m
C - 11	9892440	607000	2,00	0,55-2,00	-	N.A. 1,60 m
C - 12	9891880	606500	4,00	0,60-1,60 2,00-3,60	-	3,60
C - 13	9891540	606387	4,00	0,80-2,00 2,00-3,50	-	2,60
C - 14	9891045	606183	4,00	0,90-1,90 1,90-3,50	-	3,60
C - 15	9890440	605330	3,00	0,40-1,00 1,20-1,60	-	1,60
C - 16	9890110	605090	4,00	0,85-1,80 2,00-3,50	-	3,20
C - 17	9889600	604670	3,00	0,40-1,60 2,00-3,00	-	1,60
C - 18	9889155	604290	3,00	0,30-1,60 2,00-3,50	-	0,90
C - 19	9888780	603850	4,00	1,00-1,70 1,20-3,60	-	3,60

WORK: TRANSMISSION LINE

TEST PIT №	COORDINATE		DEPTH m	TYPE OF SAMPLE		ROCK LINE m
	N	E		DISTURBED	INDISTURBED	
C - 20	9892665	607780	1,50	0,35-1,10	-	1,10
C - 21	9892400	613400	3,00	0,40-1,00 1,00-2,15	-	2,15
C - 22			3,50	1,00-2,35	0,60-0,90	2,35
C - 23	9895874	627354	3,50	2,00-2,80	1,20-1,50	2,80
C - 24	9897090	634780	4,00	2,50-4,00	1,50-1,80	no
TOTAL						
15	-	-	50,00	25	3	-

The excavation of the test pits was performed manually, using conventional tools such as picks, shovels, buckers, etc. with dimensions of 2.0 x 2.0 m and at the maximum depth possible for excavation whether due to ground water as in C-11 or bedrock within which in some cases we excavated more than 1 meter due to completely weathered and soft mudstone.

In addition to the geological-geotechnical logs, we measured the resistance of undrained cuts every 20 cm at cohesive levels, through the use of the wind vane and the hand penetrometer although at most of the test pits the soil resistance was greater than the measuring capacity of the instruments. This information is included in the description of the consistency of the materials.

The levels and types of samples obtained were selected according to JICA. At each one of the test pits at the Open Channel two disturbed samples were taken of approximately 50 kg each of the materials considered most fitting for the purposes intended. At the test pits for the Transmission Line we could take only one undisturbed sample (0.3 x 0.3 x 0.3 m) from each test pit and one disturbed sample of the soils which could not be molded.

At test pits C-20 and C-21 we could not obtain undisturbed samples because of the characteristics of the materials.

We also obtained proper topographical documentation of each of the excavations as shown in Appendix No. 7.3.

For the geological-geotechnical classification of the soils, we used the criteria listed in Table No. 1 of Appendix No. 7.1 in which the character of the soils, color, consistency or compactness and organic material content were determined.

At the excavations where bedrock was found we evaluated geotechnical parameters such as weathering, fracturing, resistance, RQD as per the parameters listed in Appendix No. 7.1.

The geological and geotechnical logs for each of the test pits with the results of the laboratory tests are listed in Appendix No. 7.1.

5.2.2 Manual Sounding with Standard Penetration Tests

Sixty (60) manual soundings were performed with continuation standard penetration tests (SPT) with 54 performed along the line of the Open Channel, three along the Transmission Line and three in the Poza Honda sector.

The number and depth of the sounds is shown in the table herebelow:

SITE: OPEN CHANNEL

SOUNDING №	COORDINATE		DEPTH m	NUMBER OF MADE "SPT" TEST	ROCK LINE	N_{30} MAX	WATER LEVEL
	N	E					
S - 1	9892430	607520	4,05	9	2,95	44	-
S - 2	9892380	607370	3,60	8	1,95	47	-
S - 3	9892330	607370	3,60	8	1,60	40	-
S - 4	9892240	607100	2,20	4	1,00	57/25 R	-
S - 5	9892210	607010	3,15	7	1,40	50	-
S - 6	9892180	607030	7,50	6	1,50	58/25 R	-
S - 7	9892160	606840	4,95	11	3,95	21	-
S - 8	9892110	606865	4,95	11	4,25	31	-
S - 9	9891930	606620	3,60	8	1,60	37	2,25
S - 10	9891880	606650	3,15	7	1,30	42	-
S - 11	9891730	606440	4,50	10	3,00	47	-
S - 12	9891745	606410	4,05	9	2,80	29	-
S - 13	9891550	606440	3,15	7	2,20	35	-
S - 14	9891320	606485	4,05	9	3,40	55	1,50
S - 15	9891330	606460	2,00	5	1,60	30/10 R	-
S - 16	9891180	606320	2,40	6	1,70	30/10 R	-
S - 17	9891210	606310	2,50	6	1,60	30/10 R	-
S - 18	9891080	606140	4,95	11	3,80	29	-
S - 19	9890360	606130	3,50	8	3,00	30/10 R	-
S - 20	9890370	606090	3,60	8	2,60	31	-
S - 21	9890760	605950	3,90	9	2,60	30/15 R	-
S - 22	9890700	605900	2,90	7	1,60	30/10 R	-
S - 23	9890640	605830	1,20	3	0,25	30/10 R	-
S - 24	9890570	605770	0,80	3	0,30	30/10 R	-
S - 25	9890530	605730	3,10	7	2,00	54 R	-
S - 26	9890570	605830	3,15	7	1,60	49	-
S - 27	9890520	605630	3,15	7	1,20	63 R	-
S - 28	9890560	605420	2,70	6	1,20	51 R	-
S - 29	9890530	605435	3,60	8	2,50	43	-
S - 30	9890350	605280	4,30	10	2,80	30/10 R	-
S - 31	9890380	605240	2,10	5	1,60	30/10 R	-
S - 32	9890140	605240	1,60	4	1,50	30/10 R	1,00
S - 33	9890080	605090	3,00	7	2,50	30/15 R	-
S - 34	9889880	605000	2,80	7	1,70	30/10 R	-
S - 35	9889910	604960	1,50	4	0,70	30/ 5 R	-

SITE: OPEN CHANNEL

SOUNDING №	COORDINATE		DEPTH m	NUMBER OF MADE "SPT" TEST	ROCK LINE	N_{30} MAX	WATER LEVEL
	N	E					
S - 36	9889840	604790	2,70	6	1,20	34	-
S - 37	9889880	604760	3,15	7	1,20	40	-
S - 38	9889700	604670	3,15	7	1,20	48	-
S - 39	9889675	604660	1,00	3	0,90	30/10 R	-
S - 40	9889650	604630	2,70	6	1,40	44	-
S - 41	9889430	604520	1,10	3	1,00	30/10 R	-
S - 42	9889415	604540	0,95	3	0,90	30/ 5 R	-
S - 43	9889400	604560	3,15	7	1,80	38	-
S - 44	9889380	604385	4,95	11	3,20	31	-
S - 45	9889320	604370	4,20	10	3,40	30/15 R	-
S - 46	9889270	604280	4,50	10	3,80	27	-
S - 47	9889270	604240	4,95	11	3,40	35	-
S - 48	9889160	604260	2,25	5	0,90	48	-
S - 49	9889050	604190	2,25	5	1,00	38	-
S - 50	9889030	604090	1,20	3	1,10	30/10 R	-
S - 51	9889010	604010	2,70	6	1,20	42	-
S - 52	9888930	603975	4,05	9	3,00	47	-
S - 53	9888950	603950	3,20	7	2,90	30/10 R	-
S - 54	9888810	603810	4,05	9	3,00	51	-

SITE: TRANSMISSION LINE

SOUNDING №	COORDINATE		DEPTH m	NUMBER OF MADE "SPT" TEST	ROCK LINE	N_{30} MAX	WATER LEVEL
	N	E					
S - 55	9892320	608650	2,25	5	1,50	29	-
S - 56	9892380	611650	2,25	5	1,30	42	-
S - 57	9895885	627480	0,40	1	0,30	30/10 R	-
S - 57'	-	-	5,10	3	2,90	30/10 R	-

SITE: POZA HONDA

SOUNDING №	COORDINATE		DEPTH m	NUMBER OF MADE "SPT" TEST	ROCK LINE	N_{30} MAX	WATER LEVEL
	N	E					
S - 58	-	-	7,20	16	4,70	28	1,20
S - 59	-	-	4,00	8	3,00	17	2,20
S - 60	-	-	2,25	5	0,80	27	-

The manual sounding were performed with continuous standar penetration test, each 0,45 m.

Standard equipment was used for the execution of same, i.e.:

Weight of the mass:	140 lbs.
Height of the fall of the mass:	76 cm.
Diameter of sampler:	2"

At the sites where it was possible to install a headframe, when the slope was not strong, to expedite the work, a tripod or a cane tower.

Standard penetration tests were performed continuously every 45 cm using the standards for said test, i.e., the line is divided into 15 cm sections and the number of strokes necessary to drive each 15 cm section is counted. When more than 30 strokes are necessary to drive a 15 cm section or when the total strokes necessary to drive the last 30 cm reaches more than 50 strokes, then it is considered a reject.

For the interpretation of the test, we take the strokes necessary to drive the last 30 cm and obtaining the amount of N_{30}. The strokes from the top 15 cm were not used because the land could have been altered.

Samples obtained from each test with the split tube 2" in diameter have been logged with the geotechnical criteria listed in Table No. 1 of Appendix 7.1 for soils and with the geotechnical classification standards for the case of rocks. The samples have been preserved in double plastic bags, duly labeled in case it is necessary to perform laboratory tests or geotechnical logging later on.

As may be observed in the geotechnical logs of the soundings, they were performed on colluvial soils and completely weathered rock down to the depth in which rejection takes place or where it is normally possible to perform such soundings. It is important to point out that all the soundings performed detected the contact of the colluvial soils with altered or healthy rock, penetrating in certain cases more than 2 cm in completely weathered rock.

Also, we took photographic documentation of the way the soundings were performed as shown in Appendix No. 7.3.

5.3 RESULTS OBTAINED

We shall make a brief analysis of the results obtained from the field investigations for each of the sectors in the study.

5.3.1 Open Channel

Along the line of the Open Channel 10 test pits and 54 manual soundings were performed which when added to the investigations performed in the Feasibility Phase provide important documented information on the geotechnical characteristics of the soils and surface rock.

Location of the test pits and manual soundings are shown in Appendix No. 7.4.

Detailed logs of each of the test pits and each sounding are found in Appendix No. 7.1.

Excavations of the test pits were for the purpose of determining the properties of the colluvial soils for their use as building materials for the walls of the channel as well as to learn the strength of said soils for determining the exploitation volumes.

From the analysis of the bedding profiles detected we could determine the following bedding pattern:

- A black soil vegetation covering made up of black silty clays with indices of organic material (roots) with a consistency that is quite hard, in its dry state when excavations took place. Strength varies from 0.2 m to 0.50 m with a predominant strength of 0.35 m.

- Under the vegetable covering is a level of silty clays with gray or grayish brown coloring with approximately 20%-30% weathered

debris with a consistency that is quite hard and hard, found at a depth from 0.20 m to 0.90 m with a median strength of 0.70 m.

- Under the level of clays we found a stronger colluvial layer consisting completely of debris or highly weathered mudstone or siltstone, encased in a clayey-silty matrix with a brown-yellow coloration and a consistency which is quite hard. Within this layer we may observe the predominance of the clayey-silty matrix. The depth of the layer is from 0.90 m to 3.60 m with a strength varying from 1.00 m to 3.00 m.

The soils described constitute the colluvial layer which based on its characteristics are the product of on-site decay of the rock, whether mudstone or siltstone. Therefore, it is difficult to establish a clear contact of colluvial soils with the completely weathered rock since a transition occurs as a product of the degree of weathering of the rock.

Under the colluvial soils defined based on the criteria indicated, we find brown and yellow mudstone which is completely weathered and in many cases looks like weathered blocks or debris. But based on criteria for texture and bedding, we can define it as rock with a V quality index (very bad) starting from a V resistance index (no more than 20 kg/cm^2), V fracturing grade, V weathering and RQD = 0.

The mudstone or siltstone detected in the excavations belong to the onzole formation.

We should indicate that the consistence of the colluvial soils or the resistance of the weathered rock changes quite a bit with water, such as the cases of test pit C-11 in which the water level is 1.60 m deep, decreasing the consistency of the debris layer to a clayey matrix which is quite hard to somewhat consistent (> 4.5 kg/cm^2 to 1 kg/cm^2), determined with a penetrometer and hand torvane.

Manual soundings were for the purpose of determining the resistance of the soil for the purposes of foundations along the section of the Open Channel.

All the soundings made contact with soil-rock and even some got more than 2 meters deep in the weathered rock.

Based on the analysis of same, we have determined the following: 7 soundings detected contact at a depth of less than 1 m; 27 soundings detected contact between 1.0 m and 2.0 m deep; 13 soundings determined it between 2.0 m and 5.0 m deep; 6 soundings determined it between 3.0 m and 4.0 deep' 1 sounding determined it at a depth of more than 4.0 m.

The depths reached by the soundings vary between 0.80 m and 4.95 m depending on the depth that detects the presence of rock and its characteristics since at the sites where the colluvial strength was higher, we managed to reach a greater depth since the strength of the completely weathered rock was greater. While at the sites, especially at the bottom of steams where the colluvial covering has been washed, their strength is less or does not exit. Likewise, the weathered rock has less strength or has not been washed paving the way for a rock with better geotechnical characteristics.

Regarding the bedding profiles detected, they were the same as those found in the test pits with the following sequence: One layer of vegetable soil with a strength between 0.20 m and 0.50 m, followed by a silty clay layer with debris which in some soundings is not detected and a layer of weathered debris with a clayey-silty matrix followed by completely weathered rock constituted by mudstone with a V quality index.

In some cases, where soundings were at the lower sections of streams with elevations of less than 100 meters about sea level, the sequence varies,passing from a small vegetable layer measuring a few centimeters to sandstone rock with a IV quality index.

The geotechnical logs for each sounding with its values of N_{30} are shown in Appendix No. 7.1.

5.3.2 Transmission Line

Five test pits and 3 manual soundings were performed along the Transmission Line. Said investigations were for the purpose of determining the properties of the surface soils or rocks for the purposes of the foundations of the Towers.

The location of the test pits and manual soundings are shown in Appendix No. 7.4.

Because of the distance between each test pit and sounding and the considerable differences in the elevations of the sites, we have obtained different results. Therefore we will analyze each cut obtained separately.

TEST PIT C - 20

From 0,00 to 0,35 m	Hard brackish vegetal soil
From 0,35 to 1,10 m	Weathered debris of mudstone in dark brown clayey matrix, hard.
From 1,10 to 1,50 m	Completely weathered light gray mudstone with oxidated joints, soft rock.

We could not obtain an undisturbed sample from the debris level and, therefore, took a disturbed sample in order to perform the tests on the remolded samples.

TEST PIT C - 21

From 0,00 to 0,40 m	Dark brown vegetal soil very stift
From 0,40 to 1,10 m	Weathered debris and blocks of siltstone and fine grained sandstone in yellowish brown silty sand matrix, very stiff.
From 1,10 to 2,20 m	Completely weathered yellowish brown silty fine grained sandstone with oxidated joints, very soft rock, quality index V.

From 2,20 to 3,00 m Very weathered yellowish brown silty fine grained sandstone with a quality index IV.

As at test pit C-20 we could not obtain an undisturbed sample from the debris level, taking a sample of a disturbed sample for the tests on the remolded sample.

TEST PIT C - 22

From 0,00 to 0,30 m Blackish vegetal soil, hard.

From 0,30 to 0,95 m Grayish brown silty clay with some weathered debris, stiff.

From 0,95 to 2,35 m Weathered debris of siltstone and fine grained sandstone in brown silty matrix, stiff.

From 2,35 to 3,50 m Completely weathered brown mudstone with oxidated zone, quality index V (very soft rock).

Soundings S-55 and S-56 showed quite similar results with soil-rock contact at 1.50 and 1.30 m respectively and a lithological makeup constituted by hard and sandstone colluvial soils which are finely weathered.

Toward the site of test pits C-23 and C-24 and sounding S-57 the make up of the colluvial soils varies and are similar to one another. They are constituted by a vegetable soil level 0.35 m and 0.40 m thick.

There is a debris level in a clayey-silty matrix up to 0.80 m and a strong layer of grayish brown clay which is quite hard to 2.80 m at test pit C-23 and to 2.50 m at test pit C-24. This clay level takes a reddish coloration towards the base.

At test pit C-23, under the clays, we find sandstone with a very fine grain that is highly weathered with a V quality index while at C-24 from 2.50 m we find a grayish brown mud with some fine sand that is consistent. At this test pit we did not have soil-rock contact.

The cut detected in sounding S-57' is equal to that at test pit C-23.

5.3.3 Poza Honda

Three manual soundings were performed with different results.

- Sounding S-58 which is located at Estero Guajabito, reached a depth of 7.20 m and detecting an alluvial layer made up of fine silty sand, alternating with levels of soft silt up to 4.70 m and later detecting a completely weathered level of sandstone up to 5.20 m deep (possible block) and from 5.20 m to 7.20 completely weathered brown and yellow mudstone.

- At Test Pit S-59, located on a slope at the exit of Estero Guajabito, we detected a colluvial layer with a hard consistency up to 3.0 m deep and under the colluvial level a completely weathered brown and yellow mudstone with a V quality index appears.

- Sounding S-60 was performed at the exit of the Pata de Pajaro River, on a slope and a colluvial layer up to 0.80 m deep was detected. Under the colluvial layer from 0.80 to 1.80 m completely weathered mudstone with a V index is detected and then a completely weathered sandstone with very fine silt with a quality V index.

6. LABORATORY SOIL TESTS

6.1 PURPOSE AND SCOPE OF THE WORK

The laboratory soil tests were focused on two fundamental objectives:

1. Determination of the basic geomechanical characteristics of the soils for their use as materials in the Channel earth fill.

2. Determination of the geomechanical properties of the soils for the study of the foundation along the Transmission Line.

Based on these objectives, altered samples were taken of the soils and 10 test pits were excavated along the Open Channel and unaltered and altered samples from the test pits excavated along the Transmission Line.

6.2 TESTS PERFORMED

Nineteen altered tests of approximately 50 kg each were sent to the laboratory in order to study the materials for the Open Channel, and altered samples and 3 unaltered samples in a block for the study of the soils of the Transmission Line.

The number and type of tests performed is shown in the table below:

TIPO DE ENSAYO TYPE OF TEST	CANAL ABIERTO OPEN CHANNEL	LINEA DE TRANSMISION TRANSMISSION LINE	TOTAL
1. Contenido de Humedad Natural Natural Moisture content	19	9	28
2. Gravedad Especifica Specific Gravity	19	9	28
3. Granulometría (tamiz e hidrómetro) Grain size analysis (sieve and hidrometer)	19	9	28
4. Limites de Atterberg Atterberg Limits	19	9	28
5. Peso Unitario Unit Weight	10	5	15
6. Compresión Uniaxial Uniaxial Compression	10	5	15
7. Triaxial Triaxial Test	10	5	15
8. Consolidación Consolidation	10	5	15
9. Compactación Proctor Proctor Compaction	15	2	17
10. Hinchamiento Swelling	19	9	28
11. Encogimiento Shrinkage	19	9	28
12. Dispersividad Pin Hole Pin Hole Test for Dispersion	19	9	28

From the 19 samples from the Open Channel, 10 were selected for performing all the tests provided as the most promising layer for construction materials. Five were selected for performing tests as an alternating stratum including the Proctor test. On the four remaining ones only identification, swelling, shrinking and Pin Hole tests were performed.

For the Transmission Line, we managed to obtain only three unaltered samples from three different test pits. Therefore, we took altered samples from those test pits where it was impossible to obtain unaltered blocks for performing the tests provided on the remolded samples.

Therefore, from the 9 samples taken for the study of the Transmission Line, all the tests including 2 Proctor tests were performed and on the four remaining samples only the identification, swelling, shrinking and Pin Hole tests were performed.

All the Soil Mechanics Tests were performed at the HIDROSUELOS CIA. LTDA. laboratories except for the three block samples which were performed at the National Polytechnic School laboratories, complying with the standards set forth for each test.

6.3 RESULTS OBTAINED

A table summarizing the results obtained for each of the tests performed is shown herebelow. The complete tests are enclosed in ANNEX - VOLUME II.

SECTOR LOCATION	CALICATA N° TEST PIT N°	MUESTRA N° SAMPLE N°	PROFUNDIDAD DEPTH	HUMEDAD NATURAL NATURAL MOISTURE	GRAVEDAD ESPECIFICA SPECIFIC GRAVITY	GRANULOMETRIA (TAMIZ E. HIDROMETRO) GRAIN SIZE ANALYSIS (SIEVE AND HIDROMETER)			LIMITES DE ATTERBERG ATTERBERG LIMITS			CLASIFICACION CLASIFICATION	PESO UNITARIO UNIT WEIGHT		COMPRESION UNIAXIAL UNIAXIAL COMPRESSION	ENSAYO TRIAXIAL TRIAXIAL TEST		CONSOLIDACION CONSOLIDATION			COMPACTACION PROCTOR PROCTOR COMPACTION		HINCHAMIENTO SWELLING		ENCOGIMIENTO SHRINKAGE			PIN – HOLE PIN – HOLE	OBSERVACIONES REMARKS
				W %	C-s gr/cm3	#4 %	#200 %	2/1 %	WL %	WP %	IP %	SUCS USCS	HUM gr/m3	SATUR m3	qu Kg/cm2	C' Kg/cm2	ø' deg	Pp Kg/cm2	Cc	Cv mm2/min	γmax gr/cm3	Wopt %	P Kg/cm2	V %	Ws %	Ls %	Vc %		
CANAL ABIERTO OPEN CHANNEL	C-10	M-1	0.50-1.40	31.2	2.768	100	96.0	21	59.0	37.0	22.0	MH	1.54	1.683	1.82	0.90	20°	0.55	0.125	4.046	1.07	44.4	0.20	0.00		16.53	42.5	ND1	DISTURBADA / DISTURBED
		M-2	2.00-3.00	34.3	2.727	100	98.7	18	55.0	37.0	18.0	MH	1.538	-	-	-	-	-	-	-	-	-	0.40	0.00		12.98	47.88	ND2	" "
	C-11	M-1	0.55-2.00	37.7	2.606	100	86.9	20	80	54	26	MH	1.558	1.659	1.70	0.70	16°	0.46	0.136	2.62	1.07	45.6	1.25	0.00		15.80	42.09	ND1	" "
	C-12	M-1	0.60-1.60	32.2	2.679	100	90	14	61	43	18	MH	1.58	1.708	-	-	-	-	-	-	1.13	41.60	1.60	0.00		25.19	35.15	ND2	" "
		M-2	2.00-3.60	41.6	2.683	100	89	16	71	48	23	MH	1.54	1.684	2.18	0.85	20°	1.05	0.126	4.752	1.09	42.60	1.60	0.00		21.53	41.19	ND2	" "
	C-13	M-1	0.80-2.00	35.7	2.743	100	97	53	92	47	45	MH	1.566	1.750	2.53	1.00	26°	0.95	0.16	1.92	1.18	36.30	1.35	0.00		21.12	57.33	ND1	" "
		M-2	2.00-3.50	33.3	2.622	100	99	80	78	42	36	MH	-	-	-	-	-	-	-	-	-	-	-	-		21.99	40.11	ND1	" "
	C-14	M-1	0.90-1.90	31.9	2.598	100	76	19	78	43	35	MH	1.518	1.714	-	-	-	-	-	-	1.16	37.8	0.60	0.00		32.95	28.24	ND1	" "
		M-2	1.90-3.50	39.7	2.565	100	94	18	78	44	34	MH	1.523	1.708	1.01	1.60	14°	0.72	0.145	5.494	1.16	40.2	0.10	0.00		31.07	31.17	ND1	" "
	C-15	M-1	0.40-1.00	27.5	2.658	100	76	48	91	39	52	CH	1.399	1.661	1.09	0.70	22°	0.80	0.439	1.531	1.06	34.6	1.50	0.00		14.75	57.08	ND1	" "
		M-2	1.20-1.60	32.4	2.698	100	98	18	90	44	46	MH	1.400	-	-	-	-	-	-	-	-	-	1.60	0.00		12.33	57.74	ND1	" "
	C-16	M-1	0.85-1.80	30.1	2.636	100	78	28	62	36	26	MH	1.627	1.794	-	-	-	-	-	-	1.28	32.8	0.75	0.00		17.39	38.72	ND1	" "
		M-2	2.00-3.50	32.7	2.456	100	95	30	63	34	29	MH	1.642	1.759	1.88	0.70	12°	0.75	0.107	13.91	1.28	31.8	1.65	0.00		15.40	41.82	ND1	" "
	C-17	M-1	0.40-1.60	23.3	2.623	100	95	30	71	41	30	MH	1.498	1.718	1.66	1.50	11°	0.80	0.243	10.58	1.16	32.3	1.15	0.00		16.02	44.96	ND1	" "
		M-2	2.00-3.00	28.6	2.680	100	99	43	73	44	29	MH	1.496	-	-	-	-	-	-	-	-	-	1.10	0.00		18.35	42.47	ND2	" "
	C-18	M-1	0.30-1.60	21.7	2.726	100	95	24	65	35	30	MH	1.528	1.753	2.40	1.20	22°	0.70	0.335	6.224	1.19	34.6	1.30	0.00		18.28	46.14	ND1	" "
		M-2	2.00-3.50	25.5	2.715	100	95	28	64	36	28	MH	1.527	1.707	-	-	-	-	-	-	1.12	41.6	1.50	0.00		11.55	53.59	ND2	" "
	C-19	M-1	1.00-1.70	24.3	2.698	100	99	30	45	22	23	CL	1.423	1.831	-	-	-	-	-	-	1.32	29.6	0.30	0.00		13.83	39.02	ND1	" "
		M-2	1.70-3.60	23.5	2.607	100	58	20	40	21	19	CL	1.423	1.857	2.56	1.65	10°	0.65	0.098	2.443	1.39	30.2	0.30	0.00		18.28	31.00	ND1	" "
LINEA DE TRANSMISION TRANSMISSION LINE	C-20	M-1	0.35-1.10	25.7	2.649	100	80	39	49	31	18	ML	1.541	1.728	3.00	1.80	10°	0.75	0.106	7.81	1.17	37.5	0.15	0.00		19.36	40.73	ND1	" "
	C-21	M-1	0.40-1.00	18.7	2.673	100	50	16	44	28	16	ML	1.668	1.826	0.83	0.40	20°	0.74	0.134	6.18	1.32	31.00	1.10	0.00		19.99	26.61	ND1	" "
		M-2	1.00-2.15	26.7	2.579	100	88	8	40	22	18	CL	1.670	-	-	-	-	-	-	-	-	-	0.26	0.00		19.17	25.00	ND1	" "
	C-22	M-1	0.60-0.90	39.64	2.832	100		50	106	58	48	CH	1.673	1.750	13.18	1.10	26°	0.40	0.18	2.597	1.16	38.00	2.49	0.00		18.09	42.25	ND1	INDISTURBADA / UNDISTURBED
		M-2	1.00-2.35	27.3	2.658	100	49	15	60	29	31	SC	1.660	-	-	-	-	-	-	-	-	-	1.25	0.00		19.89	39.94	ND1	DISTURBADA / DISTURBED
	C-23	M-1	1.20-1.50	44.03	2.878	-	-	65	114	51	63	CH	1.719	1.757	8.38	2.60	14°	0.60	0.18	2.575	1.16	46.00	1.36	0.00		27.26	44.25	ND1	INDISTURBADA / UNDISTURBED
		M-2	2.00-2.80	37.7	2.733	100	98	50	74	30	44	CH	1.67	-	-	-	-	-	-	-	-	-	0.75	0.00		20.27	49.19	ND1	DISTURBADA / DISTURBED
	C-24	M-1	1.50-1.80	41.57	2.803	-	-	53	87	44	43	CH	1.655	1.843	1.97	0.80	14°	0.5	0.15	2.404	1.31	36.00	0.51	0.00		24.87	44.00	ND1	INDISTURBADA / UNDISTURBED
		M-2	2.50-4.00	57.7	2.681	100	90	33	64	32	32	MH	1.66	-	-	-	-	-	-	-	-	-	0.76	0.00		16.36	44.57	ND2	DISTURBADA / DISTURBED

PESO UNITARIO TOMADO EN CONDICIONES DE COMPACTACION / UNIT WEIGHT TAKED IN COMPACTION CONDITIONS

Cv. TOMADO ENTRE 4.00 Y 5.00 Kg/cm^2/ Cv. TAKED BETWEN 4.00 AND 5.00 Kg/cm.^{2} CONSOLIDATION

7. APPENDIXES

7.1 LOGGING OF TEST PIT AND SOUNDING

RULES FOLLOWED FOR THE GEOTECHNICAL DESCRIPTION OF THE TEST PITS AND SOUNDING

The figure enclosed shown the distribution of the log of the geotechnical data obtained from test pits and sounding as per the type columns.

TEST PIT

1. Project name
2. Test pit number
3. Execution date
4. Site and coordenate
5. Depth
6. Description of the type of soil or rock
   The characterization of the soils was performed based on the laboratory tests as per the modified Casagrande Classification, standard ASTM-2487 and in based on the visual-manual description, as per ASTMD-2488. The main criteria are summarized in table № 1.
   The rock characterization was corried out according to the International Society of Rock Mechanicks (Basic Geotechnical Description of Rock Masses)
7. Graphic representation of the type of land. Graph № 1
8. Result of the Laboratory Test
9. Type of sample and depth

SOUNDING

1. Project name
2. Sounding number
3. Coordenate
4. Execution date
5. Depth
6. Formation name
7. Soil and Rock type
8. Graphic representation of the type of land.Graph № 1
9. Description of the type of soil or rock
10. Soil consistency or rock grade (Bieniawsky)
11. Graphic representation of "SPT"

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE-POTOVIEJO BASIN (1) | TEST PIT N° (2) | DATE : (3)

SITE: (4) | COORDINATE : (4)

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE			LIMITES ATTERBERG			CLASIF UCCS	UNIT WEIGHT		SENSITIVITY	TRIAXIAL		CONSOLIDATION			COMPACTION		SWELLING		SHRINKAGE			PIN HOLE	REMARKS
					#4	#200	2/1	WL	WP	IP		MOIST	SATUR		C' t/m2	φ' deg	Pp kg/cm2	Cc	Cv	γmax t/m	OMC %	P t/m2	V %	Ws %	Ls %	Vc %		
(5)	(6)	(7)												(8)														(9)
1.0																												
2.0																												
3.0																												
4.0																												

PROYECTO : DISEÑO TRASVASES CHONE-PORTOVIEJO
PROYECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO (1)

SONDEO :
SOUNDING No: (2)

COORDENADAS : N E (3)
COORDINATE :

FECHA :
DATE : (4)

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30) 0 10 20 30 40 50
1.0						
(5)	(6)	(7)	(8)	(9)	(10)	(11)
2.0						
3.0						
4.0						

TABLE Nº I

CRITERION FOR SOIL DESCRIPTION

COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size	CLEAN GRAVELS FINES >5%	GW	Well graded gravels sand mixtures little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		GRAVELS WHIT FINES FINES >12%	GM	Silty gravels, poorly graded gravel-sand-silt mixtures
			GC	Clayey gravels, poorly graded gravel-sand-clay mixture
	SANDS More than half of coarse fraction in smaller than No. 4 sieve size	CLEAN SANDS FINES <5%	SW	Well graded snads, gravelly sands, litte or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		SANDS WITH FINES >12%	SM	Silty sands, poorly graded sand silt mixtures
			SC	Clayey sands, poorly graded sand-clay-mixtures
FINE GRANED SOILS More than half materials is smaller than No. 200 sieve size	SILITS AND CLAYS Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silty and organic silt-clays of low plasticity
	SILITS AND CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceus fine sandy or silty soils, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
	HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

PLASTICITY CHART

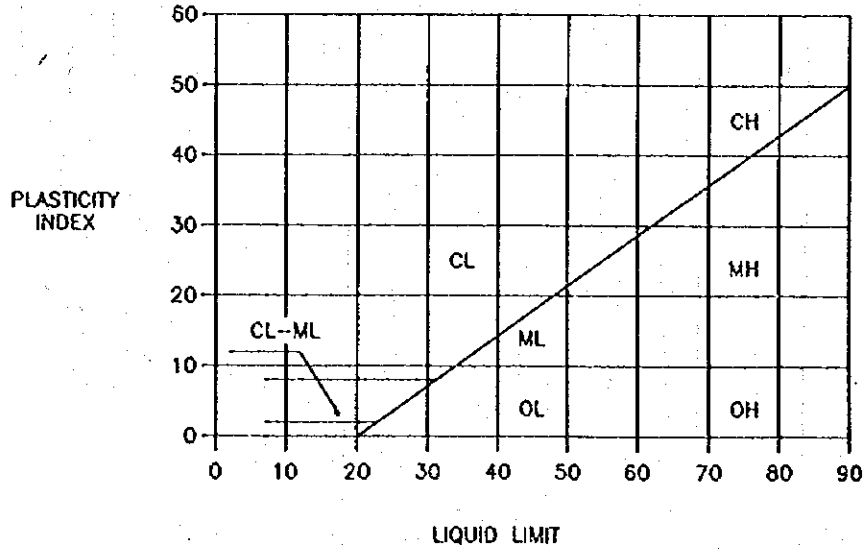

TABLE Nº I

DESCRIPTION FOR PARTICLE SIZE CONTENT

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILTS	CLAYS

SIEVE NUM ASTM		3/4"	No.4	No.10	No.40	No.200	2µ
SIEVE SIZE	100	20.0	4.7	2.0	0.5	0.74	0.002

RATE	DESCRIPTION TERM
5 – 10	TRACES
10 – 20	SOME
20 – 35	LARGE AMOUNT OF
35 – 50	CLAYEY, SILTY, ETC.

DESCRIPTION OF COMPRESSIBILITY TERMS FOR A GRANULAR SOIL

N	DESCRIPTION TERM
0 TO 4	VERY LOOSE
5 TO 10	LOOSE
11 TO 30	COMPACT DENSE
31 TO 50	DENSE
>50	VERY DENSE

DESCRIPTION OF CONSISTENCY TERMS FOR A COHESIVE SOIL

q_u (kPa)	N_{30}	DESCRIPTION TERM
<25	<2	VERY SOFT
25 TO 50	2 to 4	SOFT
50 TO 100	4 to 8	FIRM
100 TO 200	8 to 10	STIFF
200 TO 400	15 to 30	VERY STIFF
>400	>30	HARD

1 kg/cm^2 = 100 k Pa

q_u = UNIAXIAL COMPREHENSION STRENGTH

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TABLE Nº 2

ROCK'S WEATHERING

W1 Sound Rock

a) Without visible meteorization

b) The joints are slightly oxidated

W2 Slightly Weathered Rock

Weathering penetrates slightly into the rock thru main joints

W-3 Very Weathered Rock

a) Weathering follows thru all the rock's body, but the rock is strong enough not to be broken by hand.

b) Less than half of the rock's body is desintegrated and/or decomposed into soil. Some parts of the rock's body is healthy rock or slightly decolorized, as a whole, or as contiguous blocks.

W4 Highly Weathered Rock

a) Weathering thru the whole rock's body. The rock can be easily desintegrated by hand.

b) More than half of the rock's body is desintegrated and/or decomposed into soil. The rock's body could have healthy blocks or slightly decolorized blocks.

W5 Completely Weathered Rock

All the rock's body is desintegrated or decomposed into soil, being possible to recognize its original structure and rock type.

TABLE Nº 3

VISUAL RESISTANCE GRADES OF ROCK'S MATRIZ

S1 Very Stiff Rock

- Hard to break (qu > 2000 kg/cm^2)
- Very crisp sound when hit by hammer's head
- qu > 2000 kg/cm^2

S2 Stiff Rock

- Scratchable and breakable with hammer's head
- Crisp sound when hit by hammer's head
- 600 < qu < 2000 kg/cm^2

S3 Medium Rock

- Easy to scratch with hammer's head
- Uncrisp sound when hit by hammer's head
- 200 < qu < 600 kg/cm^2

S4 Soft Rock

- Easily to scratch with hammer
- Impossible to break by hand in blocks greater than 10 cm^2
- 60 < qu < 200 kg/cm^2

S5 Very soft Rock

- Hammer's head corner hit leaves a mark on the rock
- Breakable by hand
- 20 < qu < 60 kg/cm^2

Transition between rock and soil: 4 < qu < 20 kg/cm^2

2/2

TABLE № 4

STRATA THICKNESS ACCORDING TO B.G.D.'S SPECIFICATIONS

INTERVALS cm	SYMBOL	DESCRIPTION
> 200	F 1	Very thick
60 - 200	F 2	Thick
20 - 60	F 3	Medium
6 - 20	F 4	Thin
< 6	F 5	Very thin

Table 5 : The Rock Mass Rating System (after Bieniawski, 1979).

A. CLASSIFICATION PARAMETERS AND THEIR RATINGS

	Parameter		Ranges of Values						
1	Strength of intact rock material	Point load strength index (MPa)	>10	4 - 10	2 - 4	1 - 2	For this low range uniaxial compressive test is preferred		
		Uniaxial compressive strength (MPa)	>250	100 - 250	50 - 100	25 - 50	5 - 25	1 - 5	<1
	Rating		15	12	7	4	2	1	0
2	Drill core quality RQD (%)		90 - 100	75 - 90	50 - 75	25 - 50	< 25		
	Rating		20	17	13	8	3		
3	Spacing of discontinuities		> 2 m	0.6 - 2 m	200 - 600 mm	60 - 200 mm	< 60 mm		
	Rating		20	15	10	8	5		
4	Condition of discontinuities		Very rough surfaces Not continuous No separation Unweathered wall rock	Slightly rough surfaces Separation < 1 mm Slightly weathered walls	Slightly rough surfaces Separation < 1 mm Highly weathered walls	Slickensided surfaces or Gouge < 5 mm thick or Separation 1 - 5 mm Continuous	Soft gouge > 5 mm thick or Separation > 5 mm Continuous		
	Rating		30	25	20	10	0		
5	Groundwater	Inflow per 10 m tunnel length (L/min)	None	< 10	10 - 25	25 - 125	> 125		
		Ratio $\frac{\text{Joint water pressure}}{\text{Major principal stress}}$	0	< 0.1	0.1 - 0.2	0.2 - 0.5	> 0.5		
		General conditions	Completely dry	Damp	Wet	Dripping	Flowing		
	Rating		15	10	7	4	0		

B. RATING ADJUSTMENT FOR DISCONTINUITY ORIENTATIONS

Strike and Dip Orientations of Discontinuities		Very Favorable	Favorable	Fair	Unfavorable	Very Unfavorable
Ratings	Tunnels and mines	0	-2	-5	-10	-12
	Foundations	0	-2	-7	-15	-25
	Slopes	0	-5	-25	-50	-60

C. ROCK MASS CLASSES DETERMINED FROM TOTAL RATINGS

Rating	100 ← 81	80 ← 61	60 ← 41	40 ← 21	<20
Class no.	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock

D. MEANING OF ROCK MASS CLASSES

Class no.	I	II	III	IV	V
Average stand-up time	20 yr for 15 m span	1 yr for 10 m span	1 wk for 5 m span	10 h for 2.5 m span	30 min for 1 m span
Cohesion of the rock mass (kPa)	>400	300 - 400	200 - 300	100 - 200	<100
Friction angle of the rock mass (deg)	>45	35 - 45	25 - 35	15 - 25	<15

*After Bieniawski (1979).

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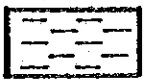
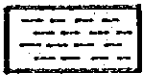
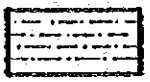
SYMBOLIC FOR EACH TYPE OF SOIL OR ROCK

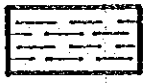
GRAPHIC Nº 1

SOILS


VEGETAL SOIL, ORGANIC SILT OR CLAY

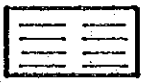

SILT

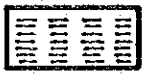

SANDY SILT OR SILTY SAND


PLASTIC CLAYS

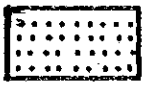

FINE GRAINED SAND WITH A SMALL CONTENT OF FINES

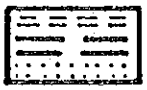
ROCKS


MUDSTONE


SILTSTONE


FINE GRAINED SANDSTONE


MEDIUM TO COARSE GRAINED SANDSTONE


ALTENATING LAYERS OF SILTSTONE, MUDSTONE AND SANDSTONE

TEST PIT

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE-PORTOVIEJO BASIN | TEST PIT Nº C - 10 | DATE : 20-12-93

SITE: OPEN CHANNEL | COORDINATE : N 9892630 E 607645

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF. σ Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv cm2/seg	COMPACTION γmax gr/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL, HARD																											
	DARK GRAY ORGANIC CLAY																											0.50
1.0	WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILT-CLAY MATRIX, HARD		31.2	2.768	100	96	21	59	37	22	MH	1.59	1.683	1.82	0.90	20	0.55	0.125	4.046	1.07	44.4	0.20	0.00		16.53	42.5	ND1	M-1 DISTURBED Nº 1 1.40
	WEATHERED YELLOWISH BROWN MUDSTONE, VERY SOFT ROCK																											2.00
2.0			34.3	2.727	100	98.7	18	55	37	18	MH	1.538	-	-	-	-	-	-	-	-	-	0.40	0.00	-	12.98	47.88	ND2	M-2 DISTURBED Nº 2 3.00
3.0	END : 3.0 m																											
4.0																												

297

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE- PORTOVIEJO BASIN

TEST PIT Nº C – 11

DATE : 15-12-93

SITE: OPEN CHANNEL

COORDINATE : N 9892440 E 607000

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/M	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONFINED Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv	COMPACTION γmax g/cm²	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL, HARD																											
	GREYISH BROWN CLAYEY SILT WITH SOME OF WEATHERED CLASTICS, HARD																											0.55
1.0	WEATHERED CLASTICS OF SILTSTONE IN YELLOWISH BROWN CLAYEY-SILT MATRIX, HARD CLAY WITH CLASTICS STIFF		37.7	2.606	100	86.9	20	80	54	26	MH	1.558	1.659	1.70	0.70	16	0.46	0.136	2.62	1.07	45.6	1.25	0.00		15.80	42.09	NDI	DISTURBED Nº 1
2.0	END : 2.0 m END OF PIT BY WATER PRESENCE																											2.00
3.0																												
4.0																												

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE- PORTOVIEJO BASIN | **TEST PIT Nº C - 12** | **DATE : 20-12-93**

SITE: OPEN CHANNEL | **COORDINATE :** N 9892440 E 606500

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	UNITES ATTERBERG WL	UNITES ATTERBERG WP	UNITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF q_u Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv cm2/min	COMPACTION γmax gr/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL, HARD																											
	DARK GRAY CLAY WITH TRACES OF OXIDIZED DEBRIS AND ORGANIC MATERIAL, HARD																											0.60
1.0	WEATHERED AND OXIDIZED DEBRIS OF SILT IN YELLOWISH BROWN SILTY-CLAY MATRIX, VERY STIFF		32.2	2.679	100	90	14	61	43	18	MH.	1.58	1.708	-	-	-	-	-	-	1.13	41.60	1.60	0.00	.	25.19	35.15	ND2	DISTURBED Nº 1
																												1.60
	YELLOWISH BROWN CLAYEY SILT WITH NUMEROUS WEATHERED AND OXIDIZED DEBRIS, VERY STIFF																											2.00
3.0	STIFF		41.6	2.683	100	89	16	71	48	23	MH	1.54		2.18	0.85	20	1.05	0.126	4.752	1.09	42.60	1.60	0.00		21.53	41.19	ND2	DISTURBED Nº 2
																												3.60
	WEATHERED BLOCKS OF YELLOWISH BROWN SILTSTONE IN SILTY-CLAY MATRIX																											
4.0																												

END : 4.0 m

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE- PORTOVIEJO BASIN | TEST PIT Nº C - 13 | DATE : 15-12-93

SITE: OPEN CHANNEL | COORDINATE : N 9891540 E 606387

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF. UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF. Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv mm2/min	COMPACTION γmax gr/cm²	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL, HARD																											
	DARK GRAY CLAY WITH DEBRIS, HARD																											
	WEATHERED DEBRIS IN GRAYISH BROWN SILTY MATRIX, HARD																											0.80
1.0	GRAYISH BROWN CLAY WITH TRACES OF OXIDIZED DEBRIS, HARD WITH SOME DEBRIS		35.7	2.743	100	97	53	92	47	45	MH	1.566	1.750	2.53	1.00	26	0.95	0.16	1.92	1.18	36.30	1.35	0.00		21.12	57.33	NDI	DISTURBED Nº 1
2.0	YELLOWISH BROWN CLAY WITH NUMEROUS OXIDIZED DEBRIS, HARD																											2.00
	WEATHERED YELLOWISH BROWN VERY SOFT MUDSTONE		33.3	2.622	100	99	8	78	42	36	MH	-	-	-	-	-	-	-	-	-	-	-	-	-	21.99	40.11	NDI	DISTURBED Nº 2
3.0																												3.50
4.0																												

END : 4.0 m

300

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE- PORTOVIEJO BASIN | **TEST PIT Nº C-14** | **DATE : 20-12-93**

SITE: OPEN CHANNEL | **COORDINATE :** N 9891045 E 606183

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF σ Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv mm2/min	COMPACTION γmax g/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL WITH OXIDIZED DEBRIS, HARD																											
	BLACKISH GRAY CLAY WITH TRACES OF OXIDIZED DEBRIS AND ORGANIC MATERIAL, HARD																											0.90
1.0	YELLOWISH BROWN WEATHERED AND OXIDIZED DEBRIS IN DARK GRAY SILTY-CLAY MATRIX, HARD		31.9	2.598	100	76	19	78	43	35	MH	1.518	1.714							1.16	37.8	0.60	0.00		32.95	28.24	NDI	DISTURBED Nº 1
																												1.90
2.0	GRAYISH BROWN CLAY WITH NUMEROUS WEATHERED DEBRIS OF MUDSTONE, HARD		39.7	2.565	100	94	18	78	44	34	MH	1.523	1.708	1.01	1.60	14	0.72	0.145	5.494	1.16	40.2	0.10	0.00		31.07	31.17	NDI	DISTURBED Nº 2
3.0																												
	BLOCKS OF SILTSTONE																											3.50
	WEATHERED YELLOWISH BROWN MUDSTONE, VERY SOFT ROCK																											
4.0																												

END : 4.0 m

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE- PORTOVIEJO BASIN

TEST PIT Nº C-15

DATE : 20-12-93

SITE: OPEN CHANNEL

COORDINATE : N 9890440 . E 605090

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF. Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv mm2/min	COMPACTION γmax gr/cm²	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL, VERY STIFF																											0.40
	YELLOWISH BROWN CLAY WITH SOME OF WEATHERED DEBRIS, VERY STIFF																											DISTURBED Nº 1
	LEVEL OF BLACKISH CLAY		27.5	2.658	100	76	48	91	39	52	CH	1.399	1.661	1.09	0.70	22	0.80	0.439	1.531	1.06	34.6	1.50	0.00		14.75	57.08	NDI	
1.0																												1.00
	LEVEL OF BLACKISH CLAY																											1.20
	WITH NUMEROUS DEBRIS, STIFF		32.4	2.698	100	98	18	90	44	46	MH	1.400	-	-	-	-	-	-	-	-	-	1.60	0.00		12.33	57.74	NDI	DISTURBED Nº 2
																												1.60
	WEATHERED YELLOWISH BROWN MUDSTONE, VERY SOFT ROCK																											
2.0																												
3.0																												
	END : 3.0 m																											
4.0																												

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE-PORTOVIEJO BASIN | **TEST PIT Nº C-16** | **DATE : 20-12-93**

SITE: OPEN CHANNEL | **COORDINATE :** N 9890110 E 605090

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv cm2/min	COMPACTION γmax g/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL, HARD																											
	DARK GRAY CLAY WITH SOME WEATHERED DEBRIS AND TRACES OF ORGANIC MATERIAL, HARD																											0.85
1.0	WEATHERED DEBRIS OF SILTSTONE AND FINE GRAINED SANDSTONE IN YELLOWISH BROWN CLAY-SILTY MATRIX, LIGHT PLASTICITY VERY STIFF		30.1	2.636	100	78	28	62	36	26	MH	1.627	1.794	-	-	-	-	-	-	1.28	32.8	0.75	0.00		17.39	38.72	NDI	DISTURBED Nº 1
																												1.80
2.0	GRAYISH BROWN CLAY WITH SOME OF WEATHERED DEBRIS, LIGHT PLASTICITY, VERY STIFF																											2.00
3.0			32.7	2.456	100	95	30	63	34	29	MH	1.642	1.759	1.88	0.70	12	0.75	0.107	13.91	1.28	31.8	1.65	0.00		15.40	41.82	NDI	DISTURBED Nº 2
	WEATHERED YELLOWISH BROWN MUDSTONE, VERY SOFT ROCK																											3.50
4.0																												

END : 4.0 m

303

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE–PORTOVIEJO BASIN

TEST PIT Nº C–17 | **DATE :** 20–12–93

SITE: OPEN CHANNEL | **COORDINATE :** N 9889600 E 604670

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF q_u Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Co	CONSOLIDATION Cv	COMPACTION γ_{max} gr/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL, HARD																											
	YELLOWISH BROWN CLAY WITH SOME DEBRIS, HARD																											0.40
1.0	WEATHERED DEBRIS OF MUDSTONE IN YELLOWISH BROWN SILTY–CLAY MATRIX, HARD		23.3	2.623	100	95	30	71	41	30	MH	1.498	1.718	1.66	1.50	11	0.80	0.243	10.58	1.16	32.3	1.15	0.00		16.02	44.96	N D1	DISTURBED Nº 1
																												1.60
2.0	WEATHERED YELLOWISH BROWN MUDSTONE, VERY SOFT ROCK																											2.00
3.0			28.6	2.680	100	99	43	73	44	29	MH	1.496										1.10	0.00		18.35	42.47	N D2	DISTURBED Nº 2
	END : 3.0 m																											3.00
4.0																												

304

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE-PORTOVIEJO BASIN | **TEST PIT Nº C-18** | **DATE : 18-12-93**

SITE: OPEN CHANNEL | **COORDINATE :** N 9889155 E 604290

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONFIT Kg/cm2	TRIAXIAL C' Kg/cm2	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv mm2/min	COMPACTION γmax gr/cm2	COMPACTION OMC %	SWELLING P Kg/cm2	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	DARK GRAY VEGETAL SOIL, HARD																											0.30
	YELLOWISH BROWN SILTY CLAY WITH WEATHERED DEBRIS OF MUDSTONE, VERY STIFF																											
1.0	WEATHERED WITHISH BROWN MUDSTONE WITH NUMEROUS SHELLS, VERY SOFT ROCK		21.7	2.726	100	95	24	65	35	30	MH	1.528	1.753	2.40	1.20	22	0.70	0.335	6.224	1.19	34.6	1.30	0.00		18.28	46.14	NDI	DISTURBED Nº 1
																												1.60
2.0	WEATHERED SOFT BROWN MUDSTONE BEDDING - HORIZONTAL																											2.00
3.0			25.5	2.715	100	95	28	64	36	28	MH	1.527	1.707							1.12	41.6	1.50	0.00		11.55	53.59	NO2	DISTURBED Nº 2
	END : 3.0 m																											3.00
4.0																												

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE-PORTOVIEJO BASIN

SITE: CANAL ABIERTO OPEN CHANNEL

TEST PIT Nº C-19 | **DATE :** 15-12-93

COORDINATE : N 9888780 E 603850

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF. Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv mm2/min	COMPACTION γmax gr/cm²	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	GRAY VEGETAL SOIL, HARD																											
1.0	GRAY CLAY WITH SOME OF FINE GRAINED SANDSTONE AND NUMEROUS WEATHERED DEBRIS OF FINE GRAINED SANDSTONE, HARD																											1.00
	GRAY CLAY, HIGH PLASTICITY		24.3	2.698	100	99	30	45	22	23	CL	1.423	1.831	-	-	-	-	-	-	1.32	29.6	0.30	0.00		13.83	39.02	N DI	DISTURBED Nº 1
2.0	GRAY CLAY WITH TRACES OF SAND AND LARGE AMOUNT OF WEATHERED DEBRIS OF FINE GRAINED SANDSTONE, HARD																											1.70
3.0	STIFF AND VERY STIFF		23.5	2.607	100	58	20	40	21	19	CL	1.423	1.857	2.56	1.65	10	0.65	0.098	2.443	1.39	30.2	0.30	0.00	-	18.28	31.00	N DI	DISTURBED Nº 2
	WEATHERED YELLOWISH BROWN CLAY, VERY SOFT																											3.60
4.0																												

END : 4.0 m

306

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE--PORTOVIEJO BASIN | **TEST PIT Nº:** C-20 | **DATE :** 15-12-93

SITE: TRANSMISSION LINE | **COORDINATE :** N 9892665 E 607780

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Co	CONSOLIDATION Cv mm2/min	COMPACTION γmax gr/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL WITH SOME OF WEATHERED DEBRIS, HARD																											0.35
1.0	WEATHERED DEBRIS OF MUDSTONE IN DARK BROWN CLAY MATRIX, HARD		25.7	2.649	100	80	39	49	31	18	ML	1.541	1.728	3.00	1.80	10	0.75	0.106	7.81	1.17	37.8	0.15	0.00		19.36	40.73	N 01	DISTURBED Nº 1
	VERY WEATHERED LIGHT GRAY MUDSTONE WITH OXIDIZED JOINTS, SOFT ROCK																											1.10
	END : 1.50 m																											1.50
2.0																												
3.0																												
4.0																												

301

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE--PORTOVIEJO BASIN | **TEST PIT Nº C-21** | **DATE : 23-12-93**

SITE: TRANSMISSION LINE | **COORDINATE :** N 9892400 E 613400

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF. Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv cm2/min	COMPACTION γmax gr/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	DARK BROWN VEGETAL SOIL WITH SOME SAND AND ORGANIC MATERIAL, VERY STIFF																											0.40
1.0	WEATHERED DEBRIS AND BLOCKS OF SILTSTONE AND FINE GRAINED SANDSTONE IN YELLOWISH BROWN SILTY-SANDY MATRIX, VERY STIFF		18.7	2.673	100	50	16	44	28	16	ML	1.668	1.826	0.83	0.40	20	0.74	0.134	6.18	1.32	31.00	1.10	0.00		19.99	26.61	NDI	DISTURBED Nº 1
2.0	VERY WEATHERED YELLOWISH BROWN SILTY FINE GRAINED SANDSTONE WITH OXIDIZED JOINTS, VERY SOFT ROCK		26.7	2.579	100	88	8	40	22	18	CL	1.670										0.26	0.00		19.17	25.00	NDI	1.00 DISTURBED Nº 2 2.20
3.0	VERY WEATHERED YELLOWISH BROWN SILTY FINE GRAINED SANDSTONE WITH OXIDIZED JOINTS, SOFT ROCK																											
	END : 3.0 m																											3.00
4.0																												

308

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE–PORTOVIEJO BASIN | **TEST PIT Nª C–22** | **DATE : 23–12–93**

SITE: TRANSMISSION LINE ✓ | **COORDINATE :**

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF q_u Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv mm2/min	COMPACTION γmax gr/cm²	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL WITH SOME OF FINE GRAINED SAND AND ORGANIC MATERIAL, VERY STIFF																											
	GRAYISH BROWN SILTY CLAY WITH SOME WEATHERED DEBRIS		39.64	2.832	100		50	106	58	48	CH	1.673	1.750	13.18	1.10	26	0.40	0.18	2.597	1.16	38.00	2.49	0.00		18.09		NDI	0.60 – 0.90 DISTURBED Nº 1
1.0	WEATHERED DEBRIS OF SILTSTONE AND FINE GRAINED SANDSTONE IN BROWN SILTY MATRIX		27.3	2.658	100	49	15	60	29	31	SC	1.660										1.25	0.00		19.89	39.94	NDI	1.00 – 2.25 DISTURBED Nº 2
2.0																												
	WEATHERED BROWN MUDSTONE WITH OXIDIZED ZONE, VERY SOFT ROCK																											
3.0																												
	END : 3.50 m																											3.50
4.0																												

301

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE--PORTOVIEJO BASIN | **TEST PIT Nª** C-23 | **DATE :** 27-12-93

SITE: TRANSMISSION LINE | **COORDINATE :** 9895874 627354

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF. Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv cm2/min	COMPACTION γmax gr/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH CLAY SILT WITH SOME FINE GRAINED SAND, HARD																											
	GRAYISH BROWN SILTY CLAY, WITH NUMEROUS WEATHERED DEBRIS OF SILTSTONE, HIGH PLASTICITY, HARD																											
1.0	GRAYISH BROWN SILTY CLAY, HIGH PLASTICITY, HARD																										1.20	DISTURBED N° 1
			44.03	2.873	100		65	114	51	63	CH	1.719	1.757	8.38	2.60	14	0.60	0.18	2.575	1.16	46.00	1.36	0.00		27.26		NDI	
	REDISH BROWN SILTY CLAY, VERY STIFF																										1.50	
2.0																											2.00	DISTURBED N° 2
			37.7	2.733	100	98	50	74	30	44	CH	1.67	-	-	-	-	-	-	-	-	-	0.75	0.00		20.27	49.19	NDI	
3.0	GRAYISH BROWN VERY WEATHERED SILTY FINE GRAINED SANDSTONE, SOFT ROCK																										2.80	
																											3.50	
	END : 3.50 m																											
4.0																												

310

PROJECT : THE DETAILED DESIGN ON TRANSBASIN CHONE--PORTOVIEJO BASIN | **TEST PIT N° C-24** | **DATE : 27-12-93**

SITE: TRANSMISSION LINE | **COORDINATE :** 9897090 634780

DEPTH m	DESCRIPTION	PROFILE	W %	SPECIFIC GRAVITY	PARTICLE SIZE #4	PARTICLE SIZE #200	PARTICLE SIZE 2/1	LIMITES ATTERBERG WL	LIMITES ATTERBERG WP	LIMITES ATTERBERG IP	CLASIF UCCS	UNIT WEIGHT MOIST	UNIT WEIGHT SATUR	UNCONF. Kg/cm²	TRIAXIAL C' Kg/cm²	TRIAXIAL φ° deg	CONSOLIDATION Pp Kg/cm2	CONSOLIDATION Cc	CONSOLIDATION Cv cm2/min	COMPACTION γmax gr/cm³	COMPACTION OMC %	SWELLING P Kg/cm²	SWELLING V %	SHRINKAGE Ws %	SHRINKAGE Ls %	SHRINKAGE Vc %	PIN HOLE	REMARKS
	BLACKISH VEGETAL SOIL WITH SOME OF SAND, HARD																											
	WEATHERED DEBRIS OF SANDSTONE AND SILTSTONE IN GRAY SILTY-CLAY MATRIX, HARD																											
1.0	GRAYISH BROWN CLAY WITH REDISH ZONE (OXIDIZED)HIGH PLASTICITY, VERY STIFF																											1.50
			41.57	2.803	100		53	87	44	43	CH	1.655	1.843	1.97	0.80	14	0.50	0.15	2.404	1.31	36.00	0.51	0.00		24.87		ND1	DISTURBED N° 1
2.0																												1.80
																												2.50
	GRAYISH BROWN SILT WITH SOME OF FINE GRAINED SAND, MEDIUM PLASTICITY, STIFF																											
3.0			57.7	2.681	100	90	33	64	32	32	MH	1.66	-	-	-	-	-	-	-	-	-	0.76	0.00		16.36	44.57	ND2	DISTURBED N° 2
4.0																												

END : 4.00 m

SOUNGING

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 1
SOUNDING No:

COORDENADAS : N 9892430 E 607520
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30) 0 10 20 30 40 50
	VEGETAL *VEGETAL*	HUMUS *VEGETAL SOIL*		SUELO VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*	
1.0	COLUVIAL *COLLUVIUM*	ARCILLAS Y CLASTOS *CLAY AND DEBRIS*		ARCILLA LIMOSA MARRON AMARILLENTO CON ALGO DE CLASTOS METEORIZADOS *YELLOWISH BROWN SILTY CLAY WITH WEATHERED DEBRIS*		4, 9
2.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMO-ARCILLOSO MARRON AMARILLENTA *WEATHERED SILSTONE DEBRIS IN YELLOWISH BROWN CLAYEY SILTY MATRIX*	CONSISTENTE *STIFF*	10, 12, 9
3.0				ARCILLA MARRON GRISACEA CON CLASTOS DE LIMOLITA MARRON OSCURA, MUY PLASTICA *GRAYISH BROWN CLAY WITH DARK BROWN SILTSTONE DEBRIS, HIGH PLASTICITY*		13
4.0	ONZOLE *ONZOLE*	LIMONITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA MARRON AMARILLENTA, COMPLETAMENTE METEORIZADA *YELLOWISH BROWN SILTSTONE VERY WEATHERED*	>1	26, 34, 44
				FIN : 4.05 m *END : 4.05 m*		

313

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 2
SOUNDING No:

COORDENADAS : N 9892380 E 607370
COORDINATE :

FECHA : 12-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30) 0 10 20 30 40 50
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		COVERTURA VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*	
1.0				LIMO ARCILLOSO GRIS BLANQUESINO CON CLASTOS DE LIMOLITA *LIGHTGRAY CLAYEY SILT WITH DEBRIS OF SILTSTONE*		2, 4
				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMO-ARCILLOSO MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN CLAYEY SILTSTONE MATRIX*	CONSISTENTE *STIFF*	7, 15
2.0	ONZOLE *ONZOLE*	LUTITA COMPLETAMENTE METEORIZADAS *VERY WEATHERED MUDSTONE*		LUTITA MARRON AMARILLENTA COMPLETAMENTE METEORIZADA *VERY WEATHERED YELLOWISH BROWN MUDSTONE*	V	26, 33
3.0						42, 47
				FIN : 3.60 m *END : 3.60 m*		
4.0						

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

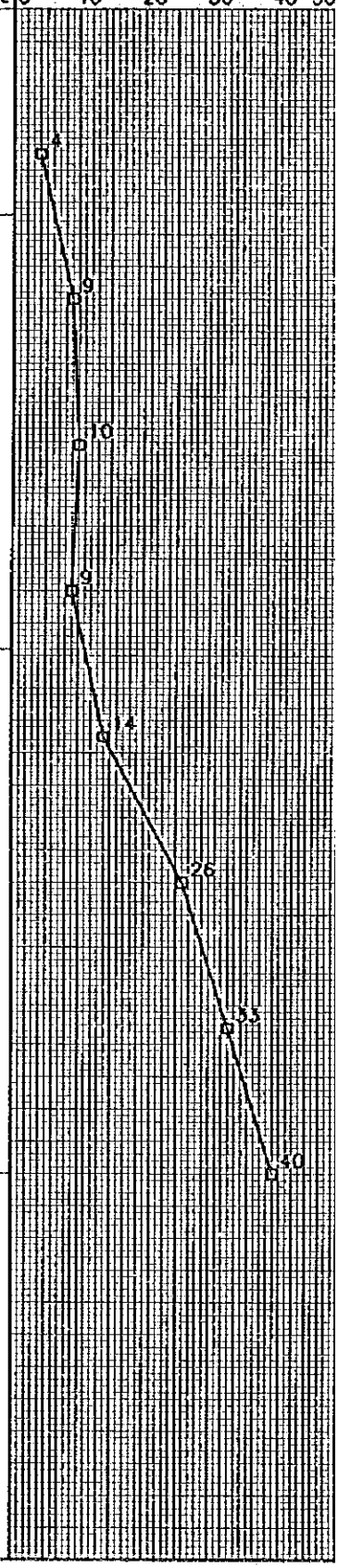
SONDEO : S - 3
SOUNDING No:

COORDENADAS : N 9892330 E 607370
COORDINATE :

FECHA : 12-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	VEGETAL *VEGETAL*		SUELO VEGETAL *VEGETAL SOIL*	
		COLUVIAL *COLLUVIUM*		ARCILLA GRIS AMARILLENTA CON ALGO DE CLASTOS METEORIZADOS *YELLOWISH GRAY CLAY WITH WEATHERED DEBRIS*	BLANDO *SOFT*
1.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMO-ARCILLOSO MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN CLAYEY SILT MATRIX*	CONSISTENTE *STIFF*
2.0	ONZOLE *ONZOLE*	LIMONITA COMPLETAMENTE METEORIZADAS *VERY WEATHERED SILTSTONE*		LIMOLITA MARRON AMARILLENTA, COMPLETAMENTE METEORIZADA CON PLANOS OXIDADOS *VERY WEATHERED YELLOWISH BROWN SILTSTONE WITH OXIDIZED JOINTS*	
3.0					
4.0				FIN : 3.60 m *END : 3.60 m*	

SPT (N30)



315

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 4
SOUNDING No:

COORDENADAS : N 9892240 E 607100
COORDINATE :

FECHA : 12-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30) 0 10 20 30 40 50
	COLUVIAL *COLLUVIUM*	VEGETAL *VEGETAL*		SUELO VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*	
1.0	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		CLASTOS METEORIZADOS DE ARENISCA FINA EN MATRIZ LIMO ARCILLOSA MARRON AMARILLA *WEATHERED DEBRIS OF FINE GRAINED SANDSTONE IN CLAYEY SILT MATRIX IN YELLOWISH BROWN COLOR*	CONSISTENTE *STIFF*	5 7
2.0	ONZOLE *ONZOLE*	ARENISCA FINA METEORIZADA *WEATHERED FINE GRAINED SANDSTONE*		ARENISCA FINA LIMOSA AMARILLA, COMPLETAMENTE METEORIZADA *VERY WEATHERED YELLOWISH SILTY FINE GRAINED SANDSTONE*		22 28
3.0				FIN : 2.20 m *END : 2.20 m*		
4.0						

16

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

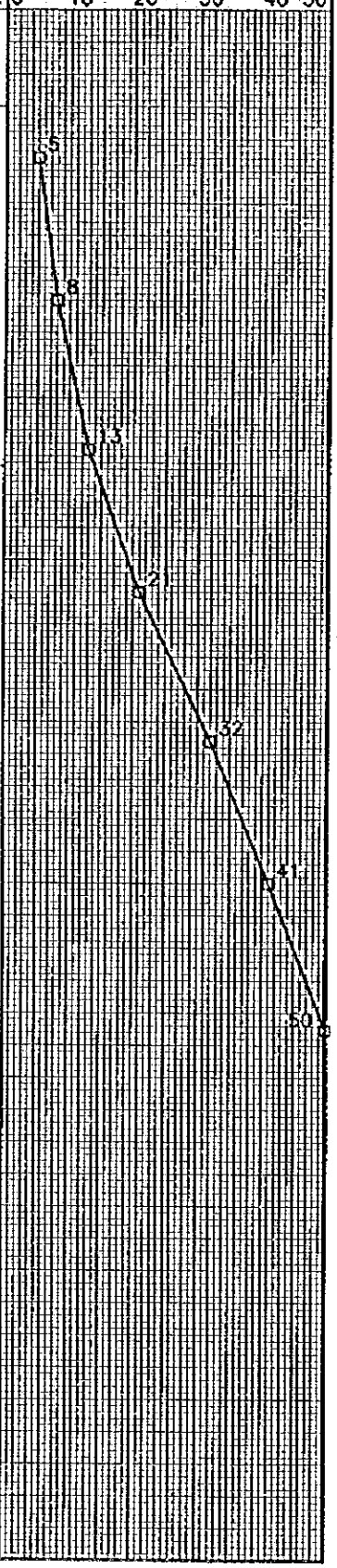
SONDEO : S - 5
SOUNDING No:

COORDENADAS : N 9892210 E 607010
COORDINATE :

FECHA : 12-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	VEGETAL *VEGETAL*		SUELO VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*
		COLUVIAL *COLLUVIUM*		ARCILLA MARRON OSCURA CON ALGO DE CLASTOS DE LIMOLITA *DARKBROWN CLAY WITH SILTSTONE DEBRIS*	CONSISTENTE *STIFF*
1.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMO-ARCILLOSA MARRON ARCILLOSA *WEATHERED DEBRIS OF SILTSTONE IN CLAYEY-SILT MATRIX YELLOWISH BROWN COLOR*	
2.0	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA MARRON COMPLETAMENTE METEORIZADA *WEATHERED BROWN SILTSTONE*	
3.0				FIN : 3.15 m *END : 3.15 m*	
4.0					

SPT (N30)



31)

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 6
SOUNDING No:

COORDENADAS : N 9892180 E 607030
COORDINATE :

FECHA : 12-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30) 0 10 20 30 40 50
	COLUVIAL *COLLUVIUM*	VEGETAL *VEGETAL*		SUELO VEGETAL *VEGETAL SOIL*	CONSISTENTE *STIFF*	
		COLUVIAL *COLLUVIUM*		ARCILLA MARRON OSCURA CON ALGO DE CLASTOS METEORIZADOS *DARKBROWN CLAY WITH WEATHERED DEBRIS*		4 7
1.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMOSA MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*		12
	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA MARRON AMARILLA COMPLETAMENTE METEORIZADA *VERY WEATHERED YELLOWISH BROWN SILTSTONE*	IV	18
2.0				MUY METEORIZADA *VERY WEATHERED*	IV	31 R
				FIN : 2.50 m *END : 2.50 m*		
3.0						
4.0						

318

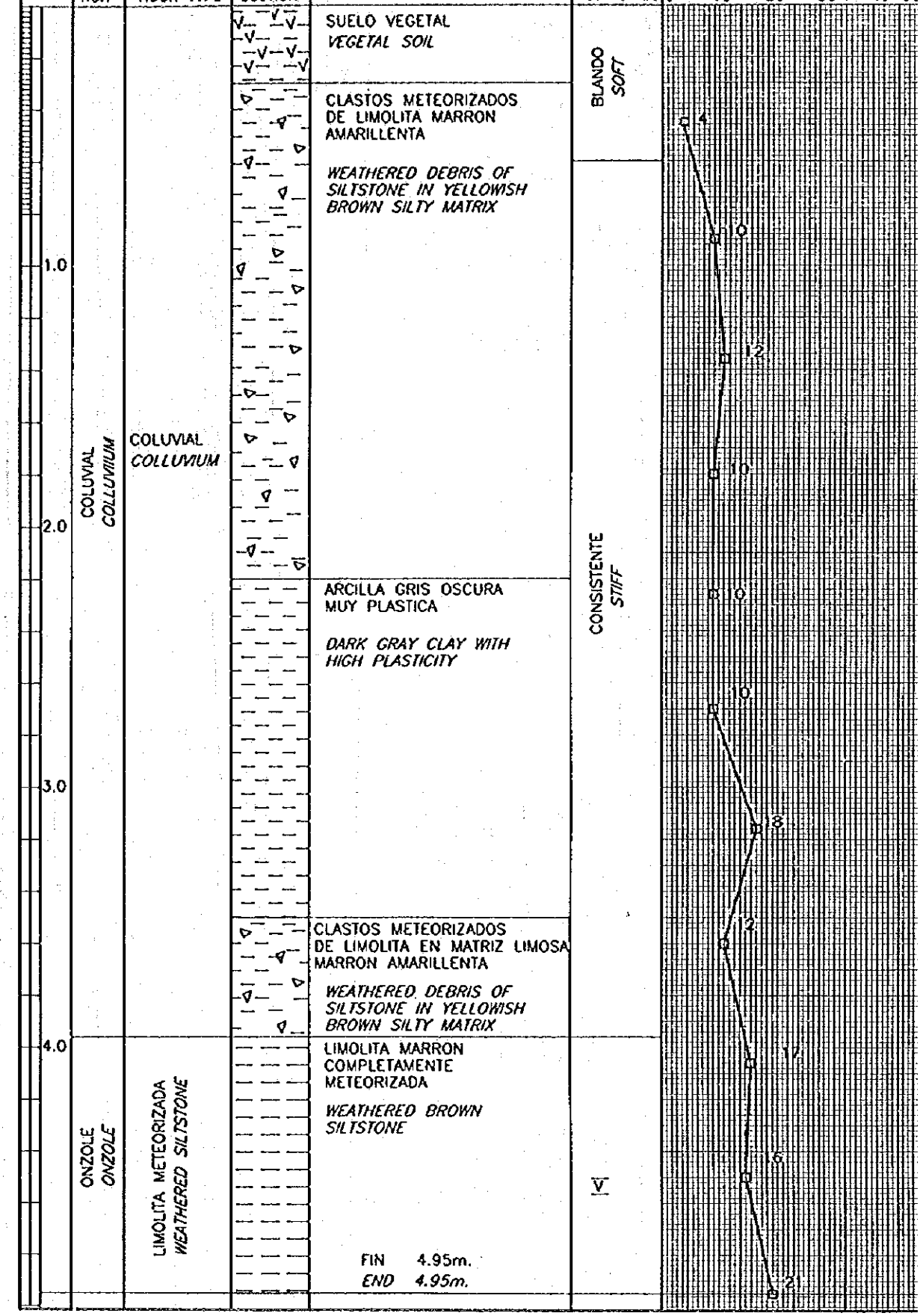
PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 7
SOUNDING No:

COORDENADAS : N 9892180 E 606840
COORDINATE :

FECHA : 13-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		SUELO VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*
				CLASTOS METEORIZADOS DE LIMOLITA MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*	CONSISTENTE *STIFF*
				ARCILLA GRIS OSCURA MUY PLASTICA *DARK GRAY CLAY WITH HIGH PLASTICITY*	
				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMOSA MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*	
	ONZOLE *ONZOLE*	LIMOLITA METEORIZADA *WEATHERED SILTSTONE*		LIMOLITA MARRON COMPLETAMENTE METEORIZADA *WEATHERED BROWN SILTSTONE*	V
				FIN 4.95m. *END 4.95m.*	



319

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

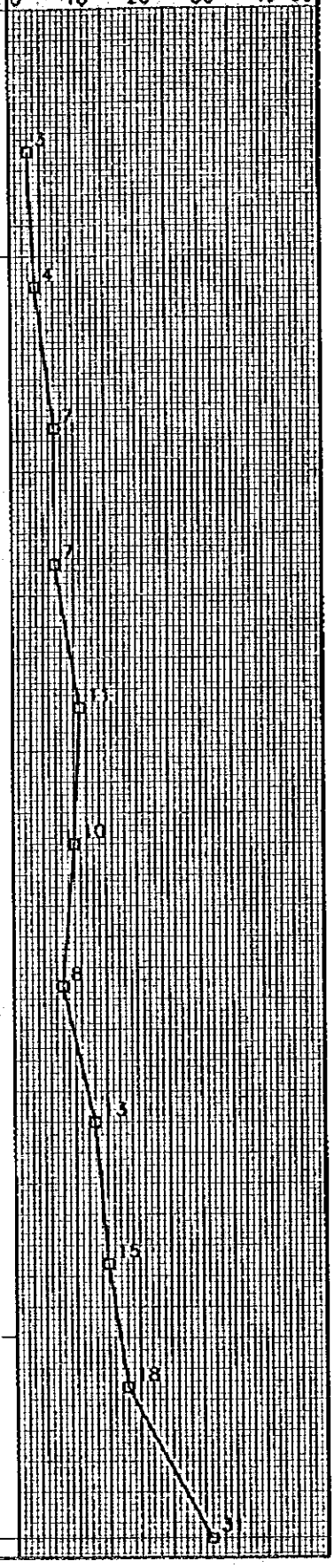
SONDEO : S - 8
SOUNDING No:

COORDENADAS : N 9892110 E 606865
COORDINATE :

FECHA : 13-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		SUELO VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*
				ARCILLA GRIS OSCURA MUY PLASTICA *DARK GRAY CLAY HIGHT PLASTICITY*	
1.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMOSA MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*	CONSISTENTE *STIFF*
2.0					
3.0				ARCILLA GRIS OSCURA CON ALGO DE CLASTOS OXIDADOS, MUY PLASTICA *DARK GRAY CLAY WITH OXIDIZED DEBRIS, HIGHT PLASTICITY*	
4.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMO ARCILLOSA MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN CLAYEY-SILTY MATRIX*	
	ONZOLE *ONZOLE*	LIMOLITA METEORIZADA *WEATHERED SILTSTONE*		LIMOLITA MARRON GRISACEA COMPLETAMENTE METEORIZADA *WEATHERED GRANISH BROWN SILTSTONE*	V
				FIN 4.95m. *END 4.95m.*	

SPT (N30)



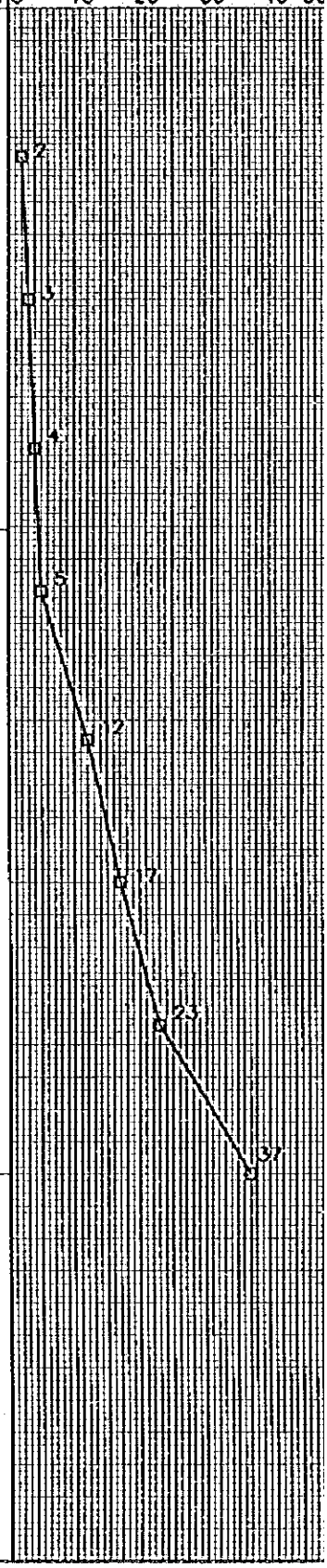
PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 9
SOUNDING No:

COORDENADAS : N 9891930 E 606620
COORDINATE :

FECHA : 13-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
				SUELO VEGETAL *VEGETAL SOIL*	
1.0	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMO-ARCILLOSA MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN CLAYEY SILT MATRIX*	BLANDO *SOFT*
2.0 3.0	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA COMPLETAMENTE METEORIZADA, COLOR MARRON AMARILLENTO *VERY WEATHERED YELLOWISH BROWN SILTSTONE*	VI
4.0				FIN : 3.60 m *END : 3.60 m*	



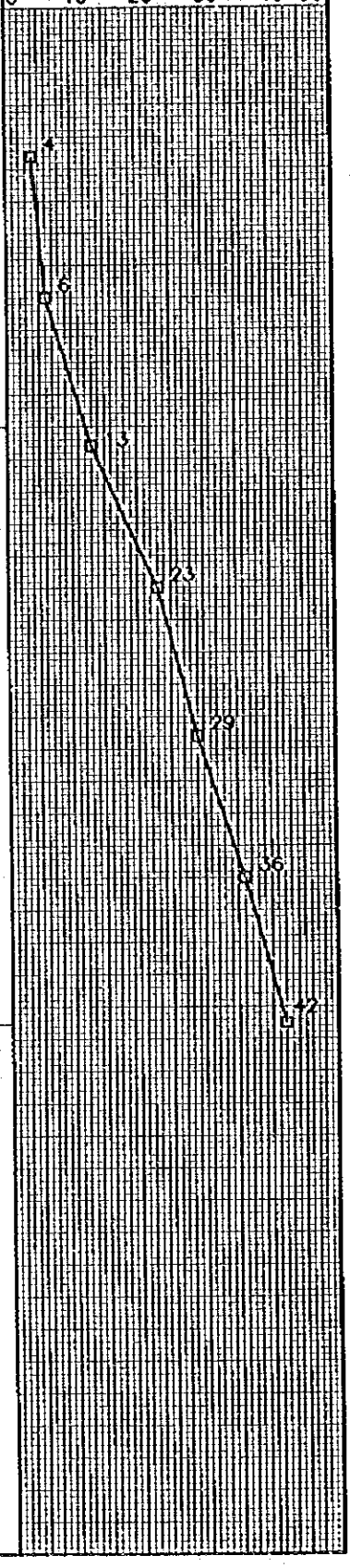
PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 10
SOUNDING No:

COORDENADAS : N 9891880 E 606650
COORDINATE :

FECHA : 13-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30)
				SUELO VEGETAL *VEGETAL SOIL*		
1.0	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMO-ARCILLOSA MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN CLAYEY SILT MATRIX*	CONSISTENTE *STIFF*	
2.0	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA COMPLETAMENTE METEORIZADA, COLOR MARRON AMARILLENTO *VERY WEATHERED YELLOWISH BROWN SILTSTONE*	VI	
3.0				FIN : 3.15 m *END : 3.15 m*		
4.0						



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PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

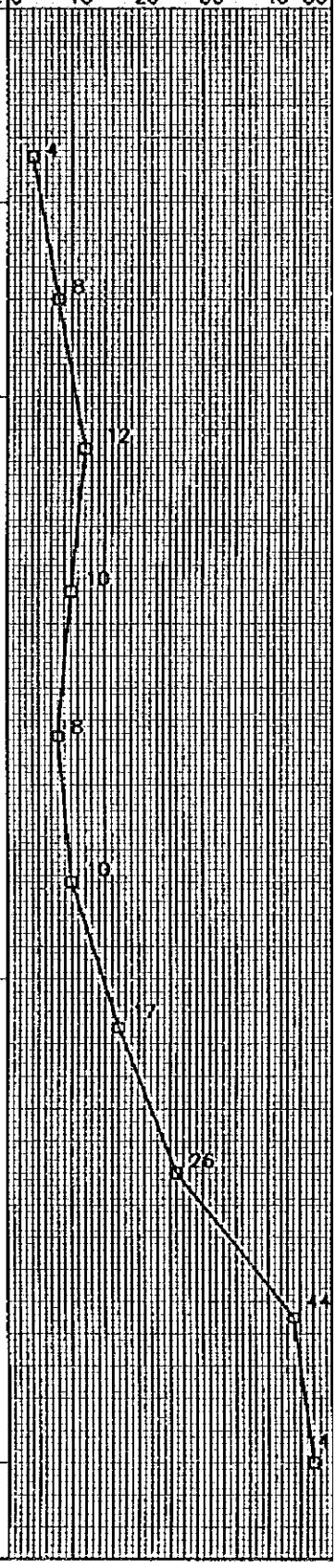
SONDEO : S - 11
SOUNDING No:

COORDENADAS : N 9891730 E 606440
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		SUELO VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*
				ARCILLA GRIS OSCURA PLASTICA *DARKGRAY CLAY HIGH PLASTICITY*	BLANDO *SOFT*
1.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMO ARCILLOSA GRIS *WEATHERED DEBRIS OF SILTSTONE IN GRAY CLAYEY SILT MATRIX*	CONSISTENTE *STIFF*
2.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMOSA MARRON AMARILLO *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*	CONSISTENTE *STIFF*
3.0	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA MARRON AMARILLA COMPLETAMENTE METEORIZADA *VERY WEATHERED YELLOWISH BROWN SILTSTONE*	V
4.0				FIN : 4.50 m *END : 4.50 m*	

SPT (N30)



323

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 12
SOUNDING No:

COORDENADAS : N 9891745 E 606410
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30) 0 10 20 30 40 50
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		SUELO VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*	
				ARCILLA GRIS PLASTICA *GRAY CLAY HIGHT PLASTICITY*		4
1.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMOSA GRIS *WEATHERED DEBRIS OF SILTSTONE IN GRAY SILTY MATRIX*	ALGO CONSISTENTE *SOME STIFF*	6
				MATRIZ COLOR MARRON AMARILLENTO *YELLOWISH BROWN MATRIX*		6
2.0						8
						8
3.0	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA MARRON AMARILLA COMPLETAMENTE METEORIZADA *VERY WEATHERED YELLOWISH BROWN SILTSTONE*	V	16
						23
4.0						29
				FIN : 4.05 m *END : 4.05 m*		

326

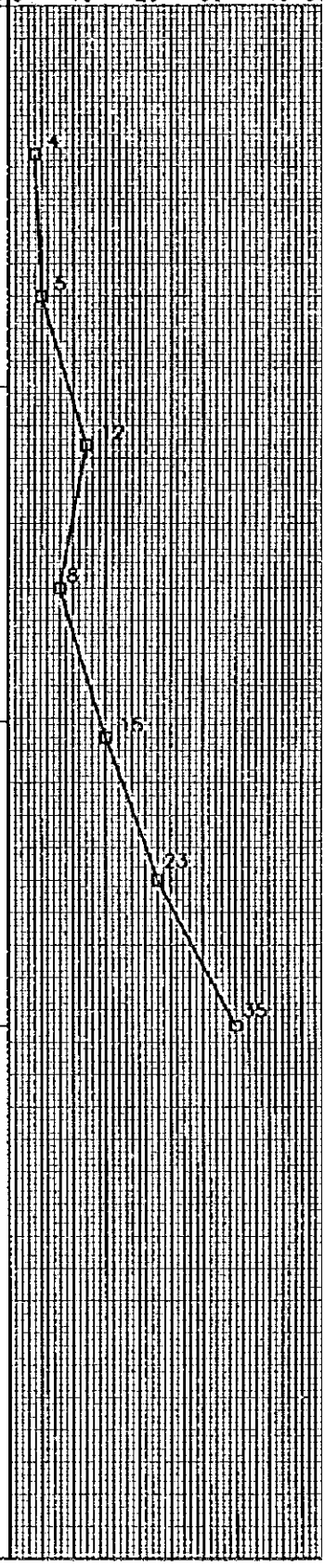
PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 13
SOUNDING No:

COORDENADAS : N 9891550 E 606440
COORDINATE :

FECHA : 14-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		SUELO VEGETAL *VEGETAL SOIL*	BLANDO *SOFT*
1.0				CLASTOS METEORIZADOS DE LIMOLITA EN MATRIZ LIMOSA MARRON AMARILLENTA *WEATHERED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*	
2.0				CLASTOS OXIDADOS *OXIDIZED DEBRIS*	CONSISTENTE *STIFF*
3.0	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA MARRON AMARILLA COMPLETAMENTE METEORIZADA *VERY WEATHERED YELLOWISH BROWN SILTSTONE*	
4.0				FIN : 3.15 m *END : 3.15 m*	



325

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 14
SOUNDING No:

COORDENADAS : N 9891320 E 606485
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30) 0 10 20 30 40 50
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		LIMO GRIS CLARO CON CLASTOS DE LUTITA METEORIZADOS *LIGHT GRAY SILT WITH WEATHERED MUDSTONE DEBRIS*	BLANDO *SOFT*	2, 4
1.0				CLASTOS METEORIZADOS DE LUTITA GRIS CLARO EN MATRIZ LIMO ARCILLOSA *WEATHERED DEBRIS OF GRAY MUDSTONE IN CLAYEY SILT MATRIX*	ALGO CONSISTENTE *SOME STIFF*	5, 3, 6
2.0				ARCILLA GRIS OSCURA CON ALGO DE CLASTOS *DARK GRAY CLAY WITH SOME DEBRIS*		5, 11
3.0	ONZOLE *ONZOLE*	LUTITA GRIS *GRAY MUDSTONE*		LUTITA GRIS VERDOSA CON INDICIOS DE CONCHAS *GREENISH GRAY SHALE WITH TRACE OF SHELLS*	121	26, 6
4.0				FIN : 4.05 m *END : 4.05 m*		

326

PROYECTO : DISEÑO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

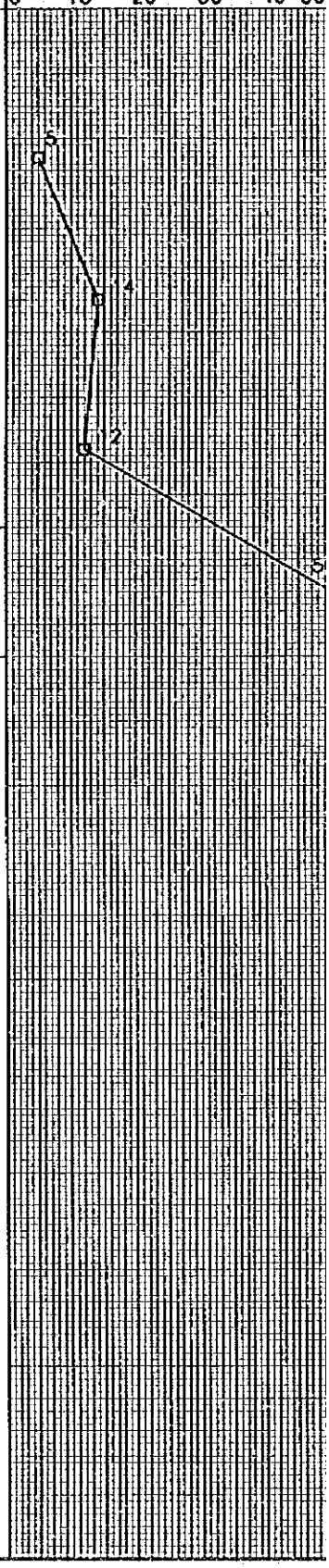
SONDEO : S - 15
SOUNDING No:

COORDENADAS : N 9891330 E 606460
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		LIMO ARCILLOSO NEGRUZCO *BLACKISH CLAYEY SILT*	CONSISTENTE *STIFF*
1.0				CLASTOS METEORIZADOS DE LIMOLITA GRIS CLARO CON ALGO DE ARCILLA GRIS OSCURA *WEATHERED DEBRIS OF SILTSTONE WITH SOME DARK GRAY CLAY*	
2.0	ONZOLE *ONZOLE*	LUTITA GRIS *GRAY MUDSTONE*		LUTITA GRIS VERDOSA CON INDICIOS DE CONCHAS *GREENISH GRAY MUDSTONE WITH TRACE OF SHELLS*	RV
3.0				FIN : 2.00 m *END : 2.00 m*	
4.0					

SPT (N30)



327

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

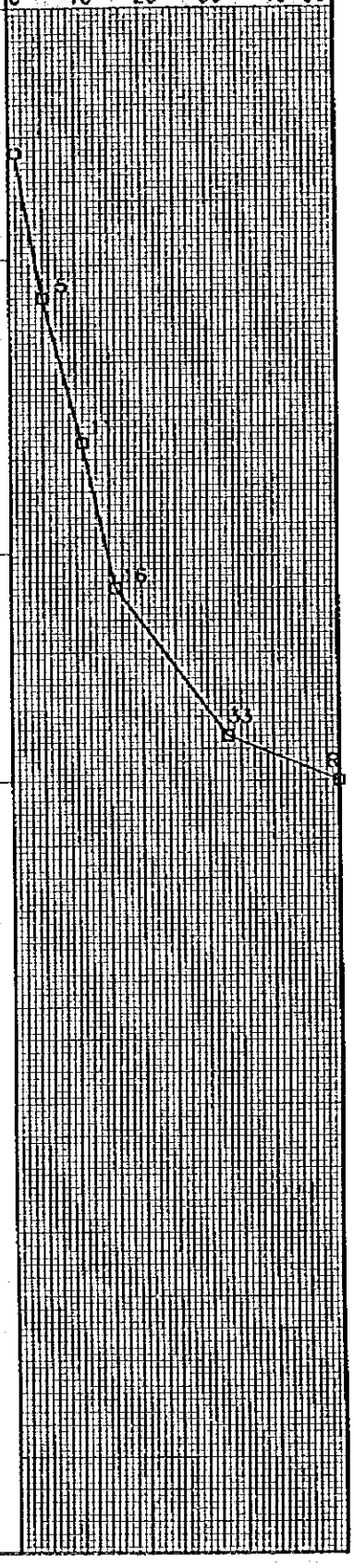
SONDEO : S - 16
SOUNDING No:

COORDENADAS : N 9891180 E 606320
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		SUELO VEGETAL NEGRUZCO *BLACKISH VEGETAL SOIL*	BLANDO *SOFT*
				ARCILLA GRIS OSCURA CON ALGO DE CLASTOS DE LIMOLITA GRIS CLARA *DARK GRAY CLAY WITH SOME DEBRIS OF LIGHT GRAY SILTSTONE*	CONSISTENTE *STIFF*
1.0				CLASTOS Y BLOQUES DE LIMOLITA GRIS CLARO EN MATRIZ LIMO ARCILLOSA *LIGHT GRAY DEBRIS AND BLOCKS OF SILTSTONE IN CLAYEY SILT MATRIX*	
2.0	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA MARRON AMARILLENTA, MUY METEORIZADA *VERY WEATHERED YELLOWISH BROWN SILTSTONE*	IV
				FIN : 2.40 m *END : 2.40 m*	
3.0					
4.0					

SPT (N30)



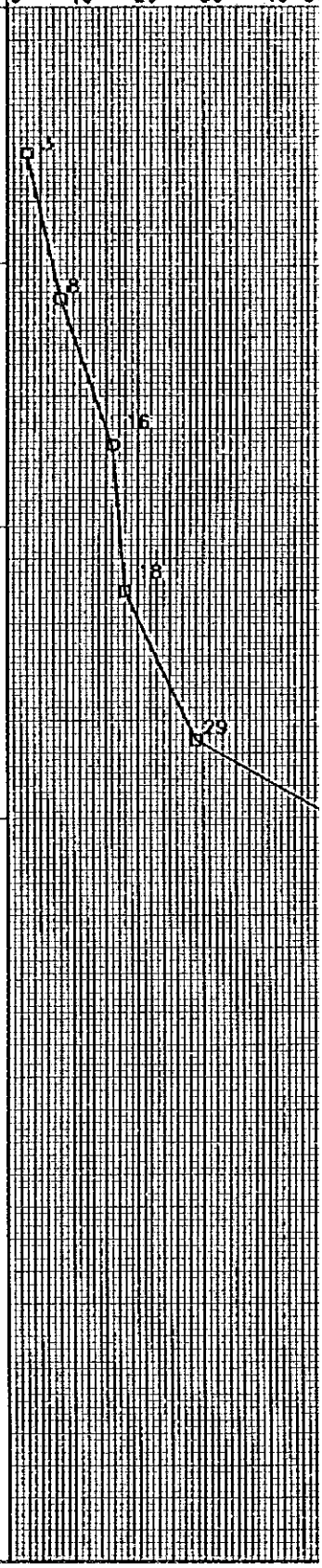
PROYECTO : DISEÑO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 17
SOUNDING No:

COORDENADAS : N 9891210 E 606310
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30)
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		SUELO VEGETAL NEGRUZCO *BLACKISH VEGETAL SOIL*		
				ARCILLA LIMOSA GRIS OSCURA CON INDICIOS DE MATERIAL ORGANICO Y CLASTOS METEORIZADOS *DARK GRAY SILTY CLAY WITH TRACES OF WEATHERED DEBRIS AND ORGANIC MATERIAL*	BLANDO *SOFT*	
1.0				CLASTOS Y BLOQUES METEORIZADOS DE LIMOLITA EN MATRIZ LIMO ARCILLOSA MARRON AMARILLA *WEATHERED SILTSTONE DEBRIS AND BLOCKS IN YELLOWISH BROWN CLAYEY SILT MATRIX*	CONSISTENTE *STIFF*	
2.0	ONZOLE *ONZOLE*	LIMOLITAS METEORIZADAS *WEATHERED SILTSTONE*		LIMOLITA MARRON AMARILLENTA COMPLETAMENTE METEORIZADA Y OXIDADA *VERY WEATHERED AND OXIDIZED YELLOWISH BROWN SILTSTONE*	IV	
				FIN : 2.50 m *END : 2.50 m*		
3.0						
4.0						



329

PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

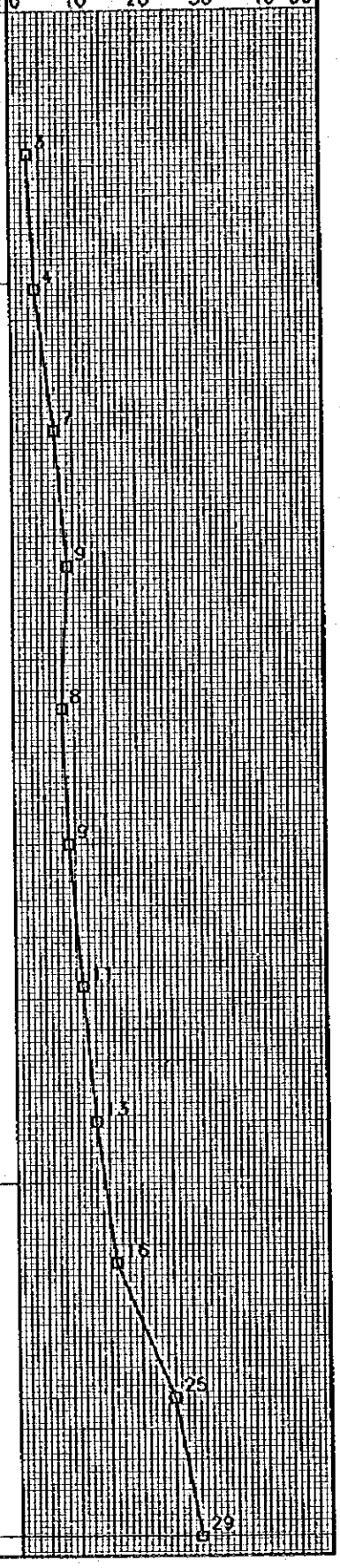
SONDEO : S - 18
SOUNDING No:

COORDENADAS : N 9891080 E 606140
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
				SUELO VEGETAL *VEGETAL SOIL*	
				ARCILLA NEGRUZCA CON INDICIOS DE CLASTOS OXIDADOS *BLACKISH CLAY WITH TRACES OF OXIDIZED DEBRIS*	BLANDO *SOFT*
1.0	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		CLASTOS OXIDADOS DE LIMOLITA EN MATRIZ ARCILLOSA MARRON AMARILLENTA *OXIDIZED DEBRIS OF SILTSTONE IN YELLOWISH BROWN CLAYEY MATRIX*	
2.0				ARCILLA MARRON GRISACEA CON BASTANTE CLASTOS METEORIZADOS *GRAYISH BROWN CLAY WITH NUMEROUS WEATHERED DEBRIS*	CONSISTENTE *STIFF*
3.0				CLASTOS METEORIZADOS Y OXIDADOS DE LIMOLITA EN MATRIZ LIMOSA MARRON AMARILLA *WEATHERED AND OXIDIZED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*	
4.0	ONZOLE *ONZOLE*	LUTITA METEORIZADA *WEATHERED MUDSTONE*		LUTITA MARRON AMARILLENTA COMPLETAMENTE METEORIZADA *WEATHERED YELLOWISH BROWN MUDSTONE*	V
				FIN 4.95m. *END 4.95m.*	

SPT (N30)



330

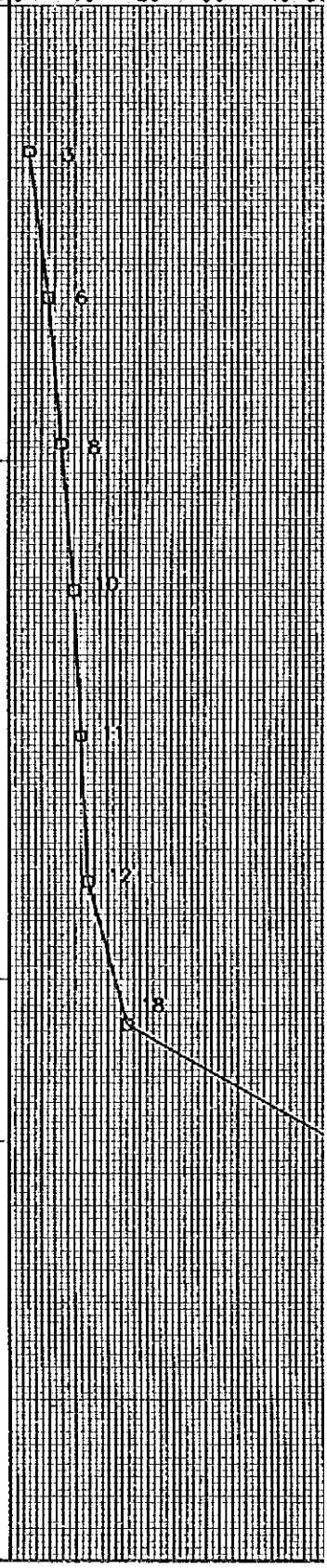
PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 19
SOUNDING No:

COORDENADAS : N 9890360 E 606130
COORDINATE :

FECHA : 11-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
				SUELO VEGETAL NEGRUZCO *BLACKISH VEGETAL SOIL*	
1.0	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		ARCILLA MARRON GRISACEA CON ALGO DE CLASTOS METEORIZADOS Y OXIDADOS *GRAYISH BROWN CLAY WITH SOME WEATHERED AND OXIDIZED DEBRIS*	BLANDO *SOFT*
2.0				CLASTOS METEORIZADOS Y OXIDADOS DE LIMOLITA EN MATRIZ LIMOSA MARRON AMARILLENTA *WEATHERED AND OXIDIZED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*	CONSISTENTE *STIFF*
3.0	ONZOLE *ONZOLE*	ARENISCA MUY FINA METEORIZADA *WEATHERED FINE GRAINED SILTY SANDSTONE*		ARENISCA LIMOSA MUY FINA MARRON AMARILLENTA *YELLOWISH BROWN FINE GRAINED SILTY SANDSTONE*	121
4.0				FIN : 3.50 m *END : 3.50 m*	



PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 20
SOUNDING No:

COORDENADAS : N 9890370 E 606090
COORDINATE :

FECHA : 12-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*	SPT (N30) 0 10 20 30 40 50
				SUELO VEGETAL NEGRUZCO *BLACKISH VEGETAL SOIL*		
1.0	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		ARCILLA MARRON GRISACEA CON ALGO DE CLASTOS METEORIZADOS *GRAYISH BROWN CLAY WITH SOME OF WEATHERED DEBRIS*	BLANDO *SOFT*	4, 6
2.0				CLASTOS METEORIZADOS Y OXIDADOS DE LIMOLITA EN MATRIZ LIMOSA MARRON AMARILLENTA *WEATHERED AND OXIDIZED DEBRIS OF SILTSTONE IN YELLOWISH BROWN SILTY MATRIX*	CONSISTENTE *STIFF*	8, 10, 11, 18
3.0	ONZOLE *ONZOLE*	ARENISCA MUY FINA METEORIZADA *WEATHERED FINE GRAINED SILTY SANDSTONE*		ARENISCA GRANO FINO LIMOSA MARRON AMARILLENTA *YELLOWISH BROWN FINE GRAINED SILTY SANDSTONE*	IV	23, 31
4.0				FIN : 360 m *END : 3.60 m*		

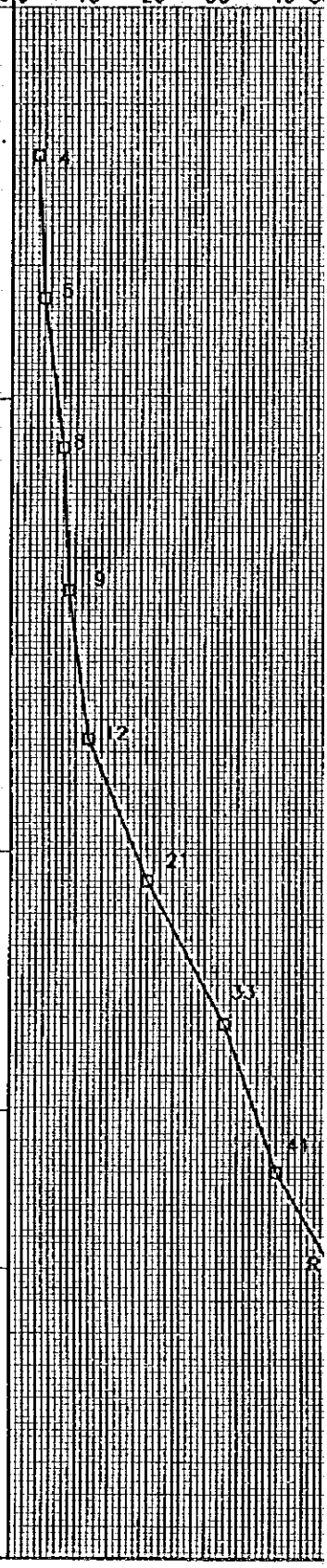
PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S - 21
SOUNDING No:

COORDENADAS : N 9890760 E 605950
COORDINATE :

FECHA : 12-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*	COLUVIAL *COLLUVIUM*		ARCILLA LIMOSA GRIS OSCURA *DARK GRAY SILTY CLAY*	BLANDO *SOFT*
1.0				ARCILLA MARRON GRISACEA CON ALGO DE CLASTOS METEORIZADOS *GRAYISH BROWN CLAY WITH SOME OF WEATHERED DEBRIS*	
2.0				CLASTOS METEORIZADOS DE LUTITA EN MATRIZ ARCILLOSA MARRON AMARILLENTA *WEATHERED DEBRIS OF MUDSTONE IN YELLOWISH BROWN CLAYEY MATRIX*	CONSISTENTE *STIFF*
3.0	ONZOLE *ONZOLE*	LUTITA METEORIZADA *WEATHERED MUDSTONE*		LUTITA MARRON AMARILLENTA COMPLETAMENTE METEORIZADA *WEATHERED YELLOWISH BROWN MUDSTONE*	IV
				MUY METEORIZADA *VERY WEATHERED*	III
4.0				FIN : 3.90 m *END : 3.90 m*	



PROYECTO : DISENO TRASVASES CHONE-PORTOVIEJO
PROJECT : THE DETAILING DESIGN ON TRANSBASIN CHONE-PORTOVIEJO

SONDEO : S-22
SOUNDING No:

COORDENADAS : N 9890700 E 605900
COORDINATE :

FECHA : 12-01-94
DATE :

PROF. *DEPTH*	FORMACION *FORMATION*	TIPO DE SUELO o ROCA *SOIL OR ROCK TYPE*	PERFIL *COLUMN SECTION*	DESCRIPCION *DESCRIPTION*	CALIDAD DE SUELO o ROCA *SOIL OR ROCK GRADE*
	COLUVIAL *COLLUVIUM*			SUELO VEGETAL NEGRUSCO *VEGETAL SOIL*	BLANDO *SOFT*
				LIMO ARCILLOSO MARRON OSCURO CON ALGO DE CLASTOS METEORIZADOS. *DARK BROWN CLAYEY SILT WITH SOME WEATHERED DEBRIS*	
1.0				MARRON AMARILLO *YELLOWISH BROWN COLOR*	CONSISTENTE *STIFF*
				CLASTOS DE ARENISCA MUY FINA COMPLETAMENTE METEORIZADOS EN MATRIZ LIMO-ARENOSA *WEATHERED DEBRIS OF FINE GRAINED SANDSTONE IN SANDY SILT MATRIX*	
	ONZOLE *ONZOLE*	ARENISCA MUY FINA METEORIZADA *WEATHERED FINE GRAINED SILTY SANDSTONE*		ARENISCA MUY FINA LIMOSA COMPLETAMENTE METEORIZADA MARRON AMARILLO *VERY WEATHERED YELLOWISH BROWN FINE GRAINED SANDSTONE.*	V
2.0					
3.0				FIN 2.95m. END 2.95m.	
4.0					

SPT (N30)